Gendered L1 attrition and L2 acquisition of pitch range in Japanese-English sequential bilinguals

Elisa Passoni

Submitted in partial fulfilment
of the requirements of the degree of
Doctor of Philosophy

December 2020

School of Languages, Linguistics and Film
Queen Mary University of London

Statement of originality

I, Elisa Passoni, confirm that the research included within this thesis is my own work or that where it has been carried out in collaboration with, or supported by others, that this is duly acknowledged below, and my contribution indicated. Previously published material is also acknowledged below.

I attest that I have exercised reasonable care to ensure that the work is original and does not to the best of my knowledge break any UK law, infringe any third party's copyright or other Intellectual Property Right, or contain any confidential material.

I accept that the College has the right to use plagiarism detection software to check the electronic version of the thesis.

I confirm that this thesis has not been previously submitted for the award of a degree by this or any other university. The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without the prior written consent of the author.

Signature:

Date: 15/12/2020

Abstract

This project investigated pitch range production in Japanese-English female and male sequential bilinguals. This language combination was chosen because high pitch level has been claimed to index femininity in Japanese (Ohara, 2019) whereas in English an increase in pitch level is used to index friendliness by both females and males (Loveday, 1981).

Data were collected through a reading task and voicemail task from 19 Japanese-English bilinguals in London (UK), 21 Japanese-English bilinguals in Tokyo (JP), 15 Japanese monolinguals in Tokyo and 16 English monolinguals in London (49 females vs 21 males). In both tasks, speech was directed to an imaginary addressee varying in formality and sex. Of interest was to examine the extent to which Japanese and English influenced one another with regard to L1 attrition and L2 acquisition. The effect of individual gender identity on pitch range was investigated to assess whether, e.g., female bilinguals who closely identified with femininity would produce a high pitch level.

In the reading task, Japanese female and male monolinguals produced significantly higher f0 maximum and wider pitch span than English monolinguals, irrespective of addressee. Regarding L1 attrition, bilingual males produced a significantly lower f0min in their Japanese than the Japanese monolingual males, suggesting a restructuring of the L1. Regarding L2 acquisition, English f0 mean and f0 maximum of the female bilinguals was significantly higher than that of the English females, suggesting an influence from Japanese on English. Additionally, English f0 mean was lower for both female bilinguals who rated themselves as more masculine and male bilinguals who rated themselves as more feminine on the English gender questionnaire. These results were not replicated in semi-spontaneous speech.

Summarising, gender-specific patterns of L1 attrition and L2 acquisition were evidenced with regard to read speech, but not semi-spontaneous speech. This suggests that the formality of read speech might enhance the production of language and gender normative pitch range and that individual gender identity might have been expressed alternatively in semi-spontaneous speech.

Publications from the thesis

Passoni, E., de Leeuw, E., & Levon, E. (2019). Two languages, two pitch ranges: The case of Japanese-English sequential bilinguals. *Proceedings of the 19th International Congress of Phonetic Sciences, Melbourne, Australia 2019*, 1650–1654.

Passoni, E., Mehrabi, A., Levon, E., & de Leeuw, E. (2018). Bilingualism, pitch range and social factors: Preliminary results from sequential Japanese-English bilinguals. *9th International Conference on Speech Prosody, Poznań, Poland, 2018*, 384–388. https://doi.org/10.21437/SpeechProsody.2018-78

Passoni, E., de Leeuw, E. & Levon, E. (accepted pending minor amendments), Bilinguals produce pitch range differently in their two languages to convey social meaning.

Acknowledgments

Almost exactly 5 years ago, on the 11th of December 2015, the very first draft of a project called 'Indexing gender in bilingual speech' was written. Five years later, after some major world political events and a pandemic, the time has come to submit the thesis that was borne out of that draft for examination. I am not going to lie; it's been a hell of a ride! Luckily, even if at times it felt really lonely, an incredible amount of people has helped and supported me along the way in many different ways. This is my time to warmly thank all of them!

First and foremost, I would like to thank my first supervisor, Dr Esther de Leeuw, whose great knowledge and wisdom have made this journey not only intellectually stimulating but also exciting. Thanks for reassuring me in times of doubt and not giving up on me despite my horrifying English. It has been a real pleasure and no words will express my gratitude.

I am also indebted to my second supervisor, Professor Erez Levon, whose knowledge about gender and society has been invaluable. I am grateful for his immense patience in dealing with my incapacity to fully grasp whether I should call females women or women females and the grace with which he has suggested several times that my highly obsessive fixation on the perfect statistical tool was a bit over the top.

I must also thank Professor Arai and Professor Kitahara (in no particular order), who welcomed me at Sophia University and allowed me to use their labs as if I were one of their students. Another mega thanks goes to Tomoko; this project would have never happened without her knowledge of Japanese and English language and society and her impeccable translation skills. I am also very grateful that, thanks to this project, I can now count her as one of my best friends. A further round of applause goes to Eri, Justin, Megumi and Yuriko; for their precious help in collecting the Japanese monolingual data and finding participants for my project.

Obviously the 72 individuals who agreed to take part in the study must also be thanked: 'Thanks for offering your voice to my research and not running away despite the length of the experiment! You have all been great participants!'

I would also like to mention Ynda, Pedro, Mohammad, and Scott who have been great PhD colleagues and friends. Thanks to Ynda, for explaining to me what gender is (at least)

1000000 times and chatting about music and life, Pedro and Mohammad for sharing some of the best (academic) chats over my (no longer existing) smoking habit, and Scott for ensuring I always drunk enough beer at the pub! Thanks also to Adib, for helping with audio and stats, for the coffees and, especially, showing me that coding does not bite ;)

I think the next round of thanks should go to my family for having always believed in me, even when I came up with the most insane idea and given me the possibility to implement all of those insane ideas. Maybe they are also insane, who knows, anyway thanks for never stopping me!

A last mega thanks goes to Kim(bal); you are the single person who contributed the most to this PhD. You were there since the very beginning, you helped with Blobby, almost become a phonetician, proofread this thesis a million times, made me coffee and sandwiches, listened to my rants etcetera etcetera. Honesty, I am surprised that you managed to take all of this in. I am not sure how to thank you enough with words and facts (especially considering that due to Covid-19 we cannot even go on holiday!); anyway, if one day you want to do a PhD, I will be there to pay my debt back to you. Till then, let's have fun ;)

This research was kindly supported by funding from the Economic and Social Research Council through the Queen Mary and Goldsmiths ESRC Doctoral Training Centre DTG 2011 (grant n. ES/J500124/1), the Great Britain Sasakawa Foundation (grant n. 5359), and the Queen Mary University of London Postgraduate Research Fund.

Table of contents

List of tables

List of figures

List of abbreviations

JWL	Japanese women language
JML	Japanese men language
SSBE	Southern Standard British English
Hz	Hertz
ST	Semitones
Mel	Melody
ERB	Equivalent rectangular bandwidth
UK	United Kingdom
JP	Japan
FFR	Fundamental frequency range
LTD	Long-term distributional

1 Introduction

Let's imagine being at the theatre, the curtain opens, the stage is empty; suddenly, a voice speaks. Less than a word is needed for the listeners to have already decided, along with many other characteristics, whether the speaker is male or female. Why? What is it about the human voice that gives it such distinctive gendered characteristics, and why is gender something that the voice seeks to convey? Is it biology, or is there a social reason? If the human voice is engendered by society, does this change from society to society, country to country, language to language, or is it a universal trait of all human societies? Do then bilinguals, as those who transcend societies, acquire and produce different female/male voices for each language they speak?

This thesis sets out to explore the effects of bilingualism on socially constrained attributes of pitch range in Japanese native speakers (here used synonymously with first language speakers) who have acquired English as a second language (L2). Japanese females have been reported to speak with an 'artificially high pitch' (Loveday, 1981, p. 83), which has been described 'as sweet as syrup, and as high as a dog whistle. Any higher, and it would shatter the crystal on the seventh floor [of the building]' (Kristof, 1995 par 3). Such high pitch in Japanese females has been attributed to Japanese socio-cultural norms, according to which Japanese women should speak in Japanese women language (JWL) (Inoue, 2006). This language sits at the intersection between gender and standard language ideology (Okamoto, 2018) and it is expected to be *polite*, *gentle*, and *refined* (Okamoto, 2018 italics not mine). This is the language of the ideal(ized) contemporary Japanese women, built on the language and character of the *good wife and wise mother* (良妻賢母), that is, the modern Japanese woman introduced at the end of the 19th century by the Meiji élite (Inoue, 2004). The *good wife and wise mother* embodied Japanese tradition (she was an obedient wife, in charge of running the household) and modernity (she was a wise mother, in charge of raising their children for them to become active part of the future Japan) (Inoue, 2004). This woman would speak Japanese women language (女性語), a submissive and gracious language that reflected and reinforced her characteristics (Inoue, 2004). Prosodically, it is implemented by the use of a sustained high-pitched voice (Ohara, 1992; Hiramoto, 2010), on average 40 Hz higher than that of Western women (Van Bezooijen, 1995). The modern Japanese men, was also attributed a language, Japanese men language (JML) (男性語) which is traditionally defined in opposition to Japanese woman language (Ohara, 2019; Sturtz Sreetharan, 2004). In terms of prosody, this has been referred to ‘a low, almost monotonous, pitch’ (Loveday, 1981, p. 83) indicating a generally “cooler” demeanour (Loveday, 1981; Tsurutani & Shi, 2018). In British English, generally females have a higher pitch level than males and, most likely, are also expected to be more polite and refined in their speech than males (e.g. Cameron, 2014), however, the differences in pitch level between English females and males are not reported to be as stark as between Japanese females and males. Furthermore, in British English, a higher pitch level has been claimed to be used by both females and males to convey friendliness (Loveday, 1981), but again, the rise in pitch to indicate friendliness in British English is far from sounding ‘as sweet as syrup, and as high as a dog whistle’ (Kristof, 1995 par 3).

The phonetic differences are described in more detail in Chapter 4, but at present it is important to emphasise that Japanese females and males, when acquiring British English as an L2, as is the case with regard to this project, may need to modify their pitch patterns to different degrees. In addition, it is conceivable that the acquisition of British English pitch patterns may impact the native Japanese of the female and male bilinguals differently.

1.1 Research question and approach

To examine the extent to which Japanese and English linguistic and social pitch norms may influence one another with regard to L1 attrition and L2 acquisition and shed light on the potential influence that (dis)aligment to language-specific gender roles may have on pitch range, three main questions were answered:

- Is there a bidirectional interaction in the production of pitch range in the two language**s** of Japanese-English female and male bilinguals residing in London (UK) or Tokyo (JP)?
- Does individual gender identity influence variation in the pitch range of the two languages of female and male Japanese-English sequential bilinguals?

- Do bilingualism predictor variables explain variation in the L1 attrition and L2 acquisition findings?

These questions were addressed with a speech production experiment comprising of two speech tasks (a reading task and a voicemail task) and two questionnaires (two gender questionnaires and a background questionnaire). In both speech tasks, important parameters that have been reported to affect pitch range in "real-life" conversations, that is, (in)formality of the addressee (Ohara, 2004; Yuasa, 2008) and sex of the addressee (Biemans, 1998) were experimentally manipulated with picture of imagined addressees. Question two was addressed by investigating the effect of individual's gender identity, operationalised as endorsement of femininity and masculinity traits typical of the Japanese and English society, on the pitch profiles of the two languages of the bilinguals and question three by investigating the role of language background (Age of Acquisition, Length of Residence, Amount of L1 Use and L1/L2 Proficiency) on the pitch range of the two languages of the bilinguals.

Beside these main questions, this project also investigated Standard Japanese and Standard Southern British English monolingual speech, thus providing new evidence on pitch range variation in female and male speakers and tackles important methodological issues relative to data collection in experimental (socio)phonetics.

1.2 Structure of the thesis

Chapter 2 situates this research within the larger theoretical framework of sociophonetics. It provides the definitions of bilingualism, L1 attrition and L2 acquisition used in this thesis and discusses the relevant L2 speech models which have been built to chart the processes involved in L2 acquisition (and which have been extended to the processes involved in L1 attrition).

Chapter 3 introduces the variable analysed in this project, that is, pitch range, and situates it within the context of prosodic variation and expression of social meaning. The chapter opens with a short overview of the roles and meanings of prosodic information in general, before turning to a detailed overview of the reasons which have been proposed for pitch variation between and among individuals.

Chapter 4 focusses on pitch range variation between- and within- speakers of Japanese and English. It opens with a description of the two main reasons which have been posited for differences between and within Japanese and English, namely, phonological and socio-cultural differences. In doing so, the concept of Japanese Women Language is introduced and historically situated, before reviewing previous empirical work describing linguistic and socio-cultural variation in the pitch range of Japanese and English monolinguals and bilinguals, which served as the theoretical justification to the methods implemented in the present study.

In Chapter 5 the general methodology of the study is detailed. Firstly, the research questions that guided this project are introduced, and the research model described. Next, the selection of the speakers and their general relevant characteristics is presented. Thereafter, a detailed description of the speaker's variables taken into account in the present research is provided. The chapter concludes with a presentation of the general predictions for this research.

Chapter 6 and 7 are dedicated to the speech tasks of this project. These two chapters are structured in the same way. Firstly, the task is introduced, and the stimuli used are described. Thereafter, the phonetic and statistical methods used for the analysis are detailed. Next, results are presented; initially, the pitch range of the monolinguals is compared to individuate language-specific pitch norms. Then, to investigate potential L1 attrition and L2 acquisition effects, the pitch range of the two languages of the bilinguals is compared to that of the monolinguals. The last step of the analysis investigates the role of individual gender identity and bilingualism predictor variables on the pitch range of the bilinguals. In all cases, the pitch range of female and male speakers were analysed separately. Each chapter concludes with a discussion of the findings and relates these to the literature described in chapter 2, 3 and 4.

The manuscript concludes with an overview of the results and implications of the project, thereafter its limitations and suggestions for future research into similar topics are explored (Chapter 8).

2 Theoretical background

2.1 Introduction

The basic theoretical background of this study is sociophonetics, that is, a subfield of phonetics which uses detailed phonetic analysis to demonstrate that very fine phonetic detail is used to construct social identity and express social meaning (Hay & Drager, 2007). This study attempts to establish a relation between speech variables (pitch range – the pitch level and span of an individual; Ladd, 2008 and see Chapter 3) and social variables (gender; see below for a definition) within a bilingual context.

There is ample research on monolingual speakers showing that phonetic variables are used to convey social meaning, or 'the conventional association of distinctions in the world with distinctions in the [phonetic] form' (Eckert & Labov, 2017, p. 3) in relation to gendered language practice (Eckert & McConnell-Ginet, 2003; Levon, 2018; Podesva, 2007; Maxwell Schmid & Bradley, 2019). Pitch range has proven particularly fruitful in this regard because much of the phonetic material that speakers produce is believed to be related to sexual dimorphism in the vocal tract anatomy (i.e. differences in the size of the phonation organs determined by differences in size between females and males of the human species; Nikitovic, 2018). While pitch range is surely heavily influenced by physiology, the roles of culture, social conventions, and gender ideology specific to a language cannot be discounted (Podesva & Kajino, 2014). For example, early sociophonetic work has observed that pitch differences between boys and girls can arise even before puberty (Graddol & Swann, 1983) and some of the earliest work on language and gender (Lakoff, 1973) drew attention to the gendering of intonation.

Asserting that the expression of *gender* (at least partially) affects pitch range invites a definition of sex (and gender). Brief definitions of these concepts refer to *sex* as a biological category and *gender* as a socio-culturally determined category (Munson & Babel, 2019). However, such definitions have been criticized as being too simplistic and categorical (Jas, 2020) because they do not allow for within-group variation and do not take into account the ability of a speaker to hold multiple (perhaps conflicting) selves. In line with

Vincent (2018), *sex* is considered in this work as the assignment of a biological category at birth and *gender* as the individual (dis)alignment with gender-prototypical norms typical of a given society and potentially reflected through language. Crucially, this definition of gender highlights that gender prototypical norms may differ across societies and languages, as is claimed to be for the languages of the project at hand (Loveday, 1981; Ohara, 1999), and stresses the role of the individual in performing gender. This is important for this study, as the focus is on determining the extent to which gender-typical norms of the two languages of Japanese-English bilinguals, and the individual endorsement of such norms, impact on pitch range production. Notably, it has been claimed that in Japanese a high pitch level is used to index femininity by females (Ohara, 2019), but in English increase in pitch level is used to index friendliness in both males and females (Loveday, 1981). It was therefore of interest to establish in the present research whether Japanese and English monolinguals would confirm these previous findings (Loveday, 1981; Ohara, 2019). For example, will the Japanese-English bilinguals transfer sociophonetic normative patterns from their first language (henceforth L1) to their second language (henceforth L2)? Will their L1 be influenced from any potential normative patterns of their L2? Will female and male bilinguals show similar cross-group patterns but differ in the extent that their individual gender identity affects pitch range variation?

Within research into bilingualism, gender has received some attention from L2 researchers within the domains of phonetics and phonology (Elliott, 1995; Flege & Fletcher, 1992) who defined gender biologically (that is categorically as sex) and looked at this variable in terms of female versus male L2 attainment. These studies did not show gender to be a strong predictor of L2 pronunciation accuracy (Piske et al., 2001); yet they helped in moulding folk linguistic ideas and beliefs such as that 'female [L2] learners generally do better than males' (Piller & Pavlenko, 2006, p. 491). Likewise, older sociophonetic research into bilingualism and gender looked at gender as a stable categorical construct (Adamson & Regan, 1991), however more contemporary work (Hansen Edwards, 2006; Ohara, 2001) has recognized that gender is 'something individuals *do* as opposed to something individuals *are* or *have*' (Ehrlich, 1997, p. 422). Using poststructuralist theoretical frameworks typical of contemporary gender studies (Piller & Pavlenko, 2001) and ethnographic and discourse-based methodologies (e.g. Ohara, 2001), this newer research indicated that bilinguals are active agents in their language use, choices and targets of acquisitions (Hansen Edwards, 2008). In other words, they showed that performance in the L2 is, at least to a certain extent, personally and socially conditioned (Dowd et al., 1990) and that bilinguals, similarly to monolinguals, take stance, make social moves, and express identities. The study at hand adds to this body of research in several ways. Firstly, through examination of pitch range using experimental phonetic methods and quantitative analysis, it enhances previous ethnographic and discourse-based methodologies. Moreover, the question as to whether socially conditioned performance in the L1 changes upon acquisition of an L2 has, to my knowledge, never been explored before and this study sets out to assess whether and how acquiring English as an L2 affects the production of a gendered L1 phonetic variable.

2.2 Bilingualism

The first theoretical concept of importance for this project is that of *bilingualism*, which is introduced in this section.

Bilingualism (and, more generally speaking, multilingualism) is a widespread phenomenon (e.g. Bhatia, 2017; de Leeuw & Celata, 2019; Grosjean, 2010); it is not an exception, but the norm world-wide. Put simply, bilingualism refers to having (some) knowledge of two languages (Montrul, 2008); however, bilingualism is a highly complex and multidimensional social, psychological, and linguistic phenomenon (Butler, 2012), and no simple definition is able to capture in its diversity (and perhaps give justice to being a bilingual). To complicate things further, bilingualism is not only an individual phenomenon, but also a societal and a political process (Butler, 2012). Notably, individual, societal and political bilingualism are closely connected. Individuals' attitudes towards a certain language may lead to language shifts within a given community, which then may be politically implemented in changes in the educational system (Baker, 2001); however, this project limits its discussion to individual bilingualism. In the remainder of this section various approaches to define bilingualism are introduced and commented upon, before arriving at the definition which is considered to be most relevant for this research.

In the linguistic literature, earlier definitions of bilingualisms revolved around language proficiency and skills. In terms of proficiency, bilingualism has narrowly been defined as having 'native-like control of two languages' (Bloomfield, 1933, p. 56), which implies that hardly anybody can be categorised as bilingual. Broader definitions of bilingualism, at the other end of the spectrum, assert that practically everyone is a bilingual, in that they contend that minimal knowledge of a language other than the native language(s) indicates bilingualism (Edwards, 2006; Fabbro, 2001). Definitions of bilingualism focussing on language skills are similarly polarised; for example, Haugen defined bilingualism as the ability to 'produce complete meaningful utterances in a language other than the native language' (1953, p. 7), whereas Macnamara (1966) indicated that minimal competence in only one of the four L2 skills is the minimum requirement of bilingualism.

Whether broad or narrow, the above-mentioned definitions of bilingualism are reductive because they fail to take into account that, in real life, pure knowledge of the L2 is often of less concern than the ability to communicate in the L2. In addition, by only focussing on the L2, those definitions indirectly suggest that L1 ability and use is immutable (Butler, 2012), but there is empirical research that proves that this is not the case (e.g. de Leeuw, 2019b and see below).

More functional approaches to bilingualism are more successful at capturing the multifaced, complex and ever evolving experience of being a bilingual. In this framework, bilingualism is defined as 'the regular use of two or more languages (or dialects)' and bilinguals as 'those people who need and use two or more languages (or dialects) in their everyday lives' (Grosjean, 2001a, p. 4), irrespective of their proficiency (Grosjean, 2001a). Thus, a bilingual is a fully competent communicator, whose language knowledge and competency are shaped by the needs of the environment they are in at a specific moment in time (Grosjean, 2010).

The shift of focus of bilingualism from knowledge to communication implies that being bilingual is not an end state but a process. Along this process, the bilingual's language capabilities, needs and outcomes are modulated by environmental characteristics (e.g. interlocutor, purpose, perceived (in)formality of the situation) as well as by the speaker's characteristics (e.g. psychological condition, language proficiency, dominance) (Cherciov, 2011). Consequently, the bilingual oscillates from states of being more dominant in one language and less dominant in the other, to states of more balanced bilingualism, and potentially to states in which the formerly more dominant language becomes less dominant and may be lost, for example as a consequence of having moved to the L2-speaking country and/or undergoing the process of L1 attrition (Schmid & de Leeuw, 2019 and see below).

Whilst Grosjean (2001a) 's definition of bilingualism is an improvement compared to the language knowledge focussed definitions detailed above, it failed however, to address the role of socio-cultural norms with respect to bilingualism. Language is a social notion and has a social function (Li Wei, 2009b), thus socio-cultural variation across languages may play an important role in shaping the bilingual experience. Socio-cultural interferences and discrepancies can be found at any level of a language, from phonetics to semantics to pragmatics, and can have a detrimental effect on communication. If the scope of bilingualism is being able to communicate successfully in two languages, then socio-cultural awareness needs to be accounted for, otherwise communication may be unsuccessful.

The socio-cultural aspect of being a bilingual has been taken into account by researchers looking at heritage language speakers. In line with a functional approach to bilingualism, Skutnabb-Kangas maintained that bilinguals are individuals who are 'able to function in two (or more) languages, either in monolingual or bilingual communities in accordance with the sociocultural demands made of an individual's communicative and cognitive competence by these communities or by the individual him/herself' (1981, p. 90 emphasis mine). This definition encompasses the real essence of bilingualism; on the one side it captures the importance of the speaker's social environment and individual characteristics, whilst emphasising the importance of communicating effectively with(in) the communities. Importantly, according to this definition, effective communication is not determined by language proficiency.

This definition of bilingualism is important for this project, and indeed, it is the one which is adopted here. This is because the phonetic variable under scrutiny is used in Japanese to index a specific community (Japanese women) and the attributes associated to this group (femininity: politeness, softness) (see 4.3). However, in English the same form of high pitch level may be used by females and males to indicate friendliness. As such, Japanese-English bilinguals, irrespective of whether female or male, besides acquiring

English intonation, might also learn to navigate and apply the ideological systems pertinent to their L2, in order to fully express themselves and their gendered identities. Conversely, the bilinguals may also desire to ensure that the meaning their L1 attributes to high pitch level is not lost in the process of L1 attrition (see below) in order not to become alienated within their native society.

2.3 Phonetic L1 attrition and L2 acquisition

Two other important concepts for this project are those of L1 attrition (here used synonymously with attrition) and L2 acquisition, which are introduced in this section.

Sociolinguistic research has amply demonstrated that monolingual speech may vary synchronically, as a consequence of making social moves, taking different stances and expressing (multiple) individual identities (Eckert & Labov, 2017; Levon, 2011; Podesva, 2011). In the L2 speech literature, there is ample evidence that (a) it is possible to acquire the phonetic system of an L2 post-puberty (e.g. Flege et al., 1999; Huang & Jun, 2011; Munro et al., 1996; Piske et al., 2001 for segmental features; Trofimovich & Baker, 2006 for suprasegmental features), even to high levels of attainment (e.g. Bongaerts, 2005 for segmental features; Mennen, 2004 for suprasegmental features; Muñoz & Singleton, 2011 for a review) and that (b) the native language prosodic system can change as a consequence of acquiring and being immersed in an L2 (Celata, 2019; Chang, 2019; de Leeuw, 2019b), through the process of L1 attrition. In addition, research using variationist approaches and methodologies to describe the speech of L2 learners has indicated that (1) L2 learners can acquire native-like patterns of sociolinguistic variation in their L2 (Type 2 variation, e.g. Mougeon et al., 2004; Drummond, 2011), however they may not reach native-like frequency of variant usage in their L2, due to reduced sociolinguistic competence (Mougeon et al., 2004) and (2) identity construction in L2 learners affects L2 speech outcome (Type 3 variation, e.g. Nance et al., 2016; Ohara, 2001, Rindal, 2010).

The present project investigated sociolinguistic variation in the speech of bilinguals; this was done both by comparing the use of sociolinguistic variants in the speech of monolinguals and bilinguals (Type 2 variation) and by exploring expression of individual identity in the speech of the bilinguals (Type 3 variation). This allowed to account for the fact that a bilingual is a multicompetent language user, whose language capacity and ability may fundamentally differ from that of monolinguals (Cook, 2004), and the potential role of identity in L2 attainment. Recent work has indicated that the native-speaker model may not always be the target of L2 speakers (Nance et al, 2016). This has been reported regarding the accent the L2 learners want to acquire and use (e.g. Nance et al., 2016; Rindal, 2010) and, most importantly for the present work, the gendered persona they want to portray (Ohara, 2001). For example, Rindal (2010) and Nance and colleagues (2016) found that some of their L2 informants aimed to speak their L2 with a neutral accent, perhaps to clearly reflect their status as bilinguals. Similarly, Ohara (2001) reported that fluent female L2 Japanese speakers may not purposefully implement the high-pitched voice customary of Japanese women specifically not to embody the gendered persona they did not believe in (see 4.4 for detail). These findings are relevant for the present project and clearly advocate for the importance of exploring the role of identity in bilingual practices. The present work expands on the above-mentioned work and findings by using the laboratory approach typical of research in L1 attrition and L2 acquisition (see Chapter 5 for detail) to describe patterns of acquisition of sociolinguistic variation in bilinguals. Importantly, this project will *also* explore (1) whether upon acquiring L2 sociolinguistic variation, bilinguals may 'unlearn' sociolinguistic variation in their L1 and (2) whether bilinguals portray different gendered personas in their different languages.

2.3.1 L1 attrition of phonetics

Narrowly defined, *L1 attrition* is the 'non-pathological- and non-age-related structural changes that an established language knowledge, that is the L1 or native language, may undergo due to the acquisition of second language' (Köpke & Schmid, 2004, p. 1).

Thus, L1 attrition is (1) not determined by neurological impairments (e.g. aphasia; Ferguson, 1991) or aging (Linville, 1996) and (2) change (or loss) is *structural* rather than functional. Structural loss indicates that L1 attrition is a deep loss, that taps into the plasticity of the L1, rather than a loss due to reduced use (de Leeuw, 2019b). Notably, a structural loss is most likely preceded by a functional loss; however functional loss can happen without leading to attrition (Chang, 2019).

A further important caveat of this definition (3) is that for L1 attrition to happen, the native language needs to have been *fully* acquired before acquiring the L2. This is why most research into L1 attrition has focussed on late sequential bilinguals, that is, speakers who acquired their L2 after puberty (de Leeuw, 2019), most commonly as a consequence of relocating to another country (e.g. Cherciov, 2011; de Leeuw, 2009; Opitz, 2011; Schmid, 2002) and therefore to a new language environment (Schmid, 2007; Schmid, 2010).

According to the narrow definition of L1 attrition, however, only a very small portion of bilinguals can be considered attriters (Schmid & Köpke, 2017) and this is because it postulates that attrition is "real" only when the effect of the L2 on the L1 goes 'beyond the online manifestations' […] 'leading to permanent and irreversible change which affects the underlying structure [of the L1]' (2017, p. 6). Instances of change in the L1 of bilinguals have been widely reported in the literature (see Köpke & Schmid, 2004, Schmid & Köpke, 2017 for a review), however, cases where a structural change has been clearly demonstrated are rare, if not unheard of, among late bilinguals (Schmid & de Leeuw, 2018). Importantly, empirical evidence of L1 attrition has been reported in (1) bilinguals who have never resided in the L2 country (Mennen, 2004) or just moved to the L2-speaking country (Chang 2012, Köpke & Schmid, 2004) and, notably, (2) in immigrants who have not actively learned (and therefore cannot speak) the language of their country of immigration (Baladzhaeve & Laufer, 2017).

A broader definition of L1 attrition may be useful in solving the above-mentioned discrepancies between the empirical findings and the theoretical underpinning of L1 attrition. Broadly defined, L1 attrition is the 'process by which a pre-existing linguistic knowledge becomes less accessible or is modified to some extent due to acquisition of a new language, in which L1 production, processing or comprehension are affected by the presence of this other language' (Schmid & Köpke, 2017, p. 14). In these terms, all bilinguals are, at least to some extent, attriters, irrespectively of how far they are in their L2-learning and of the language of their surroundings (Schmid & Köpke, 2017). In this research, it was the broad definition of L1 attrition that was adopted. Importantly, this allowed to (1) account for potential changes in the L1 of *both* groups of bilinguals investigated and (2) investigate surface changes in terms of long-term effect of the L2 on the L1. As it is detailed in Chapter 5, speech was collected from two groups of female and male bilinguals, one residing in London, UK and the other in Tokyo, Japan. If the narrow definition of L1 attrition were adopted, the speech of the bilinguals tested in Japan could not have been explored in terms of L1 attrition. Consequently, changes (if any) in the L1 of the two groups of bilinguals would have to be considered as pertaining to different processes, therefore barring cross-group comparisons. Secondly, and perhaps more importantly here, the narrow definition of L1 attrition would not have allowed a consideration of potential changes to the phonetic dimension of the L1 in terms of the domain of L1 attrition. The present study investigated the potential effect of having acquired an L2 (here English) on the phonetic implementation of pitch range in the L1 of Japanese-English bilinguals in different speech settings, therefore it focussed on the indexical function of speech prosody in these bilinguals. Phonetic changes in the L1 are surface changes, not structural changes, they may indeed lead to phonological L1 attrition (de Leeuw, 2019b), however this was not investigated in the present work.

Summarising, L1 attrition involves a change or loss of previously available phonetic representations, distinctions, and conventions. By adopting the broad definition of L1 attrition, the present project investigated potential L1 phonetic attrition in the production system of two groups of female and males Japanese-English sequential bilinguals. Due to the social nature of the phonetic variable considered in this work, this project investigated potential loss of sociophonetic competence in Japanese-English bilinguals, that is potential inability to produce (and interpret) particular phonetic nuances and intentions in the L1. If such loss may never affect the grammar of the L1 of the bilinguals, it has still the potential to vastly influence how an individual is perceived by others, *and* their own self-perception (de Leeuw, 2019b), therefore affecting the social positioning of the individual within the L1 society.

Anecdotal evidence of such process with respect in a Japanese-English bilingual is reported in *Polite Lies* (1997), an autobiographical book about the life of a Japanese woman who had spent half of her life (20 years) in the US. Commenting on her Japanese, the author remarked that, as a consequence of becoming accustomed to the American way of life, she had lost the ability to express politeness adequately in her native language, which in turn has undermined her capacity of ‘speaking (and behaving) like a real Japanese person’ (Mori, 1997, p. 11).

This quote gets to at least part of the heart of the current research. If a high pitch level expresses femininity in Japanese, and the Japanese native speakers of the current study, who have acquired English as an L2, undergo sociophonetic attrition, they might potentially likewise not adequately express femininity in their native Japanese. It may be that more generally the bilinguals tested in the UK, due to increased L2 experience, fail to produce politeness in Japanese in line with the Japanese monolinguals. Whether sociophonetic norms were transferred from the L1 to the L2 by the Japanese-English bilinguals was also investigated (see below).

2.3.2 L2 acquisition of phonetics

Turning now to the concept of L2 acquisition of speech, it is important to firstly note that there is a fundamental assumption that all theories of L2 acquisition make; that is, the assumption that the native language(s) is different from all other languages which are acquired later in life. This assumption is based on the premise that the baby's mind is a *tabula rasa*, a sort of blank slate upon which experience of language is carved during the first years of life. Thus, further language acquisition differs from L1 acquisition, in that the former happens on an already "wired" mind. Hence, a major component of the initial state for learning an L2 is previous knowledge of the L1 (see below). Within the field, there is disagreement over when the L1 is fully learnt, and consequently when the L2 is an actual L2 or a second L1 (e.g. Bongaerts et al., 1997; Long, 1990; Muñoz & Singleton, 2011); yet, that something distinguishes the L1(s) from the Ln is crucial for the field because this differentiation defines the very nature of L2 acquisition.

In this thesis, L2 acquisition is broadly defined as the process by which an individual acquires a language other than their native language (Rieder-Bünemann, 2012) with no specific focus on ultimate attainment and native-like proficiency. It is worth noting that in this work *acquiring an L2* is used to encompass *learning an L2* in the sense of formal acquisition in school settings. Despite the two processes being not exactly isomorphic, with the latter being often characterized by L2 learning via L1 instruction, this was done because all the bilinguals in the current study had learned English in high school, either before moving to London (UK), or continuing learning the L2 at university, had they not moved to the UK.

As in the case of L1 attrition, L2 acquisition was investigated in the domain of phonetics; due to the nature of the phonetic variable at hand, L2 acquisition was considered in light of acquisition of L2 sociophonetic competence, which has been defined as the acquisition of granular socially structured phonetic variation typical of a language, which may then be reflected in the L2 speech of a bilingual (Dalola & Bullock, 2017; Foulkes & Hay, 2015). For example, would bilinguals who had lived longer in the UK produce a high pitch to index friendliness in line with the English monolinguals? In this case, they would be more likely to evidence this higher pitch when talking with their friends, rather than when talking with their future boss in the case of respectively informal versus formal addressees of the voicemail task of the present project (see Chapter 7). Would the Japanese males with higher L2 proficiency raise their pitch level to express friendliness as English males do (but Japanese males are not expected to do), or would they avoid doing so, potentially to ensure they do not sound feminine?

As is detailed in the next section, models of L2 speech acquisition have traditionally eschewed the social aspect of phonetic variation, in favour of an approach that mostly relies on predicting L2 outcomes given sound similarities and differences. This is surprising considering that Lakoff (1973) herself noted that social context is relevant in learning to speak an L2 fluently and stressed the importance of paying attention to gendered practices and performances (Piller & Pavlenko, 2001). In addition, Gal's (1978) research clearly demonstrated that not only language practices but also motivation and agency in learning the L2 may be gendered. With regard to the study at hand, it might be that for the bilingual females, who aligned more with masculinity, it would have been easier to index their gender with a lower pitch level (and a narrower pitch span) in their L2 than in their L1, due to British society being more egalitarian that the Japanese one (e.g. Ohara, 1999).

2.3.3 L2 speech models

Thus far the concepts of L1 attrition and L2 acquisition of phonetics have been introduced; in this section, L2 speech learning models which account for L2 phonetic acquisition (and can be expanded to explain L1 phonetic attrition) are detailed. Notably, the present research was not designed to test these models; however, their description was considered important to facilitate an interpretation of the results at hand.

It is well attested that the phonetic system of a bilingual's L1 and L2 interact in a complex way (Mennen & de Leeuw, 2014a; Nishi & Kewley-Port, 2008). Several models have been proposed to account for these interactions and, consequently, the difficulties an individual may face in the process of acquiring an L2. Best's Perceptual Assimilation Model of L2 speech learning (PAM: Best & Tyler, 2007) and Flege's Speech Learning Model (SLM: Flege, 1995) have been built to account for L2 segmental learning, whereas PAM-S (So & Best, 2010, 2011, 2008) and Mennen's LILt (2015) to account for L2 intonation learning.

PAM-S, an extension of Best's PAM (1995), explains perception of non-native tonal information. It posits that perception precedes production, thus, to correctly produce L2 intonational categories, such as tones and intonation, one needs to firstly correctly perceive them. According to the model, L2 intonational categories are perceptually assimilated to L1 categories (So & Best, 2010, 2011, 2008) in the L2 speaker. Six assimilation types are proposed (Best, 1995):

1. Two-Category Assimilation (TC), when two non-native categories assimilate separately to two native ones;
2. Single-Category Assimilation (SC), when two non-native categories assimilate equally to one native category;
3. Category - Goodness Assimilation (CG), when two non-native categories assimilate unequally to one native category;
4. Uncategorised-Categorised Pair Assimilation (UC), when one non-native category is uncategorised and another assimilates to a native category;
5. Uncategorised-Uncategorised Assimilation (UU), when non-native categories undergo uncategorised assimilation;
6. Non-Assimilable (NA), when two non-native categories are perceived as non-speech sounds.

In line with PAM, PAM-S predicts the best discrimination for TC followed by CG, while poor discrimination is predicted for SC (Best, 1995).

Some, but not all, of PAM-S' predictions have been empirically supported by studies investigating perception of L2 tones by learners with tonal L1s (e.g. Hao, 2012; So & Best, 2010), learners with phonologically different L1s (e.g. So, 2010, 2012) and in heritage speakers of tonal languages (e.g. Kan & Schmid, 2019). To my knowledge, PAM-S has not yet been used to investigate L2 intonation production; considering that the present project only investigates bilingual pitch range production, this model will not be considered further.

L2 Intonation Learning Theory (LILt) was built to account on L2 intonation production; based on the Autosegmental Metrical model of phonology (Pierrehumbert, 1980), this model was designed to provide a framework to further our understanding of the relative difficulty that intonational parameters may pose for L2 learners (Méndez Seijas, 2019).

According to Mennen (2015), and in line with Ladd (2008), intonation may be categorised into the following four dimensions:

1. systemic (or phonological) dimension (the inventory and distribution of pitch accents and boundary tones in a language);
2. realisation dimension (how tonal targets are implemented phonetically);
3. semantic dimension (what meaning each tonal configuration carries);
4. frequency dimension (how frequently specific tones or tonal combinations are used in a language).

In the literature, there is ample support for cross-language differences in all of the above-mentioned dimensions (see Mennen, 2015 for details). In addition, empirical research has provided abundant evidence of deviations between L1 and L2 intonation in the four dimensions suggested by Mennen (2015). For example, with regard to discrepancies in the systemic dimension, Mennen and colleagues (2010) reported that Punjabi and Italian L2 learners of London English failed to produce the complex tones of this variety of English. Continuing with the realisation dimension, Mennen (2004) reported an earlier tonal alignment in Greek spoken as an L2 compared to Greek spoken as an L1 and Graham & Post (2018) reported a delayed alignment in American English spoken as L2 compared to American English spoken as an L1. In terms of deviance in the semantic dimension, Wennerstorm (2001) indicated that Chinese speakers of L2 English failed in implementing the use of a high pitch accent to signal new information customary of English spoken as an L1 (see Pierrehumbert & Hirschberg, 1990). Lastly, there is evidence that L2 speakers tend to transfer frequency of intonational patterns from the L1 to the L2 (Willems, 1982), which leads to deviations in the frequency dimension.

It is worth noting that, whilst bilingual intonation can be described in terms of deviations from the monolingual norm along these four dimensions, phonetic transfer and universal language constraints alone have been proven unable to fully explain the high variability reported in the speech of bilinguals (e.g. de Leeuw, 2009; Mennen, 2004 for L1 attrition; and Santiago & Delais-Roussarie, 2015; Trofimovich & Baker, 2006 for L2 acquisition). L1 and L2 phonetic interactions are undoubtedly triggers of L1 attrition and L2 acquisition, however, the outcome of these processes may be determined by a multitude of extralinguistic factors, which can be used to characterise the speaker's language background and social positioning (see Hansen Edwards, 2008; Köpke & Schmid, 2004; Piske et al., 2001). Social positioning, in particular, has been proven successful in explaining phonetic and phonological variation in monolingual speech (see Eckert & Labov, 2017 for a review), thus it seems reasonable that it may shape prosodic variation in the two languages of a bilingual. Yet, to date, models of L2 speech acquisition hardly incorporate any extralinguistic factors in their assumptions.

For example, LILt assumes that an earlier age of L2 acquisition (or arrival in the L2 speaking country, AoA henceforth) predicts increased success (operationalised as similarity between the L2 of the bilinguals and the native norm) in the production of L2 intonation (Mennen, 2015) and increased rate of L1 attrition (operationalised as difference between the L1 of the bilingual and the native norm). This has been often empirically confirmed, however, whether the rule of *the earlier the better in L2 acquisition* is always true is unclear. For example, Huang and Jun (2011) found that frequency of pitch accents and high boundary tones in English spoken as an L2 by Chinese-English child, but not adult, bilinguals were comparable to that of English monolinguals; however, this was not the case for articulation rate, prosodic phrasing and pitch accent type.

Continuing, LILt posits that the same basic perceptual learning abilities are available to adults learning an L2 as to children learning an L1 or L2 and that with *increased L2 experience*, learners should be able to approximate, or even reach, L2 norms (Mennen, 2015). For example, Trofimovich and Baker (2006) operationalized L2 experience as length of residence in the L2 country (LoR) and reported that it predicted accuracy of stress timing, but not accuracy of speech rate, pause frequency, pause duration, in the English L2 of Koreans L1 speakers. Jun and Oh (2011) operationalised L2 experience as the amount of L2 proficiency and, similarly, reported that more advanced knowledge of L2 Korean predicted successful production of phrase-final tones to mark a phrase boundary, but not with regards to producing the phonetic realisation of accentual phrases, in the Korean L2 of English L1 speakers. In terms of L1 attrition of intonation, increased L2 experience, operationalised as longer LoR, did not predict rate of L1 attrition in the prenuclear rise of the native German of German-English late sequential bilinguals (de Leeuw et al., 2012), however, it predicted L1 attrition in the pitch level of the native German of the tennis player Stefanie Graf (de Leeuw, 2019).

A last assumption of LILt is that the L1 and L2 categories exist in a common phonological space, and this may lead to language interaction (Mennen, 2015). Such interaction is thought to be bidirectional in nature and to take form of either assimilation (merging) of L1 and L2 properties (i.e. when the L2 speaker produces phonetic values that are intermediate between the L1 and L2) or dissimilation (polarisation) (i.e. when the L2 speaker produces phonetic values that are beyond those of the L1 and L2) (Mennen, 2015). The literature reports evidence of both merging and polarisation effects (e.g. de Leeuw et al., 2012; Mennen, 2004; Mennen et al., 2014 for merging effects; and de Leeuw et al., 2012 for polirasation effects), as well as evidence that these effects are not unavoidable (Mennen, 2015). For example, Mennen (2004) investigated bidirectional interference in the intonation of the L1 and L2 of five native Dutch speakers with near native-like knowledge of (modern) Greek. Results indicated merging effects in four out of the five speakers, notably, however, the fifth speaker managed to produce peak alignment in their L1 and L2 in conformity with the norms of monolingual speakers. Similarly, de Leeuw and colleagues (2012) reported that, out of their ten late sequential German-English bilinguals, one produced tonal alignment in entirely native-like fashion in both the L1 and L2. As noted by Mennen (2015) the reason for which some speakers are able to entirely maintain separateness of L1 and L2 systems remains unclear.

It may be argued that an analysis of the sociolinguistic aspect of L1 attrition and L2 acquisition may help inform on some of the discrepant results reported above. For example, a strong sense of belonging to both the L1 society and the L2 society may be reflected in native-like patterns in both languages of the bilingual, who may want to be considered by native speakers of both of their languages as a monolingual. Likewise, and specifically within the context of the present research, self-identification with language-specific gender norms may impact both L1 attrition and L2 acquisition processes.

2.3.4 Conclusion

In 1980, Beebe noted that 'sociolinguistic variation [was] one of the most neglected areas of inquiry in the field of second language acquisition' (1980, p. 433) and, despite a substantial amount of work having since then shown that social factors affect choice and use of phonetic variables in monolinguals (Eckert, 2019; Eckert & Labov, 2017; Foulkes & Docherty, 2006), this is to some extent still the case. The reason is that laboratory research in L1 attrition and L2 acquisition of speech still tends to focus its attention on idealistic invariant speech performances, almost forgetting that, a 'natural language is, by definition, variable' (Beebe, 1980, p. 434), and that bilinguals are active agents in their two languages (Hansen Edwards, 2008).

Building on the idea that speech does not happen in a vacuum, the present research aims to fill this gap in the literature by producing a fine-grained analysis of potential bi-directional, socially-motivated, interferences in the two languages of Japanese-English bilingual females and males. The social variable, which is hypothesised to have an effect on the pitch range of the bilinguals is *gender*. In line with Ochs (1992), this work assumes that 'gender ideologies are socialised, sustained, and transformed through talk' (1992, p. 336) and posits that a bilingual uses pitch range in both of their languages as one of many ways of constructing multiple gendered identities and to express their relationship to the world. To account for the constitutive relation between language and gender in the two languages of the bilingual, the present study endeavoured to elicit speech in varying social situations. To this end, bilinguals were asked to 'speak' to an imagined addressee varying in formality and sex, as to elicit the speech the bilinguals would have used, had they encountered these people in real life. By assessing how gender is socially constructed via pitch range in the two languages of female *and* male bilingual speakers, the present work aims to elucidate whether and how bilinguals signal what kind of female or male they want to be in both of their languages.

3 Pitch range, bilingualism and gender

3.1 Introduction

The purpose of this chapter is to introduce the concepts of *prosody* and *pitch range* and situate them within in the broader context of bilingualism and gender, with an aim to pave the way for the research questions raised in the present study.

The term *prosody* is defined in section 3.2 and *pitch range* in section 3.3. Although these definitions provide a framework for the type of approach followed in this study, still other approaches remain available to be chosen from. The criterion for the selection on this specific approach was that the specific framework had already been related to pitch, bilingualism and gender (in any combination). Indeed, the goal of the present study is not to present different approaches to pitch, bilingualism and gender analysis, nor to broaden the type of approaches used in research related to these topics, but to deepen our knowledge of and further explore the relationship between them in the case of Japanese-English sequential bilinguals.

It is important to note that the literature discussed in the remainder of the chapter, as in further chapters, will not include work referring to pathological prosody. This is because atypical prosody is beyond the scope of this work and because extralinguistic prosodic variations may be intentional markers of social identity for non-atypical speakers, whereas this might not be the case for pathological speakers (Peppé, 2009)

3.2 Prosody: “The glue of language”[1]

Prosody is ‘an intrinsic determinant of the form of spoken language’ (Cutler et al., 1997, p. 141). No speech exists without prosody; no matter how short or in what language an utterance may be, it will always present a certain duration, amplitude or fundamental frequency. Of these three phonetic dimensions of prosody, it is fundamental frequency, or

[1] Metaphor used by Dr de Leeuw during the *Voices in Society* workshop, March 2017, Queen Mary University of London

the perceptual correlate of pitch, which is the object of the present research (see below for detail).

The term prosody is not defined and used uniquely in the fields of Linguistics and Speech Studies; at one extreme, some researchers use it in an abstract way as the 'phonological organisation of segments into higher-level constituents and […] the pattern of relative prominences within these constituents' (Shattuck-Hufnagel & Turk, 1996, p. 196). At the other extreme, there are researchers who refer to prosody as 'the realisation itself' (Cutler et al., 1997, p. 142), in other words they use the term as a synonym for suprasegmental features, such as pitch, loudness, duration (Mennen & de Leeuw, 2014b). As pointed out in the literature (e.g. Cutler et al., 1997; Mennen & de Leeuw, 2014b; Shattuck-Hufnagel & Turk, 1996), perhaps to define prosody the two above-mentioned views should be merged as to see prosody as 'the linguistic structure which determines the suprasegmental properties of utterances' (Cutler et al., 1997, p. 142).

Therefore, prosody has both phonetic and phonological aspects. The phonological aspect is the hierarchical organization of segments into constituents with patterns of relative prominence and includes phrasing, stress, accents, tones and intonations, whereas the phonetic aspect refers to the suprasegmental surface phonetic encoding of those prosodic structures via pitch, duration and loudness (Keating, 2006). The present research focusses on one of the phonetic encodings of prosody, that is pitch range, by investigating the effects of language-specific socio-cultural factors on bilinguals' voice melody. Due to the emphasis the present work attributes to the role of sociolinguistic factors on phonetic variation, the above definition of prosody is here expanded to account for its social side to the 'linguistic and *socio-cultural* structures which may determine the suprasegmental properties of utterances'.

Prosody serves a variety of functions which range on a continuum from linguistic to extra-linguistic (Cruttenden, 1997; Crystal, 1975; Ladd, 2008), through to paralinguistic (Clark et al., 2007). At the linguistic end, there are features such as lexical tone, intonation, and prominence which are functional to the specific language variety and often vary widely across, and within, languages (Clark et al., 2007). At the extra-linguistic end, there are features such as the habitual aspects of a speakers' voice quality and overall pitch range and loudness (Laver, 1994) which vary in function of the physiology of the speaker and can be acquired as habitual characteristics (Clark et al., 2007) and are used by listeners to characterise speakers in social groups (Laver, 1994). Paralinguistic information sits in a grey area in between the two above-mentioned extremes and refers to circumstantial information such as emotional state, intentions, and attitudes of the speaker, which are added to the linguistic content (Ladd, 2008). Importantly, paralinguistic information, despite being non-linguistic in nature, is coded in speech and its meaning can be particular to the culture of the speaker, thus it cannot always be interpreted by assuming some sort of universal basis of meaning (Laver, 1994). An example is the use of *falsetto* in adult male speech. This type of phonation, where the top of the fundamental frequency range is markedly higher than in ordinary modal phonation, has been reported to be used by English-speaking adult males as a mocking device (Laver, 1994), whereas in Tzeltal, a language spoken in Mexico, it has been reported to be used in greetings as a marker of honorific respect (Brown & Levinson, 1987). Interestingly, more contemporary research on adult English male speakers found that falsetto was used to index a diva persona by a gay man (Podesva, 2007), which shows that the paralinguistic meaning of intonation may vary within a culture.

Prosody varies along the linguistic/non-linguistic continuum, in a way that the non-linguistic message affects the interpretation of the utterance as a whole (Ladd, 2008). Separating linguistic and non-linguistic channels might be very tricky: for example, it is extremely complicated to determine whether a particular speech style is an unconscious habit or a deliberate - hence communicative - attempt to project a certain personality (Clark et al., 2007). An example is the effect of nervousness; it is easily detectable in speech, however it is nearly impossible to tell if a person is genuinely nervous in the specific occasion or if they are trying, for example, to gain sympathy using features of nervous speech deliberately (Clark et al., 2007). The field of forensic studies has extensively studied non-linguistic information communicated via prosody because it may be pivotal in further interpreting the verbal accounts of defendants, witness and victims (see Jessen, 2008 for a review). An example is increased pitch which may mean that the speaker is lying, but this same acoustic manifestation could be due to the emotional stress of being under pressure (Streeter et al., 1977). With regard to the current study, an increased pitch in English spoken as an L2 may be intentional and convey indexical information such as friendliness (Loveday, 1981), however, the same acoustic manifestation could be due to increased nervousness whilst speaking in the L2 (Järvinen et al., 2013).

Prosody operates within several areas of communicative functions and is used to convey a variety of information, ranging from syntactic to lexical, from semantic to discourse information, from affective to indexical (Ladd, 2008). Most relevant for the present research is the affective and sociolinguistic information conveyed by prosody. Feelings and attitudes of a speaker towards what they are saying are conveyed by prosody. This use of prosody is pervasive and can, at times, contradict the information carried by what the actual words used mean (as in the case of sarcasm) (Peppé, 2009). Idioms, and formulaic language more generally speaking, have been shown to have a unique acoustic structure, that is a narrower range of intonational contours (Bolinger, 1986). Listeners have been reported to be able to distinguish idiomatic from literal utterances using only prosodic cues (Van Lancker & Canter, 1981) with pausing, fundamental frequency height and contour and duration being found to differ significantly between literal and idiomatic expression. Interestingly, the prosodic cues used in discriminating idioms from literal meanings seem to be language and dialect specific. Van Lancker and Sidtis (2003) reported that L2 speakers of American English and speakers of other English dialects (specifically, British, New Zealand, South African and Australian) were significantly worse than native speakers of American English in discriminating between literal and idiomatic meaning of utterances, with the L2 speakers performing worse than the speakers of different dialects of English. This is relevant to the current research because it suggests that L2 speakers might misinterpret language specific meanings in their L2, if they are conveyed by the same prosodic cues as in their L1. In addition, in terms of L1 attrition, it also suggests that a bilingual use of a specific prosodic cue might be misinterpreted by L1 listeners. For example, if a Japanese male becomes accustomed at signalling English politeness by increasing their f0mean and transfer this feature onto their L1, Japanese native listeners might perceive the bilingual as being effeminate.

Most relevant to the current thesis, prosody has an indexical function. Each individual speaker has (among other speech idiosyncrasies) established speaking parameters: a habitual pitch, a usual rate of speech, a distinctive speech rhythm and a normal loudness. Importantly, speakers have been reported to creatively ‘bend’ their habitual prosodic settings to make social moves and construct multiple identities (Levon, 2016, 2018; Lewis, 2002; Podesva, 2011). For example, high rising terminals (HRTs), that is the prominent rising tunes realised not on questions, where they might be expected, but on declaratives (Daly & Warren, 2001), have been described as a sociolinguistic variable in Australian, New Zealand, American and British English (Barry, 2007; Britain & Newman, 1992; Daly & Warren, 2001; Guy et al., 1986; Levon, 2016; Nance et al., 2018; Ritchard & Arvaniti, 2014). Irrespective of the dialectal variety taken into consideration, research showed that HRTs are used by both females and males, yet their usage is gendered because (1) females produce more HRTs than males (Britain & Newman, 1992; Clopper & Smiljanic, 2011; Guy et al., 1986; Levon, 2016), (2) females produce HRTs with larger pitch variation than males (Barry, 2007) and (3) with different pragmatic meanings (Levon, 2016). Another example is creaky voice (or vocal fry) defined as the phonation type in which pulses occur at a very low frequency and are irregularly spaced (Laver, 1994). This phonation type is characterised by a very low pitch, and it is generally attributed to male voices (Eckert, 2019), yet recent work indicates that this type of phonation has gone beyond the simple one-to-one mapping between the feature (low pitch) and gender (men) (Eckert, 2019). For example, Leftkowitz and Sicoli (2007) reported that female speakers use creaky voice to index an authoritative stance, and Mendoza-Denton (2011) indicated that it is used by girls to signal being ‘hard of heart’ and in (emotional) control.

The above-mentioned studies demonstrated that gender features are encoded through prosodic patterns and suprasegmental cues, yet they only considered monolingual speech. In the current study, whether gendered prosodic features are expressed in the two languages of bilinguals is taken into consideration. With bilingualism in mind, it is well established that bilinguals vary prosodic patterns across their two languages (e.g. Altenberg & Ferrand, 2006; Deutsch et al., 2009; Graham, 2015; Zimmerer et al., 2014) and some studies have explained such variation in terms of the different language-specific gender constraints that bilinguals face in their two languages (e.g. Ordin & Mennen, 2017; Voigt et al., 2016).

Concluding, it is worth noting that a speaker’s control over prosodic variation differs from function to function and, crucially, speakers can achieve specific communicative functions by intentionally misusing a prosodic feature (Peppé, 2009). For example, Japanese lesbians have been reported to purposefully not use the burikko-style falsetto that Japanese society expects of female speech to index their non-confirmative sexuality, thus rejecting the girly, cutie image that Japanese culture attributes to women (Camp, 2009). Similarly, Ohara (2001) reported that the decision of employing or non-employing a Japanese-like pitch level by fluent English native Japanese L2 female speakers was a conscious choice made either in attempt to 'fit into the culture' (Ohara, 2001: p. 243), thus trying to project a Japanese identity, or not to portray an identity they felt did not pertain to them (see section 4.4 for detail). These two studies are particularly relevant to the current research; they indicate that prosodic patterns may be used to (dis)align with societal norms and suggest that bilinguals, at least those who are fluent, have agency in their language choices. In the case of the bilinguals of this study, control over prosodic features of their two languages and ability to use or misuse them may be dependent on L2 experience (Mennen, 2015). It might be, for example, that the Japanese and English pitch range of the bilingual females who lived longer in the UK is more English-like than the pitch range of the females who spent less time in the L2-speaking country. Similarly, the pitch range of both languages of the bilingual females tested in Japan was expected to be more Japanese-like that that of the bilingual females tested in the UK due to increased exposure to the L1.

Building on the idea that no speech exists without prosody and that speakers can use prosodic features intentionally, but perhaps also unintentionally, to align and disalign with specific socio-cultural constraints, this short overview has sketched the importance of prosody in spoken language. It has briefly reminded the many communicative purposes served by prosody, showed the type of information prosody transmits and the role such information has in complementing the actual content of an utterance. For the aim of the present research, of interest is the socio-cultural meaning indexed by prosody as it sets out to investigate how different linguistic and social norms influence one another with regard to L1 attrition and L2 acquisition in Japanese-English bilinguals. The specific component of prosody relevant to the present research, that is, *pitch range*, is introduced in the following section.

3.3 What is pitch range?

Pitch range has been defined as 'the perceptual attribute which allows the ordering of [voices] on a frequency-related scale extending from low to high' (Klapuri & Davy, 2006, p. 15). This perceptual attribute arises through the acoustic correlate of fundamental frequency (f0)[2], which is defined as 'the number of times per second that the vocal folds complete a cycle of vibration' (Clark et al., 2007, p. 331). Pitch is controlled by the muscular forces which determine vocal fold settings and tensions in the larynx, and by the aerodynamic forces of the respiratory system which drive the larynx and provide the source of energy for phonation itself (Clark et al, 2007).

Pitch is normally scaled in Hertz (Hz), or cycles per second. Pitch rises when the f0 rises and lowers when the f0 lowers. The acoustical scale for frequency is linear, however pitch perception in the human auditory system is not linear (Clark et al, 2007 among others). Research has shown that humans are more sensitive to some frequency changes than to others so that an f0 rise from 100 Hz to 200 Hz results in a much greater change in perceived pitch than a rise from, for example, 2000 Hz to 2100 Hz. Other measurement scales, that are more reflective of the perceptual situation in the human auditory system, have been proposed. An example is the musical scale measured in semitones (ST). This scale arose in music research, and it is logarithmic (Goldstein, 2010); in other words, the difference in semitones between two frequencies grows more slowly as the frequency increases (Baken & Orlikoff, 2000). A further scaling possibility are psycho-acoustic scales, which are derived from measurements of the frequency selectivity of the human auditory system. For example, the Mel-scale (Stevens et al., 1937), whose name derives from the word melody, is a perceptual scale constructed from determinations of the half-value of pitches at various frequencies. The Bark-scale (Zwicker, 1961) is a non-linear frequency scale modelled on the human hearing system, related to the Mel-scale. The Bark scale is approximately linear below 500 Hz and logarithmic at higher frequencies, and it is composed by 24 critical bandwidth of hearing (Hermes & van Gestel, 1991). The Equivalent-Rectangular-Bandwidth-

---

[2] Throughout this thesis, the terms pitch range and F0 range are used synonymously.

rate (ERB-rate) scale is a variant of the Bark-scale proposed by Hermes and van Gestel (1991). In this scale, the critical bands are narrower than in the Bark scale, especially at lower frequencies (under 500 Hz). The ERB scale is considered to give the best approximation of the way human hearing perceives changes in f0 (Van Bezooijen, 1995).

Based on Ladd (2008), in this thesis pitch is considered to be a manifestation of Fundamental Frequency Range (FFR), or *pitch range*, which varies across two quasi-independent dimensions: (1) *level* and (2) *span*. Level, or *register* (Cruttenden, 1997), defines the overall height of the speaker's habitual voice (Ordin & Mennen, 2017). Span, or *key* (Cruttenden, 1997), refers to the frequencies covered by an individual when speaking (Ordin & Mennen, 2017). Level and span are considered to be quasi-independent, as two speakers may have roughly the same height of voice, that is, the same level, but may vary in the extent of frequencies they cover. On the contrary, two speakers can vary their span similarly, that is, they can encompass similar frequencies, while speaking at considerably different levels (see Ladd 2008 for a more detailed account of the evidence of the relative independence of level and span in individuals). Both dimensions of FFR were investigated in this project, due to the growing empirical evidence for the existence of cross-language differences in both the level and span dimensions of pitch range (Ordin & Mennen, 2017).

As noted by Mennen and colleagues (2008), pitch range is methodologically difficult to quantify and, in the literature, there often appears to be no consensus as to what constitutes pitch range and no agreement relative to which is the best approach to quantify the two dimensions of pitch range, with a variety of measures being used. In addition, disagreement lies with regard to which is the most suitable scale to report pitch measurements, with Hz and ST being, perhaps, the most used ones. Building on previous relevant work investigating bilingual pitch range (e.g. Busà & Urbani, 2011; de Leeuw, 2009, 2019a, 2020; Keating & Kuo, 2012; Ordin & Mennen, 2017), long term distributional (LTD henceforth) measurements were chosen to quantify pitch range. Scaling in Hz was used to report linear measures (pitch level) and in ST to report frequency differences (pitch span). The Hz scale was preferred to the ST scale for pitch level because to use ST to scale pitch level measures, an arbitrary reference point would have had to be defined (Mennen et al., 2012).

Concluding, the purpose of this project was to examine pitch range variation in the two languages of Japanese-English bilingual females and males, in order to see whether differences arose between the two languages of these speakers, as they each had different L1 norms and L2 targets. Specifically, in Japanese, a high-pitched voice is used to index femininity (and politeness); whereas in English, whilst females are also expected to have an overall higher pitch level than males, speakers increase their pitch to index friendliness. Thus, upon learning English, Japanese females and males will need to become accustomed with the meaning English attributes to higher pitch. Whether bilinguals were successful in their acquisition and whether learning to manipulate pitch range in their L2 affected their native pitch range was explored by comparing bilingual speech to that of monolinguals, as it is described in more detail in the methodology section of each analysis chapter.

3.4 Differences in pitch across individuals

If intonation is a common fund of possibilities that each language both shares with other languages and yet conventionalizes in its own way, within languages there are differences that depend on upbringing, social class, age, sex, and even, in the case of trained speakers, personal choice (Bolinger, 1989).

This is particularly true in the case of pitch range, which has been reported to vary greatly among individuals (e.g. de Leeuw, 2019a, 2020; Dolson, 1994; Ordin & Mennen, 2017; Passoni et al., 2018) due to a variety of factors. Before reviewing the literature relative to these factors, it is important to remember that f0 is determined by the tension of the vocal folds of the speaker (Ladefoged, 2001). If the vocal folds are stretched, the f0 of a voice increases; and conversely, if they are less stretched the f0 decreases. While altering vocal fold tension is the most common way of producing f0 variation in normal speech; that is not the only mean available to speakers. For example, an increase in the pressure of the flow of air that is released by the lungs increases pitch, hence why stressed vowels usually have higher f0 than unstressed ones (Ladefoged, 2001). Moreover, variation in f0 occurs also in association with the position of the vocal folds in different phonation types, thus creaky voice usually has a low f0 and falsetto has a high f0 (Ladefoged, 2001). Such acoustic variation is skilfully used by speakers to convey information which can be (1) linguistic in nature, and or (2) linked to extra-linguistic factors. Linguistic variation has been reported to be linked to (1a) dissimilarities in the intonational structure of each linguistic/dialectal variety (Mennen et al., 2012; Yamazawa & Hollien, 1992), and (1b) dissimilarities due to discourse dimensions (Wennerstrom, 2001). Extra-linguistic variation, which is the focus of the present project, ranges on a continuum between biology and socialisation (Bolinger, 1989) and deals with (2a) speakers' anatomy and physiology (Titze, 1989), (2b) ethological factors (Ohala, 1983, 1984), (2c) a speaker's current emotional state (Scherer, 2003), (2d) basic aspects of interpersonal interaction (Biemans, 1998; Lewis, 2002) and (2e) differences in cultural and social norms within and among linguistic communities (Deutsch et al., 2009; Dolson, 1994; Ordin & Mennen, 2017). Not surprisingly, the above-mentioned dimensions are closely related to each other, and it might be argued that it is their combined effect that *really* determines variation in pitch across and within individuals. Yet, functionally, they differ in nature: that is linguistic variation is categorical, whereas extra-linguistic variation is gradient (Ladd, 2008). As detailed later, this thesis will focus on gradient variation in pitch range as its aim is to describe overall f0 variation determined by different socio-cultural norms, rather than individuating the specific turning points at which linguistic differentiations may arise. This is not to say that such an investigation would not be valuable for our understanding of the subject at hand; however, keeping with previous similar work (Loveday, 1981; Ohara, 1992, 1999), it was decided to only focus on gradient variation to ease comparisons. In the remainder of this section, each type of variation will be briefly presented.

As noted in the previous chapter, pitch range is influenced by the intrinsic variation in the phonological and intonational structure of each linguistic variety (Ladd, 2008). Importantly, overall pitch range differences have been found in typologically different languages, as well as in languages from the same family, and it is not dependent on the sex of the speaker. For example, Keating and Kuo (2012) investigated f0 profiles of female and male Mandarin and English native speakers, that is, speakers of a tonal and a stress language. They reported that, despite the physiological f0s of their participants being comparable across languages, both female and male Mandarin speakers used a higher f0mean, f0max, f0min and a wider span than English speakers when reading single words in isolation. In addition, the authors reported that the two languages differed *only* in f0mean in the read passage. Specifically, Mandarin read speech was produced with a higher f0mean than English read speech; this indicates that type of speech (read words vs read passage) influences pitch range in Mandarin and English monolingual speakers. In a similar vein, this study explored pitch range of both read and semi-spontaneous speech; this was done because it was assumed that, when only the phonetic dimension of speech may be manipulated, as it is the case in read speech, the use of pitch range to index social meaning may have been clearer than in semi-spontaneous speech where others dimension of speech may be manipulated.

Continuing with a study comparing pitch range across two typologically similar languages, that is, Czech and British English, Volín and colleagues (2015) reported significantly lower pitch levels and narrower pitch spans in the speech of Czech female and male speakers compared to British female and male speakers. Specifically, for pitch level, an average f0mean of 165 Hz (female) and of 107 Hz (male) was reported for Czech and an average f0mean of 190 Hz (female) and of 120 Hz (male) for British English. For pitch span, an average 80%span of 5.2 ST (female) and 6.1 ST (male) was reported for Czech and 7.1 ST (female) and 8.1 ST (male) for British English. Notably, 80%span of both the Czech and the British males was larger than that of the females, which is at odds with the general stereotypes that females speak with a swoopy voice (Henton, 1989). Unfortunately, the authors did not expand further on the result, however, may be a critical finding for the study at hand. Japanese males have been reported to speak with a low pitch level and monotonous pitch span (Loveday, 1981; Tsurutani & Shi, 2018), perhaps to contrast to the high pitch level and wide pitch span of the speech of Japanese females (Ohara, 2019). The larger pitch span of the English males may appear effeminate to a Japanese male and, consequently, not a desirable target for L2 acquisition. This may be detrimental for the Japanese-English bilingual male; by mapping a narrower pitch span on their English, they may be perceived negatively by English monolinguals (Loveday, 1981).

The claim that pitch patterns vary across languages is supported by perceptual work. Both babies and adults have been found to be able to detect languages only by using intonational (as well as durational and rhythmical) cues. For example, research by Mehler and colleagues (1988) reported that babies as young as a few days old can discriminate between languages and show a preference (shown by an increased sucking rate) for the melody of their native language. In addition, Ohala & Gilbert (1981) reported that Japanese, American English and Cantonese adult speakers can tell all these languages apart when presented with stimuli which only contained f0, amplitude and timing characteristics, with a preference for their own language. Dufter and Reich (2015) reported similar results for Romance languages (namely, French, Spanish, European and Brazilian Portuguese). They low pass filtered stimuli of read speech and spontaneous speech samples and played them to native listeners. They reported that listeners could identify languages correctly, above chance level, and this was especially true for the spontaneous speech samples.

Collectively these studies indicate that there is a relationship between language spoken and pitch range. Notably, however, most of the above-mentioned evidence was gathered from female and male monolingual speakers, thus whether the same differences are replicated in bilinguals is not certain. As suggested earlier in this section, beside linguistic factors, there is also a wide range of extra-linguistic factors that may influence pitch range. Below the most common factors reported in the literature are described.

3.4.1 Biology and physiology

The first variables of relevance are biology and physiology. As mentioned in the previous chapter, there are biological differences between females and males that presumably affect voice production (Gelfer & Bennett, 2013), which are assumed to have arisen due to natural selection as a form of size-sound symbolism (Bolinger, 1989; Ohala, 1984). Despite sexual dimorphism being a common phenomenon among living (and extinct) primates, the human vocal dimorphism is unique among apes (Puts et al., 2006). Female-male differences in human vocal organs are much larger than in any in other apes, suggesting that, at some point along the evolutionary line, it was vital for the male hominid to sound bigger than they actually were, which in turn led to an actual increase in the size of male vocal organs (Lieberman, 2007). Sexual dimorphism in the vocal anatomy is indeed the most common explanation found in the literature for variation in pitch across females and males, however, it is conceivable that pitch values are further emphasized by individuals, either by choice or due to broader societal habits. In the present study, the avenue of the role of individual choice and broader societal habits is explored by considering both group and individual variation in the pitch range of the two languages of Japanese-English bilinguals, that is, two languages the socio-cultural norms of which differ with regard to pitch range.

Physiologically speaking, research has reported that the adult male larynx is approximately 50% larger than the adult female larynx (in the anterior-posterior dimension); this, in turn, gives rise to longer vocal folds in males than females (Ohala, 1984; Titze, 1989). Consequently, the male voice has lower resonance, hence the lower average f0 commonly found in males (Hewlett & Beck, 2010; Ladefoged, 1996). Females have smaller larynxes than men, hence shorter and thinner vocal folds and produce, on average, higher frequencies than males (Hewlett & Beck, 2010). Specifically, the literature reports an average f0 of 220 Hz for females and 120 Hz for males (Cruttenden, 1997; Hewlett & Beck, 2010; Laver, 1994). It must be noted that these averages are based on English (decontextualised) read speech, thus they may not be indicative of the average pitch range of other languages and spontaneous speech. For example, as it is detailed in the next chapter, Japanese females have been reported to have, on average, a f0mean 40 Hz higher than the English counterparts. Moreover, despite most (socio)phonetic research having traditionally analysed decontextualised read speech (Takano & Ota, 2017), there is evidence that the prosody of read and spontaneous speech differs (Moyer, 2004; Yaeger-Dror, 2002).

Continuing with physiology, children are significantly smaller than adults, thus have very short and thin vocal folds, and have been reported to have an average f0 of 265 Hz (Cruttenden, 1997). Age is one of the biggest issues affecting f0 due to the physiological changes which occur with aging. Changes in f0 over the lifespan are expected to be broadly predictable (Baken & Orlikoff, 2000) and research has reported systematic maturational developments in humans (Baken & Orlikoff, 2000; Linville, 1996). During childhood f0 values for girls and boys are generally comparable (Graddol & Swann, 1983 and below); with a constant decline in f0 over the years leading to puberty, when children become adult-like in their vocal apparatus (normally by the age of 14 for girls and 17 for boys; Marcell, 2011). f0 starts changing once again in both females and males after the age of 40, when female voices start lowering and male voices increasing, due to hormonal changes in the body (Linville, 1996) as well as changes in the musculature of the vocal tract (Cooper & Sorensen, 1981).

A last remark on physiology concerns the potential role of speakers' height and weight on f0 values. As detailed above, f0 is dependent on vocal fold length and thickness and vocal tract size, which in turn are proportionate to the size of the speakers (Fitch &

Giedd, 1999), and perceptual research has reported that naïve listeners are able to accurately estimate the height and weight of speakers (Lass et al., 1980). Production research has, however, not yet reported evidence of a direct link between size of the speaker and pitch range (Künzel, 1989; Mattingly, 1966). Nonetheless, this potential relationship is important for this project due to potential height differences between Japanese and English speakers, with the former being, on average, smaller than the latter (see *Average Sizes of Men and Women*, 2020 for relevant statistics). To ensure that difference in height between populations did not lead to differences in pitch, information relative to height of the speakers was collected in this project (see 5.5.7).

There is a wealth of research about voice property and sex of the speaker: listeners are said to be particularly good at inferring the sex of a speaker using acoustic cues in their voices (Addington, 1968), however it is not clear why the sex of a voice is so easily identified (Graddol & Swann, 1989). It has been claimed that the size of the vocal apparatus alone is not sufficient to attribute a voice to a sex (Sachs, 1975) and, indeed, research has reported inconclusive evidence on the relationship between f0 (and formant frequencies) and larynx size and vocal cords thickness (Hollien, 1960). Whilst some researchers have proposed that vocal cord length is the primary scaling factor for differences in average f0 between males and females (Titze, 1989), this does not explain why there are discriminable acoustic differences between the voices of boys and girls before they reach puberty (Graddol & Swann, 1989). This implies that the reported acoustic differences between girls' and boys' voices are due to a learning element in speaking style (Fitch & Giedd, 1999).

Concluding, if it is undeniable that biology and physiology impact f0 values, the findings reviewed above suggest that there is more to pitch production than mere differences between these variables; in other words, biology and physiology do not prescribe f0. As it will be proposed later in this section, an analysis of the social practice of gender may contribute to explaining differences in pitch among females and males, as this study aims to investigate through an examination of the influence that self-conceptualisation of gender has on the pitch range of the two languages of Japanese-English bilinguals, given that the gender norms in each of these languages differs.

3.4.2 Ethology

Ethological factors have also been put forward to account for pitch variation in individuals. (Ohala, 1984), looking at evolutionary causes of pitch variation, claimed that f0 variation in speech can be explained with reference to an innately specified *Frequency Code* which, he posited, 'is an inherent part of the human vocal communication system (Ohala, 1983, p. 14). This inherently biological code associates 'high acoustic frequency with the primary meaning of small vocalizer […] and low acoustic frequency [with] the primary meaning of large vocalizer' (Ohala, 1984, p. 1). This correlation is thought to be universally exploited to express power relations in speech, with high pitch sounds meaning 'subordinate, submissive, non-threatening' (Ohala, 1984, p. 1) and low pitch sounds meaning 'dominant, aggressive, threatening' (Ohala, 1984, p. 1). Ohala based his observations on Morton's (1977) explanation for the similarities in patterns of 28 avian and 28 mammalian vocalizations in competitive interactions (Gussenhoven, 2002). Specifically, Morton (1977) reported that a low f0 is used by vocalising species to sound aggressive, whereas a high f0 is used to sound non-threatening. To understand this claim, it suffices to think about the perceived acoustic difference between a dog's growl and a whine (Ohala, 1984). Thus, a lower pitch suggests that the organ producing the vocalisation is larger, and in turn that the animal producing it may be larger, and conversely for a higher pitch.

The exploitation of these correlations in nature is not confined to variation within individuals, but it also hard-wired in the biology of many species via sexual dimorphism (Gussenhoven, 2002). As detailed earlier, sexual dimorphism in the human anatomy has translated into different larynx size and position in the vocal tract, as well as vocal cord size in females and males. On average, males' speaking apparatuses are larger than females', thus producing lower frequencies and suggesting larger animals. Since f0 is used by the listener to assess the speakers' body size (and attitude), it is conceivable that it may be modulated by the producer to meet specific needs (Ohala, 1996). For example, a low pitched and rough vocalisation may be used by a smaller animal to purposely give the impression of being large and dangerous and, conversely, a high-pitched vocalisation may be used to give the impression of being small (and non-threatening).

Research has shown a correlation between pitch, the expression of power and affective relations (Puts et al., 2006); as a consequence, high pitch and submissiveness have then come to be associated with 'feminine' values and low pitch and dominance with 'masculine' values. The affective meanings which are generally associated with high pitch are *politeness*, *friendliness* and *vulnerability,* whereas a lower pitch is associated with *confidence*, *dominance* and *aggressiveness* (Gussenhoven, 2002). Notably, perceptual work has indicated that listeners tend to rate higher pitches as polite and friendly and feminine, and conversely, lower pitches as aggressive and masculine, independently on whether the voice pertained to a female or a male (Biemans, 2000). Moreover, in some languages, for example Puerto Rican Spanish and Wolof, speakers who are of low prestige have been reported to speak with a higher pitch (Henton, 1995), which is interesting in relation to the present study, if one considers women to be socially less powerful than men and sees this in relation to the "artificially high pitch" in Japanese females, reported by Loveday (1981).

It has been claimed that *Frequency Code* is universal (Ohala, 1984) and this is true in that its phonetical implementation is based on the size of the vocaliser (Gussenhoven, 2002). However, the fine-grained interpretation of the paralinguistic meanings derived from this biological code have been shown to be mediated by the language (and culture) of the listener. For example, Chen and colleagues (2001) reported that Dutch and British English speakers rate stimuli with increased pitch range as more friendly and less confident than stimuli with decreased pitch range in both Dutch and British English (universal meaning). However, at identical pitch ranges, British English was rated as less confident and friendlier than Dutch by the respective native speakers. The researchers argued that, since Dutch is characterised by an overall narrower pitch range compared to British English, a given pitch range would be perceived as higher when uttered in Dutch compared to British English, thus the difference in ratings (language-specific meaning). Whether an increase in the pitch level and a widening of the pitch span in the two languages of the bilinguals was interpreted differently by native speakers of Japanese and English was outside the scope of the present project. However, as it is suggested in 8.4, exploring what pitch patterns convey is paramount to fully appreciate the extent to which the two languages of the bilinguals may interact with one another with regard to social variables.

3.4.3 Emotions

Thus far, the correspondence between submissiveness and high pitch and dominance and low pitch has been proposed in relation to perceived (and portrayed) size, however it may be argued that such links are also exploited in the communication and perception of emotions. Borkowska & Pawlowski (2011) suggested that a low pitch can create an impression of dominance by signalling that the speaker is calm and assertive. Notably, females in position of power have been reported to be ‘advised’ to modify their voice pitch to sound more authoritative. A relevant case is that of Margaret Thatcher, whose voice was considered a liability to the image the media wanted to portray of her (Romaine, 1999) and thus she took elocution lessons to learn how to lower her average pitch, narrow her span, and maintain a steady pitch whilst speaking so to carry her voice through rather than over potential noise; in other words, she was taught how to sound more masculine, which in turn was interpreted as more confident and authoritative.

Johnstone and Scherer (2000) have reported that intense emotions, such as *panic*, *fear*, and *anger*, acoustically correlate with higher pitch level and wider pitch range. By contrast, less intense emotions, such as *boredom* and *sadness*, correlate with lower pitch level and narrow pitch span. It may be, therefore, that emotions which are correlated with the social status of women versus men contribute to pitch differences between the sexes, rather than actually being biologically female versus being male (Hilton, 2014). For example, Plant and colleagues (2000) investigated gender stereotypes of emotions and their relationship with the interpretation of emotionally expressive behaviour and reported that, in the USA, people expect women to experience and express a broader variety of emotions than men, who seemed to be expected to experience mostly pride and anger. Interestingly, the two emotions that are stereotypically considered more masculine, that is pride and anger, are characterised by a with low pitch level and narrow pitch span (Hilton, 2014), which indirectly supports the stereotypical correlation between high pitch level and wide pitch span in female speech. In the current study, this avenue will not be pursued; however, information about emotional state of the participants was collected to rule out possible confounds (see Chapter 4).

3.4.4 Socialisation

Thus far, potential causes of pitch variation have been investigated with regard to the speaker. Yet, speech is a social activity, which hardly happens without an interlocutor (or audience); not surprisingly, interlocutors have been shown to affect speech in general, and pitch range in particular. As far as pitch level is concerned, English-speaking infants have been reported to vary their median f0 according to whether they 'talk' to their mother or father (Lieberman, 1975). Biemans (1998) has also reported an effect of sex of the conversational partner on median f0 in Dutch native speakers. Specifically, when addressing a member of the opposite sex, both males and females increased their median f0, which in turn expanded the speakers' span by ca. 2 ST. No significant variation was detected in same-sex dyads. Biemans proposed that her female speakers modulated their pitch to highlight their femininity, whereas male speakers accommodated to their female interlocutors.

Speakers tend to have ideas about what is the appropriate way to speak to someone with certain social characteristics and such appropriate ways may vary according to culture (Lewis, 2002). For example, interlocutor's status has been reported to affect f0mean of Japanese and American females differently, with the former increasing their f0mean to signal politeness, and the latter decreasing it to convey seriousness (Ohara, 2001). Yuasa (2008) reported that both Japanese female and male speakers narrow their span when addressing unfamiliar interlocutors in a work setting (i.e. in a formal situation). Lewis (2002) reported that American females widen their pitch range when speaking with unfamiliar compared to familiar females.

Closely related to the effect of interlocutor's status on pitch range is the effect of politeness; or how speakers react to (in)formality of their interlocutor. Increased f0 is generally considered a marker of polite speech (Brown & Levinson, 1987; Gussenhoven, 2002) and this link has traditionally been assumed to be universal (however see Ide, 1989). Notably, contemporary research on Catalan and Korean spontaneous speech has confuted this claim providing evidence that polite speech is characterised by a decrease in f0mean compared to informal speech (Hübscher et al., 2017; Winter & Grawunder, 2012), and this was valid for both females and males. In addition, Sherr-Ziarko (2019) and Guillemot & Sano (2020) reported that Japanese informal spontaneous speech is characterised by a higher f0mean than Japanese formal spontaneous speech and, again, this was valid for both female and male speakers. Notably, for both Japanese and Korean, there appears to be some sort of mismatch between production and perception in terms of the phonetic profile of polite/formal speech. For example, Ofuka and colleagues (2000) reported that Japanese native listeners consistently rated as polite stimuli with increased f0mean; nonetheless, the production results of their study did not support this perceptual finding. Idemaru and colleagues (2015) reported this perception-production mismatch in polite speech to be gender-dependent in Korean native speakers. Specifically, Korean female listeners rated Korean speech with higher f0mean as significantly more polite than speech with lower f0mean; notably, the opposite was true in male listeners, however the difference for males was not significant.

In relation to this work, findings indicating that sex and the social position of an interlocutor may affect pitch range are important. As it is detailed in the methodology chapter (Chapter 5), the effect of sex and (in)formality of an addressee on pitch variation was explored in the project at hand in relation to Japanese-English bilinguals because previous work suggested that, despite politeness having been broadly characterised by an increase in f0mean in both Japanese and English, there appears to be a difference in the semantic meaning of politeness between the two languages and gender differences in how this is implemented by speakers of both languages (see 4.3). The effect of the addressee on bilingual speech was investigated both in the reading and semi-spontaneous speech production task by showing images of imagined addressees to whom participants were asked to speak, as to recreate the same type of speech they would use, had they spoken to these people in real life (see 6.2.3 and 7.2.3).

3.4.5 Culture

Moving on, the pitch range of an individual's voice has also been claimed to be strongly influenced by the pitch of the linguistic community they are part of (Deutsch, 1992). There is a wealth of research which has reported that pitch level is influenced by the cultural and social norms specific to a language/dialect and/or society (Deutsch et al., 2009; Dolson, 1994; Ordin & Mennen, 2017; Pemberton et al., 1998; Van Bezooijen, 1995). For example, Deutsch, Le, Shen and Henthorn (2009) found evidence that speakers of two phonologically similar dialects of Mandarin differed in the pitch level employed in reading a short, emotionally neutral article in Standard Mandarin. They speculated that this is due to the individuals being part of two different social communities. Interestingly, Pemberton, McCormack & Russell (1998) carried out a cross-sectional study of the f0mean of Australian women over nearly 50 years, from 1945 to 1993 and reported that the average f0mean in Australian women decreased from 229 Hz in 1945 to 206 Hz in 1993. Given that they experimentally controlled for many of the factors that may have an influence on pitch (for example, age, smoking, steroid intake) they concluded that such a lowering was due to social and generational influences within a culture on the voice (Pemberton et al., 1998). Pemberton and colleagues' findings are particularly interesting as they suggest that cultural and social influences on voice pitch may vary along the diachronic scale; in other words, they showed that socio-cultural signalling via voice pitch is embedded in time. Time-related variation is outside the scope of this work, however, it was deemed important to mention it in this review because, as it is detailed in the next chapter (4.4), there appear to be diachronic discrepancies in previous work on pitch range variation in Japanese-English bilinguals.

One of the most reported loci of cultural variation for f0 is gender. As noted elsewhere, this variable has often been invoked in the literature to explain differences in pitch range which cannot be ascribed to sexual dimorphism. For example, Ordin & Mennen (2017) looked at f0 variation in the two languages of simultaneous Welsh-English bilinguals and found that a significantly wider span and higher f0max were consistently used by female participants when speaking Welsh compared to English, and this held true when they looked at the measurements of their female participants both as a group and individually. Notably, these patterns were not evidenced across the two languages of the male Welsh-English bilinguals. They argued that their finding shows that switching pitch range across languages is a learnt behavioural pattern, and that 'male and female speakers manifest behaviour that is more appropriate to what has historically been considered typical gender expression' (Ordin & Mennen, 2017, p. 18). They maintained that the correct behaviour is determined by specific sociocultural factors, but did not elaborate further on this claim.

Interestingly, growing up in a gender-egalitarian societies has been reported to affect pitch range variation in children and adults. For example, Moore (1995) reported that

Finnish adults, American adults, Finnish kindergarten teachers and Finnish older children were unable to attribute gender to the speech of young Finnish children, differently from what has been reported for English children (see above). Moore (1995) proposed that in a gender-egalitarian society, adults may not need to index their gender through pitch range and, consequently, no gender-specific attributes may be found young children's voices. It is worth mentioning that Moore also argued that her results may be driven by the interlocutor (that is the researcher herself). In Finland, interacting with strangers is considered an unusual practice and Finns use a special voice to do so (Moore, 1995). The researcher was not acquainted with her participants, thus, she argued, the children may have used exactly that special voice the Finns use to interact with strangers whilst talking to her, and this may have overridden potential gender differences in their pitch range (Moore, 1995).

Continuing, Weinrich and Simpson (2018) also explained different cross-sex pitch patterns in adults Swedish and German native speech invoking the role of living in a gender-egalitarian society. Specifically, they looked at f0mean variation in female and male Swedish and German native speakers and reported that sex-related differences in f0mean were larger for German than Swedish speakers. In addition, they collected information relative to their speakers' gender identity using the feminine scale of the GEAPQ questionnaire (2007) and reported that female and male German, but not Swedish, speakers showed significant gender differences on the questionnaire. They argued that the parallel between f0 patterns and gender identity results was an indication of socio-cultural influence on the pitch of these speakers. Specifically, they argued that their results showed that in more gender-egalitarian societies (in this case the Swedish one) speakers feel less pressured to express gender in speech. This work is important for the present research because it investigates the effect of relocating to a more gender-egalitarian society (arguably, the English society) from a less gender-egalitarian society (the Japanese society) and its effect on pitch range production in the two languages of female and male Japanese-English bilinguals.

Support for the view that there exists an interplay between pitch production and societal gender norms comes also from perceptual studies: van Bezooijen (1995), for example, showed that Japanese and Dutch individuals have different degrees of differentiation between their ideal woman and man, according to perceptual ratings of tokens manipulated in pitch level. Specifically, Japanese listeners rated low pitched voices as unattractive, whereas Dutch listeners rated low pitched voices as attractive. Interestingly, despite the perceptual discrepancies in the two groups of listeners, the actual differences in f0 between the original Dutch and Japanese female voices was not significant (180Hz for Dutch and 185Hz for Japanese). Van Bezoojien (1995) argued that as her participants were all highly educated, this would explain the lower pitch in Japanese. Indeed, research on gender roles in the Japanese society has reported that attending university for a Japanese female equals not endorsing the stereotypical roles attributed to femininity by the Japanese society (Sugihara & Katsurada, 2002), which might also translate in a less normative pitch.

Aside from group influences, individual gender identity might have an effect on pitch variation. Biemans and Van Bezoojien (1996) investigated the effect of speakers' gender identity on average f0mean and overall pitch settings (operationalised as the difference between a person's f0mean and their lowest pitch) on semi-spontaneous speech produced by dyads of Dutch females. Gender identity was measured with the *Femininiteit en Masculiniteit* questionnaire (Willemsen & Fisher, 1996). The researchers hypothesised that speakers with a more masculine gender identity would use a lower f0mean and have narrower pitch settings, however their results showed the opposite trend. In a subsequent study, Biemans (1998) investigated the effect of self-reported gender identity on pitch variation in mixed-sex speaking dyads. The researcher reported a significant relationship between high minimum pitch and masculinity, and this was valid for both female and male speakers. Biemans did not propose an explanation for her counterintuitive results. Taking these two studies together, however, it might be suggested that the effect of the interlocutor might have somehow impacted the expression of gender identity in the speakers. Indeed, all speakers were friends, and as such they might have felt comfortable at speaking with their normal voice, with no necessity to index their gender acoustically. In a more recent study, Kaźmierski (2015) has attempted to explain individual's f0 variation in terms of gender identity. Speech was collected from Polish female native speakers and gender was measured the BSRI-12, which was translated in Polish by the main researcher. No relationships were found between gender identity and pitch range, and the researcher attributed lack of results to the questionnaire. Somehow, regrettably, no pitch range measurements are reported in the paper, thus it is impossible to judge whether there was much variation in pitch across participants. However, since speech was collected by the researcher in conversation with undergraduate students, it might be argued that participants might have been speaking in a polite voice, which might have concealed the expression of each speakers' individual gender identity. Despite the inconclusive results, these studies are important for this work because one of its aims is to describe individual pitch variation in the two languages of Japanese-English bilinguals as an effect of each speaker's gender identity.

3.4.6 Bilingualism

Bilingualism is a further source of variation in pitch between (and within) individuals. Work investigating the pitch range of the two languages of sequential bilinguals has reported that it tends to differ significantly from the monolingual norm (de Leeuw, 2019a; Mennen et al., 2014; Mennen & Chousi, 2018). In addition, work investigating the pitch range of the two languages of simultaneous bilinguals has tended to compare the languages to each other and reported significant cross-language differences (Altenberg & Ferrand, 2006; Graham, 2015; Ordin & Mennen, 2017; Voigt et al., 2016). An infelicitous consequence of the above mentioned methodological choices is that phonetic research looking at sequential bilinguals has attributed bilingual's pitch range findings almost uniquely to strictly L1/L2 phonetic interferences (Busà & Urbani, 2011; Ullakonoja, 2007; however see de Leeuw, 2020), whereas work on simultaneous bilinguals has proposed that the differences in pitch range may be due socio-cultural constraints specific to each language of the bilingual (Ordin & Mennen, 2017; Voigt et al., 2016). As mentioned in 2.3, work investigating SLA using a variationist approach has indicated that L2 learners acquire sociolinguistic variation in their L2 (Drummond, 2011; 2012) and that the use of specific sociolinguistic variants may be dependent on the persona the learner wishes to portray (Nance et al., 2016). The present project intends to marry these two strands of second language acquisition literature by considering the potential effect of language-specific phonetic and social norms on the pitch range of the two languages of two groups of Japanese-English bilinguals.

It is worth noting now that there is a widespread belief that L2 f0 profiles tend to be narrower than those of native speakers (Aoyama & Guion, 2007; Busà & Urbani, 2011) which has, however, not been substantiated empirically. For example, Busà and Urbani

(2011) reported a higher pitch level in English spoken as an L2 than in English as an L1. Similarly, Järvinen and colleagues (2013) compared pitch level between the two languages of sequential Finnish-English and English-Finnish bilinguals and reported higher f0mean in the L2 than the L1 of both groups of bilinguals. They argued that the higher f0mean in the L2 of their speakers was a consequence of higher psychological anxiety whilst speaking in the L2 which led to increased tension in the laryngeal structures, stiffer articulators and, consequently, an increase in the f0mean (Järvinen et al., 2013). Interestingly, a high pitch level has been claimed to indicate *uncertainty* and a lower pitch level *certainty* (Gussenhoven, 2002) and there is exacting research which found that doubtful voices are marked by a higher pitch than confident ones, which tend to display larger variability (Jiang & Pell, 2017). The reported effect of nervousness and uncertainty on pitch level is important for this project. As is detailed in the methodology chapter (Chapter 5), bilinguals were not screened for proficiency in their L1 and L2 pre data collection, thus, it might be that less fluent individuals produced their L2 with a higher pitch level than more proficient bilinguals, irrespective of whether female or male. A similar effect may have also been evidenced on the L1 of the bilinguals, due to the L1 attrition effects.

3.5 Conclusion

This section has provided a review of the factors that research has found to determine variation in pitch range across individuals.

Previous research showing the relationship between social norms and the production of pitch was considered of particular importance for the present work, as it sets out to investigate the role of different social constraints on the pitch range of Japanese-English bilinguals. Importantly, however, in order to localize the effect of gender norms on the production of pitch range, it is crucial to be able to discount the potential confounds detailed in this section. In addition, the interaction between some of the variables listed in this section and gender norms needs to be considered; for example, variation in the interlocutor may interact with gender norms and therefore females, but not males, may be under pressure to modify their voice to align phonetically with what expected in a given social situation.

Especially interesting is the study from Ordin and Mennen (2017) which has reported clear-cut gender difference in pitch range, as the main aim of the present study is to investigate whether and how Japanese-English bilinguals manipulate their pitch in both their L1 and L2, as an effect of gendered practices. Again, they found that *only* the female participants increased their pitch level (they produced a higher f0max) and wider span when speaking Welsh compared to English. They maintained that the fact that only females, and not males, increased their pitch range when speaking Welsh and not English, was evidence against the difference in pitch range being due to the phonological/intonational structure of the two languages (Ordin & Mennen, 2017). With regard to the current investigation, it may be that the female speakers, and not males, will speak Japanese and English with different pitch ranges, thus providing evidence that the potential difference in speaking fundamental frequency between the two languages is sociocultural in nature.

In the next chapter, research describing pitch differences between Japanese and English speakers is presented. The research mostly focusses on bilingual subjects, although studies that examined monolingual subjects of both languages are also included. The exploration of previous work dealing with topics similar to the one of the present project was carried out to provide a framework for the set-up of the experimental design of the present study, which is described in detail in Chapter 5.

4 Differences in pitch between individuals: the case of Japanese and English

4.1 Introduction

In the previous chapter reasons for pitch range variation among individuals have been reviewed. In this section, the attention turns to previous work dealing with the languages object of the present research, that is, Japanese and English. This chapter opens with a brief phonological description of the two languages, followed by an account of the social norms which affect pitch range in the two languages. The chapter concludes with a detailed account of previous work investigating pitch range variation between Japanese and English females and males. Both work looking at bilinguals and monolinguals of both languages is reviewed to present the background research the present study is based upon.

As it is detailed below, it is often thought that Japan and the Western Anglophone world exemplify completely opposite sets of cultural norms and consequently offer excellent sample pools by which to compare and contrast abiding social variables (Yuasa, 2008). Notably, in the Japanese society a high-pitched voice has reported to be 'an important way of performing [female] gender' (Ohara, 2001, p.234). In English, whilst females generally have a higher-pitched voice than males (Cameron, 2003), an increase in pitch has been claimed to be used by females and males alike to express friendliness. Thus, Japanese and English do not perfectly align in the way female and male speakers perform gender as well as the normative social meaning that the two languages attribute to high-pitched voices. As it is to be further discussed, it is precisely the speakers' navigation and implementation of this normative mismatch that was considered pertinent to examine within the field of bilingualism. Before continuing, it is important to note that issues of cultural and linguistic diversity within the British and Japanese societies are outside the scope of this work.

4.2 Voice pitch and phonology: the case of Japanese and English

Beside sociocultural differences (see below), Japanese and English have been reported to differ prosodically and rhythmically (Beckman & Pierrehumbert, 1986). The former is a pitch-accent language (Ladefoged, 2001) or non-stress accent language (Beckman, 1986) or mora-timed language (see Warner & Arai, 2001 for a review), whereas the latter is a stress language (Beckman, 1986) or stress-timed language (Pike, 1979).

In pitch accent languages the accent is a lexical property of words; as a consequence, presence or absence of pitch accent depends on which word is being produced (Beckman & Pierrehumbert, 1986). An example is the word *hashi*:

- ***hashi*** with the pitch accent on the first mora means 'chopsticks' （箸）
- ***hashi*** with the pitch accent of the second mora means 'bridge' （橋）
- ***hashi*** with no accent means 'edge' （端）[examples taken from Tsuji, 2004].

In stress-accent languages, pitch accents are primarily prominence-lending used to make accent-bearing units more intentionally prominent than others, that is, to signal pragmatical discourse functions (Ladd, 2008). In addition, in pitch accent languages the accented syllable is realised invariably with a high pitch (Ladefoged, 2001); whilst, in stress accent languages, the accented syllable also varies in terms of duration (Beckman, 1986). Specifically, Beckman (1986) examined the acoustic correlates of accent in Japanese and English and reported that, in Japanese, accents are manifested by f0 modulation only (see also Ladd, 2008; Lehiste, 1970) whereas, in English, pitch accents are marked by a change in f0 with a combination of other acoustic parameters, such as increased duration and intensity and various spectral correlates. Beckman also reported that native Japanese speakers rely significantly more on f0 variation than variation in duration and amplitude to perceive stress in English, whilst native English speakers use all the three to approximately the same extent (1986).

These observations are relevant to the present research. As outlined in chapter 3, one of the possible causes of pitch differences between languages is intrinsic phonological differences between languages (3.4). Indeed, some previous research looking at pitch range in Japanese-English bilinguals has argued that differences in pitch range across these two languages are due to phonological reasons (Graham, 2015; Yamazawa & Hollien, 1992). This explanation, however, does not completely rule out the potential effect of different socio-cultural norms on pitch range. As it is detailed in the remainder of this chapter, a strictly phonological explanation does not fully explain why some have reported that only Japanese-English female bilinguals *consistently* use a higher pitch in Japanese than in English (Loveday, 1981; Ohara, 1992, 1992 and see below). As it is proposed later, the real cause for pitch range differences between Japanese and English may be due to a combination of phonological and socio-cultural reasons; indeed, the two explanations are far from mutually exclusive. Models of L2 speech predict language differences; however, they are unable to account for the fact that research has reported systematic differences across genders within languages. For example, although Japanese has higher peaks than English due to the pitch accent nature of the former, it is only Japanese-English female bilinguals who have been reported to systematically manipulate their pitch level to reflect the formality of the interaction. To explain such findings, socio-cultural factors need to be taken into account, as it is the case in the present project.

4.3 Voice pitch and social meaning: the case of Japanese and English

As mentioned in the previous chapter, pitch range variation conveys social meaning, or 'the conventional association of distinctions in the world with distinctions in the [phonetic] form' (Eckert & Labov, 2017, p. 3). Notably, due to its conventional nature, social meaning is dependent on a shared cultural common ground (Eckert, 2019), and thus varies across social and language groups. Japanese and English are interesting in this regard because of the different meanings conventionally attributed to high pitch level and wide pitch span by their speakers (see below). In the remainder of this section a brief account of these differences is provided; in doing so, the concept of Japanese Women Language (JWL) is introduced.

Japanese norms of behaviour have traditionally been highly gendered (Okamoto, 1995) and the Japanese language has been characterized as having distinct women and men languages, whose differences are deemed to be more extensive and rigid that those in English (Okamoto, 1995). There has been a great deal of discussion and data on gender differences in spoken Japanese which has focussed on sentence final particles, vocabulary, pitch range, usage as well as honorifics and politeness (e.g. Ide, 1982; Inoue, 2006; Miller, 2004; Miyazaki, 2004; Ohara, 2019; Okamoto, 1995, 2018). Japanese women are stereotypically expected to use Japanese Woman Language (JWL; *joseigo*) (Inoue, 2006; Ohara, 2019; Okamoto & Shibamoto Smith, 2007), a 'more polite or less vulgar form of language than Japanese Men Language' (JML; *doseigo*) (Ohara, 2019, p. 238). Prosodically, JWL is implemented by the use of a sustained high-pitched voice (Hiramoto, 2010), on average 40 Hz higher than that of Western women (Van Bezooijen, 1995). Japanese Men Language is traditionally defined in opposition to Japanese Woman Language (Ohara, 2019; Sturtz Sreetharan, 2004), as the rule from which JWL deviates. In terms of prosody, this has been referred to as 'a low, almost monotonous, pitch' (Loveday, 1981, p. 83), and a generally 'cooler' demeanour (Loveday, 1981; Tsurutani & Shi, 2018).

JWL and JML are gender-specific language varieties, that embody specific linguistic ideologies, and are coded at every level, from syntax, to morphology, and from phonetics to pragmatics (Inoue, 2004; Okamoto, 2018; Okamoto & Shibamoto Smith, 2007). The notion of how a woman *should* speak has been claimed to be 'a socially powerful truth' in Japanese society (Inoue, 2004, p. 57); JWL is closely connected with notions of Japanese culture and tradition, in the assumption that women's language is uniquely Japanese, a historical heritage and the sign of the higher refinement typical of the *real* Japanese woman (Okamoto, 2017).

A question lends itself; why, and how, some speech forms and functions have become to be identified as JWL? To respond to this question, and consequently situate the variable investigated in this study within the context of Japanese language, a short historical account of the creation of JWL is needed. The construction of gender linguistic norms in Japanese language and society dates to early pre-modern times (ca. 800 AD). At this time, the first collections of general behavioural norms indicating that women should speak gently and quietly, avoid kanji (ideograms) and Sino-Japanese words (which were reserved for men) appeared (Okamoto, 2017). During the feudal Edo-period (1603-1867), under Confucian and Buddhist ideology of male supremacy (and female inferiority), women's language and behaviour began to be more explicitly regulated (Nakamura, 2007); conduct manuals and ethics books maintaining that women should speak in a reserved, gentle, polite and refined manner, prefer Japanese language and spelling to the Chinese one and use of the polite prefix *o-* became particularly popular (Okamoto, 2017).

However, it is the late Meiji rule (end of 19^{th} century) that was pivotal for the affirmation of JWL and the creation of contemporary ideal Japanese woman (and man). Under the Meiji rule, Japan was unified, modernised and opened up for the first time to the Western world. Heavy industry and a new national transportation system were introduced, along with a new constitution (which stated that only male children could become heir to the throne), a civil code, a new unified and standardised language (i.e. Standard Japanese) and a new, compulsory, state-sponsored schooling system (Camp, 2009; Inoue, 2004). The new nation-state needed new citizens and the Meji rulers did not fail to account for that (Inoue, 2004). Individuals were organised as modern (imperial) subjects; they were given clearly defined roles and clear expectations related to being an individual in the new society which lead to the introduction of two new categories, namely the *modern Japanese man* and the *modern Japanese woman* who were attributed explicit expectations to enact the roles considered pertinent to their relationship with the new nation-state (Camp, 2009; Inoue, 2004). The modern Japanese state was built around Confucianist views of hierarchy and obedience with the family as the basic unit of society (Kajino, 2014). Within the family, the man was given the role of the bread winner, in charge of working outside the house and earn money, and the woman the role of the 'good wife and wise mother' (*ryoosai kembo*) (Inoue, 2004). In line with traditional Confucianist virtues and values, the new Japanese woman had to obey to the males of the family and rationally and scientifically manage the household (i.e. good wife), whilst carrying out her new modern role of educating her children (i.e. wise mother) (Inoue, 2004; Kajino, 2014). The newly introduced compulsory public education was pivotal in enacting the 'good wife and wise mother' (Inoue, 2004). In the new higher institution establishments funded by the government, Japanese women were taught the skills to perform their role and encouraged to speak with soft and gentle voices and use self-referential forms, beautifying prefixes (e.g. *o-* and *go-*), honorific expressions and new specific feminine word-final particles (e.g. *wa*) (Okamoto, 2018).

Whether the concept of JWL language appeared as a consequence of Meiji rule or as a societal by product is not an easy question to answer. Inoue (2004) claimed that the modern Japanese woman (and her language) were the product of modernity (i.e. of the

Meiji rule) totally severed from the concepts of the (ideal) woman in pre-modern Japan. Okamoto & Shibamoto Smith (2016), on the other hand, maintained that the modern Meiji woman and her language neither completely break off nor pass down faithfully from premodern times. To them, modern JWL and the ideal modern woman were 'the result of a more complex process in which the modern ideology of Standard Japanese [was] integrated into older ideologies of femininity and of how women should speak' (Okamoto, 2018, p. 682). Indeed, some of the qualities and stances that had previously been advocated for the Japanese woman remained available in the modern times (i.e. being reserved, polite and gentle), whilst, new specific references to linguistic features imbued in the Standard Japanese ideology were proposed (e.g. the use of new feminine word particles). Importantly, according to Okamoto (2018) in the late Meiji period, JWL ceased to be just the language of the 'ideal Japanese woman' to become the language of the 'idealistic woman' of the upper-middle class in Tokyo (i.e. the woman who speaks Standard Japanese); the woman that, in the view of the government, any other woman in Japan should aim to be like. Nakamura (2008) noted that the propagation of JWL among women was a critical part of the establishment of the new national language standardised among Japanese men. Under the Meiji rule, Standard Japanese was implicitly masculinised; this was accomplished by positioning it against the marked, exceptional, and marginal language of the JWL (Nakamura, 2008), and thus effectively rendering it as the language of men.

Efforts to sustain gender linguistic norms are still alive in the 'supposedly democratic post-war Japan' (Okamoto, 2018, p. 682). In today's Japanese society, women are still encouraged to act femininely (*onna rashiku)* (Reynolds, 1990) and speak in a feminine speech style (*onna rashii*) (Camp, 2009). Again, this speech style is polite, tentative; it employs special vocabulary, verb forms and sentence structures (Endo, 1995) and it is characterised by 'a distinctive tone of voice and carriage' (Endo, 1995, p. 29) implemented by a sustained high-pitched voice, on average 40 Hz higher than that of Western women (Van Bezooijen, 1995). Again, JML is defined in contrast with JWL, as being more coarse, direct and being characterised by a low and narrow pitch span (Loveday, 1981; Ohara, 2019).

Notably, although such linguistic gender norms still exist in contemporary Japan, research has shown that such stereotypical language is mostly relegated to novels, television and films (Inoue, 2003) and that the speech employed by real Japanese speakers varies widely between- and within-gender (Okamoto, 2018). In other words, whilst all Japanese women (and men) are aware of the languages they should use, real language practices have been reported to differ from prescriptive accounts (Kajino, 2014; Sturtz Sreetharan, 2004; Sunaoshi, 2004). The present research aimed to explore both between and within gender differences in the two languages of Japanese-English bilinguals; to this end, it investigated whether similar factors determined variation in the pitch range of female and male bilinguals and assessed the role on individual gender identity in explaining patters of variation within the female and male speakers.

While English does not display as many morphological or syntactic possibilities for explicit gender marking as Japanese, research has reported gender differences in English intonation. An example is the use of HRTs, which has been found to be gendered in a variety of English dialects. Specifically, research reported that English-speaking women produce HRTs (1) more frequently, (2) with wider pitch variation and (3) to express different pragmatic meanings than men (see 3.2). With regard to pitch range, as it is generally expected, English women have an overall higher pitch level than English men (Shevchenko, 1999). Perceptual work tapping into British English gender stereotypes and pitch range indicated that, when asked to speak in a *feminine* way, both British English females and males increase their f0mean and decrease it when asked to speak in a *masculine* way (Cartei et al, 2012, see Hiramoto, 2010 for a similar finding in Japanese). Interestingly, pitch span has been reported to be wider in the speech of (British) English men than women (Henton, 1989; Shevchenko, 1999; Volín et al., 2015).

Moving on to politeness and its phonetic implementation in Japanese and British English; it is worth first noting that positive politeness is often considered to be a woman's concern (or quality) across many languages (Holmes, 1995). There is empirical work that has claimed that women speak more politely than men, both with regard to Japanese (e.g. Ohara, 2019) and English (e.g. Trudgill, 1974). Politeness is often assumed to be some sort of pancultural phenomena of human interaction and there is a widespread belief that politeness, and its principles, as detailed by Brown & Levinson (1987) and Grice (Grice, 1975) are language universals (e.g. Pizziconi, 2007). These dominant accounts of politeness have been criticised for overgeneralising both pragmatic rules and semantic meaning of politeness. For example, Ide (1989) noted that the Western pragmatic meaning of politeness lacks fit to Japanese society. In addition, Pizziconi (2007) indicated that the conceptualisation of the semantic domain of politeness in British and Japanese society, despite having similarities, are not fully isomorphic. For the purpose of this study, pragmatic and semantic approaches to politeness are of less interest that those that focus on different acoustic and sociolinguistic aspects of politeness in Japanese and English. Before reviewing the latter, it is nonetheless important to address the issue of pragmatic and semantic constraints and politeness in the two languages, because they have been reported to account for phonetic differences across the two languages (see below).

Politeness may be defined as strategies for managing attention to people face, needs and/or social rights (Brown & Levinson, 1987). These strategies are important in human interaction; they are 'a precondition of human cooperation' (Gumperz, 1987, p. xiii), 'something developed in societies in order to reduce friction in personal interaction' (Lakoff, 1973, p. 64). Brown and Levinson (1987) claimed that reduction of friction can be accomplished either by showing *deference* (negative politeness) or by showing *friendliness* (positive politeness). The former is avoidance-based and is characterised by self-effacement, formality, and restraint (Brown & Levinson, 1987); whereas the latter assumes that the speaker and the addressee share the same cultural or moral values, with in-group rights, duties, and expectations of reciprocity (Brown & Levinson, 1987) and it is stereotypically attribute to women's speech.

Broadly speaking Japanese politeness involves showing deference whereas British politeness involves showing friendliness (Yuasa, 2008); however, there is more to Japanese politeness than purely showing deference. Ide (1989) claimed that to explain the practice of linguistic politeness in Japanese culture the concept of *discernment* (*wakimae*), or the practice of polite behaviour according to social convention, is pivotal. She maintained that it is with the rules of discernment that, in Japan, a speaker acknowledges their social position in a given situation and enact the appropriate expression of linguistic politeness (for example by using the correct honorifics and the appropriate voice pitch). The factors determining distance between interlocutors, and consequently use or not use of polite speech, are differences in social status, age, power, formality (of participants, occasion, and topic) (Ide, 1982). If, in general, Japanese linguistic politeness is mainly a matter of conforming to social conventions and signalling social distance (Yuasa, 2008); English linguistic politeness is more oriented to positive politeness and signalling social similarity (Meierhoff, 2011). As a consequence, despite the semantic field of politeness in British English and Japanese overlapping, they differ in emphases: modesty and being reserved are linked to politeness in Japanese, whereas friendliness is linked to politeness in English, whereas (Pizziconi, 2007).

Japanese politeness is generally considered a feminine characteristic and therefore it is associated with JWL (Ohara, 2019). Prosodically, it is claimed to be implemented by an increase in the pitch level and a widening of the pitch span, at least in female speakers (Ohara, 1999, 2004). In British English, friendly politeness has been claimed to be prosodically implemented with a higher pitch level and a wider pitch span by both females and male monolinguals (Loveday, 1981; Tsuji, 2004). These differences are important for this project as it aimed to investigate the effect of perceived (in)formality of an imaginary addressee on pitch range in the two languages of the bilinguals.

4.4 Pitch range variation in the two languages of Japanese-English bilinguals

Thus far, the two main reasons which have been claimed to determine pitch differences between Japanese and English have been briefly introduced. Of particular interest for the present project is the difference in social meaning that the two languages conventionally attribute to high pitch level (and wide pitch span) as it sets out to provide a fine-grained analysis of patterns of L1 attrition and L2 acquisition of a gendered variable. Here, previous work looking at pitch span in Japanese and English bilinguals, as well as monolingual females and males is detailed, with the aim of presenting previous findings on which the present project is based.

To my knowledge, the first two studies that attempted to investigate cross-language differences in pitch range between English and Japanese monolinguals are the two studies by Hanley and colleagues (Hanley et al., 1966; Hanley & Snidecor, 1967). In 1966, they gathered data, read speech and spontaneous speech, from 24 male college students who were monolingual speakers of American English, Japanese, Spanish respectively (eight speakers per language). By comparing the median f0 and standard deviation of both types of speech samples, they ranked Japanese as the highest language on a pitch continuum, followed by Spanish and American English. Moreover, on a pitch variability continuum, they classified Japanese as being the most variable, followed by American English and Spanish. It must be noted that, somehow regrettably, these results only referred to read speech, as spontaneous speech provided unstable results (Hanley & Snidecor, 1967). Their 1967 study focused on read speech from 32 female college students who were monolingual speakers of American English, Japanese, Spanish, and Tagalog respectively (eight participants per language). This study did not replicate the results of the 1966 study; however, not considering Tagalog, the researcher reported a trend for Japanese to be the highest language on a pitch continuum, followed by Spanish and American English. The authors did not comment on the reason for differences in pitch across language groups in neither study.

Research comparing the pitch range of Japanese-English bilinguals has produced somehow discrepant results, with older studies reporting that only females employ a higher pitch when speaking Japanese than English (Ohara 1992; 1999; 2001; Loveday, 1981) and a more contemporary one that both males and females use a higher pitch in Japanese than in English (Graham 2015) – importantly, however, no study reports bilinguals using a higher pitch in English than in Japanese. The remainder of this section presents such studies in detail, along with relevant work that has looked at pitch range of Japanese and English monolinguals, with the aim of building a framework to set up the experimental design of the present research, which is reported in Chapter 5.

Loveday (1981), following a casual comment from a Japanese male friend about ‘how feminine [he felt] when using polite formulae in English’ (1981, p. 71), investigated intonational differences in the expression of politeness in English and Japanese. The aim of the study was to show that the channelling of pitch level in English and Japanese is essentially different for the male speakers of the two languages. Ten subjects (two female and three male Japanese-English bilingual speakers, and two female and three male monolingual English native speakers, aged 23-46) were recorded reading a role in a dialogue about meeting someone in the streets and being invited for lunch later involving several politeness formulae (*Oh hello* / ああこんにち - *aa konnichi wa*, *thank you* / ありがとございます - *arigato gozaimasu* and *bye* / さよなら - *sayonara*), imagining that their interlocutor was a non-intimate acquaintance (played by the experimenter). The Japanese participants did the role play both in English and Japanese, whereas the British English participants did it only in their native language. Both the pitch level used in politeness formulae, as well as the individuals' phonational ranges, i.e. the range of frequencies (highest to lowest) that an individual can produce were analysed. Participants' phonational ranges were very similar (73 Hz – 369 Hz for Japanese males, 75 Hz- 384 Hz for English males; 115 Hz – 835 Hz for Japanese females and 115 Hz- 825 Hz for English females), which did not explain the striking differences in the overall pitch level in the politeness formulae. In Japanese, male bilinguals were found to constantly adopt a much lower pitch than their English counterparts, 80-120 Hz in Japanese versus 70-310 Hz in English. Two out of three bilinguals appeared to transfer Japanese pitch patterns to their English, whereas the third Japanese speaker attempted to produce English higher pitch norms, sounding unnatural (Loveday, 1981). Interestingly, English males' performance reached and sometimes equalled English females' top range, while this was never the case for Japanese males in relation to Japanese females. Japanese females adopted an extremely high pitch in expressing Japanese politeness formula (with peaks of 450 Hz), clearly separating themselves from Japanese males, but this was not the case for the English monolingual speakers. The frequency band separating males and females in Japanese was found to be between 100 and 150 Hz, whereas for English speakers it was between 20-50 Hz. Furthermore, he reported that Japanese females lowered their pitch in English, generally reproducing frequencies more similar to the ones produced by the British female informants; the same could not be said for the Japanese males who seemed to simply transfer their low Japanese pitch to English (with the exception of one subject who reported to be aware of the difference in pitch norms in the two languages and attempted for a higher pitch in English, and produced 'pitch contours which sounded really unnatural' (Loveday, 1981, p. 86)

Loveday concluded that there must have been something more than simply language related features that pushed Japanese and English females and males to produce different pitches. He argued that differences in pitch were employed in different ways between the two cultures: 'in English, it is a marker of politeness adopted by both sexes; whereas in Japanese increased pitch is a stereotypical marker of femininity' (Loveday, 1981:86). Thus, why English male speakers do not seem to have any problem in raising their pitch when, for example, *thinking*; whereas Japanese males keep their pitch very low even in English, somehow portraying a 'cool profile' (Loveday, 1981: 82). An explanation may be that Japanese expectations of sexual and social roles are much more rigid than those prescribed by English norms, hence Japanese women are expected to be very decorative and feminine in their speech (Ohara, 1999) and using an artificially high pitch would serve this purpose (Loveday, 1981). It must be noted, however, that Loveday collected his data in Germany, thus it might be that the pitch span registered for his participants were influence by exposure to the German language. Moreover, and as pointed out by Sherr-Ziarko (2019), Loveday's findings are not based on inferential analysis but on descriptive results; nonetheless, this study is important as it is one of the first attempts to investigate gendered patterns in bilingual pitch production.

The first study to propose a phonological explanation to differences in pitch between American English and Japanese was carried out by Yamazawa and Hollien in 1992. The researchers compared the pitch range of 32 Japanese females to that of 24 White American females (both groups comprising college-aged sequential bilingual speakers of both languages, and monolingual native speakers of the two target languages). They found that the f0mean of the Japanese females was significantly higher than that of the American females. Specifically, Japanese monolingual speakers exhibited an average f0mean of 224 Hz, whereas the American monolingual speakers were found to speak with an average f0mean of 195 Hz. For the Japanese-English bilingual groups an average f0mean of 225 Hz when speaking Japanese, and 220 Hz when speaking English were reported. American-Japanese bilinguals were found to slightly increase their pitch span when speaking Japanese compared to when speaking English (f0mean 211 Hz in Japanese versus 209 Hz in American English). The researchers argued that these differences were likely to have resulted from fundamental intonational differences intrinsic to the two languages. Given that Yamazawa and Hollien (1992) only investigated female speakers, their explanation does not completely rule out the possibility that these differences may be (also) due to socio-cultural constraints.

Ohara (1992, 1999) investigated pitch range in Japanese-English bilinguals and attributed differences in pitch between Japanese females and males to socio-cultural constraints, similarly to Loveday (1981). Based on the assumption that female native Japanese speakers would modify their pitch level when speaking Japanese relatively to when speaking English, Ohara (1992) recorded 12 Japanese-English bilingual speakers (6 males and 6 females, age 21-31), reading 10 sentences in English and their translation in Japanese. Results indicated that the females, but not the males, produced a consistently higher f0mean (on average at least 19 Hz higher in Japanese than in English) and wider span in Japanese than English (83 Hz for Japanese and 76 Hz for English). Ohara (1992) argued that her results showed clearly that the pitch differences between the two languages of the Japanese-English female, but not male, bilinguals indicate that 'speakers may modify their pitch in order to convey a particular image or conform to stereotyped expectations prescribed by [the] society' and the social norms relative to the language they are speaking (Ohara, 1992, p. 6). Thus, the difference in pitch patterns for females and males registered by Ohara may reflect the conceptualisation of gender roles in the Japanese society. Consequently, whilst speaking Japanese, Japanese females would adopt a high pitch to convey the impression of femininity as expected by Japanese society. This does not explain though why Ohara's Japanese females did not keep the same high pitch when speaking English, and the researcher did not expand on this point. Perhaps her speakers were balanced bilinguals and aware of the different language norms of Japanese and English. The Japanese males of Ohara's study showed hardly any differences in pitch between the two languages (Ohara, 1992). The author provided two possible reasons for this lack of variation: (1) Japanese males use a low pitch when speaking both languages because high pitch is considered to be feminine in both languages. For example, Kramer (1977) reports that one of the stereotypical images of an 'effeminate' or 'female' voice is that it is produced in high pitch even in Western societies. Otherwise, she argued that (2) in Japanese society, male gender is seen as 'unmarked' (Ohara, 1992, p. 437), so men would not need to use pitch to differentiate from women in none of their languages. In addition, it might be suggested that Ohara's male participants very low pitch in both of their languages is an indirect effect of the researcher being a Japanese female; it might be that, perhaps subconsciously, Ohara's males somehow highlighted their maleness in their speech, following Japanese male language norms. As it will be detailed in the next chapter, to overcome any possible interference from the researcher on the speech of participants, in this study bilinguals were instructed by a custom-made animated character considered to be gender neutral, rather than a person (see 5.3.2)

In a subsequent study, Ohara set out to retest the same hypothesis of her 1992 study, that is that Japanese females – but not males - raise their pitch level when speaking their L1 but not when speaking their L2. This time, her participants were female and male Japanese speakers in fluent American English L2 speakers as well as American English L1 speakers fluent in Japanese. Twenty informants, 10 for each language group, aged 26-46, all students at the University of Hawaii at the time of the experiment, were asked to perform three tasks, in both languages: (1) reading isolated sentences, (2) engaging in a conversation with the researcher based on a written script and (3) leaving a message on an answering machine. Only the results of the last task were reported in her 1999 paper. The purpose of the task was to elicit a more natural type of speech. Each subject was invited to leave four messages, one for a Japanese professor, one for a Japanese friend, one for an American professor, and one for an American friend in the appropriate language. No script was provided but the subjects had to include certain items in their messages, which were about borrowing a book. They had to (1) leave their name and course number, and other information, such as (2) which book they were looking for, (3) that they could not find it at the library, (4) if they could borrow the book and (5) that they would have called again. The f0mean for the five pieces of information included in the message were averaged to get one average f0mean measurement for each message. Ohara (1999) reported that f0mean interacted with gender, culture and addressee (formal vs informal); note, however, that no statistical tests were performed on the f0 measurements and results were purely observational. More precisely, Ohara (1999) reported that the Japanese-English females showed a distinct variation in f0mean across languages, with an effect of the formality of the situation, i.e. a higher f0mean was produced when talking to a professor than a friend, in Japanese only. The difference in f0mean registered across languages ranges from 9 to 38 Hz. The pitch level of Japanese-English males, on the contrary, not only varied minimally across languages, ranging from 0 to 8 Hz, but also across interlocutors in both languages. The female English-Japanese speakers has a higher f0mean when speaking Japanese than English, ranging from 5 to 29 Hz; however, they were inconsistent in modulating their pitch level according to the person with whom they were talking, i.e. professor vs friend. Similarly to Japanese-English male bilinguals, the English-Japanese male participants did not vary much their pitch neither across languages nor addresses. Ohara (1999) argued, again, that only by exploring gender could the results of the study be explained, and this was for two reasons. Firstly, the fact that bilingual females employed higher frequencies when speaking Japanese, and not males, suggested that differences in f0mean were not due to the language itself. In addition, such variation could not be attributed to different anatomical features in American and Japanese female bilinguals, as both female groups showed the same pattern. Ohara then suggested that it was the different gender roles attributed to females in the two societies that were the real reason of the registered differences in f0mean. In American society, she argued, females are not required to use a specific pitch (Ohara, 1999); if anything, males seem more likely to be sanctioned for using the wrong pitch (Crystal, 1975; Kramer, 1977). On the contrary, in Japan, a high pitch level is considered to be a sign of femininity, a way of performing gender as expected by society (Okamoto, 1995), thus the variation between the Japanese and English pitch of the female bilinguals (Ohara, 1999).

There is some perceptual evidence in support of the claim that gender roles explain pitch differences between Japanese females and males. Ohara (1993 & 1997 cited in Ohara, 1999 and Tsuji, 2004) ran a voice perception experiment to investigate the meaning of high pitch in Japanese. She recorded two native Japanese female speakers saying the words こんにちわ (*hello*) and さよなら(*goodbye*) and manipulated the pitch of the recordings to three levels (high, low and original). The higher the voice pitch the more the voice was perceived by native Japanese female and male speakers alike as pertaining to 'cute, soft, gentle, kind, polite, quiet, young, and beautiful […] marriable' (Ohara, 1999, p. 112) women. This suggests that even contemporary traits of *femininity* (and *masculinity*) are based on gender stereotypes similar to those expected in the Meiji Era during which girls were brought up to be obedient, polite and non-argumentative and boys to be active, brave and strong (Kameda, 1996). Interestingly, van Bezooijen (1995) reported a preference in Japanese culture for women with a high-pitched voice with no effect of the sex of the listener, again suggesting the pervasiveness of gender roles in Japan.

Importantly, for the present research, Ohara's (1999) study showed that bilingual females, but not males, consistently used a higher pitch when leaving a voicemail message for a professor in Japanese but not in English; thus, providing evidence to the claim that Japanese females are expected to use a feminine and polite language, that is, the Japanese Women Language. It is somehow curious that the English-Japanese females did not adopt the same pattern, and Ohara did not provide a reason for the mismatch in the bilingual results. It may be tentatively argued that this discrepancy is due to a lower L2 language proficiency and, perhaps consequently, socio-cultural awareness in her English-Japanese informants.

A further study from Ohara somehow indirectly tackles the above-mentioned discrepancy by investigating whether American English speakers, who were learners of Japanese, employ a higher pitch when speaking in Japanese to satisfy cultural expectations (Ohara, 2001). Voice pitch levels of two different groups of female American English L2 speakers of Japanese, (a) beginner L2 speakers and (b) proficient L2 speakers, were examined. Data was also collected from a group of female Japanese L2 speakers of English who served as baseline for comparisons. For this research, Ohara reused the same tasks of her 1999 study. In addition, she carried out ethnographic interviews to investigate participants' awareness of their voice when speaking Japanese, and their feelings relative to the relationship between their voice and identity. Beginner L2 users did not exhibit much difference in their meanf0 when speaking English and Japanese in any task. As far as pitch variation according to the interlocutor goes, they used a higher pitched voice when leaving a message to friends both in Japanese and English and they lowered their pitch when leaving a message to the Japanese professor, possibly in an attempt to convey seriousness (Ohara, 2001). Pitch behaviours in the Japanese-English fluent bilinguals replicated Ohara's (1999) findings; more precisely, Japanese f0mean was significantly higher than English f0mean in all tasks. As far as the effect the addressee is concerned, no cross-languages statistically significant difference was found in the message to the friends, that is, bilinguals used similar f0s when addressing friends in English and Japanese. Cross-language f0mean differences were significant for the message to the professor, that is, Japanese f0mean was significantly higher than English f0mean in the message to the professor. Moreover, in English pitch differences across addressees was not significant, whereas they were significant in Japanese; in other words, Japanese-English bilinguals differentiated their pitch level when addressing a professor compared to addressing a friend in Japanese but not in English. The most interesting, yet surprising, results were from the proficient English-Japanese female bilinguals. Pitch patterns were rather mixed in all tasks, with two participants showing patterns similar to the ones of the beginner speakers, that is, not much difference in pitch across languages and a higher f0mean when addressing friends compared to professors, and the three other participants showing patterns like that of native speakers of Japanese, that is, they produced a statistically higher pitch when speaking Japanese than when speaking English and differentiated across addressees in their Japanese but not in English. To understand the puzzling results from the proficient L2 speakers, Ohara turned to the interviews with the participants, which revealed that beginner learners were not aware of the symbolic use of pitch in Japanese to signal social gender, whereas all bilinguals were. In terms of the mixed pitch results for experienced L2 speakers, interviews showed that the pitch employed by the speakers ‘correlated neatly with their attitude toward the kinds of images typically associated with Japanese women’ (Ohara, 2001, p. 242). The speakers that varied their pitch patterns across languages did so because they had consciously decided to embrace the Japanese conventions, in an attempt to ‘fit into the culture’ (p.243). In a similar way, by speaking ‘with [their] natural voice’ (p.244), the remaining two speakers consciously decided to reject a cultural identity they did not want to project, because they felt it did not pertain to them. This study is particularly interesting for the present research as (1) it reaffirms the presence of ‘expectation about femininity in Japanese society’ (Ohara, 2001, p. 434) and (2) shows how L2 proficient speakers are thoughtful actors who, given their knowledge of the language and the culture associated to it, are able to ‘choose a code that matches their (desired) identity in a given situation’ (Siegal, 1996, p. 356).

Continuing with the expression of politeness with pitch range in Japanese, Ohara (2004) collected data on Japanese monolingual speakers and their usage of pitch in the workplace, in an attempt to place voice pitch within *actual* interactions. Her subjects were four native speakers of Japanese (2 males and 2 females), aged 35-39, who were working in businesses located in Honolulu (Hawaii). The participants were given a microphone and were asked to record their interactions during their workday, while speaking Japanese. The researcher focused on the pitch used in two particular speech acts, namely *requests* and *negations*, as they were the most frequent in the data and occurred with a wide range of interlocutors (customers, co-workers, business associates, acquaintances). Results showed that while, overall, female speakers showed a pattern of elevated pitch, this was not always the case (Ohara, 2004). Female speaker B, for example, used an average f0 of 166 Hz when talking to an acquaintance, which was lower than the average pitch produced by male participant D when talking to an acquaintance, which was 218 Hz. This seems d to contradict previous findings; note, however, these speakers lived in an English-speaking environment which might have impacted their Japanese pitch. Ohara (2004) did not delve into potential language interferences to explain her results, rather she focussed on the fact that *only* her female subjects consistently raised their voices when talking to customers compared to when talking to acquaintances (260 Hz versus 217 Hz for female speaker A and 202 Hz versus 166 Hz for female speaker B) to signal politeness. This, she maintained, suggests that pitch variation in these females is not casual and that Japanese women, but not men, 'face constraints such that they are expected to use a high-pitched voice to express politeness' (Ohara, 2004, p. 237).

Notably, Ohara (2004) reported that both female and male speakers in her study used their voices dynamically to accomplish *emphasis* (Ohara, 2004). This finding is important for this project as it seems to suggest that the strict boundaries between Japanese female and male language may not be as rigid as once thought (see also Miyazaki, 2004; Sturtz Sreetharan, 2004). However, and in line with Ohara (2004), the fact that *also* Japanese males may use their voices dynamically does not rule out the existence of gendered-associated patterns of pitch usage in Japanese. Indeed, monolingual females, and not males, constantly used high-pitched voices when talking to customers, which again supports the idea that females face constraints such that they are expected to use a high-pitched voice to express politeness' (Ohara, 2004, p. 237), as previous literature has already concluded (see Loveday 1981 and Ohara 1999).

Continuing, Tsuji (2004) investigated f0 modulation in Japanese and British English monolingual speakers in an attempt to assess patterns of usage and meaning of high pitch level in both languages. She recorded speech from 16 informants, 8 native English (4 females and 4 males) and 8 native Japanese speakers (4 females and 4 males), in their twenties (average age = 24). The recordings consisted of read speech as well as spontaneous speech (role-plays and simulated phone calls to friends). Results showed pitch differences between languages and sex of the speaker: Japanese females showed an overall average higher f0mean than English females (226 Hz vs 216 Hz); whereas Japanese males showed an overall lower average f0mean than English males (110 Hz vs 124 Hz). Importantly, f0mean varied according to speaking style (formal vs informal); specifically, English speakers used a higher f0mean when greeting friends on the phone (270 Hz for English females and 140 Hz for English males compared to 235 Hz for Japanese females and 116 Hz for Japanese males), whereas Japanese speakers used a higher f0mean in the formal role-play (250 Hz for Japanese females and 120 Hz for Japanese males compared to 205 Hz for English females and 118 for English males). Tsuji (2004) suggests that the use of high pitch level in formal versus informal speech is more linked to overall cultural differences than sex differences, which aligns with the previous comments that, perhaps, pitch norms in female and male Japanese speakers are not as categorically different as previously thought. Nonetheless, it must be noted that Tsuji's participants were all students in London at the time of data collection, thus an effect of English on her Japanese speakers' results cannot be ruled out.

There is some evidence that a higher pitch level and a wider pitch span are stereotypically associated with femininity in the Japanese language. Hiramoto (2010) investigated prosodic variation of the neutral sentence final particle *ne* in the speech of female and male native speakers of Standard Japanese who were asked to produce sentences in a feminine and masculine style, as well as in their normal voices. Results showed that speakers, irrespective of their sex, increased their pitch level and widened their pitch span (and increased duration) when speaking in the feminine style. Hiramoto concluded that sentence final particles may act as a locus of femininity projection in Japanese (2010), similarly to tag questions in English (Lakoff, 1975). Interestingly, perceptual work on sentence final particles indicates that they may also act as a locus for the expression of politeness. Specifically, Ofuka and colleagues (2000) reported an increased pitch span in sentence final particles in the formal speech of male native Japanese speakers. Taken together these two studies are interesting for this project because they provide empirical evidence substantiating the postulated link between performance of femininity, politeness and high pitch level at least in terms of the intonation of sentence final particles.

With regard to the expression of politeness in Japanese, Yuasa (1998) investigated pitch production in female and males' native speakers of Tokyo Japanese with the aim of assessing the role of sex of the speaker on the expression of deference in a work setting. Results showed that both females and males used narrower pitch span (calculated as the difference between the highest and lowest f0 in an IP) when addressing unfamiliar recipients (work superiors) compared to familiar ones (work colleagues); in other words, a narrower span was used to index deference. In a subsequent study, Yuasa (1999) explored the effect sex of the addressee on the expression of politeness in Japanese male native speakers. Results replicated findings from the previous study; specifically, a narrower pitch span was detected when addressing unfamiliar recipients, and this was valid both when the addressee was a woman and a man. In other words, unfamiliar interlocutors, irrespective of their gender, elicited a narrower pitch span than familiar ones in Japanese males. Yuasa (1999) argued that, in the Japanese culture, there exists a tight relationship between politeness, emotions and group consciousness; a narrow pitch span would then be preferred by Japanese speakers in formal situations as it communicates absence of emotions and negative politeness; whereas a wider pitch span would be used in informal situations to express emphatic emotions and positive politeness (Yuasa, 2008) According to Yuasa (2008), such manipulation of pitch span is independent on the sex of the speaker and of the interlocutor; however, only males took part in her 1999 study, thus a potential effect of sex of the interlocutor on female speech cannot be ruled out.

Yuasa (2008) compared pitch manipulation in 9 Japanese and 9 California American native speakers to assess the role of sex of the speaker and culture on f0 variation in the expression of deference. Results from the Japanese monolinguals replicated her 1998 and 1999 studies; that is, deferent speech was characterised by a narrower pitch span. As far as cross-language comparison goes, somehow regrettably, Yuasa only collected speech directed to familiar interlocutors and reported that, overall, Japanese native speakers used wider pitch movements than American speakers, irrespective of their sex. Interestingly, sex comparisons showed that American females' pitch movements were much wider than that of American males, whereas both Japanese females and males used large pitch movements, with the average pitch movements of Japanese males being slightly wider than that of Japanese females. Yuasa did not use statistical tests to support her observations, nonetheless this research is important for two reasons. In terms of Japanese males' speech behaviour, her findings marry two otherwise seemingly discrepant claims made by others, by situating them in specific interactions: on the one side Japanese males use the monotone pitch and deep voice reported by Loveday (1981) when addressing unfamiliar interlocutors to show negative politeness, whilst at the same time they are able to widen their pitch span emphatically, perhaps to demonstrate inner-group oriented characteristics when addressing familiar interlocutors (Yuasa, 2008). The discrepancy between Yuasa's work and other work reviewed earlier in this section (Ohara, 1999, 2004; Tsuji, 2004) is likely due to how politeness was operationalised. As noted by Sherr-Ziarko (2017), the meaning of politeness and formality largely overlap in Japanese, yet they are not exactly the same. Arguably, Yuasa's (1998, 1999, 2008) work was situated in a more formal setting (work setting) than Ohara's (1999) who situated her study within a university setting and this may elucidate the differences in the directions of the results. Regardless of whether pitch level increases or decreases in the speech of Japanese females, of importance here is the findings that in Japanese politeness is indexed through pitch range. The present research further explores this avenue by exploring speech produced by both female and male Japanese native speakers to (in)formal female and male addressees.

Graham (2015) investigated voice pitch in Japanese-American English balanced simultaneous bilinguals, i.e. bilinguals who act as monolinguals in both of their languages (Grosjean, 1998). Ten simultaneous bilingual speakers of Tokyo Japanese and American (Californian) English (5 males and 5 females, age 19-25) were asked to read 20 English sentences (5 declarative statements and 15 questions) and their corresponding translations in Japanese. Following the methodology proposed by Mennen and colleagues (2012), linguistic measurements were made for level and span, as the researcher was interested not only in determining whether or not the f0 range varies between American English and Japanese, but also in what dimension (i.e. pitch level and/or pitch span) the potential difference occurred. Overall, he found that f0 range was realised differently between the two languages in both dimensions; more precisely, pitch level was higher, and span was wider in Japanese than in American English, and revealed that these differences did not depend on the sex of the speaker (i.e. male and female informants showed the same patterns in their realisation of pitch) and sentence type. Specifically, female informants were reported to present an overall level in Japanese 26 Hz higher than in English (233 Hz in Japanese versus 207 Hz in English), with post hoc tests showing that Japanese was realised significantly higher than English on two measures: mean of initial peak and onset f0 for all sentence types (Graham, 2015). The pitch level of male informants in Japanese was 10 Hz higher than in English (125 Hz in Japanese and 115 Hz in English) and post hoc test revealed a similarity to the results of the females, the male bilinguals realised Japanese significantly higher than English in terms of onset F0 and initial peak (Graham, 2015). Overall span in Japanese was realised 4.8 ST wider than in English: specifically, an overall span of 10 ST in Japanese and in 5.16 ST in English for females and an overall span of 10.01 ST in Japanese and 5.41 St in English for males was reported. Graham's (2015) evidence appears to contradict the socially driven explanation provided by the literature explored above, at least for simultaneous bilinguals, however, he conceded that, taken together with Loveday's and Ohara's work, his study would suggest that both social and phonologically driven differences may be at work. This resonates with other research reviewed above which showed that Japanese males, and not only females, manipulate their voice pitch in interaction. However, the fact that it seems imperative only for Japanese female to always modify their voice pitch suggests that there are social factors at play, which do not seem to affect Japanese males (Ohara, 2004).

Notably, there seems to be some sort of a diachronic discrepancy in the findings reported in this section; older literature (i.e. work carried out before the end of last century) has indicated a stark divide in Japanese females' and males' pitch, whereas more contemporary findings show more of an overlap in females' and males' pitch patterns. It might be that these discrepancies indicate a change (perhaps in progress) in the Standard Japanese (pitch) norms (see Lewes, 2002 for a similar suggestion). Interestingly, Hiramoto (2010) has shown that female and male Japanese monolinguals produce gender-neutral sentence final particles with a higher pitch level and a wider pitch span when instructed to read in 'feminine style'. This suggests that Japanese native speakers, irrespective of whether female or male, are aware of the ideological qualities of JWL and can use these pitch realisations to perform *femininity*, if desired. It is therefore possible that the discrepancies evident across studies of Japanese-English bilinguals result from conflating individuals with various gender identities into overly simplistic sex-based categories. In the present project, this avenue of inquiry is pursued by taking into account the effect of individual gender identity on the pitch realization of the two languages of female and male Japanese-English bilinguals.

4.5 Conclusion

Concluding, despite these discrepancies, the findings reported above seem to indicate that, overall, Japanese females are under more constraints than Japanese males in the use of their pitch in their native language, and it is on this finding that the current research builds. Its main scope is to examine whether and how Japanese-English sequential bilinguals navigate and manipulate variation in their respective languages, by investigating how a gendered variety in the L1 influences and is influenced by acquiring a less gender-prescriptive L2 with regard to L2 acquisition and L1 attrition. The current study is novel because it is the first study which aims at providing a fine-grained gender analysis of speech collected by combining methods of research on bilingualism and sociolinguistic research. Using questionnaires which directly assess the endorsement of gender stereotypes, the potential individual variation in production of pitch is explored in detail to enlarge our understanding how individuals align or disalign with conventionalised linguistic expectations of their L1 and L2 in different contexts and with different interlocutors. Furthermore, the role of bilingualism typical predictor variables is also assessed to explain potential variation which may not be clearly reflected in group trends.

5 General methodology

5.1 Introduction

Chapter 5 introduces the general methodology for the present study, which represents an investigation into the production of the two dimensions of pitch range and their interplay with bilingualism and gender in Japanese-English sequential bilinguals. Accordingly, the present experiment builds upon experiments from the relevant literature as detailed in the previous chapters.

The present chapter opens with the main questions of the experiment. Thereafter, the focus is on a detailed outline of the methodology, which begins with an account of the recruitment procedure, followed by the overall experimental procedure followed in this research. Thereafter information regarding the profiles of the bilingual and monolingual participants is reported (5.4) with a specific view towards how participants satisfied the selection criteria for this study and the extra-linguistic variables object of this investigation (5.5. and 5.6). Specifically, in 5.5.1 an account of the gender questionnaires used in this work is presented. The chapter concludes with an account of the general predictions of this project.

5.2 Outline of the research

The present study concentrates on two groups of bilingual Japanese-English speakers: (1) the first group comprises Japanese native speakers who moved to the UK and who were residents of London at the time of the data collection; (2) the second group comprises individuals who were residents of Tokyo (Japan) at the time of the data collection, some of whom had resided in an English-speaking country before moving back to Tokyo.

The primary question of this project investigated whether there was a bidirectional interaction between Japanese and English linguistic and socio-cultural norms on the pitch range of the two languages of female and male bilinguals. In addition, it also aimed at shedding light on the influence individual (dis)alignment to society-specific gender roles has on pitch range in the two languages of bilinguals.

As detailed in 4.4, this question was prompted by the somehow incongruous previous findings on Japanese-English bilinguals' pitch production which indicated that (1) only female bilinguals use a higher pitch when speaking Japanese compared to English (Loveday, 1981; Ohara, 1992, 1999) and increase their Japanese pitch to index politeness, and that (2) both male and female simultaneous bilinguals use a higher pitch when speaking Japanese compared to English (Graham, 2015).

Data from self-identified females and males were collected to investigate whether *all* sequential Japanese-English bilinguals use a higher pitch in Japanese than in English, or if being female has an effect on pitch range production and whether residing in the L2-speaking country magnifies such potential effect. Beside group trends, potential individual patterns of variation were assessed by investigating whether the bilinguals' individual gender identity impacted pitch range production. This was done to determine if, for example, bilingual females that more closely identified with Japanese feminine gender traits had a higher pitch level (and potentially a wider pitch span) in their Japanese than those who more closely identified with masculine gender traits. In addition, of interest was to assess whether this was replicated in English. This was done because, as proposed in 4.4, inconsistent results from previous work on similar populations may have been linked to researchers operationalising gender categorically (i.e. as female versus male differences), thus conflating individuals with various gender identities into overly simplistic sex-based categories. To my knowledge, the role of individual gender identity on bilingual pitch range has never been investigated; however, there is sociophonetic work indicating that monolingual speakers vary their voice pitch in line with their gender identity (Biemans & Van Bezooijen, 1996; Podesva & Callier, 2015; Schmid & Bradley, 2019). Thus, this is the first work of its kind to attempt to provide a fine-grained analysis of the effect of gender on the two languages of female and male bilingual speakers.

With regard to L1 attrition and L2 acquisition, several studies have shown that sequential bilinguals differ in the extent of the phonetic interaction between the L1 and the L2 (de Leeuw et al., 2012; Mennen, 2004; Mennen et al., 2014). To investigate the combined effect of L1 attrition and L2 acquisition, data from two monolingual groups, one comprising Southern Standard British English (English henceforth) monolinguals resident of London (UK) and one comprising Standard Japanese (Japanese henceforth) monolinguals resident of Tokyo (JP) were collected. This allowed to compare the pitch realisation of the bilingual participants in both of their languages with, respectively, the English and the Japanese of the monolinguals (see Flege, 1987 for work recommending comparing both languages of bilinguals to monolingual norms). Accordingly, and differently from previous work on Japanese-English bilinguals, both the L1 and the L2 of the sequential bilinguals were examined in the experiment. As such, both the process of L1 attrition and L2 acquisition were taken into consideration in this project. Importantly, and unusually, data was collected from two groups of bilinguals, one residing in the L1-speaking country and the other in the L2-speaking country, which enabled an investigation on the effect of change in language environment on the L1 and L2 of bilingual speakers.

With the aim of exploring individual variation in the bilingual groups which may have been covered by group trends, a last question of the analysis focused on the role of extra-linguistic predictor variables commonly studied in research into L1 attrition and L2 acquisition of phonetics (namely, Age of Acquisition (AoA), Length of Residence (LoR), Amount of L1 use and L1/L2 proficiency). AoA has been reported to impact L2 learning outcomes due to biological (e.g. Aoyama & Guion, 2007; Huang & Jun, 2011 for work on prosodic features of speech; and Birdsong & Molis, 2001 for a general review) and social factors (e.g. Stevens, 1999). Similarly, age of arrival to the L2 country has been reported to influence the rate of attrition, with L1 attrition increasing with earlier arrivals (de Leeuw et al., 2012). Whether age effects occur in the speech of these bilinguals at the level of pitch range in both of their languages was therefore considered to be of relevance. LoR has been extensively studied both in L1 attrition and L2 acquisition literature, with previous findings not yet offering a conclusive picture. Specifically, the literature points to an effect of LoR at the beginning of the subjects' bilingual experience, which may then either reach a plateau, or lessen (DeKeyser & Larson-Hall, 2005). Despite the still unclear effect of this variable, it was decided to take it into consideration for consistency with previous literature on similar topics (de Leeuw, 2009; Mennen et al., 2014). Analysis of amount of L1 use was also justified by previous literature which has reported an influence of L1 use patterns on bilingual speech (see Hansen Edwards, 2008; Piske et al., 2001 for general reviews). Lastly, bilingual performance has been linked to proficiency in the two languages (e.g. Mennen et al., 2014; Ullakonoja, 2007), however empirical evidence for an interconnection between L1 and L2 proficiency on bilingual speech production is still sporadic. Major's (1992) work on phonological change in bilingual speech segments suggests an inverse relationship between L1 and L2 pronunciation, or in other words, the more proficient the bilingual is in L2 pronunciation, the less native-like they sound in their L1; however, whether this is also valid in the case of pitch range has not yet been reported. This warranted the decision to explore proficiency here. Exploring the above-mentioned variables in terms of both L1 attrition and L2 acquisition was considered of interest not only to as to explain potential variability on the data at hand, but also to study their relationship with bilingualism.

Through investigating the above questions, the overall aim of this project was to attain a more conclusive picture of how a gendered variety of an L1 is impacted by and impacts the acquisition of an L2. Notably, differently from previous work on gender constraints on speech, this project investigates both self-reported female and male bilinguals, some of which are residents of their L1 and some of other of which are residents of their L2 speaking country, thus providing a fine-grained analysis of the effect of social constraints on bilingual speech.

5.3 Methodology

This section reports on the general methodology for the experiment, which comprises three tasks, two production tasks (*Sentence Reading* and *Voicemail*) and one perception task (*Gender traits attribution*). The specific methods relative to each production task are detailed in the relevant analysis chapters; in the interest of space, the perceptual task is not detailed in this thesis (however see Appendix G for a short summary of it).

This research was granted ethical approval by the Research Ethics of Queen Mary University of London on the 15th of March 2017, ethical approval code QMREC1947a. To collect data in Japan, the Research Ethics of Sophia University further assessed this project ethics documents and deemed them appropriate on the 2nd of February 2018 (Appendix A).

5.3.1 Recruitment procedure

The recruitment of participants was conducted in two countries, in each one of which two groups of participants, that is, a bilingual and a monolingual group, were recruited. In

London (UK), at the Queen Mary University of London Phonetics Lab, data from 19 Japanese-English sequential bilinguals and 16 English monolinguals were collected in the winter and autumn 2018. In the spring of 2018, data from 21 Japanese-English sequential bilinguals and 15 Japanese monolinguals were collected in the Phonetics Lab of Sophia University in Tokyo (JP) (see Table 5.1 below for further detail).

In both countries, potential candidates were sought through personal contacts, fliers and posters distributed at universities, and via Facebook (see Appendix B). Specifically, in London, flyers and poster were distributed at the at QMUL, UCL, King's, SOAS and East London universities; and calls for participants were shared on the Facebook pages of the Japanese societies of the London universities, as well as pages for Japanese-English cultural exchange. Flyers were also distributed in shops closed to the Japanese community in London (e.g. the JP Book Shop and the Japan Centre). In Tokyo, flyers were distributed at Sophia and Waseda University, but most of the participants were recruited thanks to the main researcher's affiliation with the Arai-sensei Lab and the Phonetics Lab of Sophia University. Ultimately, in both countries, the recruitment process also relied on word-of-mouth between participants.

During recruitment, the project was advertised as *Multilingual diversity in London* in the UK and as *Multilingual diversity in Tokyo* in Japan, in order to avoid mentioning issues of *L2 acquisition*, *L1 attrition*, and *Gender and Language*. Such concealment of the actual purpose of the investigation is recommended in the literature to avoid bias on the part of the participants in the actual areas of interest of the research project (Wray & Bloomer, 2006). For example, Saville-Troike (2003) indicated two types of bias a researcher must pay attention to: the 'courtesy' and the 'sucker' bias, that is the participants' potential inclination to intentionally either please or mislead the researcher, respectively. Furthermore, advertising the project with such a broad title prevented other types of bias in the recruitment of participants, such as personal interest of an individual in some aspects of the topic of this research. If, for example, the title of the research was Adult Bilingualism, some participants could have decided to take part in the study due to an interest in perfecting their L2 skills.

From this initial recruitment stage, interested participants emailed the main researcher directly. The email exchange continued with a very short pre-screening questionnaire, the aim of which was to make sure that the potential participant was (1) not bilingual from birth and (2) within the suitable age bracket. If the participant met the criteria, a formal appointment was then arranged, and participants were sent a detailed background questionnaire to fill in before the appointment (see below). The materials used to advertise the project and the email exchange with the bilinguals were always in English. This was done to ensure that participants had a minimum level of English proficiency and that they were not aware that half of the project would be conducted in Japanese, similarly to other studies on L1 attrition (e.g. de Leeuw et al., 2012). Obviously, to recruit participants for the Japanese monolingual group, both advertisement material and email communication were in Japanese[3].

Participants received a small contribution at the end of the data collection, to make sure that they were fairly reimbursed for their time and travels. Furthermore, they were all offered refreshments and given a thank you letter (Figure 5.1). Finally, the researcher offered the participants the possibility of being kept informed about the progress and the outcomes of the study.

Figure 5.1 Thank you letter

5.3.2 Experimental procedure

Once the participants had been recruited, the data collection took place, which the present section will report on. In London (UK), data were collected in the soundproof booth of the Phonetics Lab at Queen Mary University; while in Tokyo (JP) in one of the sound attenuated

[3] The main researcher acknowledges the generous and precious help of the RAs of the Arai-sensei lab and the members of the Phonetics lab of Sophia University in navigating Japanese formal email exchange thus ensuring monolingual speakers were recruited.

recording rooms of the Phonetics Lab at Sophia University. For practical reasons, a similar but not identical set up was used in the two countries. Discrepancies were minor and, ultimately, did not influence the experimental procedure. Specifically, in the UK the experiment was presented via a Dell PC (Intel ® Core ™ i7-4790s) remotely connected to a monitor screen in the booth; whereas in Japan, the monitor screen was connected to a Dell Ultrabook E7450 laptop hooked to an external audio interface (Steinberg UR22). In both countries, the recording chain was a Røde NT1-A condenser microphone (cardioid polar pattern) and a Steinberg UR22 audio interface (microphone preamp and analogue to digital converter). All audio was recorded on a MacBook Pro at a sample rate of 44.1 kHz, 16-bit. Recording levels were monitored by the main researcher (see Chapter 6 and 7).

Regardless of whether the individual was bilingual or monolingual, data collection was carried out in one session to avoid dropouts. The session lasted 1 hour and 20 minutes for the monolingual participants and 2 hours for the bilinguals. Monolingual participants carried out the experiment only in their native language, whereas bilinguals in both of their languages separately. For the latter, the experimental procedure was divided into two identical halves: the English half and the Japanese half. To control for learning effects and fatigue, the order of the two halves was counterbalanced across participants, so that a similar amount of data collections started and terminated in both languages (Graham, 2015). To elicit speech in a supposed monolingual mode (Grosjean, 2001b), the two languages of the bilinguals were strictly separated during the halves: this meant that during the English half, participants were only exposed to English and in the Japanese half only to Japanese (see Figure 5.2 for a schematic representation of the data collection). This was done to guarantee that potential interaction effects across the two languages of the bilinguals were due to processes of L1 attrition and L2 acquisition, rather than online interactional effects such as language drift (e.g. Chang, 2012). The distinction between the use of language in monolingual or bilingual speech modes is pertinent to the contexts of L1 attrition and L2 acquisition; the former is more likely to happen when the speaker is often in the bilingual mode, which may lead to the creation of a new language variety. As far as L2 acquisition is concerned, if the speaker is often in a bilingual mode, static interactions across the two languages may be more prominent (i.e. a stronger foreign accent) compared to when the speaker is often in a monolingual mode. Importantly, as noted by Grosjean (2001b), along the language mode continuum, all of the bilingual's linguistic systems remain, to some extent, active and available in their mind at all times, independently of the intention (or requirement) to use one language alone.

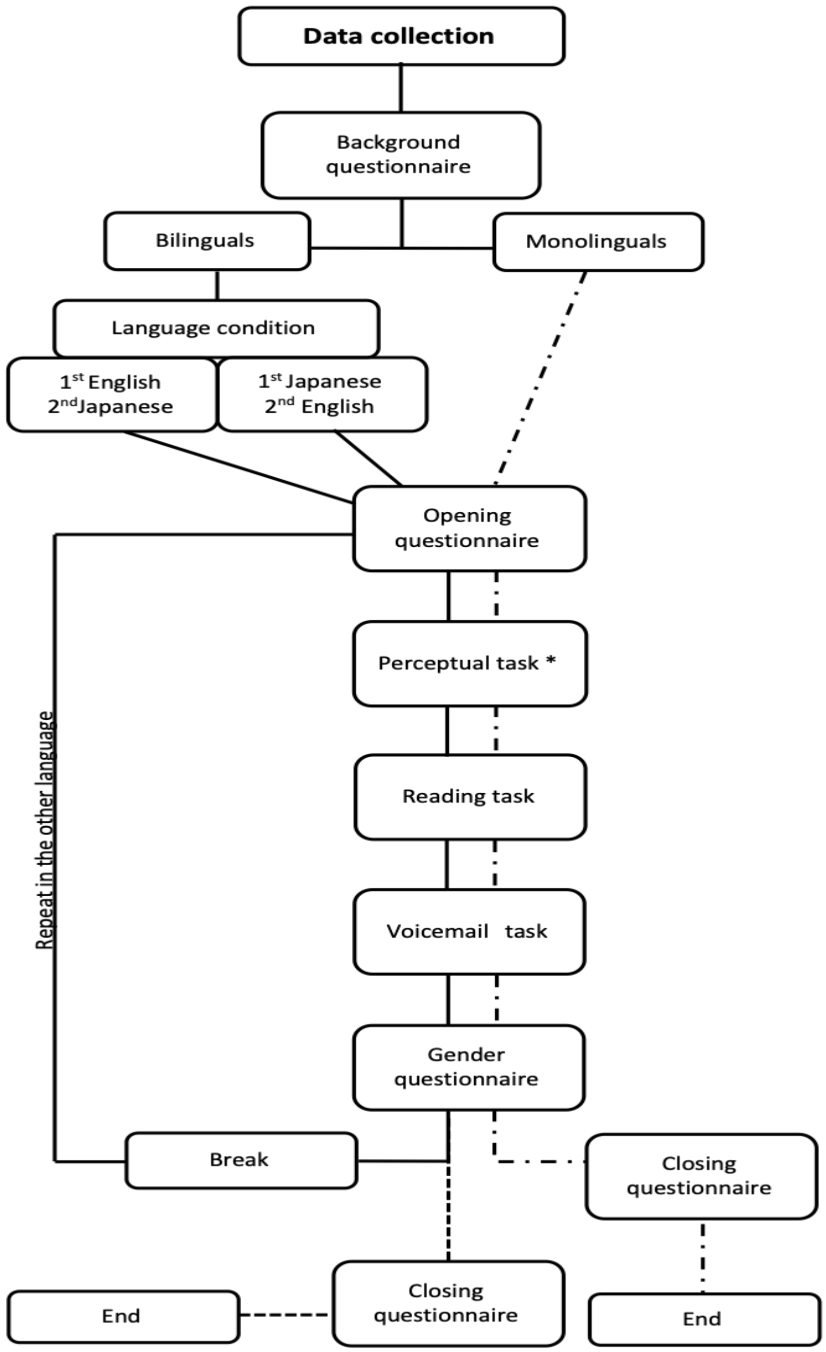


Figure 5.2 Flowchart depicting the various steps of the data collection.

** this task is not analysed in this thesis due to space constraints*

As already explored in Chapter 3, human interaction may affect speech due to accent imitation (e.g. Adank et al., 2013) and (socio)phonetic accommodation (e.g. Babel, 2012; Pardo et al., 2012). To experimentally control for such possible cofounds, an innovative elicitation technique, considered to be gender-neutral, was used. A series of short animation clips starred by a little green blob, named ‘Blobby’, which wore glasses and held onto a clipboard (Figure 5.3) was created. The character ‘spoke’ via speech bubbles to the participants either in Japanese or English, giving instructions on how to execute the tasks, and, as such, no specific accent, neither intonation was prompted. Initially, it was thought to use a cartoon bear dressed up in a Lab outfit, but this decision was discarded because the main researcher and a senior researcher thought the bear was likely to evoke the image of being male or female, depending on the shape of the eyes used in the animation. ‘Blobby’ did not represent a real living or imagined entity, thus it was considered to be more gender-neutral (see Biemans, 1998 for gender interaction on pitch range in spontaneous speech).

Participants read the instructions from a screen, and executed the tasks requested of them. The content of the speech bubbles for the animation were created in English by the main researcher and then translated into Japanese and back-translated into English by two translators, as is the recommended standard best practice in cross-cultural research (Brislin, 1970). The main researcher and the first translator worked closely during the translation process, to ensure that the translation was faithful to the script not only in terms of content, but also in terms of presentation, thus ensuring that the two halves of the experiment were as similar as possible. At the end of the process, an English and a Japanese version of the same data elicitation process was created (scripts can be found in Appendix C). Automated data collection has been previously employed in other sociolinguistics research to avoid accent interactions (e.g. Carrie & Drummond, 2017). Importantly, data collection was closely monitored by the main researcher; only on one occasion data had to be fully discarded due to technical problems.

When a participant arrived at the recording studio, the procedure was as follows. Firstly, the participant was welcomed by the main researcher in English. The participant was then led to the recording studio where an overview of the experimental procedure was provided. Thereafter, the participants were able to ask questions, which were fully answered taking care not to disclose the main focus of the experiment. Once all the questions were answered, a consent form was signed by both the investigator and the participant.

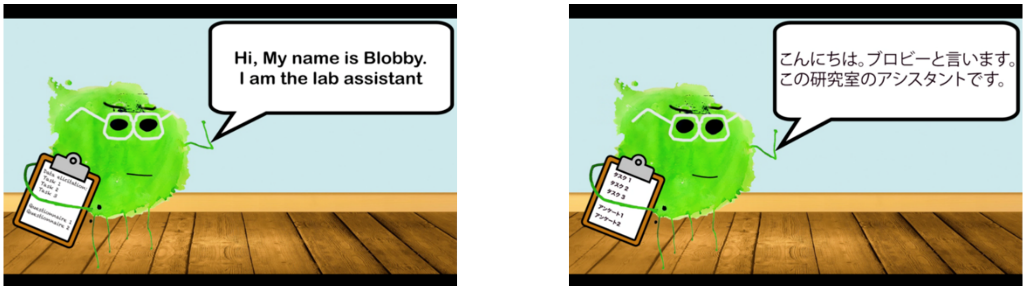


Figure 5.3 Blobby, the main character of the animation
(English version on the left and Japanese version on the right).

Once the introduction took place, the participant was left in the recording room, and the data collection began. Firstly, participants were presented with a short introductory questionnaire, which served to set the language mode for the bilinguals and enquired, among other things, about participants' emotional state (see below). Participants were then reminded that the aim of the data collection was *not* to test language proficiency and of their right to withdraw at any time. Thereafter, the first Blobby scene introduced the perceptual task (the Gender traits attribution task; Appendix G). Once the task was completed, the second Blobby scene introduced the first production task (Sentence Reading task; Chapter 6). This was followed by Blobby scene 3 and the second production task (Voicemail task, Chapter 7). Blobby scene 4 was then shown on the screen followed by the gender questionnaire. The various tasks of the experiment were created in PsychoPy (Peirce, 2007), with additional elements built in Adobe Character Animator (Adobe, 2017) and Google forms. If the participant was bilingual, the gender questionnaire was the last step of the first half of the data collection; if the participant was monolingual, the gender questionnaire was followed by a short closing questionnaire, which bilinguals completed at the very end of the data collection, after the second half of the experiment (Figure 5.2). To account for language modes, there was a 30-minute break between experiment halves. This procedure was followed in both countries with all participants but the Japanese monolinguals who were welcomed by the main researcher in Japanese and then introduced to the experiment by one of three research assistants (two females and one male), who were members of the Arai-sensei Lab at Sophia University. This was deemed important to ensure that the Japanese monolinguals did not adjust their speech to speak with a non-fluent non-native speaker as the main researcher was.

A final note is that a feasibility experiment was carried out at Queen Mary University of London in the autumn of 2017. Data were collected from four participants, one female and one male English monolingual and one female and one male Japanese-English bilingual. Minor changes were applied to the experiment after the trial experiment, specifically the sentences of reading task were reduced from 20 to 16 and the addressees from three (formal, informal, highly formal) to two (formal, informal). Since changes only involved removing a few features, data collected with the pilot were also analysed as part of the main experiment. The main researcher is aware that this is not common practice but time constraints and the difficulty in finding male participants informed this choice.

5.4 Speakers

Data were collected from a total of 72 participants divided into four groups, of which two were bilingual and two were monolingual (Table 5.1). To have a fully balanced dataset, it was hoped to recruit 20 participants per group for a total of 80 participants, however this was not possible due to the difficulty in recruiting male participants and ultimately time constraints. Data from another five participants (one male and two female bilinguals from Tokyo and two English monolingual females) were collected but then completely excluded from the analysis. The two female bilinguals went to American boarding schools in Japan since nursery school, thus they grew up in an international environment where English was the everyday language, and the bilingual male was actually an exchange student from Canada. One of the English monolinguals was excluded due to a slight Northern Irish accent in her English (e.g. Grabe et al., 2000 for intonational diffferences between Southern Standard British English , SSBE henceforth, and Northern Irish English), while another was omitted due to technical problems.

Table 5.1 : Participants to the experiment, divided by group

Group	Language(s)	Total number	Testing Location	Testing time
Japanese monolinguals	Standard Japanese	15	Tokyo (JP)	Spring 2018
English monolinguals	SSBE	16	London (UK)	Winter 2018 + Autumn 2018
Bilinguals UK	Standard Japanese-English	19	London (UK)	Winter 2018
Bilinguals JP	Standard Japanese-English	21	Tokyo (JP)	Spring 2018

To select the pool of speakers a number of criteria were formulated based on findings and results of previous research reported in Chapters 2, 3 and 4. In the remainder of this section, first of all a general depiction of the bilingual and monolingual participants is provided, followed by a description of the criteria used for the recruitment along with a report of how well participants fitted in each criterion. Screening was done via the initial email exchange, as well as the language background questionnaires that participants were asked to fill in prior to data collection.

An adapted version of the Language Experience and Proficiency Questionnaire – LEAPQ (Marian et al., 2007) was used in this project to collect information relative to the language background of all participants. The bilinguals and English monolinguals completed the questionnaire in English, whereas the Japanese monolinguals completed the official Japanese version of the questionnaire (translated by Koji Miwa, University of Alberta, and Yoshino Okuma, Kwansei Gakuin University). The original English document was slightly adapted for this project, without changing it in any substantial way. For example, since the project was carried out in the UK, references to the USA were modified into reference to the UK, that is, the question “when did you move to the US?” became “when did you move to the UK?”, or “high school” was replaced by “A-levels”. Moreover, three questions enquiring about musical training taken from the ‘Musical training’ section of the Gold-MSI questionnaire (Müllensiefen et al., 2014) were added at the end of the background questionnaire. All modifications were translated in Japanese using the reverse-translation technique (Brislin, 1970). Both questionnaires can be found in Appendix D.

The LEAP-Q was chosen because it was constructed within the context of bilingualism theories that look at L2 acquisition as the outcome of an interplay between proficiency and experience variables (Marian et al., 2007). Such an approach was deemed important for this research because bilingualism is here considered as the result of cognitive, social and environmental factors (Hakuta et al., 2003), rather than simply L1/L2 linguistic factors. In addition, the LEAP-Q was conveniently created to be completed by participants independently before the data collection (Marian et al, 2007). This allowed the main researcher to check participants' responses ahead of the established meeting, thus being able to (1) ask for eventual clarifications and/or (2) cancel appointments with non-suitable participants. Participants were sent a link to the questionnaire, which was set up as in Google Doc, via email, along with an ID number, to ensure that no identifying information were shared via internet. Participants reported to take between 5 and 15 minutes to complete the questionnaire. None reported any form of hearing, language and learning impairment and a third of them reported to wear glasses or contact lenses.

5.4.1 Bilingual speakers

The participants of the bilingual group were native speakers of Standard Japanese who learnt English as a second language after acquiring Japanese, in other words, they were sequential bilinguals. Sequential bilinguals are often also referred to as 'consecutive' or 'successive' bilinguals (Li Wei, 2009) and these terms are used synonymously in the literature. For simplicity, in what follows, the term 'bilinguals' will be used meaning 'sequential bilinguals', unless otherwise stated. In line with the literature reviewed in 2.2, the term *bilingual* is here used in an inclusive fashion, that is, bilinguals are individuals who use two or more languages in their everyday lives (Grosjean, 2001a), with no focus on perfect fluency. This is in line with similar research examining differences between individuals who speak more than one language (Bogulski et al., 2015; de Leeuw & Bogulski, 2016)

Since one of the foci of this project is on L1 attrition, it was initially hoped to recruit only late sequential bilinguals, that is, speakers who acquired their L2 post-adolescence, however given the status of English as a global language (Crystal, 2012) and the fact that the Japanese government supports English as a foreign language in the classroom (Hagerman, 2009), finding English-Japanese bilinguals who had never been exposed to English before the end of adolescence was not a realistic goal. English as a foreign language has been part of the Japanese national curriculum of Junior High and Senior High schools since 2002, when it was introduced as a compulsory subject for the students of the last two years of Primary School (Ikegashira et al., 2009). Accordingly, all bilinguals had some English in their formal education, either from 12-13 years of age (i.e. when Junior High School starts) or 10 years of age (i.e. when the 4^{th} grade of Primary school starts), depending on each participant's year of birth. This is not considered to invalidate the investigation of L1 attrition patterns in the present project, and it is in line with the definition of L1 attrition used in this project (see 2.3.1).

Ideal eligibility criteria also had to be slightly relaxed for the bilinguals tested in Japan, due to an initial difficulty in recruiting bilingual participants in Tokyo, where speakers who had been exposed to English from an earlier age than the state school age (i.e. between 4 and 10 years of age) due to private English education in Japan or having spent some time in an English-speaking country with their parents, were accepted. Given that, at the time of testing, all bilinguals were resident of Tokyo, enrolled at Sophia University and all reported Japanese to be their dominant language, the bilingual participants tested in Japan were however considered homogeneous in their exposure to English.

A final note of caution must be made in relation to the English variety that the bilinguals, especially those residing in Japan, had been and were exposed to. Due to the geographical and political proximity of Japan and the USA, which facilitates movement of people between the two countries, it was impossible to ensure that the bilinguals were solely exposed to British English. For example, statistics retrieved from the HESA (the UK Higher Education Student Data), the US Embassy in Japan and the JASSO (Japanese Student Service Organization) showed that Japanese students are more likely to enrol in American than British universities (in 2016/16, 19.064 Japanese students enrolled in American universities compared to 3.210 in British ones – *Japan-Open_Doors-2015*, 2015; *Top Ten Non-European Union Countries of Domicile in 2016/17 for HE Student Enrolments*, 2018). Similarly, more American than British students enrol in Japanese universities (in 2016, 2786 US students vs 640 UK students came to Japan to study – *Result of an Annual Survey of International Students in Japan 2017*, 2017). Since American English is extensively present in the media (especially in the film industry, but also on online platforms and channels), even if all bilinguals had only been exposed to SSBE and lived in the UK, their English may nevertheless have been influenced by American English via media exposure (see Kitamura et al., 2013; Kuppens, 2010; Huang & Jun, 2011 for research showing the effect of media exposure on speech in monolingual and bilingual speakers). Thus, exposure to American English was not considered to be a problematic for the project at hand insofar all participants may have been exposed to it to a greater or lesser extent.

5.4.2 Monolingual speakers

The participants of the two monolingual groups were either native speakers of Southern Standard British English, recruited in London, or of Standard Japanese, recruited in Tokyo. Care was taken that the English monolinguals were not proficient in Japanese as well as in other languages and, conversely, that the Japanese monolinguals were not proficient in English as well as in any other languages.

Japanese is taught in state-run and private schools in the UK, however not extensively – according to a report from The Japan Foundation 264 establishments offered Japanese classes in the UK in 2015 (which is roughly a hundredth of a total of 24,288 schools registered in the UK in 2015 – the UK Department of Education (2016). Therefore, finding native SSBE speakers, who were neither proficient in Japanese nor exposed Japanese, was easy. On the other hand, it was impossible to find SSBE speakers who had never been exposed to other European languages, since Modern Foreign Languages is a compulsory subject in the national curriculum in the UK. Nevertheless, all English participants reported to have a negligible to null knowledge of a foreign language and not to be exposed or use it in their daily lives.

With regard to the Japanese monolinguals, due to English being taught at school (see above), all Japanese monolinguals had some formal English education. Nevertheless, comparably to the English speakers, the Japanese monolinguals reported to have a negligible knowledge of English and not to use it in their daily lives. It seemed then reasonable to conclude that both the English and Japanese monolingual participants were “functional” monolinguals for the purpose of this study (e.g. de Leeuw & Bogulski, 2016 for a similar reasoning).

5.5 Speakers' variables

As detailed in Chapter 3, there exists a number of extra-linguistic variables that may affect speech in general and pitch range in particular. The present section refers to some of those variables detailing how they were implemented in this project. Notably, these variables were chosen in view of the findings from the relevant previous work reviewed in chapter 3 and 4, however different variables could have been chosen by different researchers.

In the remainder of this section, the variables are introduced, Firstly, the experimental variable individual gender identity is introduced, followed by sex assigned at birth. Thereafter the variables that the project controlled for are presented, with an emphasis on the degree of success achieved in the process.

5.5.1 Individual gender identity

A fundamental speaker characteristic in the present work is individual gender identity. As detailed in the previous chapter, despite being influenced by physiological factors (cf. Titze, 1994), pitch range characteristics have been shown to be determined by learning (e.g. Ordin & Mennen, 2017; Voigt et al., 2016). Importantly, beside broader gender norms specific to each language and culture, the speaker's own personal gender identities, that is, their own version of the learnt femininity/masculinity, have been reported to affect their vocal linguistic strategies (Lewis, 2002). By investigating individual gender identity, this project sought to determine whether, for example, Japanese-English female bilinguals who clearly aligned with feminine norms were more likely to produce a higher pitch in their Japanese, and perhaps in their English, regardless of whether they resided in the UK or Japan. Alternatively, whether male bilinguals who clearly aligned with feminine norms were more likely to adopt a higher pitch in their Japanese, and perhaps in their English, regardless of where they lived at the time of testing.

To answer such questions, each participant's gender identity was measured using two questionnaires that are believed to reflect socio-cultural constraints of gender of the Japanese and Western anglophone societies; namely, the Japanese Gender Role Index – JGRI (Sugihara & Katsurada, 2002) for Japanese and the Bem Sex Role Inventory-short – BSRI-short (Bem, 1979) for English (Appendix F). Both of these questionnaires are 'measures of support for and adherence to cultural gender norms' (Smiler & Epstein, 2010, p. 134). Given that cultural norms are often represented in stereotypical form (Turner, 1999), these questionnaires may be also considered as indicators of endorsement of gender stereotypes (Smiler & Epstein, 2010).

These two questionnaires are based on the assumption that femininity and masculinity are socio-cultural constructs, and that gender identity is not dichotomous. In other words, they do not consider femininity and masculinity as the ends of a bipolar continuum (Hoffman & Borders, 2001) but as two independent dimensions (Bem, 1974), both of which are present in each individual to greater or lesser extent. Despite being developed in the 1970's, the BSRI-short was chosen because it is one of the most widely employed measures of (cultural) gender (Kaźmierski, 2015). In addition, the JGRI has been specifically created on the same premises of the BSRI-short, however attuned to research gender roles in Japanese society (Sugihara & Katsurada, 2002).

All speakers filled in the gender questionnaire (Figure 5.2); the monolinguals filled in the questionnaire relative to their native language (i.e. Japanese vs English). The bilinguals filled in both questionnaires; this was done because bilinguals have been reported to be able to activate behavioural expression of personality appropriate in the corresponding linguistic-social context they are in (e.g. Chen & Bond, 2010).

Each questionnaire comprised 30 traits, that is, 10 feminine, 10 masculine and 10 neutral traits and respondents are asked to indicate on a 7-point scale anchored 1 (never applies – 少しもあてはまらない) and 7 (always applies – 非常にあてはまる) how well each of the 30 items describes them, without "thinking too much" (Appendix F). From both questionnaires, a Femininity and Masculinity score was computed for each participant as the mean self-rating for all the feminine and masculine items separately, therefore varying vary between 1 and 7 (Kaźmierski, 2015)

Prior to attributing gender scores to the participants, responses to the feminine and masculine traits of the questionnaires underwent a reliability and a confirmatory factor analysis (CFA) in R (R Core Team, 2019) with the *alpha* call of the *psych* package (version 1.8.12 Revelle, 2018) and the *cfa* call with robust estimator (MLM) of the *lavaan* package (version 0.6.5 Rosseel, 2012).This was done to ensure that the constructs on which the questionnaires are based were homogeneously ratified by the participants (Field, 2012). Monolingual and bilingual data were analysed together for Japanese and English separately.

Inter-reliability for the JGRI is summarised in Table 5.2: all Cronbach Alphas for the BSRI-short are > .7, thus interrater agreement was considered acceptable for each trait.

Table 5.2 Cronbach alpha for each item of both scales of the JGRI

(the English equivalent for the Japanese traits listed below was taken from Sugihara & Katsurada, 2002)

Feminine traits JGRI	α	Masculine traits JGRI	α
Innocent	0.85	Have a leadership ability	0.72
Graceful	0.86	Strong willed	0.71
Affectionate	0.86	Ability to implement action of one's own accord	0.72
Have charm	0.87	Have a broad perspective	0.73
Attentive to the need of others	0.85	Ability to bring others together	0.72
Polite	0.86	Have guts	0.72
Calm	0.86	Become self-supportive	0.73
Love children	0.86	Persuasive	0.73
Like to care for others	0.85	Relied on by others	0.71
Have neat habits	0.86	Upstanding	0.72
Overall Femininity	0.87	Overall Masculinity	0.74

A CFA was used to test a two-factor model of gender traits endorsement. A two-factor model of gender traits endorsement for the JGRI was compared to a single-factor solution and a two-factor solution that did not allow covariance between the two latent factors. In both cases model comparisons did not vary significantly. However, the AIC of the two-factor model with covariance was lower than the AIC of the other two models ($AIC_{2factor\_w/covariance}$= 4016 $AIC_{2factor\_no/covariance}$= 4034; $AIC_{1factor}$= 4036), thus this model was chosen for further analysis. Model fit was almost acceptable (robust TLI = 0.64), with a robust RMSE of 0.12 (and 90% confidence interval of 0.093 and 0.124). Inspection of the standardised coefficients as well as of the residual correlations revealed that some of the traits were not properly explained by the model (i.e standardised coefficients <.4 and residual correlations

>0.1). Problematic traits were *Strong Willed* and *Have guts* for the masculine scale and *Graceful* and *Attentive to the needs of others* for the feminine one (Appendix F).

Inter-reliability for the BSRI-short is summarised in Table 5.3: all Cronbach Alphas for the BSRI-short are > .8, thus interrater agreement was considered high for each trait.

Table 5.3 Cronbach alpha for each item of both scales of the BSRI-short

Feminine traits BSRI-short	α	Masculine trait BSRI-short	α
Affectionate	0.85	Defend my own beliefs	0.83
Sympathetic	0.84	Independent	0.83
Sensitive to others' needs	0.85	Assertive	0.8
Understanding	0.85	Strong personality	0.82
Compassionate	0.84	Forceful	0.84
Eager to soothe feelings	0.84	Have leadership abilities	0.81
Warm	0.83	Willing to take risks	0.83
Tender	0.86	Dominant	0.83
Love children	0.88	Willing to take a stand	0.82
Gentle	0.84	Aggressive	0.85
Overall Femininity	0.86	Overall Masculinity	0.84

A CFA was used to test a two-factor model of gender traits endorsement. The two underlying factors were feminine and masculine, each of which included ten traits. CFAs confirmed that a two-factor model of gender traits endorsement for the BSRI-short fit the data significantly better that a single-factor solution (X^2 (1) = 4.9, p = .002), or a two-factor solution that did not allow covariance between the two latent factors Model fit was almost acceptable (robust TLI = 0.75), with a robust RMSE of 0.099 (and 90% confidence interval of 0.073 and 0.124). Inspection of the standardised coefficients and of the residual correlations revealed that some of the traits were not properly explained by the model (i.e. standardised coefficients <0.400 and residual correlations >0.1). Problematic traits were *Forceful* and *Aggressive* for the masculine scale *Understanding* and *Love children* for the feminine scale (see Appendix F).

For both questionnaires, problematic traits were inspected and consequently removed from the analysis. This was done because they all seemed to refer to a traditional gender role dichotomy which attributes the female to the role of housewife/caregiver and the male to the role of breadwinner. This has been reported to have become outdated in the contemporary Japanese (Sugihara & Katsurada, 2002) and English society (Colley et al, 2009), which justifies the methodological choice.

After removing the problematic traits, new CFAs were used to test a two-factor model of gender traits endorsement for each questionnaire separately. For both English and Japanese, the CFAs confirmed that the two-factor model of gender traits fit the data significantly better that a two-factor solution that did not allow covariance between the two latent factors ($X^2_{BSRI}(1) = 4.4221$, $p = .03$; $X^2_{JGRI}(1) = 3.876$, $p = .04$). Model fit improved: for the BSRI-short it was good, with a robust TLI of 0.9 and a robust RMSE of 0.07 (90% CI of 0.29 and 0.11); for the JGRI it was almost good, with a robust TLI of 0.8 and a robust RMSE of 0.08 (90% CI of 0.37 and 0.12). All the indicators showed positive acceptable factors loadings (Appendix F).

Participants were then assigned one femininity and one masculinity score per questionnaire(s), for a total of two scores per monolingual and four scores per bilingual speaker. Each score corresponded to the average of all the remaining feminine and masculine traits separately, thus ranging from 1 (low femininity or low masculinity) to 7 (high femininity or high masculinity), for each questionnaire.

Descriptive statistics for each trait of the two final scales of the JGRI divided by sex of the speaker are reported in Table 5.4 and 5.5 below.

Table 5.4 Descriptive statistics for each trait of the feminine scale of the JGRI

Feminine trait	Females		Males	
	$\bar{x}$	SD	$\bar{x}$	SD
Innocent	4.0	1.7	4.0	1.7
Affectionate	5.1	1.6	5.0	1.7
Have charm	4.6	1.4	4.6	1.4
Polite	4.7	1.6	4.7	1.6
Calm	4.5	1.5	4.4	1.5
Love children	3.9	1.4	3.8	1.5
Like to care for others	4.1	1.5	4.0	1.5
Have neat habits	4.4	1.5	4.4	1.5
Overall Femininity	4.4	1.6	4.4	1.6

Table 5.5 Descriptive statistics for each trait of the masculine scale of the JGRI

Masculine trait	Female speakers		Male speakers	
	$\bar{x}$	SD	$\bar{x}$	SD
Have a leadership ability	5.2	1.4	5.3	1.4
Ability to implement action of one's own accord	4.3	1.7	4.2	1.7
Have a broad perspective	5.0	1.6	4.8	1.6
Ability to bring others together	4.3	1.7	4.2	1.3
Become self-supportive	4.1	1.6	4.2	1.6
Persuasive	4.5	1.5	4.6	1.5
Relied on by others	4.5	1.6	4.6	1.6
Upstanding	4.3	1.6	4.2	1.6
Overall Masculinity	4.2	1.6	4.2	1.6

A two-way ANOVA revealed that Japanese females and males did not rate themselves significantly different on neither scale of the JGRI. Sugihara and Katsurada (2002) also reported lack of statistical differences between females and males on the scales of the JGRI, which they explained invoking the development of equal educational opportunities for females in Japan towards the end of the 1980s. Again, they argued that Japanese females going to university and becoming active part of the workforce meant a change in women's role in the Japanese family, with the consequence that traditionally masculine traits were also endorsed by females (Sugihara & Katsurada, 2002). Pearson product-moment correlations revealed that there was a linear relationship between the two scales of the JGRI [r (54)=5.2, *p*<.0001] (Figure 5.4).

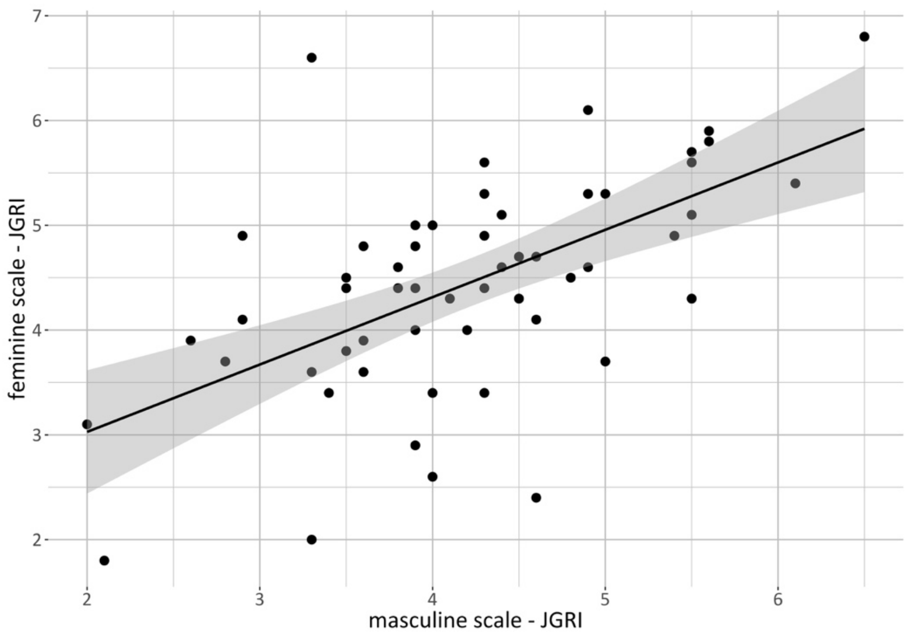


Figure 5.4 Scatterplot depicting the significant relationship between the two scales of the JGRI. Fitted line represents line of best fit for and shading indicates 95% confidence intervals.

Continuing with the BSRI-short, descriptive statistics for each trait of its two final scales by sex of the speaker are reported in Table 5.6 and 5.7 below.

Table 5.6 : Descriptive statistics for each trait of the feminine scale of the BSRI-short.

Feminine traits	Females		Males	
	x̄	SD	x̄	SD
Affectionate	4.8	1.5	4.8	1.6
Sympathetic	4.9	1.4	4.8	1.8
Sensitive to other's needs	5.2	1.5	5.2	1.5
Compassionate	5.2	1.2	5.1	1.3
Eager to sooth feelings	4.7	1.3	4.8	1.3
Warm	4.9	1.3	4.9	1.3
Tender	4.6	1.2	4.6	1.3
Gentle	4.2	1.3	4.2	1.3
Overall Femininity	4.8	1.4	4.7	1.4

Table 5.7 Descriptive statistics for each trait of the masculine scale of the BSRI-short

Masculine traits	Female speakers		Male speakers	
	$\bar{x}$	SD	$\bar{x}$	SD
Defend my own beliefs	5.2	1.4	5.3	1.4
Independent	5.0	1.4	4.9	1.4
Assertive	4.3	1.7	4.2	1.7
Strong personality	5.0	1.6	4.8	1.6
Have leadership abilities	4.3	1.7	4.2	1.3
Willing to take risks	4.1	1.6	4.2	1.6
Dominant	3.9	1.2	3.8	1.3
Willing to take a stand	4.5	1.5	4.6	1.5
Overall Masculinity	4.5	1.6	4.6	1.6

A two-way ANOVA indicated that females, irrespective of their group, rated themselves as significantly more feminine than males ($F(2,51) = 5.96$, $p = .018$) on the BSRI-short, which is in line with previous similar work (e.g. Bem, 1974; Biemans, 2000). Scores did not significantly differ across sexes or group on the masculine scale of the BSRI-short. This has not been reported before (e.g. Bem, 1974; Biemans, 2000); it is here tentatively suggested that this may be due to a lower endorsement of masculine gender roles in the English contemporary society. Pearson product-moment correlations indicated that the two scales of the BSRI-short were not correlated (Bem, 1979) (Figure 5.6).

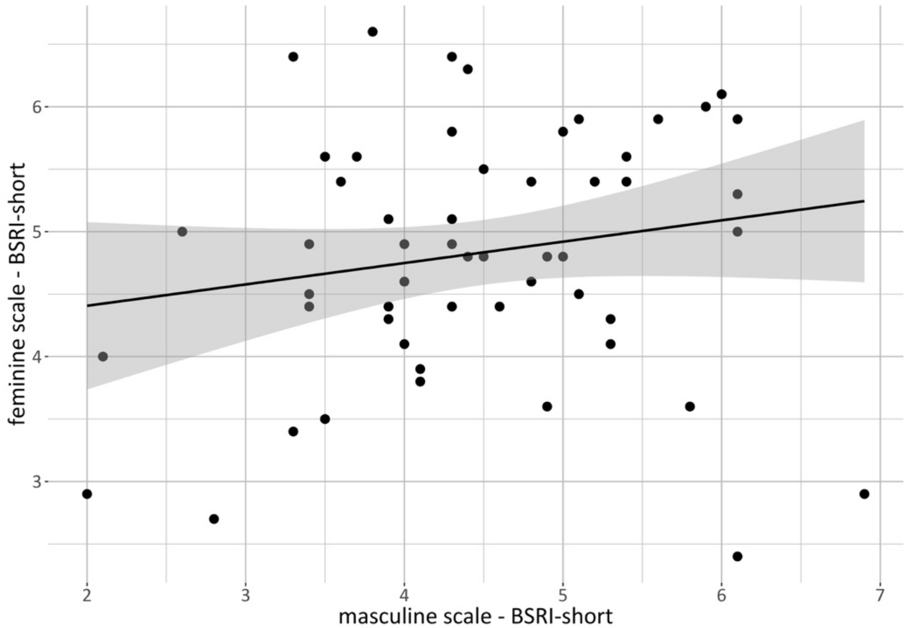


Figure 5.5 Scatterplot depicting the non-significant relationship between the two scales of the BSRI-short. Fitted line represents line of best fit for and shading indicates 95% confidence intervals.

For subsequent analysis, each speakers' scores on both scales of both questionnaires were entered as predictor variables in the regressions for the analyses. Again, this was done to assess whether, for example, there was a relationship between higher self-attribution of masculine traits and lower mean f0 and if such relationship was language and/or sex dependent.

5.5.2 Sex[4]

As noted in the previous chapters, the focus of the present work is the effect of L1 attrition and L2 acquisition on gendered language norms in the speech of Japanese-English bilinguals. To ensure that any potential effect of gender was not cofounded with sex, data was collected from female and male speakers.

Table 5.8 reports percentages of female and male participants divided by group. It was initially hoped to recruit an equal number of female and male speakers for each group; however, this was not possible, and males were roughly a third of the participants. This was

[4] In this thesis, the term sex, rather than sex assigned at birth, is used because that is the wording which was used in the background questionnaire. For the same reason, female and male are used instead of assigned female at birth and assigned male at birth The main researcher is however aware that the term sex assigned at birth is preferred by current trans-gender research (Vincent, 2018).

because males were less likely to respond to the research ads (even the ones directly aimed at 'male speakers') and the word-of-mouth among males was less effective than among females. Such an effect of sex on participation in non-clinical research is commonly reported both anecdotally and, in the literature (e.g. Porter & Whitcomb, 2005), hence it is assumed that this was not a fault of the recruitment procedure. The researcher is aware that small sample size may affect statistical testing (e.g. Button et al., 2013; Hackshaw, 2008) and this is noted in the discussion of the results of each task (see Chapter 6 and 7).

Sex was self-reported in the background questionnaire (Appendix D). Participants were asked to choose among three options: female, male, other. None chose the latter.

Table 5.8 Percentage of participant per each sex, divided by groups

	Females		Males		Total	
	N	%	N	%	N	%
Japanese monolinguals	10	67%	5	33%	15	100%
English monolinguals	10	63%	6	37%	16	100%
Bilinguals UK	12	63%	7	37%	19	100%
Bilinguals JP	17	81%	4	19%	21	100%
Total	49	69%	21	34%	71	100 %

5.5.3 Age

Difference in voice among various age groups was not a focus of this research, that is why data was collected from adults between the ages of 18 and 39 (18≤age<40), that is, when voices have more or less stable age-related characteristics (Biemans, 2000). The lower limit was chosen due to research showing that the maximum change in the male voice takes place at puberty (Harries et al., 1997) which on average ends at 17 years of age (Marcell, 2011). Additionally, subjects older than 39 years of age were not included because of the changes in phonation that can occur at the age of 40, typically leading to a decrease in pitch for women, and an increase in pitch for men (cf. Linville, 1996). Moreover, sociolinguistic research has reported age to affect language use. For example, adolescents have been reported to use more vernacular than adults do, who, in turn, have been reported to be more conservative (see Eckert, 2017 for a review), and this further warrants the chosen age bracket.

Table 5.9 reports age distribution (mean and standard deviation) for each group of participants divided by sex. A two-way ANOVA revealed that age varied significantly across groups [F (3,64) = 6.219, p = .001]. Post hoc tests indicated that the bilinguals tested in the UK were significantly older than both the monolinguals (diff = 5.6, p = .003) and bilinguals tested in Japan (diff = 5.5, p = .002). This is most likely due to the difficulty to recruit speakers other than university students in Japan, due to time constraints. To rule any potential confounds linked to these age differences, a series of two-way ANOVAs were used to test whether age predicted pitch range in the Japanese of the speakers (see Chapter 6 and 7 for detail).

Table 5.9 Descriptive statistics for participants' age, divided by group and sex

	Females				Males			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Japanese monolinguals	22	3.1	19	28	21	0.9	20	22
English monolinguals	22	2.4	18	29	27	5.5	20	35
Bilinguals UK	27	7	20	38	28	5	21	35
Bilinguals JP	22	3.2	18	30	22	4.6	19	29
All	23	4.9	18	38	25	5.3	19	35

5.5.4 Dialectal variation

Dialectal variation has been reported to affect pitch range, and this is valid for British English (e.g. Grabe et al., 2000; Grice et al., 2019) and Japanese (Igarashi, forthcoming). Here the focus was on Southern Standard British English and Standard Japanese; and all participants reported to be native speakers of either varieties. Yet, all participants resided in two mega cities (i.e. London (UK) and Tokyo (JP)) and most of them were enrolled in international universities; thus, it was impossible to ensure that they were solely exposed to the standard variety of their language(s) in their daily lives (see Ofuka et al., 2000 for a similar argument).

5.5.5 Education

Education has been reported to predict speech production, with educated speakers speaking differently from those who are less educated (Trudgill, 1974). In addition, level of education has been claimed to indirectly impact the rate of attrition (Jaspaert & Kroon, 1989). More educated speakers are considered less likely to undergo the erosion of the system underling language competence than less well-educated people (Herdina & Jessner, 2002), because higher education levels correlate with greater linguistic knowledge. This has been posited to predict greater likeliness to maintain the L1 in the new environment and higher possibility of maintaining contacts with the L1 environment (i.e. friends and family) (Cherciov, 2011). As far as the specific population of this study is concerned, Japanese traditional societal norms stipulate that the woman's place is primarily in the home, taking care of the family (Yoshihara, 2010). Since the 80's, however, an always increasing number of Japanese females have enrolled at university and continued working, even after having children; this has been related to a change in traditional Japanese gender roles, with females having to endorse both feminine and masculine roles (Sugihara & Katsurada, 2002).

Given that this project takes into account the effect of individual gender identity on speech production and perception, level of education was controlled for by only recruiting participants who either (1) were enrolled in a university at the time of testing or (2) had at least completed a BA degree (or Japanese equivalent), that is, they all were relatively highly educated speakers. Table 5.10 reports information on the education of the participants; in total 62 were university students at the time of testing, and the remaining 10 participants had completed a university course at MA or PhD level. Participants were then assumed to be homogeneous on this variable.

Table 5.10 Participants' education, divided by group

	University students		Completed university course	
	N	%	N	%
Japanese monolinguals	14	93%	1	7%
English monolinguals	15	93%	1	7%
Bilinguals UK	17	89%	5	11%
Bilinguals JP	18	81%	3	19%
Total	62	86%	10	14%

5.5.6 Emotional state

As mentioned in Chapter 3, emotional state may affect pitch range. Before data collection commenced, participants were asked to report how they felt on that day by selecting maximum two options out of happy, stressed, peaceful, sad and other.

The majority of participants reported to be happy and peaceful (46 out of 72) and the remaining 26 reported to be only happy; it was assumed that participants were homogeneous in terms of emotional state.

5.5.7 Height

Despite the somehow inconclusive results relative to the relationship between pitch range and body size reported in the literature (see 3.4.1), information relative to the height of each speakers was collected to rule out the possibility that differences between the pitch level of Japanese and English females could be imputed to Japanese females being, on average, smaller than English females (see *Average Sizes of Men and Women*, 2020 for relevant statistics). Participants were asked to select their height on a scale comprising 13 steps of 5 cm, from 140 cm to more than 200 cm.

Figure 5.6 and 5.7 below show the distribution of height for female and male participants divided by group. A Kruskal–Wallis test indicated no significant difference between the height of the Japanese and English speakers.

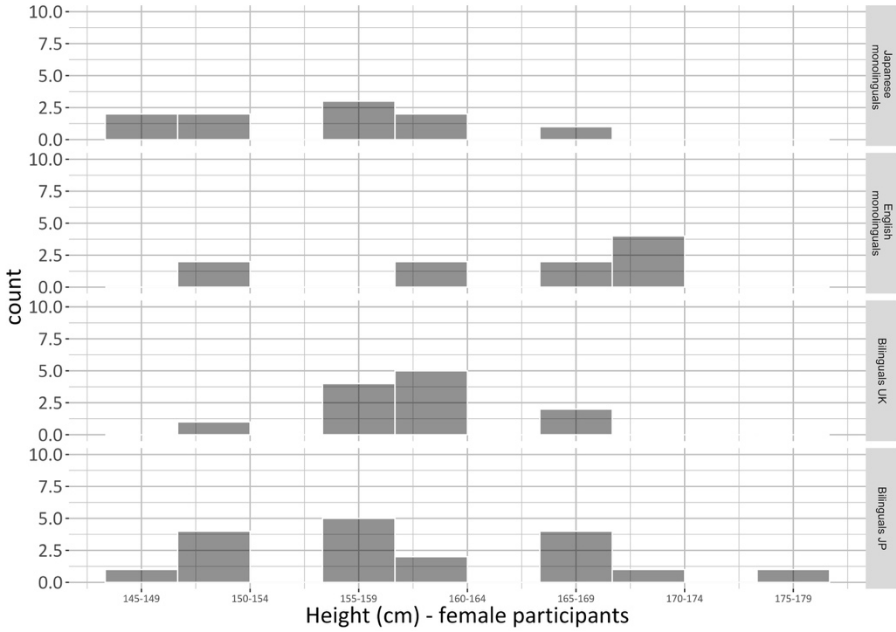


Figure 5.6 Histograms depicting the distribution of the height of the female speakers divided by group.

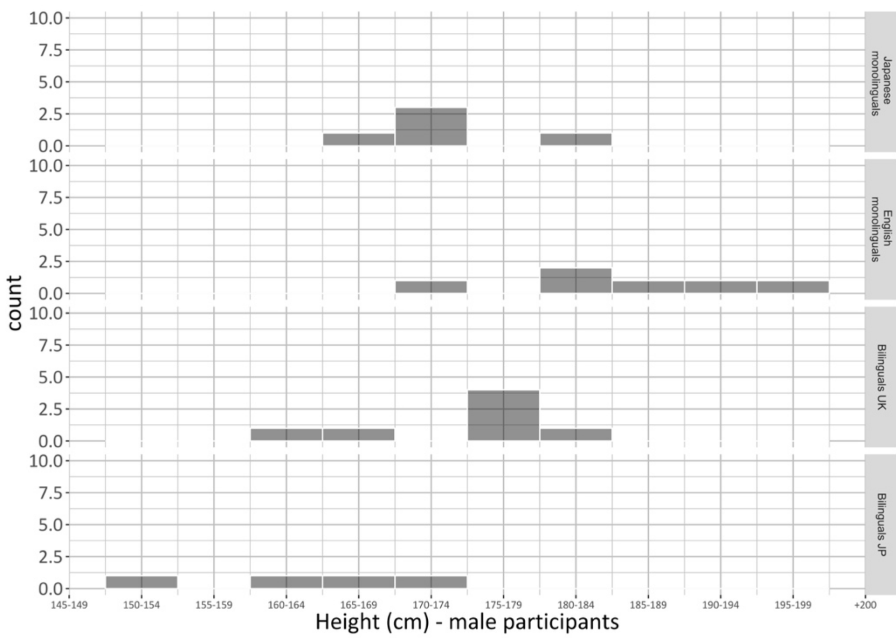


Figure 5.7 Histograms depicting the distribution of the height of the male speakers divided by group.

5.5.8 Musical Training

There is a growing body of research showing a link between speech production/perception and musical training (e.g. Bidelman et al., 2011; Slevc & Miyake, 2006). It was considered important to only recruit non-professional musicians.

Of 72 participants only seven reported to have received more than a basic musical training in their lives, however none reported to actively play music/sing at the time of testing. Participants were assumed to be homogeneous on this variable.

5.6 Bilingualism predictor variables

Thus far a description of the speaker's variables accounted for in this project has been provided, in this section bilingualism predictor variables whose effect was explored in the analysis are detailed. Information was gathered via the Language Experience and Proficiency Questionnaire – LEAPQ (Marian et al., 2007)and analyses were carried out in R (R Core Team, 2019) using the *stats* (version 3.6.0 R Core Team, 2019) and the *psych* (version 1.8.12 Revelle, 2018) packages.

5.6.1 Age of Acquisition (AoA)

Table 5.11 below documents the bilinguals' age of L2 acquisition (AoA) calculated in years, divided by location. Again, initially it was hoped to only collect data from participants who had started learning English after adolescence, however this requirement was later relaxed and participants who had started learning English earlier were accepted. All participants received some formal English education in Japan; therefore, differently to other research looking into L1 attrition (e.g. de Leeuw, 2009; Opitz, 2011), here AoA and age of emigration to the L2 country were not the same.

Table 5.11 Bilingual participants' AoA, divided by testing location and sex

	Female participants				Male participants			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Bilinguals UK	11	3.4	5	13	12.3	1.3	10	14
Bilinguals JP	9.3	3.4	4	13	8.3	4	5	13

A two-way ANOVA revealed that bilinguals did not significantly differ in terms of AoA neither between testing locations.

5.6.2 Length of residence in an L2-speaking country (LoR)

Table 5.12 reports descriptive statistics for Length of Residence (LoR), measured in years, divided by testing location and sex. All bilinguals, apart from seven females from the Tokyo group, reported to have spent some time in an English-speaking country, with the bilinguals tested in London still living in the L2-speaking country. All participants recruited in London had been living in the UK for a portion of their lives, with five of them having also lived in North America and one in Australia. Only three bilingual participants recruited in Tokyo had lived in the UK; whereas 12 had lived in North America and the remaining 7 had never lived in an English-speaking country at the time of testing. Importantly, regardless of whether they resided in London or Tokyo, all bilingual participants reported to have spent a longer portion of their lives in Japan than in an English-speaking country.

Table 5.12 Bilingual participants' LoR, divided by testing location and sex

	Female participants				Male participants			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Bilinguals UK	3.9	4.2	0.2	14.5	3.6	4	0.2	9
Bilinguals JP	2.7	3.4	0	12	7.2	4.4	1	11

A two-way ANOVA revealed that participants did not significantly differ in term of LoR neither sex nor testing locations.

5.6.3 Amount of L1/L2 use

A further variable taken into consideration in this project was amount of L1 and L2 use, which was operationalised as self-reported quantity of L1 and L2. Information relative to quality of L1/L2 use was acquired but not further taken into account because almost all participants reported that they were exposed to their L2 via education and peers/friends. Two of the participants tested in London also reported to be exposed to English in their family and two in Japan due to their jobs.

Amount of language use was quantified on two scales, that is, percentage of passive exposure to L1 and L2 and percentage of active exposure. The latter referred to (a) decision to read in their L1/L2 and (b) decision to speak in their L1/L2. Participants indicated on Likert scales anchored 0% (never) and 100% (always) how often they were currently, and on average, exposed to their languages. Participants were reminded that L1 and L2 percentages of use should have added up, however some individuals over-assessed themselves by reporting the total amount of exposure to their two languages as being higher than 100%. Following de Leeuw (2008), a normalised exposure to L1 and L2 use was obtained for each scale which was derived from the absolute total amount reported on the scale, as shown in the equations below in the case of passive exposure to English:

$$English_{PassiveExposure\_Normalized} = \frac{English_{Exposure}}{English_{Exposure} + Japanese_{Exposure}}$$

To compute a composite L1/L2 use score, the following procedure was used. Participants' responses were firstly altered from percentages to integers, for simplicity. For example, if a participant responded that: (1) they were exposed to their L1 60% of the time and (2) they were exposed to their L2 40% of the time, the figures were changed into 6/10 and 4/10. This meant that the scales ranged from 0 to 10. Thereafter, normalised amounts of passive exposure to the L1 and L2 were obtained. To calculate the normalised amount of active exposure, the two subscales were firstly normalised and then averaged, thus providing a score for active exposure to the L1/L2. Thereafter, the composite L1/L2 language use scale was created averaging the passive exposure and active exposure scales for both languages separately. Tables 5.13 and 5.14 and report descriptive statistics (average and standard deviation) for L1 and L2 use respectively.

Table 5.13 Bilingual participants' L1 use, divided by testing location and sex

	Female participants				Male participants			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Bilinguals UK	5.4	1.2	4	7	5.6	1	4	7
Bilinguals JP	7	1.5	4	9	7	1.8	5	9

Table 5.14 Bilingual participants' L2 use, divided by testing location and sex

	Female participants				Male participants			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Bilinguals UK	4.5	1.2	3	6	4.4	1	3	5
Bilinguals JP	3	1.8	1	5	2.8	1.5	1	6

Not surprisingly, bilingual residents of London (UK) reported to use their L1 less and their L2 more than participants who were resident of Tokyo. A series of two-way ANOVAs revealed that testing location predicted amount of L1 and L2 use, respectively [$F_{L1use}(1,37) = 14.07$, $p = .001$ and $F_{L2use}(1,37) = 14.07$, $p = .001$)], whereas percentage of use did not differ significantly across sexes.

To recap, the aim of the quantification process of L1/L2 use was to come up with a variable which could be used in assessing the role of language use in L1 attrition and L2 acquisition of pitch. However, there are numerous ways of critiquing the above-explained procedure; firstly, it does not assess the type of language use, that is, in which settings and with whom the bilinguals use their two languages. Moreover, language mixing is not taken into account: it might be that when participants decide to speak English with somebody who speaks both of their languages, there might be a lot of code-mixing, which was not quantified in the present scales. Despite the above-mentioned, and potentially additional, disadvantages, it was thought that the quantification process used in this research expressed the overall amount of L1 and L2 use in these participants.

Given that amount of L1 use and L2 use summed up to 1, in keeping up with previous work indicating that amount of L1 is a better predictor of both bilingual speech outcomes (Piske et al., 2001), amount of L1 use was entered for further analysis. To do so, this variable was reverted to a percentage; and entered in the analysis as continuous variables to interpret L1 attrition and L2 acquisition in the domain of phonetics.

5.6.4 L1/L2 proficiency

The last predictor which was used to explore individual variation in L1 attrition and L2 acquisition was language proficiency. In line with previous work on L1 attrition (e.g. de Leeuw, 2009) it was initially hoped to gather data about proficiency using a Cloze test (Carroll et al., 1959), however this idea had to be discarded due to the lack of pre-existing equivalent Cloze tests in English and Japanese. As a consequence, information about L1 and L2 proficiency was only self-reported.

Despite the nature of the judgement being more subjective, self-assessed proficiency has been claimed to be reliable (Marian et al, 2007). In trying to reduce subjectivity to a minimum, participants were asked to rate their proficiency twice on the same scales. The first time in the background questionnaire and the second time after completing the data collection. The final proficiency ratings were an average of the self-reported scores across the two questionnaires. A composite proficiency rating was calculated for each language of the bilinguals by averaging rating on the speaking, understanding and reading scales (Schroeder et al., 2015).

Descriptive statistics for average L1 and L2 proficiency for bilinguals divided by testing location and sex are reported in Tables 5.15 and 5.16.

Table 5.15 Bilingual participants' self-reported L1 proficiency, divided by location and sex

	Females				Males			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Bilinguals UK	9.5	0.7	8	10	9.8	0.4	9	9
Bilinguals JP	9	1.1	7	10	8.8	2.5	5	10

Table 5.16 Bilingual participants' self-reported L2 proficiency, divided by location and sex

	Females				Males			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
Bilinguals UK	7	1.4	5	10	7	1	6	9
Bilinguals JP	6.6	1.8	3	9	7.5	2.4	4	9

Overall participants reported very high Japanese proficiency ($M = 9.3$, $SD = 0.6$ for individuals tested in London; $M = 9$, $SD = 1.4$ for individuals tested in Tokyo) and good English proficiency ($M = 7.4$, $SD = 1.4$ for individuals tested in London; $M = 6.8$, $SD = 1.9$ for individuals tested in Tokyo). A series of two-way ANOVA revealed that individuals did not significantly differed in self-reported proficiency neither across testing location, nor sexes. This is surprising as it was assumed that the bilinguals tested in London had a higher L2 proficiency, and perhaps lower L1 proficiency, than the bilinguals tested in Tokyo.

5.6.5 Language dominance

A further variable investigated with the background questionnaire was language dominance, which in the project at hand is regarded as 'the language in which the bilingual felt more comfortable at expressing themselves in'.

All bilinguals reported Japanese to be their most dominant language followed by English, thus they were considered homogeneous on this variable.

5.6.6 Summary

Summing up, in this section, bilinguals scores on the predictor variables taken into account in this project were introduced. The overall picture is of a surprisingly homogeneous group of bilinguals, despite the two testing locations. Whether these variables could explain L1 attrition and L2 acquisition in the pitch range of the bilingual of the present group was, nonetheless, investigated.

5.7 General predictions

The general predictions for each research questions of this project are based on previous literature on Japanese-English bilinguals, findings from L1 attrition and L2 acquisition and voice pitch research detailed in the previous chapters (Chapter 2-4) and in section 5.2.

With respect to RQ 1 regarding the speech of the bilinguals, *Is there a bidirectional interaction in the production of pitch range in the two languages of Japanese-English female and male bilinguals residing in London (UK) and Tokyo (JP)?*, predictions were made for both L1 attrition and L2 acquisition.

In terms of L1 attrition, (1a) the female bilinguals – especially those residing in the UK – were expected to produce Japanese with a significantly lower pitch level and narrower pitch span than the Japanese monolingual females, but (1b) this was not expected for male bilinguals (Ohara, 1999; Loveday, 1981).

With regard to L2 acquisition, no significant differences were expected between (1c) the English of the female bilinguals and the English monolingual females (Ohara, 1999; 2001) nor between (1d) the English of the male bilinguals and the English monolingual males (Ohara, 1999; Loveday, 1981).

With respect to RQ2 , *Does individual gender identity explain variation in the pitch range of the two languages of the bilinguals?*, it was predicted that, irrespective of language spoken and sex of the speakers, (2a) a higher self- attribution of feminine traits in both female and male bilinguals would pattern with a higher pitch level and wider pitch span and, conversely, (2b) a higher self-attribution of masculine traits would pattern with lower pitch level and narrower pitch span (Biemans, 1999; Biemans & van Bezooijen, 1996).

With respect to RQ3, *Does language history explain variation in the pitch range of the two languages of the bilinguals?*, it was predicted that, irrespective of whether female or male, (3a) a later AoA would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Moreover, it was predicted that (3b) shorter LoR would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Finally, it was considered possible that an increased L1 use (3c) and higher L1 proficiency (3d) would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals.

5.8 Conclusion

In the present chapter, the general methodology for the study at hand has been presented and the speakers' profiles detailed. In doing so, an account of how each speaker's variable has been operationalized in the present research has been detailed. The section concluded with an account of the general predictions for this of project. The specific methods employed in the data collection and the analysis of each production task are detailed in the next two chapters, specifically chapter 6 for the reading task and chapter 7 for the voicemail task, along with the relevant results.

6 Pitch range variation in read speech

6.1 Introduction

Chapter 6 documents the first production analysis of this project, that of pitch range in a sentence reading task. The purpose of this task was to collect high-quality data, with a fixed content, thus enabling a precise analysis of pitch range variation among participants. Both absolute differences in the realisation of pitch range in Japanese and English (that is, linguistic differences) and differences due to the expression of social meaning (that is, variation elicited by different addressees and expression of gender identity) formed the basis of this production analysis (see Chapter 4). To fully understand the impact of acquiring an L2 on pitch range, both the effect of L1 attrition and L2 acquisition on the two languages of the bilinguals were assessed by comparing the bilinguals' pitch range with the pitch range of Japanese and English monolinguals respectively (see Flege, 1987 for research indicating the importance of comparing bilinguals to monolingual speakers of both of their languages). Notably, and in line with similar research (de Leeuw, 2009; Mennen, 2014), group trends as well as interpersonal variation were investigated. This was done by taking into account the effect of each individual's gender identity (Biemans, 1998; Biemans & Van Bezooijen, 1996; Kaźmierski, 2015), as well as bilinguals' language background. Specifically, the effect of age of acquisition, length of residence, L1 use and L1/L2 proficiency on the L1 and the L2 of the bilinguals was assessed (de Leeuw et al., 2012; Hansen Edwards, 2008; Mennen et al., 2014; Trofimovich & Baker, 2006).

As detailed in 4.4, findings from previous work on Japanese-English bilinguals provided a somehow inconclusive picture. Some research reported that only Japanese-English bilingual females (1) decrease their pitch when speaking English compared to Japanese (Loveday, 1981; Ohara, 1992, 1999) and (2) increase their Japanese pitch when addressing formal interlocutors (Ohara 1999). Yet, there is work that has provided a somehow less categorical picture of differences between the speech of Japanese female and male speakers both bilinguals and monolinguals (Graham, 2015; Guillemot & Sano, 2020; Ohara, 2004; Passoni et al., 2018; Sherr-Ziarko, 2019; Tsuji, 2004; Yuasa, 1999; Yuasa, 2008). Specifically, these more contemporary studies indicate that also Japanese males vary their pitch level and pitch span; however, perhaps, not as much as females. As proposed in 4.4, these discrepancies between newer and older research may be attributed to methodological differences in the studies and in the way, results have been interpreted. In addition, they may also be testimony of a change (perhaps in progress) in Japanese language norms (see Lewis, 2002 for a similar suggestion).

It should be pointed out that previous bilingual results (both from older and more contemporary research) are potentially only partly applicable to the participants of the present study. For example, here sequential bilinguals are investigated, whereas Graham (2015) investigated balanced simultaneous bilinguals, i.e. bilinguals who do 'equally well in both of their languages' (Grosjean, 2010). Ohara (1992, 1999, 2001) and Loveday (1981) do not clearly state what type of bilingual they investigated, however the lack of L1 transfer in their data suggests they may have also investigated balanced bilinguals. Methodological issues might also impact results; in this study attention was taken to ensure that the bilinguals were in a monolingual mode, however this is not specified neither in Ohara's nor in Loveday's work. Notably, Loveday (1981) conducted his data collection in Germany, thus an influence of exposure to the German language on the speech of both the monolingual English and the Japanese-English bilinguals cannot be ruled out.

It is also worth observing that previous work focussed on bilinguals who were residing in the L2-speaking country at the time of testing. In this project, speech from both bilinguals residing in the L2-speaking country (the UK) and in the L1-speaking country (Japan) was analysed. This was considered important to ensure that potential cross-language differences in pitch range were not exacerbated by the effect of being part of a minority L1 group in the L2 country, with the pitch ranges of the participants being potentially representative of in-group specificity due to speech convergence phenomena (see D'Imperio & Sneed, 2015 for phonetic imitation; Giles et al., 1991 for accommodation). Moreover, this was relevant in terms of L1 attrition research, with more L1 attrition being expected in the bilingual group in the UK than in the bilingual group in Japan (de Leeuw, 2019b; Köpke & Schmid, 2004) and in terms of L2 acquisition research, with enhanced L2 acquisition attainment expected in the group abroad than in the group at home due to living in the L2 environment (Méndez Seijas, 2019; Ullakonoja, 2007).

Summarising, despite the somehow discordant results, previous studies on Japanese-English bilinguals warranted an investigation into L1 attrition and L2 acquisition of pitch range in Japanese-English sequential bilinguals because the general conclusion is that pitch range tends towards language specificity in these two languages. Importantly, this language-specificity appears to be due to a potential interplay between (1) the intrinsic intonational make-ups of each language (Graham, 2015) and (2) by the different social meaning attributed to high pitch in the two languages [femininity (and politeness) in the Japanese language; Ohara, 1992, 1999 and friendliness in English; Loveday, 1981)]. This means that the Japanese-English bilinguals in the current study did not only have to acquire English intonation per se, but also learn, if they wished, to manipulate their pitch in accordance with the different social rules of their L2 (Ordin & Mennen, 2017). In addition, acquiring English pitch might have impacted their native Japanese pitch through the process of L1 attrition (de Leeuw, 2009; de Leeuw et al., 2012).

With respect to RQ 1 regarding the speech of the bilinguals, Is there a bidirectional interaction in the production of pitch range in the two languages of Japanese-English female and male bilinguals residing in London (UK) and Tokyo (JP)?, predictions were made for both L1 attrition and L2 acquisition.

In terms of L1 attrition, (1a) the female bilinguals – especially those residing in the UK – were expected to produce Japanese with a significantly lower pitch level and narrower pitch span than the Japanese monolingual females, but (1b) this was not expected for male bilinguals (Ohara, 1999; Loveday, 1981).

With regard to L2 acquisition, no significant differences were expected between (1c) the English of the female bilinguals and the English monolingual females (Ohara, 1999; 2001) nor between (1d) the English of the male bilinguals and the English monolingual males (Ohara, 1999; Loveday, 1981).

With respect to RQ2 , *Does individual gender identity explain variation in the pitch range of the two languages of the bilinguals?*, it was predicted that, irrespective of language spoken and sex of the speakers, (2a) a higher self- attribution of feminine traits in both female and male bilinguals would pattern with a higher pitch level and wider pitch span and, conversely, (2b) a higher self-attribution of masculine traits would pattern with lower pitch level and narrower pitch span (Biemans, 1998; Biemans & Van Bezooijen, 1996).

With respect to RQ3, *Does language history explain variation in the pitch range of the two languages of the bilinguals?*, it was predicted that, irrespective of whether female or male, (3a) a later AoA would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Moreover, it was predicted that (3b) shorter LoR would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Finally, it was considered possible that an increased L1 use (3c) and higher L1 proficiency (3d) would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals.

Whether read speech reflects everyday life speech is unclear and some work has reported that bilinguals may be more target-like on more formal tasks, such as a reading task, than on more spontaneous ones (Laan, 1992; Moyer, 2004), and that is why more spontaneous speech was also investigated (see Chapter 7). Note, however, that most of the previous work on Japanese-English bilinguals has investigated read speech (see 4.4), thus why including a reading task in the present project was deemed important.

6.2 Methods

6.2.1 Participants

For information relative to the speakers the reader is referred to Chapter 5.

6.2.2 Presentation

The sentence reading task was always the second task of the experiment, i.e., it always followed the gender traits attribution task (for reasons of brevity, not reported here; see Appendix G) and preceded the voicemail task (Chapter 7). There was a short break of two minutes between the gender traits attribution task and the reading task. In line with Grosjean's (2001b) description of language modes, the Japanese reading task took place in the Japanese half of the study, whilst the English reading task in the English half of the study. As per every step of the data collection (see 5.3.2) the animated character Blobby instructed participants to read each sentence without changing its content to the person they saw on the screen (Figure 6.1 and Appendix C for the script).

Figure 6.1 Blobby instructing participants for the reading task.

English on the left and Japanese on the right.

Speakers were given time to read the sentences to themselves before reading them aloud. In case any misreading occurred, speakers were instructed to pause and re-read the sentence from the beginning. A familiarisation trial session was conducted prior to the experiment, with different sentences and different addressees. Data from the trial session are not included in the analysis. The familiarisation trial gave the researcher an opportunity to check the recording levels. The reading task took approximately 4 minutes to complete. This, in addition to the preparation beforehand, took approximately 8 minutes in total. The duration of the task was similar in both languages.

6.2.3 Material

The stimuli used for the reading task were the same as those used in Graham (2015). The original English sentences are from the IVIE project (Grabe et al., 2001), the Japanese translations are from Graham (2015). The stimuli comprised four types of sentences: namely, Alternative Questions, Declarative Questions, Declarative Statements and Wh-Questions. Four sentences per type were used in this study, for a total of 16 sentences (however, note that Graham’ s (2015) original stimuli comprised 20 sentences). These sentences were chosen because they were (1) neutral in content and (2) favourable for pitch analysis, that is, they contained a high amount of fully voiced segments, which allows the avoidance of f0 discontinuities associated with voiceless segments (Graham, 2015). Notably, this was valid for both languages. Note that the effect of type of sentence was not investigated here, as it lays outside the scope of this work; however, in line with similar previous work (Ohara, 1992; 1999; 2001), stimuli with a variety of canonical shapes and referring to a variety of pragmatic meanings were chosen as it was considered that the data would reflect some “real-life” variability. A sample for each type of sentence is provided below, whilst for the full list the reader is referred to Appendix H:

- When will you be in Ealing? / なんでいいリングーにいる？
- You remembered Lil? / リルのことを思い出した？
- Did you say red or bed? / レッドとベッドのどっちを行ったの？
- We remembered Lil. / リルのことを思い出したリルのこと出した。

To account for the effect of politeness on Japanese females’ pitch range as reported in the literature (Ohara, 1999, 2004), that is, that only Japanese females would increase their pitch when addressing formal versus informal interlocutors, a visual component was added to the elicitation procedure. Images of four addressees per language were chosen to elicit the pitch that speakers would have produced, had they met these people in real life (for other phonetics research using images to elicit speech variation see Babel, 2009).

Examining the effect of imagined social interaction on the pitch of the speakers even in such a controlled task was crucial because in a spontaneous task, participants may have expressed politeness through means of grammar, or word choice; but when only the phonetic dimension could be varied, since the task was controlled, it may be that the role of pitch range to reflect politeness comes through more saliently. Importantly, since the sentences were judged to be non-marked in style (for example, they did not contain polite formulations, such as honorifics and passives) by monolinguals of both languages, if there was variation in pitch between the groups, this could have been due to the effect of the images.

Four addressees per languages were chosen, two formal addressees (i.e. older-looking addressees in business-like attire) and two informal addressees (i.e. younger-looking addressees in school-uniforms (see image descriptions in Figure 6.2 and 6.3)

Portrait photo of a middle-aged British English female in business attire	Portrait photo of a middle-aged British English male in business attire	Portrait photo of a middle-aged Japanese female in business attire	Portrait photo of a middle-aged Japanese male in business attire

Figure 6.2 Description of the images of the formal addressees; the images have been removed due to copyright reasons.[5]

Portrait photo of a young British English female in school uniform	Portrait photo of a young British English male in school uniform	Portrait photo of a young Japanese female in school uniform	Portrait photo of a young Japanese male in school uniform

Figure 6.3 Description of the images of the informal addressees; the images have been removed due to copyright reasons.[6]

The formality (or lack thereof) of the addressees was judged by the main author and two senior researchers and informally tested by asking participants of the pilot study to rate the formality of the people shown in the images. For each formality level, one image that would be typically assumed to be of a female and a male was chosen. Controlling for the effect of sex of the addressee on pitch was considered important here because it allowed to observe whether, for example, an even higher pitch was elicited by the formal male compared to the formal female, and whether this effect was seen across all sequential bilinguals in both languages, or whether variation between languages would be observed. For the workflow, each sentence was presented only once, always with the same addressee (see Appendix H). The order of presentation was randomised.

Again, the purpose of this task was to investigate whether bilinguals' read pitch range differed from those of the monolinguals in both of their languages and whether a higher-pitched voice, potentially with a wider span, might have been produced when addressing the sentences to the formal interlocutors, and whether this was particularly the case with Japanese female participants. It might also have been the case that Japanese-English bilinguals living (longer) in the UK may have had more English-like pitch production

[5] Images were sourced from the internet, URLs can be found in the bibliography (*English Formal Female*, 2017; *English Formal Male*, 2017; *Japanese Formal Female*, 2017; *Japanese Formal Male*, 2017)
[6] Images were sourced from the internet, URLs can be found in the bibliography (*English Schoolboy*, 2017; *English Schoolgirl*, 2017; *Japanese Schoolboy*, 2017; *Japanese Schoolgirl*, 2017)

than the Japanese-English bilinguals tested in Japan, both in English and Japanese, reflecting the process of L1 attrition.

6.2.4 Annotation

Firstly, speech relevant to the task was separated from other speech (such as the researcher's instructions), but selecting the first repetition without dysfluencies, noise or inappropriate phrase boundaries of each sentence. Thereafter, recordings were transcribed and then visually and auditorily inspected in Praat (Boersma & Weenink, 2016) (Figure 6.4 and 6.5).

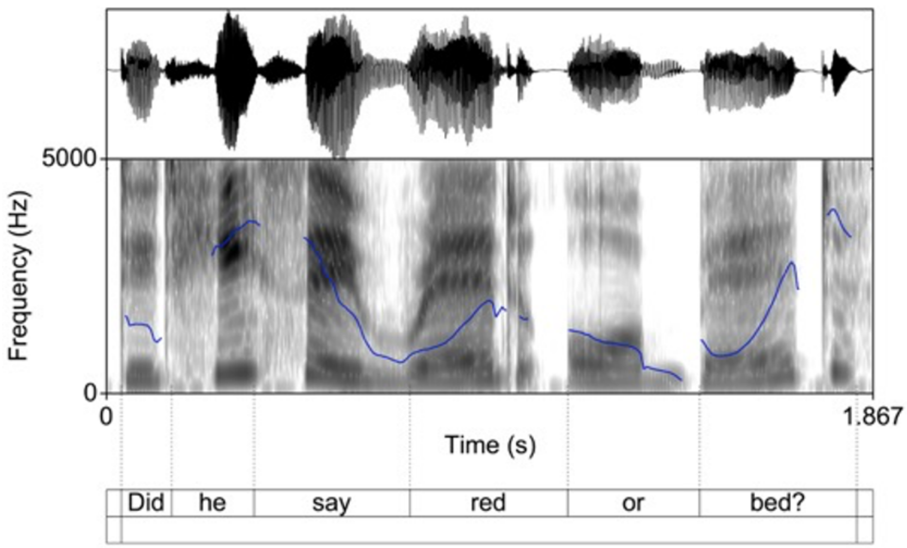


Figure 6.4 Example of acoustic waveform and spectrogram for a Japanese female bilingual speaking in English

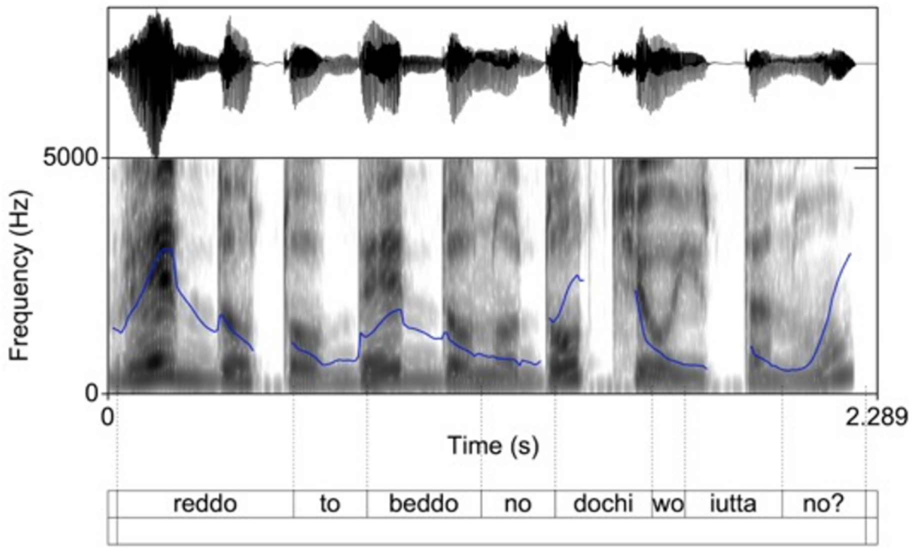


Figure 6.5 Example of acoustic waveform and spectrogram for a Japanese female bilingual speaking in Japanese. (Translation: Did he say red or bed?)

Waveforms and spectrograms were examined in 5-10 second intervals to check for peak and trough estimation errors (octave jumps and/or pitch doubling or halving) and to manually correct them. At this point in the analysis, sections of creaky voice were also annotated and subsequently removed from the analysis, as is standard procedure (e.g. de Leeuw, 2009, 2019a; Ordin & Mennen, 2017). Notably, none of the participants appeared to use creaky voice as a speaking style in this reading task, that is, nobody produced (almost) full utterances in creaky phonation.

6.2.5 Measuring pitch range

Pitch range was measured in Praat (Boersma & Weenink, 2016), using the analysis settings recommended in the Praat manual (see below). Using a semi-customised script, f0mean, f0min and f0max in Hz were obtained to quantify pitch level; the difference between the 90th and the 10th percentile span (80%span) in semitones (ST) was obtained for pitch span. These measurements were chosen based on previous literature on similar topics (e.g. Busà & Urbani, 2011; de Leeuw, 2009, 2020; Ordin & Mennen, 2017; Ullakonoja, 2007).

As noted in 3.3, pitch range is methodologically difficult to quantify and there appears to be no consensus on the best approach to measure it (Mennen et al., 2008). Two main types of measures are found in the literature: (1) long-term distributional (henceforth

LTD) measures, based on the analysis of f0 distributions (Urbani, 2012) and (2) linguistic measures, which link level and span to specific turning points in the f0 contour, which in turn are linked to phonological tones (Mennen et al., 2008). Here, LTD measures were chosen, because the primary focus of this project was the overall differences in the pitch of the two languages of Japanese-English sequential bilinguals. Importantly, this has been the approach preferred by previous work investigating gender and pitch variation in bilingual speakers (e.g. de Leeuw, 2020; Ohara, 1992, 1999; Ordin & Mennen, 2017), thus enabling comparisons between the present findings and previous results. In addition, a phonetic analysis was preferred to the phonological one because most of the prosodic annotation systems currently available rely on the assumption that the phonological system of the language to transcribe is known, which is potentially problematic with the interlanguage that often characterises sequential bilingual speech (Santiago & Delais-Roussarie, 2015).

The analysis settings recommended in the Praat manual were adhered to. This was done because, by listening to the participants, it was observed that the values specified in the Praat manual characterised the voice of the participants. Moreover, initial analysis of f0min and maximum of some sample participants from each group, revealed that the values fell within the Hz specified by Praat. As a consequence, the settings were only adjusted according to self-reported sex of the participant, but not by language group or speakers' pitch range. Accordingly, for females, pitch floor was always set at 100 Hz and pitch ceiling at 500 Hz. For males, pitch floor was set at 75 Hz and pitch ceiling at 300 Hz. The time step used by Praat with these settings was 10 ms. Fundamental frequency was tracked using the Praat standard algorithm for f0 tracking, based on the autocorrelation method. Based on those settings, a number of different values related to pitch range were obtained with a semi-customised script and pitch extractions were further checked for spurious results against single-cycle f0 measurements, to avoid pitch-tracking mistakes. Following previous work (e.g. de Leeuw, 2019a; Keating & Kuo, 2012; Ordin & Mennen, 2017; Ullakonoja, 2007), f0mean, f0max and f0min in Hertz (Hz) were investigated for pitch level and the difference between the 90th and the 10th percentile (80%span) in semitones (ST) was investigated for pitch span.

6.2.6 Statistical analysis

All data from all participants was entered in the analysis for a total of 1808 tokens, that is, 16 tokens per each monolingual speaker and 32 tokens per bilingual speaker. Data were analysed using R version 3.6 (R Core Team, 2019) with the R packages *lme4* package (Bates et al., 2015) and *lmerTest* (Kuznetsova et al., 2017). All plots were created using the ggplot2 package (Wickham, 2016).

Mixed effect models were chosen to account for the repeated measures design of the study: each participant read 16 sentences in their native language (English or Japanese) and bilinguals read a further 16 sentences in their L2 (English). Models were fitted based on existing literature. In line with Levon (2018), female and male data were analysed separately to ensure that the eventual emergence of significant findings was not an artefact of differences between females' and males' average f0. In line with the comparative sociolinguistics methods (Tagliamonte, 2013), any potential effect of identifying as female versus identifying as male in this reading task was extrapolated from the analysis by assessing whether factors behaved (dis)similarly across sex groups.

Maximal models (i.e. models with all main effects and interactions) evaluated with maximum likelihood (ML) ratio tests for model selection against the model without interactions to achieve a best-fit model (Mehrabi, 2018). The significance of each best-fit models' predictor and interaction was estimated using type III analysis of variance (ANOVA) with Satterthwaite's degrees of freedom approximation from the *lmerTest* (Kuznetsova et al., 2017); significance level was set at $p < .05$. If results revealed significant interactions between predictors, any potential main effect was not expanded upon because main effects are uninterpretable in case of a significant interaction (see Winter & Grawunder, 2012). Residual plots were visually inspected to detect any obvious deviation from normality and homoscedasticity. Post-hoc analyses were run using the *emmeans* package (Lenth & Love, 2017) with levels of significance Bonferroni-adjusted for pairwise comparisons.

6.3 Results

Results of the analyses of the data collected with the reading task are reported below. Below, firstly results of the analysis of pitch level are reported (6.3.1) followed by results of the analysis of pitch span (6.3.2).

6.3.1 Analysis of pitch level in the reading task

This section details the analysis of the pitch level of the two languages of the bilinguals in the reading task.

For all analyses below, if not otherwise stated, models were built with *group* (English monolinguals; Japanese monolinguals; Japanese-English bilinguals UK; Japanese-English bilinguals JP), formality of the addressee (formal vs. informal) and sex of the addressee (female vs. male) and their interactions as fixed independent factors and *speaker* as random intercept. Models including by-item random intercepts and by-speaker and by-item random slope were tested but failed to converge. Only results for best-fit models are reported in each section of the results, firstly for female and thereafter for male speakers.

6.3.1.1 Monolingual pitch level comparisons in the reading task

A pre-requisite for any L1 attrition and L2 acquisition analysis is that the pitch range of the monolinguals differ significantly (de Leeuw, 2009). Thus, the first step of the analysis involved assessing whether the pitch range of the monolinguals differed significantly across languages and whether variation in the addressee affected monolinguals' pitch range differently.

Based on previous research (Loveday, 1981; Ohara, 1999, 2001; Tsuji, 2004), it was considered possible that the pitch level of the Japanese female monolinguals would be significantly higher than that of the English female monolinguals, and that formal addressees would elicit a higher pitch level than informal addressees in the monolingual Japanese females, but not necessarily in the monolingual English females. In addition, male addressees were expected to elicit a significantly higher pitch level than female addressees both in the speech of the Japanese and the English female monolinguals. No overall differences were predicted between the pitch level of monolingual male speakers (Loveday, 1981).

6.3.1.1.1 Monolingual females

Descriptive statistics (average and standard deviation) for absolute differences in the pitch level of the monolingual females are divided by language in Table 6.1. Table 6.2 and display statistics by formality of the addressee and Table 6.3 by sex of the addressee.

Table 6.1 Descriptive statistics for pitch level of the female monolinguals by language, in the reading task. Average and SD for each measurement are reported in Hz

Group	Language	f0mean		f0min		f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Japanese	226	19	173	19	298	32
English female monolinguals	English	217	17	177	22	263	34

Table 6.2 Descriptive statistics for pitch level of the female monolinguals by formality of the addressee in the reading task. Average and SD for each measurement are reported in Hz

Group	Language	Formality of the addressee	f0mean		f0min		f0max	
			$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Japanese	Informal	225	18	174	18	298	32
		Formal	226	21	173	20	298	32
English female monolinguals	English	Informal	217	18	177	22	262	39
		Formal	216	30	176	22	263	30

Table 6.3 Descriptive statistics for pitch level of the female monolinguals by sex of the addressee in the reading task. Average and SD for each measurement are reported in Hz.

Group	Language	Sex of the addressee	f0mean		f0min		f0max	
			$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Japanese	Females	225	19	174	19	299	31
		Males	226	20	173	20	296	33
English female monolinguals	English	Females	219	18	179	22	263	28
		Males	215	17	174	22	262	40

For f0mean, results from the LMERs indicated a main effect of sex of the addressee (p = .034) and a marginally significant interaction between sex and formality of the addressee (p = .048) (Table 6.4). Given that a significant interaction between factors means that it is not reasonable to analyse this model in terms of main effects (Nelder, 1977), the post–hoc analysis was carried out only on the interaction between sex and formality of the addressee (see below).

Table 6.4 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0mean of female monolinguals in the reading task.

Factor	Sum of squares	Mean square	F	*p*-value
Group	179.38	179.38	1.28	.268
Sex of the addressee	628.85	628.85	4.51	.034
Formality of the addressee	1.79	1.79	0.01	.909
Group: Sex of the addressee	139.13	139.13	0.99	.318
Group: Formality of the addressee	201.45	201.45	1.44	.230
Sex of the addressee: Formality of the addressee	548.89	548.89	3.93	.048
Group: Sex of the addressee: Formality of the addressee	85.59	85.59	0.61	.433
N=320, Random intercepts: Participant (20), Log likelihood: - 1275.5, Conditional R2= 0.66				

Figure 6.6 depicts the significant interaction between gender and formality of the addressee for f0mean of the female monolinguals (*p* =.048).

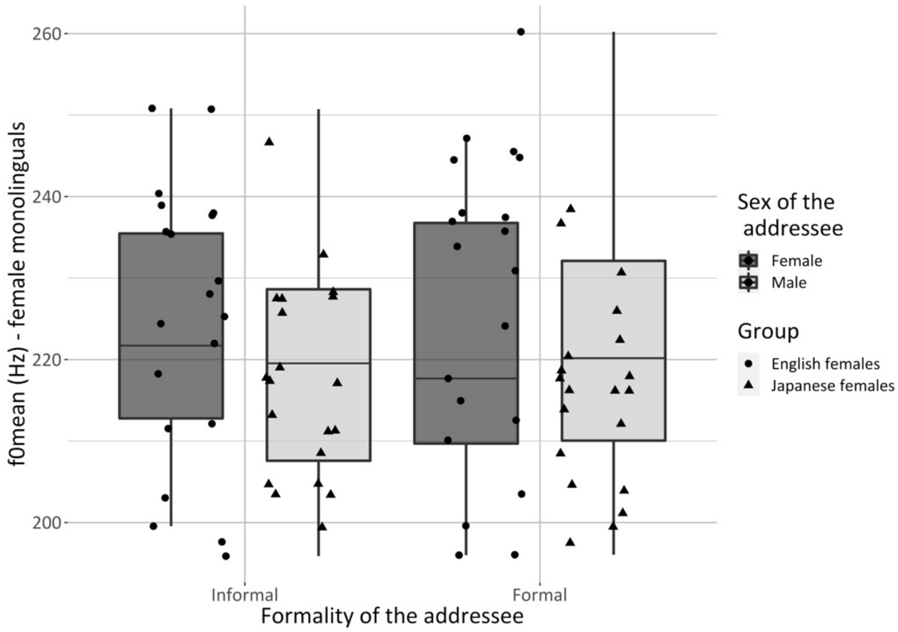


Figure 6.6 Boxplots illustrating the significant interaction between formality and sex of the addressee for f0mean in the speech of the monolingual females in the reading task. Values are averages for each participant.

As it can be noted that the formal male addressee elicited a slightly higher f0mean than the formal female, whereas the informal female elicited a higher f0mean than the informal male (right panel). Moreover, the formal female elicited a slightly lower f0mean than the informal one, whereas the formal male elicited a slightly higher f0mean than the informal male (left panel). All post-hoc pairwise comparisons failed to reach significance (Table 6.5).

Table 6.5 Pairwise comparisons for the significant interaction between formality and sex of the addressee for the f0mean of the monolingual females

Formality of the addressee	Sex of the addressee	contrast	estimate	SE	t-ratio	p-value
Informal		Females - Males	3.96	1.89	2.1	.145
Formal		Females - Males	- 1.27	1.89	-0.68	1
	Females	Informal - Formal	2.47	1.89	1.31	.764
	Males	Informal - Formal	-2.77	1.89	-1.47	.571

Results are averaged over some or all of the levels of: Group;Degrees-of-freedom method: Kenward-Roger; *p*-value adjustment: Bonferroni method for 4 tests

Continuing with f0min, the analysis indicated no effects of group (Japanese vs English), but an overall main effect of sex of the addressee (Table 6.6).

Table 6.6 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0min of the female monolinguals

Factor	Sum of squares	Mean square	F	*p*-value
Language	27.1	27.1	0.17	.679
Sex of the addressee	761.1	761.1	4.94	.026
Formality of the addressee	42.7	42.7	0.30	.580
N=320, Random intercepts: Participant (20), Log likelihood: - 1293.6, Conditional R^2= 0.64. All interactions, p>0.05				

The post-hoc analysis indicated that, when the addressee was a female, f0min of the Japanese and English females was 3.08 $\pm$ 1.54 Hz higher compared to when the addressee was male (p = .02) (Figure 6.9).

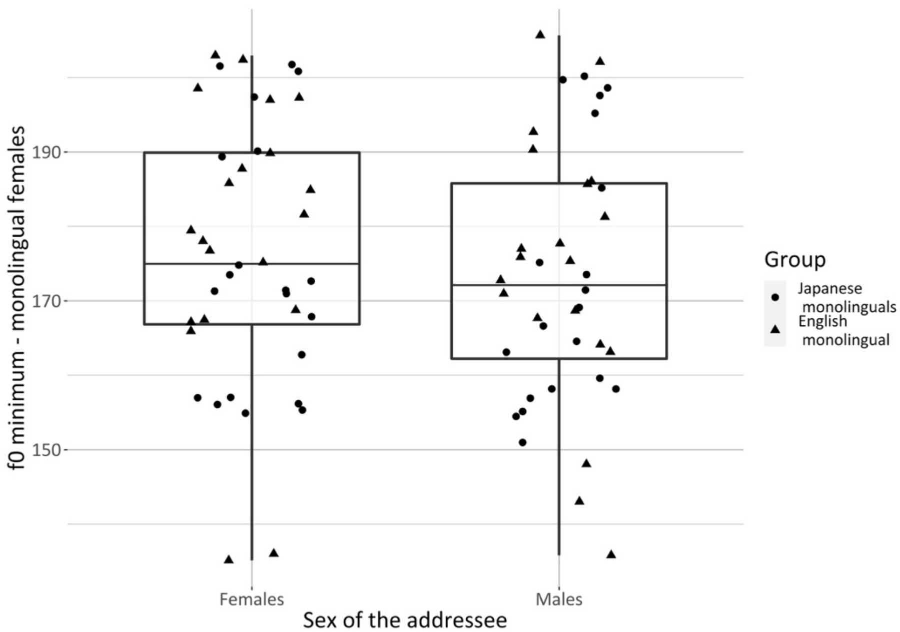


Figure 6.7: Boxplots depicting the significantly higher f0min elicited by the female addressees compared to the male addressees in the speech of the monolingual females. Values are averages for each participant.

Turning to f0max, the LMER revealed a significant effect of group, that is, the f0max of the Japanese females was significantly higher than that of the English females (Table 6.7). Post-hoc pairwise comparisons indicated that the f0max of the Japanese females was 35 $\pm$ 10 Hz higher than the f0max of the English females (p = .002) (Figure 6.7).

Table 6.7 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0max of the monolingual females

Factor	Sum of squares	Mean square	F	*p*-value
Language	8610.1	8610.1	12.87	.002
Formality of the addressee	21.9	42.7	0.032	.856
Sex of the addressee	307.1	307.1	0.459	.498
N=320, Random intercepts: Participant (20), Log likelihood: - 1519.3, Conditional R2= 0.52 all interactions, *p*>0.05				

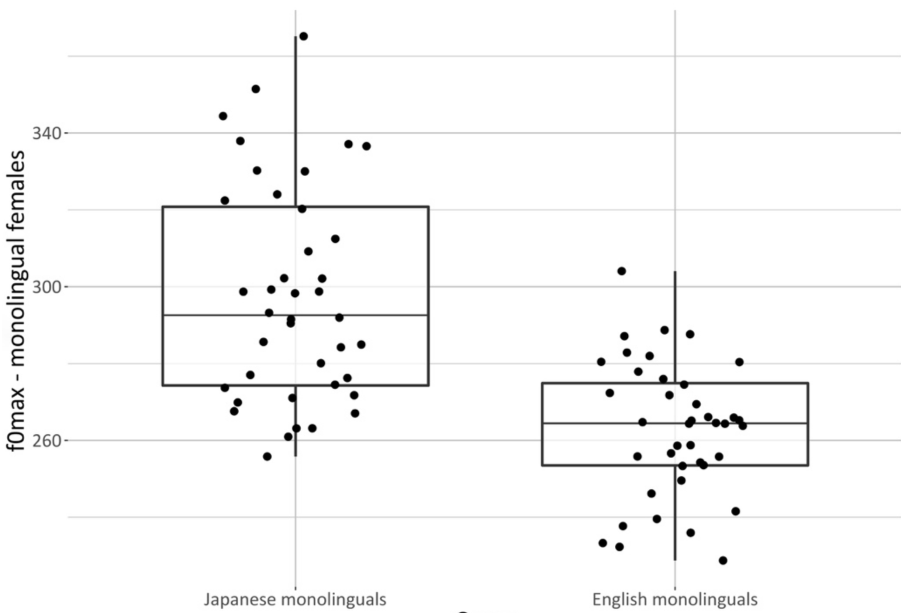


Figure 6.8 :Boxplot depicting the significantly higher f0max of the Japanese female compared to that of the English female monolinguals. Values are averages for each participant.

To recap, thus far the results of the comparisons between the pitch level of the monolingual females has been described. As expected, results indicated that Japanese was produced with a significantly higher pitch level, specifically f0max, compared to English. This indicates that, at least for these female monolinguals in the reading task, language differences in pitch level are limited to f0max. As far as variation as a result of the addressee is concerned, surprisingly, no differences between female monolinguals were revealed. Interestingly, in both Japanese and English, (1) the formal male addressee elicited the highest f0mean and (2) female addressees elicited a numerically higher f0min than male addressees.

6.3.1.1.2 Monolingual males

Turning now to the analysis of the pitch level of the monolingual males, the reader is reminded that no noticeable differences were thought to be observable between Japanese and English monolingual males.

Descriptive statistics for the pitch level of the two groups of male monolinguals are reported below. Specifically, Table 6.8 reports on absolute pitch level variation by group; whereas Table 6.9 and 6.10 on the effect of formality and sex of the addressee respectively.

Table 6.8 Descriptive statistics for pitch level of the male monolinguals by language in the reading task. Average and SD for each measurement are reported in Hz

Group	Language	f0mean		f0min		f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Japanese	125	12	97	9	176	22
English female monolinguals	English	119	14	95	12	151	29

Table 6.9: Descriptive statistics for pitch level of the male monolinguals by language and sex of the addressee in the reading task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	f0mean		f0min		f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Informal	125	13	96	10	177	24
	Formal	126	11	97	9	174	20
English male monolinguals	Informal	120	15	95	12	153	32
	Formal	119	14	94	11	150	27

Table 6.10 Descriptive statistics for pitch level of the male monolinguals by language and formality of the addressee in the reading task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	f0mean		f0min		f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Women	125	12	97	9	178	22
	Men	125	11	96	10	173	22
English male monolinguals	Women	120	15	95	12	150	26
	Men	119	14	94	11	153	33

Results of the inferential analysis for f0mean and f0min did not reveal significant differences between the speech of the two groups of male monolinguals. A significant effect of group (Japanese vs. English) was detected on the males' f0max, but no effect of the addressee (Table 6.11).

Table 6.11 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0max

Factor	Sum of squares	Mean square	F	*p*-value
Group	3301	3301	8.07	.016
Sex of the addressee	184.5	184.5	0.451	.502
Formality of the addressee	119.1	119.1	0.29	.59
N=176, Random intercepts: Speaker (11), Log likelihood: -790.6, Conditional R2= 0.46; all interactions, *p*>0.05				

Pairwise comparisons revealed that the f0max of the Japanese males was 25 $\pm$ 9 Hz higher than that of the English males (p = .016) (Figure 6.11).

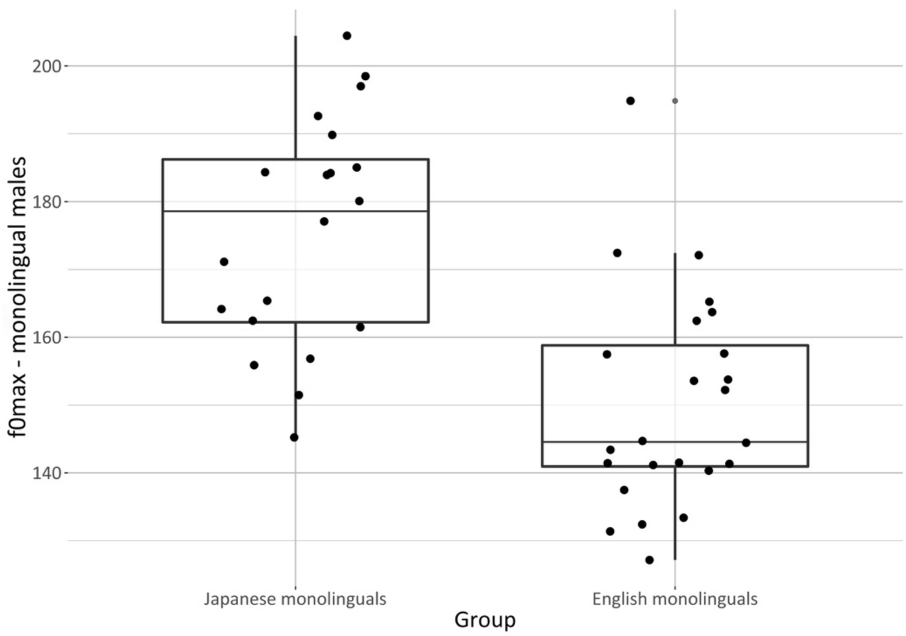


Figure 6.9 Boxplot depicting the significantly higher f0max of the Japanese female compared to that of the English male monolinguals. Values are averages for each participant.

Summarising, unexpectedly, the f0max of the Japanese monolingual males was also significantly higher than that of the English males.

6.3.1.1.3 Summary of the results of the pitch level analysis of the monolinguals

The most striking finding of the analysis of pitch level in the monolingual speakers was that the f0max of *both* female and male Japanese monolinguals was significantly higher than that of the English female and male monolinguals; this indicates that Japanese is produced with higher peaks than English. This finding held true for both female and male Japanese monolinguals, which suggests that f0max in Japanese and English is language-specific, but not gender-specific. Whether similar results will repeat in more spontaneous speech was assessed with the next task, where the same analysis was applied to data collected with a semi-spontaneous speech task (see Chapter 7).

As far as variation in the addressee is concerned, it did not elicit significant cross-language differences. However, results revealed that both the Japanese and English monolingual females, but not males, produced the highest f0mean when addressing the formal male and significantly higher f0min when addressing the female addressees.

It is now of interest to assess whether these findings are at least in part replicated in the bilinguals. Particularly, how will f0max be reflected in the bilinguals' L1 and L2 speech, and will there be sex-specific findings? Moreover, will the female bilinguals also increase their f0min when addressing females compared to males in both of their languages? Will there be any significant effect of formality of the addressee on the pitch level of the bilingual females? These are some of the questions addressed in the next two sections whereby the pitch level of both languages of the bilinguals is compared to the pitch level of the monolinguals.

6.3.1.2 Japanese monolinguals and bilinguals pitch level in the reading task

This section reports on the analysis of the L1 of the bilinguals which was compared to the Japanese of the monolinguals. Initially, the results from the females are reported, followed by the results from the males.

Note that it was predicted that (1a) the pitch level of the female bilinguals – especially of those residing in London – would differ significantly from the pitch level of the Japanese monolingual females, as a consequence of acquiring English as an L2. No significant differences were predicted between the Japanese of the monolingual and bilingual male speakers (1b). Recall, however, that monolingual comparison revealed that the f0max of the Japanese male monolinguals was significantly higher than that of the English male monolinguals, thus a restructuring of the L1 in the Japanese males was deemed possible.

Recall that the bilinguals tested in London were significantly older of both the Japanese monolinguals and the bilinguals tested in Tokyo (5.5.3). Therefore, prior to comparing the pitch level of the Japanese of the bilinguals and monolinguals, a series of two-way ANOVAs was performed to rule out the potential confound of age of the speakers. No significant differences were detected, so age was not considered to be a potential confound in this research and removed from further analysis.

6.3.1.2.1 Japanese female monolinguals and bilinguals

Descriptive statistics (average and standard deviations) for differences in the pitch level of the Japanese of the females are reported by language in Tables 6.12, 6.13 and 6.14.

Table 6.12 Descriptive statistics for the pitch level of the Japanese of the females by group in the reading task. Average and SD for each measurement are reported in Hz.

Group	Japanese f0mean		Japanese f0min		Japanese f0max	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	226	19	173	19	298	32
Female bilinguals UK	221	16	164	18	310	38
Female bilinguals JP	226	24	176	21	306	45

Table 6.13 Descriptive statistics for the pitch level of the Japanese of the females by formality of the addressee in the reading task. Average and SD for each measurement are reported in Hz.

Group	Formality of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Informal	225	18	174	18	297	32
	Formal	226	21	173	20	298	32
Female bilinguals UK	Informal	219	15	162	18	310	38
	Formal	223	16	166	18	310	36
Female bilinguals JP	Informal	225	23	175	22	307	46
	Formal	226	25	178	20	306	44

Table 6.14 Descriptive statistics for the pitch level of the Japanese of the females by sex of the addressee in the reading task. Average and SD for each measurement are reported in Hz.

Group	Sex of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
Japanese female monolinguals	Females	225	19	174	19	299	31
	Males	226	20	173	20	296	33
Female bilingualsUK	Females	220	15	164	18	315	40
	Males	222	16	163	18	305	33
Female bilinguals JP	Females	224	24	178	20	307	44
	Males	227	24	175	21	306	46

For f0mean, results indicated a significant effect of formality of the addressee (p = .009) and a significant interaction between formality of the addressee and sex of the addressee (p < .0001) (Table 6.15).

Table 6.15 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0mean of the Japanese of the females in the reading task.

Factor	Sum of squares	Mean square	df	F value	*p*-value
Group	86.11	43.02	2	0.43	.653
Sex of the addressee	335.02	335.02	1	3.35	.067
Formality of the addressee	685.38	685.38	1	6.85	.009
Group: Sex of the addressee	32.22	16.11	2	0.16	.851
Group: Formality of the addressee	188.38	94.19	2	0.94	.390
Sex of the addressee: Formality of the addressee	2575.4	2575.36	1	25.75	<.0001
Group: Sex of the addressee: Formality of the addressee	36.49	18.24	2	0.18	.833
N=624, Random intercepts: Speaker (39), Log likelihood: -2398.8, Conditional R^2= 0.76					

Pairwise comparisons for the interaction between formality and sex of the addressee (Table 6.16) indicated that the formal male elicited a significantly higher f0mean than both the formal female (p < .0001) and the informal male (p < .0001). Differences across female addressees and informal addressees were not significant (Figure 6.10).

Table 6.16 Pairwise comparisons for the significant interaction between formality and sex of the addressee for the f0mean of the Japanese of the female

Formality of the addressee	Sex of the addressee	contrast	estimate	df	t-ratio	*p*-value
Informal		Females - Males	2.12	594	1.81	.279
Formal		Females - Males	-6.20	594	-5.3	<.0001
	Females	Informal - Formal	2.10	594	1.72	.340
	Males	Informal - Formal	-6.31	594	-5.39	<.0001

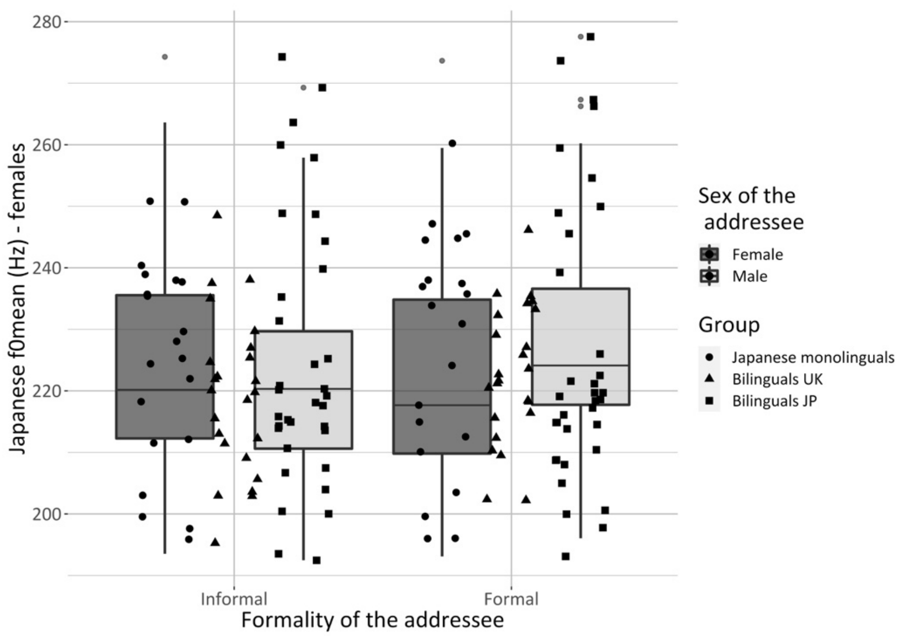


Figure 6.10 Boxplots illustrating pairwise comparisons for the significant interaction between formality and sex of the addressee for the f0mean of the Japanese of the females. Values are averages for each participant.

Moving now to the analysis of the f0min of the Japanese of the bilinguals, the analysis did not reveal any significant effect for group. Alternatively, a significant main effect of sex of the addressee (p = .045) and a significant effect of formality of the addressee (p = .024) on the f0min of the Japanese of the females were detected (Table 6.17).

Table 6.17 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0min in the Japanese of the females

Factor	Sum of squares	Mean square	df	F value	*p*-value
Group	368.13	184.06	2	1.89	.163
Sex of the addressee	392.35	392.35	1	4.04	.045
Formality of the addressee	491.5	491.5	1	5.07	.024
N=624, Random intercepts: Speaker (39), Log likelihood: -2398.8, Conditional R^2= 0.76					

Female addressees elicited an f0min 1.58 $\pm$0.8 Hz higher than informal addressees (*p* = .045) (Figure 6.11); formal addressees elicited an f0min 1.77 $\pm$0.8 Hz higher than informal ones (Figure 6.12).

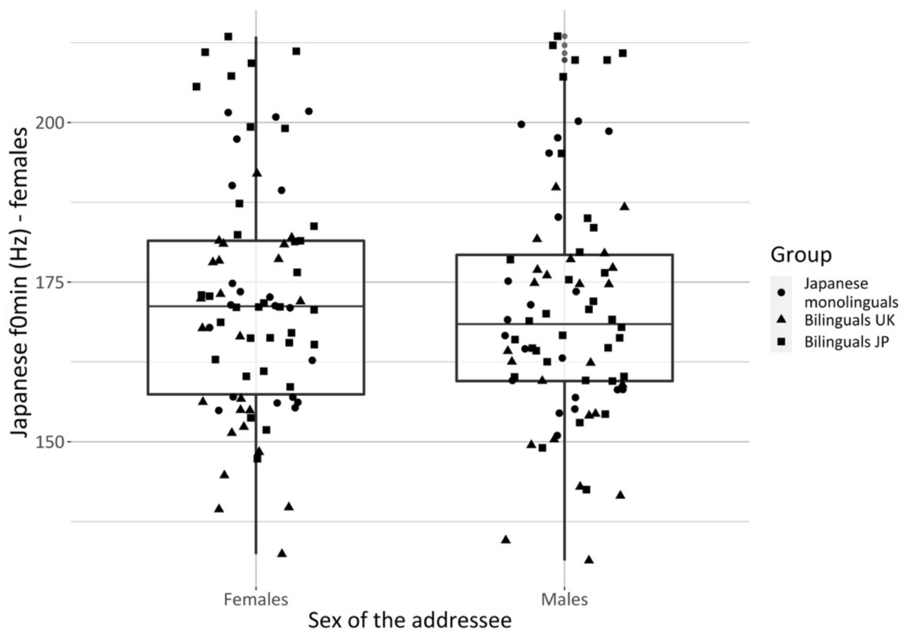


Figure 6.11 Boxplot showing the significantly higher f0min elicited by the female compared to the male addressees in the speech of the Japanese females. Values are averages for each participant.

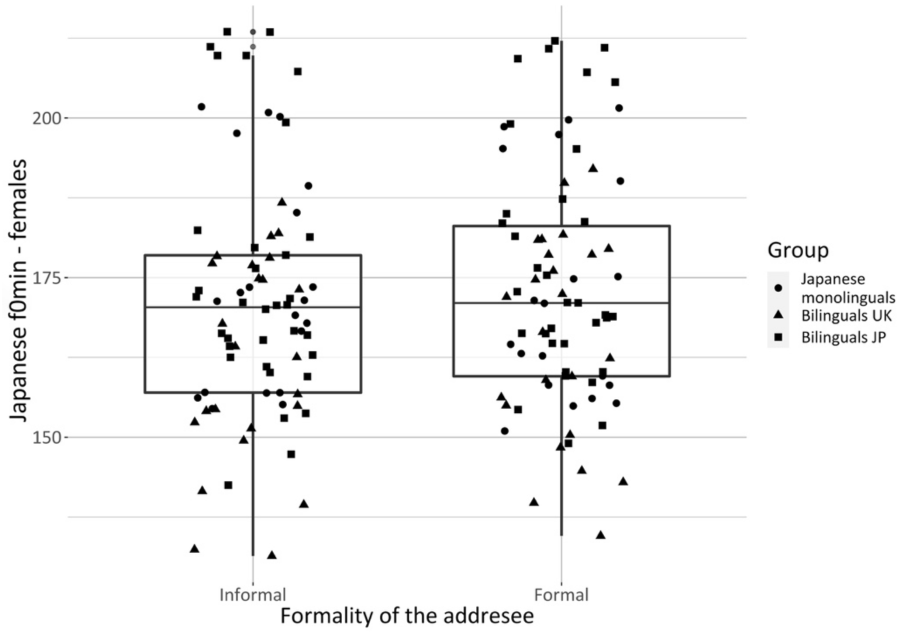


Figure 6.12 Boxplot showing the significantly higher f0min elicited by the female compared to the male addressees in the speech of the Japanese females. Values are averages for each participant.

Continuing with the comparisons between the f0max of the Japanese of the monolingual and bilingual females, the LMER revealed a main effect of sex of the addressee was evidenced (Table 6.18). Specifically, female addressees elicited an f0max 4.5 $\pm$2 Hz higher than male addressees (*p* = .024) (Figure 6. 13).

Table 6.18 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0max in the Japanese of the females.

Factor	Sum of squares	Mean square	df	F value	*p*-value
Group	561	280.5	2	0.44	.646
Sex of the addressee	3245.1	3245.1	1	5.09	.024
Formality of the addressee	46.2	46.2	1	0.07	.787
N=624, Random intercepts: Speaker (39), Log likelihood: -2961.8, Conditional R^2= 0.6					

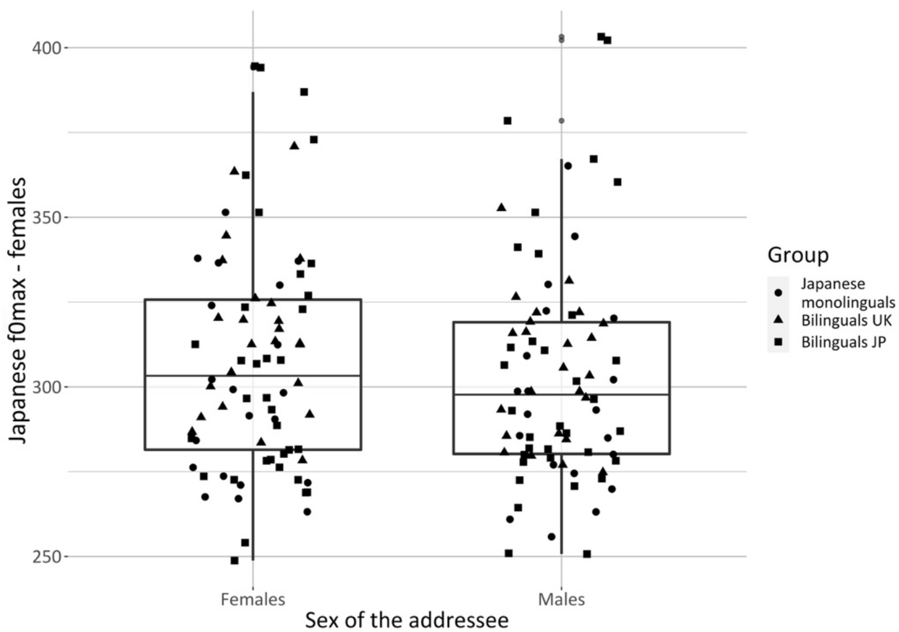


Figure 6.13 Boxplot showing the significantly higher f0min elicited by the female compared to the male addressees in the speech of the Japanese females. Values are averages for each participant.

Summing up, the pitch level of the Japanese of the female bilinguals did not differ significantly cross-group, thus not upholding prediction (1a). With regard to the effect of the addressee, a significant interaction between formality and sex of the addressee revealed the formal male elicited a higher f0mean than the formal female *and* the informal male, which is in line with monolingual findings.

6.3.1.2.2 Japanese male monolinguals and bilinguals

Turning now to the analysis of the pitch level of the Japanese of the male bilinguals, the general prediction was that no differences would be reported between male monolinguals and bilinguals in Japanese.

Note, however, that, due to monolingual findings indicating that the Japanese of the monolingual males was produced with a significantly higher f0max than the English of the monolingual males, significant differences between the Japanese of the bilingual and monolingual males may have arisen.

Tables 6.19, 6.20, 6.21 report average measurements for variation in the pitch level of the Japanese of the males by group, formality of the addressee and sex of the addressee respectively.

Table 6.19 Descriptive statistics for the pitch level of the Japanese of the males by group in the reading task. Average and SD for each measurement are reported in Hz.

Group	Japanese f0mean		Japanese f0min		Japanese f0max	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	125	12	97	9	176	22
Male bilinguals UK	123	13	88	7	176	31
Male bilinguals JP	119	12	86	9	169	21

Table 6.20 Descriptive statistics for the pitch level of the Japanese of the males by formality of the addressee in the reading task. Average and SD for each measurement are reported in Hz.

Group	Formality of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Informal	125	13	96	10	177	24
	Formal	126	11	97	9	174	20
Male bilinguals UK	Informal	123	12	87	7	176	32
	Formal	124	14	86	7	176	30
Male bilinguals JP	Informal	118	11	87	7	169	21
	Formal	120	13	88	9	170	21

Table 6.21 Descriptive statistics for the pitch level of the Japanese of the males by sex of the addressee in the reading task. Average and SD for each measurement are reported in Hz.

Group	Sex of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Females	125	12	97	9	178	22
	Males	125	11	96	10	173	22
Male bilinguals UK	Females	123	15	86	7	180	33
	Males	123	12	88	7	172	29
Male bilinguals JP	Females	119	12	87	9	171	20
	Males	119	13	87	8	168	22

LMERs revealed thar the f0mean and the f0min of the Japanese of the males were not affected by any of the factors taken into consideration. Unexpectedly, a significant main effect of group was detected on the f0min of the males (p = .04) (Table 6.22).

Table 6.22 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0min of the Japanese of the males.

Factor	Sum of squares	Mean square	df	F value	*p*-value
Group	196.68	98.34	2	3.87	.04
Sex of the addressee	28.47	28.47	1	1.12	.29
Formality of the addressee	1.32	1.32	1	0.05	.819
N=272, Random intercepts: Speaker (17), Log likelihood: - -853.7, Conditional R^2= 0.71, all interactions, p>0.05					

Pairwise comparisons indicated that the f0min of the bilingual males was significantly lower that of the monolingual males (Table 6.23) (Figure 6.14). This was confirmed for both groups of bilinguals. No significant differences were registered between the f0min of the two groups of bilingual males.

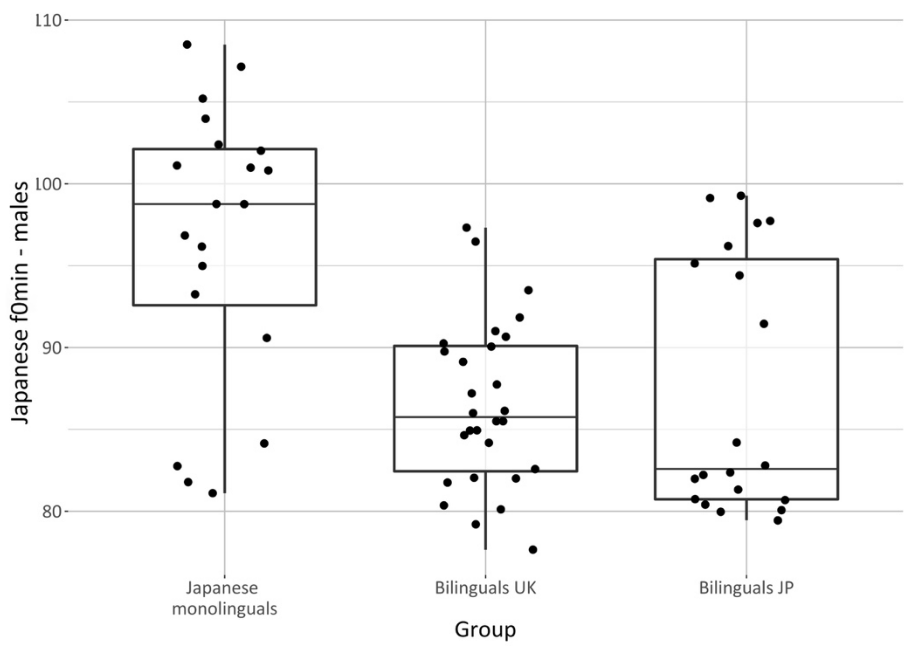


Figure 6.14 Boxplot showing the significantly lower f0min produced by the male bilinguals compared to the male monolinguals. Values are averages for each participant.

Table 6.23: Pairwise comparisons for the significant effect of group on the f0min of the Japanese of the males

Contrast	Estimate	SE	df	t-ratio	*p*-value
Japanese male monolinguals – Bilinguals UK	10.5	4.23	20.6	2.57	.047
Japanese male monolinguals – Bilinguals JP	9.2	4.57	20.6	-3.01	.044
Bilinguals UK – Bilinguals JP	-0.8	4.23	20.6	-0.19	.978

Results are averaged over the levels of: Sex of the addressee, Formality of the addressee; Degrees-of-freedom method: Kenward-Roger;
p- value adjustment: Tukey method for comparing a family of 3 estimates

Summing up, results of the analysis of the pitch level of the Japanese of the male speakers *unexpectedly* revealed a significant effect of group (monolingual vs bilinguals) on f0min; specifically, the f0min of both groups of bilinguals was significantly lower than that of the monolinguals.

6.3.1.2.3 Summary of the analysis of the pitch level of the Japanese of the bilinguals

To recap, this step of the analysis revealed that the f0min of the bilingual males was significantly lower than that of the monolingual males and that no differences were evidenced between the pitch level Japanese of the female monolinguals and bilinguals. Importantly, the Japanese of the females, in line with monolingual results, was significantly affected by variation in the addressee. Specifically, the male formal addressee elicited a higher mean f0 than the formal female and the informal male. Whether similar results will repeat in more spontaneous speech is assessed with the voicemail task (Chapter 7).

In the next section, the English of the bilinguals is compared to the English of the monolinguals. Would different L2 acquisition patterns be revealed for female and male bilinguals? Would the bilingual females also modify their pitch level to respond to variation in the addressee in line with the English monolingual norms? Would bilinguals residing in the L2-speaking country have a more “English-like” pitch level? These were some of the questions explored with the next step of the analysis.

6.3.1.3 English of the monolinguals and bilinguals pitch level in the reading task

In this section, the pitch level of the English of the bilinguals was compared to that of the monolinguals. It was predicted that the pitch level of the English of the female bilinguals would not significantly differ from that of the English monolingual females cross linguistically (1c). Similarly, no differences were predicted between the pitch level of the English monolinguals and bilingual male speakers in their L2 of English (1d).

Note, however, that due to monolingual findings (f0max of the Japanese monolinguals was significantly higher than that of the English monolinguals), the f0max of the English of the bilingual females and males – especially those residing in Tokyo (JP) – could have been significantly higher than that of the English monolinguals.

6.3.1.3.1 English female monolinguals and bilinguals

Starting with the analysis of the English of the females, Tables 6.24, 6.25 and 6.26 below present descriptive statistics of the variation across the pitch level of the English of the female bilinguals and monolinguals by respectively group, formality of the addressee and sex of the addressee.

Table 6.24 Descriptive statistics for pitch level of the English of the females by group in the reading task. Average and SD for each measurement are reported in Hz

Group	English f0mean		English f0min		English f0max	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English female monolinguals	217	17	177	22	293	34
Female bilinguals UK	236	17	180	22	310	48
Female bilinguals JP	234	22	189	19	299	48

Table 6.25 :Descriptive statistics for pitch level of the English of the females by formality of the addressee, in the reading task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	English f0mean		English f0min		English f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English female monolinguals	Informal	217	18	177	22	262	39
	Formal	216	17	176	22	263	30
Female bilinguals UK	Informal	237	17	181	23	311	50
	Formal	236	18	179	22	310	47
Female bilinguals JP	Informal	235	23	189	19	299	48
	Formal	233	22	190	18	299	47

Table 6.26 Descriptive statistics for pitch level of the English of the females by sex of the addressee, in the reading task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	English f0mean		English f0min		English f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English female monolinguals	Female	219	18	179	22	263	28
	Male	215	17	174	22	262	40
Female bilinguals UK	Female	238	19	180	21	315	51
	Male	234	16	180	24	306	45
Female bilinguals JP	Female	235	22	189	19	302	48
	Male	233	23	189	19	296	47

Table 6.27 reports results for the best-fit model for the f0mean of the English of the females which revealed a significant effect of group (p=.004) and of sex of the addressee (p =.002).

Table 6.27 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for f0mean in the English of the females

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	2359.68	1179.84	2	6.21	.004
Sex of the addressee	1743.68	1743.68	1	9.18	.002
Formality of the addressee	325.82	325.82	1	1.71	.190
N= 624, Random intercept = Speaker (39), Log likelihood= -2577.8, Conditional R^2=0.58 all interactions p>0.05					

Figure 6.15 depicts variation in the f0mean of the English of the females by group; irrespective of the testing location, the English of the female bilinguals was significantly higher than that of the monolinguals. Interestingly, the f0mean of the females residing in London was even higher than that of the females residing in Tokyo.

Post-hoc pairwise comparisons indicated that the f0mean of the bilingual females tested in London was 19 $\pm$ 6.4 Hz higher than that of the English monolinguals (p = .011), and that the f0mean of the bilinguals tested in Tokyo was 18 $\pm$ 6Hz than that of the English monolinguals (p = .013). No statistically significant differences were revealed between the f0mean of the two groups of female bilinguals (Table 6.28).

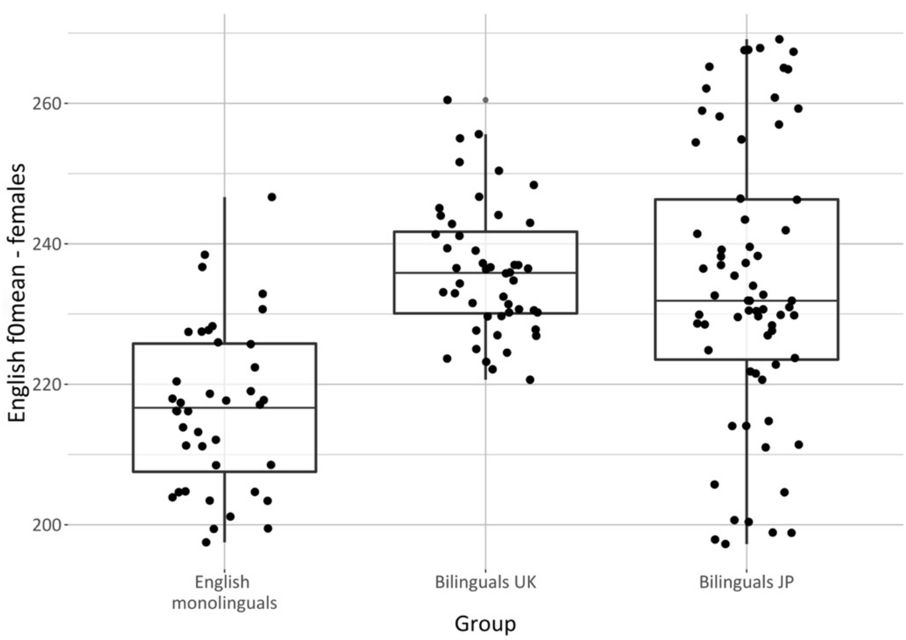


Figure 6.15 Boxplot showing the significantly higher English f0mean of groups of female bilinguals compared to the English f0mean of the female monolinguals. Values are averages for each participant.

Table 6.28 Pairwise comparisons for the significant main effect of group on the f0mean of the English of the females

Contrast	Estimate	SE	df	t-ratio	*p*-value
English monolinguals – Bilinguals UK	-19.54	6.39	42	-3.06	.011
English monolinguals – Bilinguals JP	-17.66	5.95	42	-2.97	.013
Bilinguals UK – Bilinguals JP	1.88	5.42	42	0.34	.941

Results are averaged over the levels of: Sex of the addressee, Formality of the addressee; Degrees-of-freedom method: Kenward-Roger;
p-value adjustment: Tukey method for comparing a family of 3 estimates

Continuing with the detected effect of sex of the addressee on the English f0mean of the female speakers, the analysis indicated that the female addressees elicited a f0mean 3 $\pm$1 Hz higher than the male addressees (p = .002) (Figure 6.16).

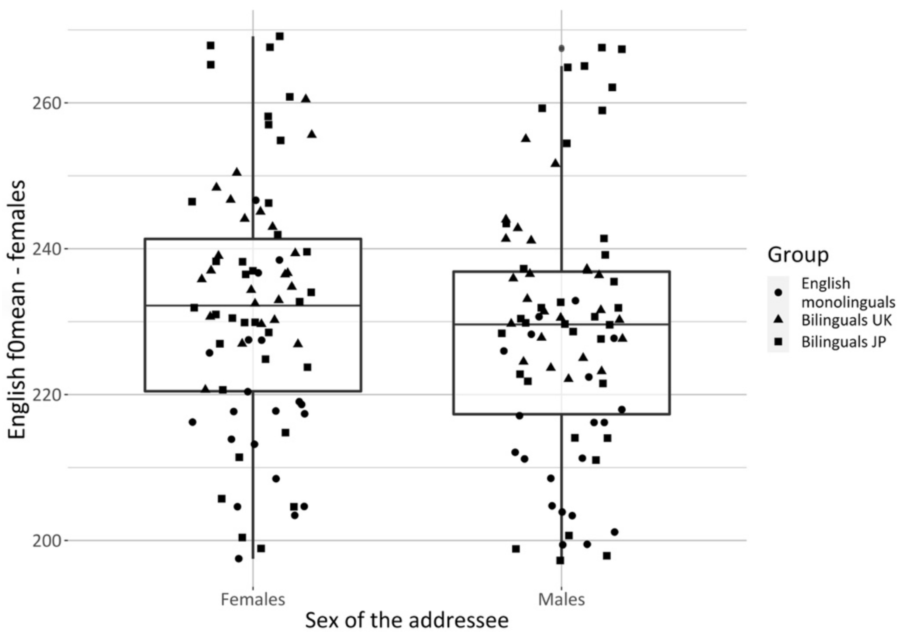


Figure 6.16 Boxplot showing the significantly higher f0mean elicited by the female addressees compared to the male addressees in the English of the females. Values are averages for each participant

The LMER for English f0min did not yield any significant results. LMER for f0max revealed a significant effect of group (p = .003) and sex of the addressee (p = .041) (Table 6.29).

Table 6.29 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for f0max in the English of the females

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	155598	7799	2	6.97	.002
Sex of the addressee	4654.9	4654.9	1	4.16	.041
Formality of the addressee	0.6	0.6	1	0.05	.982
N= 624, Random intercept = Speaker (39), Log likelihood= -3126.3, Conditional R^2=0.53 all interactions p>0.05					

Figure 6.17 depicts differences in the f0max of the English of the three groups of females; pairwise comparisons revealed that the f0max of the English of the female bilinguals tested in London was 48$\pm$14Hz higher than the f0max of the English monolingual females (p=.003) and that the f0max of the bilingual females tested in Tokyo was 36$\pm$12.8Hz higher than that of the monolinguals (p =.019). Again, the f0max of the two bilingual groups did not vary significantly (Table 6.30).

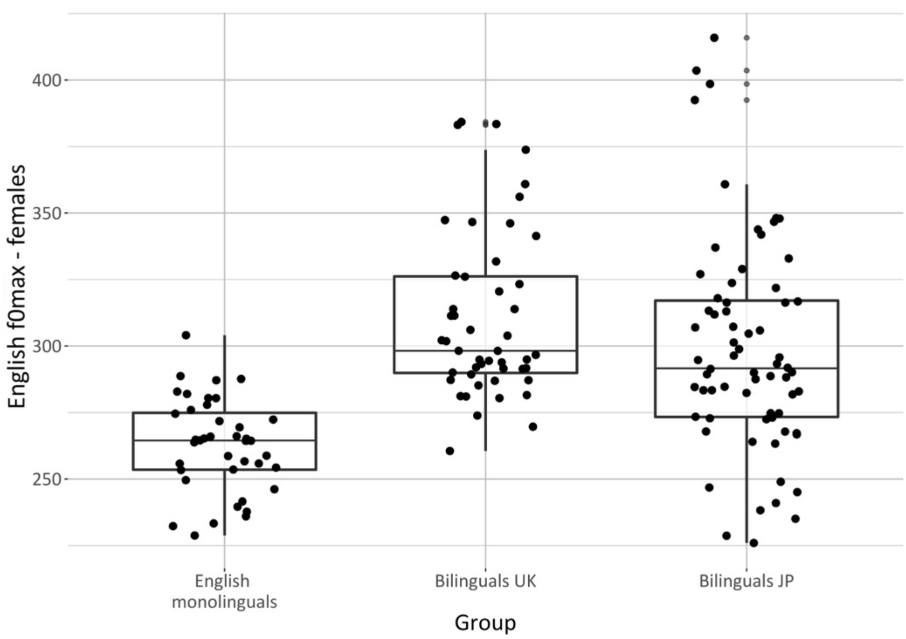


Figure 6.17 Boxplot showing the significantly higher English f0max of both group of female bilinguals compared to that of the female monolinguals. Values are averages for each participant.

Table 6.30 Pairwise comparisons for the significant main effect of group on the f0max of the English of the females

Contrast	Estimate	SE	df	t-ratio	*p*-value
English monolinguals – Bilinguals UK	- 47.65	13.8	42	-3.45	.003
English monolinguals – Bilinguals JP	-36.19	12.8	42	-2.81	.019
Bilinguals UK – Bilinguals JP	11.46	12.2	42	0.94	.616

Results are averaged over the levels of: Sex of the addressee, Formality of the addressee; Degrees-of-freedom method: Kenward-Roger;
p-value adjustment: Tukey method for comparing a family of 3 estimates

As far as the significant effect of sex of the addressee is concerned, comparisons indicated that the female addressees elicited an f0max 5.5 $\pm$ 2.7 Hz higher than the male addressees (Figure 6.18).

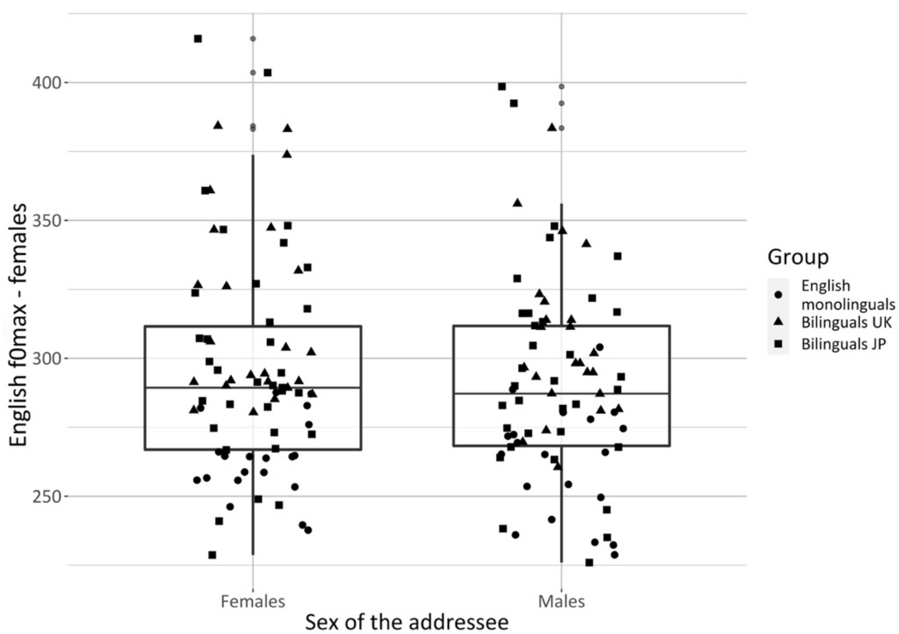


Figure 6.18 Boxplot showing the significantly higher f0max elicited by the female addressees compared to the male addressees in the English of the females. Values are averages for each participant

Summing up, contrary to prediction (1c) but in line with monolingual findings, English f0mean and f0max were significantly higher in the speech of the bilinguals than in that of the monolinguals. In addition, whilst no group differences were detected with regard to variation of the addressee, results indicated that the female addressees elicited a significantly higher f0mean and f0max than the male addressees in the English of the females.

6.3.1.3.2 English male monolinguals and bilinguals

This section reports the analysis of the pitch level of the English of the bilinguals. The general prediction was that there would be no significant differences among the English pitch level of monolingual and bilingual male speakers (1d). However, recall that, the f0max of the Japanese monolingual males in English was significantly higher than the f0max of the English monolingual males, and this may be reflected in the English pitch level of the male bilinguals.

Descriptive statistics (average and standard deviation) for the pitch level of the English of the males, divided by group, formality of the addressee and sex of the addressee are reported in Tables 6.31, 6.32, 6.33.

Table 6.31 Descriptive statistics for pitch level of the English males by group in the reading task. Average and SD for each measurement are reported in Hz

Group	English f0mean		English f0min		English f0max	
	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
English monolinguals	119	14	95	11	150	27
Male bilinguals UK	137	25	98	14	183	25
Male bilinguals JP	128	16	96	12	170	27

Table 6.32 Descriptive statistics for pitch level of the English males by formality of the addressee in the reading task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	English f0mean		English f0min		English f0max	
		$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
English monolinguals	Informal	120	15	95	12	151	27
	Formal	119	14	94	11	159	27
Male bilinguals UK	Informal	135	23	98	13	181	49
	Formal	139	28	98	15	185	46
Male bilinguals JP	Informal	127	17	96	12	166	27
	Formal	128	16	96	12	174	26

Table 6.33 Descriptive statistics for pitch level of the English males by sex of the addressee in the reading task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	English f0mean		English f0min		English f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English monolinguals	Female	120	15	95	12	150	26
	Male	119	14	94	11	151	27
Male bilinguals UK	Female	136	23	98	12	184	46
	Male	138	28	99	16	182	45
Male bilinguals JP	Female	128	17	96	12	168	25
	Male	128	16	97	12	172	29

Inferential analyses did not reveal any significant differences between the English of the monolingual and bilingual males, thus substantiating prediction (1d).

6.3.1.3.3 Summary of the analysis of the pitch level of the English bilinguals

Summarising, contrary to prediction (1c) but in line with monolingual findings, results revealed language differences among the English pitch level of the female monolinguals and bilinguals. Specifically, both groups of bilingual females produced English with a significantly higher f0mean and f0max than the English monolinguals. This was not replicated in the English of the male bilinguals.

With regard to the addressee, again findings indicated that *only* the female speakers were significantly affected by variation in the addressee; specifically, English was produced with a significantly higher f0max in the speech directed to the female than the male addressees.

6.3.1.4 Individual variation in the pitch level in the reading task

Thus far group comparisons for the pitch level of the bilinguals in the reading task have been detailed, in this section the attention turns to the effect of individual variables on the pitch level of the two languages of the bilinguals. As detailed in Chapter 3, pitch level has been reported to be affected by individual gender identity (Biemans & Van Bezooijen, 1996; Levon, 2011, 2016, 2018; Podesva, 2007) and as a consequence of the bilingual's language background (de Leeuw et al., 2012; Mennen et al., 2014). The results of this step of the analysis relate closely to those presented in the previous sections; however, the focus here is on variation across seemingly homogeneous speakers.

6.3.1.4.1 Individual gender identity

For information relative to how individual gender identity was operationalised, the reader is referred to 5.5.1. The general prediction was that, regardless of native language and sex of the speaker, (2a) enhanced endorsement of feminine gender stereotypes would pattern with a higher pitch level on the semi-spontaneous voicemail task and, conversely, that (2b) enhanced endorsement of masculine gender stereotypes would pattern with lower pitch levels.

A series of mixed effects models were carried out on the monolingual and bilingual speakers separately, with significance level Bonferroni-adjusted for multiple comparisons to $p < .025$ (Hervé, 2010). Maximal models for both languages included group (Japanese monolinguals, English monolinguals, Bilinguals-UK, Bilinguals-JP), individual gender identity (operationalized as scores on the feminine and masculine scales of the JGRI and BSRI-short respectively) or and their interactions as fixed independent factors. Speaker was entered as a random intercept. Importantly, analyses were carried out separately for monolinguals and bilinguals, as the scope here was to assess individual variation, rather than patterns of acquisition/attrition.

Firstly, the effect of individual gender identity as measured with the JGRI (Sugihara & Katsurada, 2002) questionnaire was explored. Results of the LMERs indicated that individual gender identity as measured with the JGRI was not successful in predicting pitch level variation in the reading task.

On the contrary, individual gender identity as measured with the BSRI-short (Bem, 1979) was successful in explaining variation in the English f0mean of both the female and male bilinguals, but not monolinguals. With regard to the English f0mean of the female bilinguals, a significant relationship between f0mean and self-attribution of masculine traits on the BSRI-short (p = .005) was revealed (Table 6.34).

Table 6.34 Type III Analysis of Variance Table with Satterthwaite's method investigating the effect of individual gender identity as measured with the BSRI-short on the English f0mean of the bilingual females

Factor	Sum of squares	Mean Square	df	F-value	*p*-value
Group	70.02	70.02	1	0.37	.547
Femininity scale BSRI -short	11.61	11.61	1	0.06	.805
Masculinity scale BSRI -short	1685.97	1685.97	1	8.93	.005
N= 464, Random intercept = Speaker (29), Log likelihood= -1913.07, Conditional R^2=0.6					

Specifically, higher self-attribution of masculine traits correlated with lower f0mean (ß= -11.7, t-value= -2.86, *p* = .014), which is in line with to stereotypical patterns of gendered voices in English (Figure 6.19).

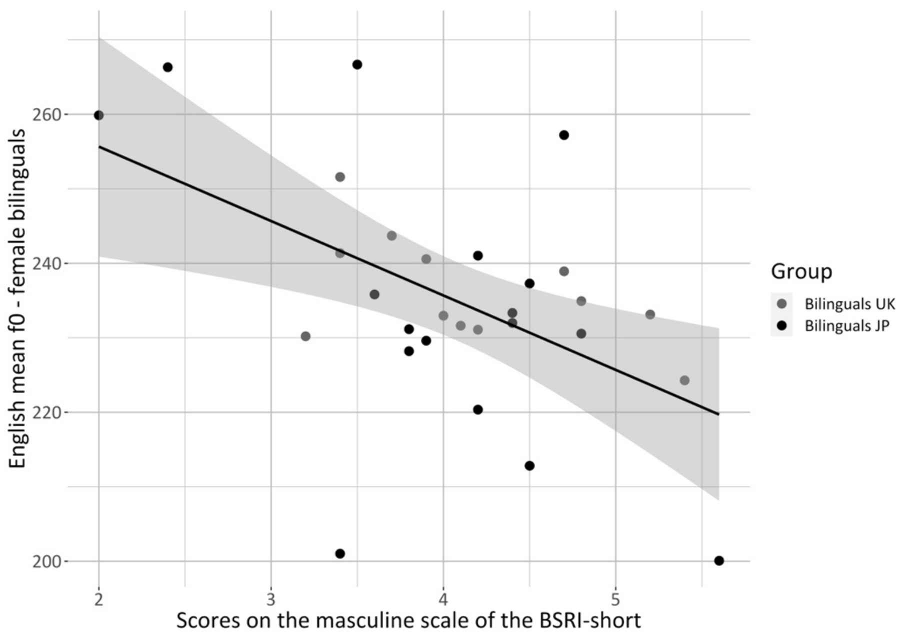


Figure 6.19 Scatterplots showing the significant relationship between lower scores on the masculinity scale of the BSRI-short and lower f0mean in the English of the female bilinguals. Values are averages for each participant. Fitted line indicates regression line and shading indicates 95% confidence intervals.

Continuing, the analysis of the English pitch level of the male bilinguals revealed that self-attribution of feminine traits on the BSRI-short significantly predicted f0mean (Table 6.35). Specifically, higher self-attribution of feminine traits correlated with lower f0mean (ß=-10.7, t-value=-2.98, *p*=.005) (Figure 6.20).

Table 6.35 Type III Analysis of Variance Table with Satterthwaite's method investigating the effect of individual gender identity as measured with the BSRI-short on the English f0mean of the bilingual males

Factor	Sum of squares	Mean Square	df	F-value	*p*-value
Group	59.00	59.00	1	0.41	.532
Femininity scale BSRI -short	1168.71	1168.71	1	8.20	.014
Masculinity scale BSRI -short	628.95	628.95	1	4.41	.060
N= 192, Random intercept = Speaker (12), Log likelihood= -767.12, Conditional R^2=0.7, all interactions p>.05					

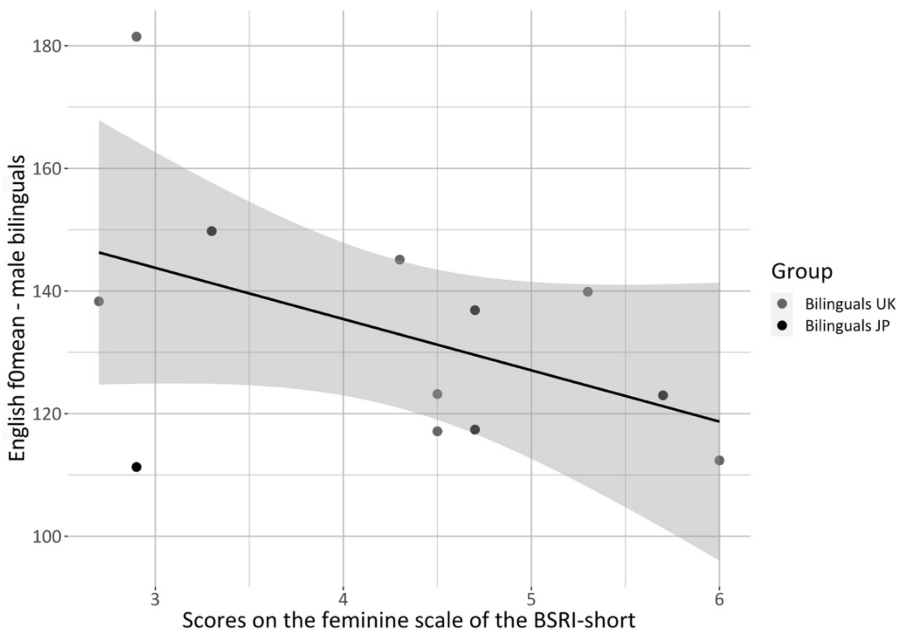


Figure 6.20 Scatterplots showing the significant relationship between higher scores on the femininity scale of the BSRI-short and lower f0mean in the English of the male bilinguals. Values are averages for each participant. Fitted line indicates regression line and shading indicates 95% confidence intervals.

Summing up, scores on the Japanese JGRI did not predict variation in the pitch level of the participants, whereas scores on the two scales of the English BSRI-short were successful at predicting f0mean variation in both the bilingual females and males in their English. Specifically, in line with stereotypes of gender and voice, female bilinguals who aligned more with English masculine traits produced English with a significantly lower f0mean than bilingual females who aligned less with masculine traits. In addition, male bilinguals who aligned more with English feminine traits produced English with a significantly lower f0mean than males who aligned less, which is contrary to gender expectations.

6.3.1.4.2 Bilingualism predictor variables

The last step in the analysis of pitch level focussed on the role of bilingualism predictor variables detailed in 5.6 (i.e. age of arrival (AOA), length of residence (LOR), amount of L1 and L1/L2 proficiency) in the pitch production of Japanese and English on the part of the bilinguals.

Importantly, since no attritional effects *stricto sensu* were observed in the bilingual females (i.e. there were no significant differences reported between the monolingual Japanese females and the bilingual Japanese-English females in their Japanese), it was considered inappropriate to explain non-significant group effects through an analysis of predictor variables, thus, in terms of L1 attrition, the analysis was carried out only for the bilingual males. Specifically, given that significant differences between the Japanese of the monolinguals and bilinguals was evidenced only in the f0min of the males (i.e. the f0min of the Japanese of the bilinguals was significantly lower than the f0min of the monolinguals), only this measurement was considered for the present step of the analysis. In a similar vein, since only the L2 of the female bilinguals significantly differed from that of the monolinguals (i.e. the f0mean and the f0max of the bilinguals was significantly higher than that of the monolinguals), male speech was not further analysed in terms of the predictor variables (see de Leeuw, 2009 for a similar rationale).

The general prediction was that, irrespective of whether female or male, (3a) a later AoA would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Moreover, it was predicted that (3b) shorter LoR would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Finally, it was considered possible that an increased L1 use (3c) and higher L1 proficiency (3d) would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals.

Maximal models were built with group (Bilinguals UK vs. Bilinguals JP), formality of the addressee (formal vs. informal), sex of the addressee (female vs. male), AoA (continuous in years), LoR (continuous in years), L1 use (continuous from 0% to 10%) and L1 proficiency/L2 proficiency (continuous from 0 to 10) and their interactions as fixed independent factors and speaker as random intercept.

With regard to the Japanese f0min of the male bilinguals, none of the factors taken into consideration could explain the registered variation in pitch level. It is worth noting that the number of bilingual male speakers were low (N=11) and this might explain lack of significant findings. It is here proposed that, had numbers been larger, results might have been clearer. It is also true, however, that the analysis of the background questionnaire indicated that bilingual speakers were incredibly homogeneous, despite the two different testing locations. Similarly, no significant patterns were evinced for the speech of the female bilinguals, which, again, might be due by the homogeneity of the participants (see Chapter 4).

6.3.1.4.3 Summary of individual variation in the pitch level of the bilinguals

Summing up, individual gender identity operationalized on the BSRI-short patterned with variation in the pitch level of the female and male bilinguals. More precisely, enhanced self-attribution of masculine traits in the female bilinguals and enhanced self-attribution of feminine traits in the male bilinguals patterned with a significantly lower English f0mean. Individual gender identity operationalized on the JGRI, however, did not explain variation in the Japanese pitch range of the bilinguals. Similarly, bilingualism predictor variables failed in explaining variation in the two languages of the bilinguals.

6.3.1.5 General summary of the analysis of pitch level in the reading task

Insofar the results of the analysis of the pitch level of the two languages of the bilinguals in the reading task have been reported. Interestingly, language-specific differences were detected in f0max for both female *and* male monolinguals, which indicates that Japanese and English differ in their peaks.

With regard to L1 attrition and L2 acquisition, findings indicated gender-specific results. More precisely, male bilinguals produced Japanese f0min significantly lower than the Japanese male monolinguals, which suggest a restructuring of the L1. The L2 of the female bilinguals, on the other hand, showed L2 acquisition effects; specifically, the female bilinguals produced English with a significantly higher f0mean and f0max than the English female monolinguals. With regard to the addressee, results indicated that only the speech of the females varied to accommodate variation in the addressee. This held true for both monolingual and bilingual females. Lastly, individual gender identity operationalised with the BSRI-short predicted English f0mean of the female and male bilinguals; specifically, more masculine females and more feminine males produced English with a significantly lower f0mean compared to the other female and male bilinguals.

In the next sections, the analysis of the second dimension of pitch range, that is, pitch span, is reported. The same procedure was followed to answer the same questions as in the previous analysis; of interest was to assess whether pitch level results were replicated in the case of pitch span or whether this dimension of pitch range was constrained by other factors in this reading task.

6.3.2 Analysis of the pitch span in the reading task

This analysis follows the same structure as the analysis of pitch level. The monolinguals' pitch span is compared first, followed by comparisons for the pitch span of the two languages of the bilinguals with that of the monolinguals. Thereafter, the roles of individual gender identity and bilingualism predictor variables were explored.

For model syntax the reader is referred to section 6.3.1 above. Although pitch span values were reported in semitones (ST), that is the recommended measurement to avoid the potential confound of physiological differences in f0 averages between females and males (Henton, 1995; Henton, 1989), in keeping with the previous analyses, analyses for females and males were carried out separately. While maximal models for female and male speakers were identical, only results for best-fit models are reported below.

6.3.2.1 Monolingual pitch span comparisons

Firstly, the questions of whether the pitch span of the monolinguals differed significantly across languages and whether variation in the addressee affected monolingual's pitch span differently was explored. It was expected that the pitch span of the Japanese females would be wider than that of the English females (Ohara, 2001) and that formal addressees would elicit a wider pitch span in the Japanese female speech than in the English female speech

(Ohara, 2001). No differences were predicted between the pitch span of the monolingual males (Loveday, 1981).

6.3.2.1.1 Monolingual females

Tables 6.36, 6.37 and 6.38 report descriptive statistics (mean and standard deviation) for the span of the female monolinguals respectively by language, by formality of the addressee and by sex of the addressee.

Table 6.36 Descriptive statistics for pitch span of the monolingual females by language in the reading task. Average and SD for each measurement are reported in ST

Group	Language	80%span	
		$\overline{x}$	SD
Japanese monolingual females	Japanese	6.4	1.7
English monolingual females	English	4.4	2.4

Table 6.37 Descriptive statistics for pitch range of the monolingual females by formality of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Language	Formality of the address	80%span	
			$\overline{x}$	SD
Japanese monolingual females	Japanese	Formal	6.3	1.7
	Japanese	Informal	6.4	1.7
English monolingual females	English	Formal	4.5	2.5
	English	Informal	4.5	2.3

Table 6.38 Descriptive statistics for pitch range of the monolingual females by sex of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Language	Sex of the address	80% span	
			$\overline{x}$	SD
Japanese monolingual females	Japanese	Female	6.6	1.6
	Japanese	Male	6.2	1.7
English monolingual females	English	Female	4.4	2.3
	English	Male	4.5	2.5

Table 6.39 reports results of the analysis of the pitch span of the monolingual females. Analysis indicated a significant effect of group was detected (p = .015), but not of the addressee. Specifically, the 80%span of the Japanese monolingual females was 1.9$\pm$0.8 ST wider than the 80%span of the English monolingual females (p = .02) (Figure 5.24).

Table 6.39 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for 80%span for the two groups of monolingual females

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	12.44	12.44	1	6.94	.015
Sex of the addressee	1.96	1.96	1	1.09	.293
Formality of the addressee	0.41	0.41	1	0.23	.634
N= 320, Random intercept = Speaker (20), Log likelihood= -578.6, Conditional R^2=0.65; all interactions p>0.05					

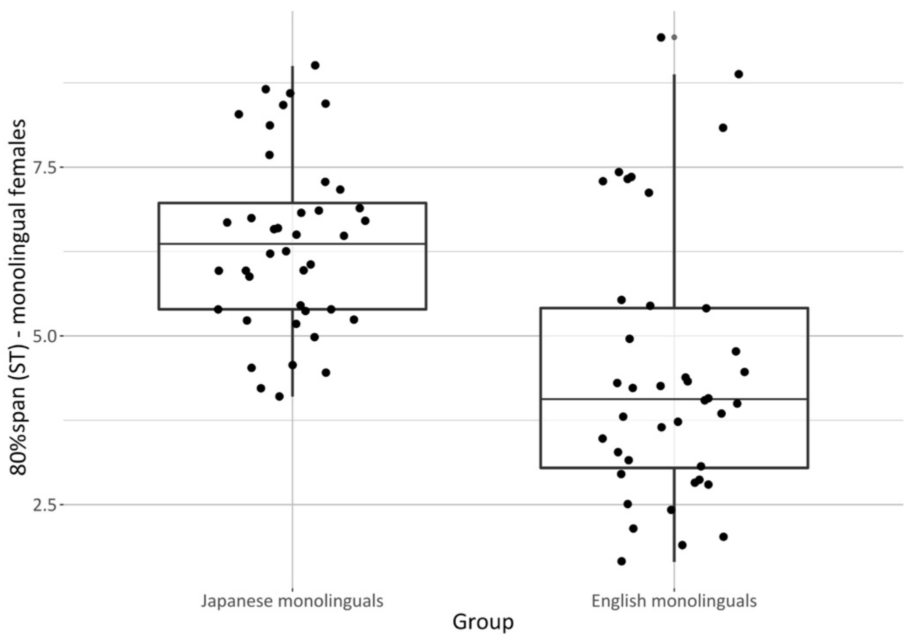


Figure 6.21 Boxplot showing the significantly higher 80%span produced by Japanese female monolinguals compared to the English female monolinguals. Values are averages for each participant.

Summarising, as expected, with regard to the speech of the monolingual females, Japanese 80%span was significantly wider than English 80%span. Taken together, the present finding and the finding that the Japanese was produced with significantly a higher f0max than English suggest an upward expansion of the pitch span of the Japanese female monolinguals compared to that of the English female monolinguals.

6.3.2.1.2 Monolingual males

Turning now to the analysis of the pitch span of the male monolinguals, descriptive statistics (mean and standard deviation) are reported in Table 6.40; 6.41; 6.42 by language, by formality of the addressee and by gender of the addressee respectively.

Table 6.40 Descriptive statistics for pitch range of the monolingual males by language in the reading task. Average and SD for each measurement are reported in ST

Group	Language	80% span	
		$\overline{x}$	SD
Japanese male monolinguals	Japanese	7.5	1.6
English male monolinguals	English	5.4	1.9

Table 6.41Descriptive statistics for pitch range of the monolingual males by formality of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Language	Formality of the address	80% range	
			$\overline{x}$	SD
Japanese monolingual males	Japanese	Formal	7.6	1.6
	Japanese	Informal	7.5	1.5
English monolingual males	English	Formal	5.3	2
	English	Informal	5.5	1.9

Table 6.42 Descriptive statistics for pitch range of the monolingual males by sex of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Language	Formality of the address	80% span	
			$\overline{x}$	SD
Japanese monolingual males	Japanese	Formal	7.6	1.7
	Japanese	Informal	7.5	1.5
English monolingual males	English	Formal	5.3	2
	English	Informal	5.5	1.8

LMER for the pitch span of the male monolinguals revealed a significant effect of group (Table 6.43). Specifically, the 80% span of the Japanese monolingual males was 2.1$\pm$0.3 ST wider than the 80%span of the English monolingual male (p < .0001) (Figure 6.25).

Table 6.43 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for 80% span for the two groups of monolingual males

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	172.81	172.81	2	57.18	<.0001
Gender of the addressee	0.07	0.07	1	0.02	.874
Formality of the addressee	0.06	0.06	1	0.02	.883
N=176, Random intercept = Speaker (11), Log likelihood= -347.9, Conditional R^2=0.38 all interactions p>0.05					

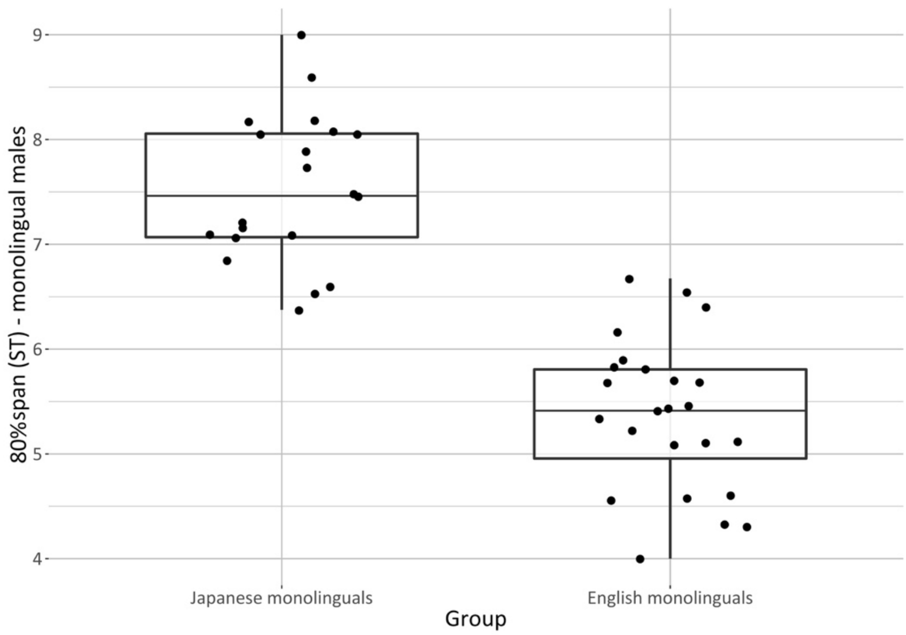


Figure 6.22 Boxplots showing the significant difference between the 80% span of the monolingual males.

Summing up, contrary to the expectations (Ohara, 1992), but in line with monolingual results reported in 6.3.1, the pitch span of the Japanese male monolinguals was significantly wider than that of the English male monolinguals.

6.3.2.1.3 Summary of the results of the pitch span of the monolinguals

Thus far results from the comparisons between the pitch span of the two monolingual groups has been presented. It revealed that Japanese was produced with a significantly wider span than English by both the females and the male monolinguals. This suggests that Japanese span was characterised by an upward expansion compared to English span, which might be due to the significantly higher peaks (f0max), but not valleys (f0min), that denoted Japanese pitch level (see 6.3.1.1).

Assessing whether these monolingual findings were reflected in the bilinguals' L1 and L2 speech, or whether gender-specific findings arose, was addressed in the next two sections whereby the pitch span of both languages of the bilinguals was compared to the pitch span of the monolinguals.

6.3.2.2 Japanese of monolinguals and bilinguals pitch span in the reading task

In this section, whether acquiring English as an L2 impacted the pitch span of the native Japanese of the bilinguals was explored by comparing the Japanese of the bilinguals to the Japanese of the monolinguals.

The general prediction was that (1a) the pitch span of the female bilinguals - especially those residing in London - would be narrower than that of the female monolinguals, whereas (1b) pitch span was not predicted to significantly vary between bilingual and monolingual males. Nonetheless, due to monolingual results, it might have been that the pitch span of the L1 of the male bilinguals would be narrower than that of the male monolinguals. Due to monolingual findings, the addressee was not expected to impact pitch range in the bilinguals.

As was the case for the pitch level (6.3.1.2), to rule out a potential effect of age of the speakers on the Japanese pitch span of the bilinguals, a series of one-way ANOVA were performed. Age did not significantly affect the pitch span of the Japanese of the groups of females and males; thus, it was discarded from further analyses.

6.3.2.2.1 Japanese female monolinguals and bilinguals

Descriptive statistics (mean and standard deviation) for the Japanese of the female bilinguals are reported in Tables 6.44, 6.45, and 6.46. Results indicated that, despite monolingual findings that 80%span was wider in Japanese than in English, the Japanese span of the bilingual females was not affected by either group or addressee.

Table 6.44 Descriptive statistics for pitch span of the Japanese of females by group in the reading task. Average and SD for each measurement are reported in ST

Group	Japanese 80%span	
	$\overline{x}$	SD
Japanese monolingual females	6.4	1.7
Bilingual females UK	7	2.5
Bilingual females JP	6.1	2.1

Table 6.45 Descriptive statistics for pitch span of the Japanese of females by formality of the speaker in the reading task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	Japanese 80% span	
		$\overline{x}$	SD
Japanese monolingual females	Formal	6.4	1.6
	Informal	6.3	1.7
Bilingual females UK	Formal	7.1	2.4
	Informal	6.9	2.6
Bilingual females JP	Formal	6.1	2
	Informal	6.2	2.3

Table 6.46 Descriptive statistics for pitch span of the Japanese of females by sex of the speaker in the reading task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	Japanese 80% span	
		$\overline{x}$	SD
Japanese monolingual females	Female	6.6	1.6
	Male	6.2	1.7
Bilingual females UK	Female	7.2	2.5
	Male	6.8	2.4
Bilingual females JP	Female	6.2	2.1
	Male	6	2.1

6.3.2.2.2 Japanese male monolinguals and bilinguals

Results from the analysis of the pitch span of the male bilinguals also did not elicit significant patterns and descriptive statistics (Tables 6.47, 6.48, 6.49) indicated negligible variation in the Japanese pitch span of the male monolinguals and bilinguals. Again, this was not in line with monolingual findings.

Table 6.47 Descriptive statistics for pitch span of the Japanese of the males by language in the reading task. Average and SD for each measurement are reported in ST

Group	Japanese 80%span	
	$\bar{x}$	SD
Japanese monolingual males	7.5	1.6
Bilingual males UK	7.9	3.2
Bilingual males JP	7.8	2.2

Table 6.48 Descriptive statistics for pitch span of the Japanese of the males by formality of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	Japanese 80%span	
		$\bar{x}$	SD
Japanese monolingual females	Formal	7.5	1.5
	Informal	7.5	1.6
Bilingual females UK	Formal	7.9	3.2
	Informal	7.9	3.2
Bilingual females JP	Formal	7.9	2.2
	Informal	7.7	2.3

Table 6.49 Descriptive statistics for pitch span of the Japanese of the males by sex of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	Japanese 80% span	
		$\bar{x}$	SD
Japanese monolingual females	Female	7.6	1.7
	Male	7.5	1.5
Bilingual females UK	Female	8.1	3.3
	Male	7.7	3
Bilingual females JP	Female	7.8	2.3
	Male	7.8	2.1

6.3.2.2.3 Summary of the analysis of the pitch span of the Japanese of the bilinguals

Findings indicated that bilingual and monolingual speakers produced Japanese 80%span similarly in the present task, which was not in line with monolingual findings and predictions. With regard to the effect of the addressee, Japanese pitch span was not affected by the addressee. Whether similar discrepancies with the monolingual findings would also be evidenced in the English of the bilinguals was assessed in the following section.

6.3.2.3 English monolinguals and bilinguals pitch span in the reading task

Turning now to the English pitch span of the bilinguals, the general prediction was that both the pitch span of the female and male bilinguals did not differ from that of the monolinguals (predictions 1c and 1d).

6.3.2.3.1 English female monolinguals and bilinguals

Descriptive statistics (mean and standard deviation) for the pitch span of the English of the females are reported in tables 6.50, 6.51, and 6.52. The average measurements in the tables below which suggested that the pitch span of the English of the bilinguals might have been wider than that of the monolinguals were not inferentially substantiated. In addition, similar to monolingual results, English pitch span was not affected by variation in the addressee.

Table 6.50 Descriptive statistics of the pitch span of the English of the females by language in the reading task. Average and SD for each measurement are reported in ST

Group	English 80% span	
	$\bar{x}$	SD
English monolingual females	4.5	2.4
Bilingual females - UK	6.3	2.3
Bilingual females - JP	5.4	2.2

Table 6.51 Descriptive statistics of the pitch span of the English of the females by formality of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	English 80% span	
		$\bar{x}$	SD
English monolingual females	Formal	4.5	2.3
	Informal	4.5	2.5
Bilingual females UK	Formal	6.5	2.5
	Informal	6	6.2
Bilingual females JP	Formal	5.4	2
	Informal	5.4	2.4

Table 6.52 Descriptive statistics of the pitch span of the English of the females by sex of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	English 80% span	
		$\bar{x}$	SD
English monolingual females	Female	4.4	2.3
	Male	4.5	2.5
Bilingual females UK	Female	6.4	2.6
	Male	6.2	2.6
Bilingual females JP	Female	5.5	2.2
	Male	5.3	2.2

6.3.2.3.2 English male monolinguals bilinguals

Tables 6.53, 6.54, and 6.55 similarly suggested that the male bilinguals produced English with a wider pitch span than the English monolinguals, however this was again not inferentially confirmed. In addition, no effect of variation in the addressee was detected on pitch span, thus prediction (1d) was upheld. Note however, that, with regard to absolute language differences, this was not in line with monolingual findings.

Table 6.53 Descriptive statistics of the pitch span of the English of the males by language in the reading task. Average and SD for each measurement are reported in ST

Group	English 80% span	
	$\bar{x}$	SD
English monolingual males	5.4	1.9
Bilingual males UK	6.5	3.1
Bilingual males JP	7	2.4

Table 6.54 Descriptive statistics of the pitch span of the English of the males by formality of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Formality of the address	English 80% span	
		$\overline{x}$	SD
English monolingual males	Formal	5.5	1.9
	Informal	5.2	1.9
Bilingual males UK	Formal	6.5	3.2
	Informal	6.5	3
Bilingual males JP	Formal	7.2	2.3
	Informal	6.7	2.4

Table 6.55 Descriptive statistics of the pitch span of the English of the males by sex of the addressee in the reading task. Average and SD for each measurement are reported in ST

Group	Sex of the address	English 80% span	
		$\overline{x}$	SD
English monolingual females	Female	5.3	2
	Male	5.5	1.8
Bilingual males UK	Female	6.6	3.2
	Male	6.5	2.9
Bilingual males JP	Female	6.7	2.4
	Male	7.2	2.3

6.3.2.3.3 Summary of analysis of the pitch span of the English of the bilinguals

Results reported in the previous sections indicated that the pitch span of the English of the bilinguals did not differ from the pitch of the English of the monolinguals. Notably, this held true for both female and male bilinguals. These results are in line with predictions (1c) and (1d), but at odds with monolingual findings which indicated that Japanese was produced with a significantly wider 80%span than English by the female and male monolinguals.

6.3.2.4 Individual variation in the pitch span in the reading task

Given that no L1 attrition and L2 acquisition patterns were evidenced in the previous pitch span analysis, it was considered inappropriate to explain non-significant group effects through an analysis of predictor variables; thus, only the role of individual gender identity on the pitch span in the present voicemail task was explored in the present project – both in monolinguals and bilinguals. For model syntax the reader is referred to 6.3.1.4.

6.3.2.4.1 Individual gender identity

For information relative to how individual gender identity was operationalised, the reader is referred to 5.5.1. The general prediction was that independent of L1 and the sex of the speaker, (3a) enhanced endorsement of feminine gender stereotypes would pattern with wider pitch span and, similarly, that (3b) enhanced endorsement of masculine gender stereotypes would pattern with narrower pitch span.

Individual gender identity as measured with the JGRI questionnaire and the BSRI-short did not pattern with pitch span variation in any of the groups of participants.

6.3.2.5 General summary of the analysis of pitch span in the reading task

Summarising, this section detailed the results of the analysis of the pitch span of the two languages of the bilinguals in the reading task. It was found that Japanese monolingual females *and* males had a wider 80%span than the English monolinguals, but no differences were revealed between monolinguals and bilinguals. In addition, neither variation in the addressee nor in individual gender identity explained pitch span variation between and within speakers, which is contrary to what is reported for pitch level (6.3.1). Whether these results were replicated in more spontaneous speech was investigated in the next chapter (Chapter 7).

6.4 Discussion

Firstly, regarding the monolingual groups, the results indicated that f0max was significantly higher and 80%span significantly wider for Japanese monolinguals than English monolinguals across female and male speakers in both instances. These findings indicated that cross-language differences in the pitch range of the Japanese and English monolinguals were due to Japanese being produced with higher f0 peaks which, in turn, determined an upward expansion of the span.

The current results are arguably in line with Graham (2015); however, note that his participants were balanced simultaneous bilinguals of Japanese and English who had been rated as monolinguals in both of their languages by monolingual naïve listeners (see Graham, 2015 for details), thus the comparison might not be appropriate. Graham (2015) argued that his result clearly indicated that differences in Japanese and English are phonological in nature, because the same patterns were replicated both in the speech of the female and male speakers.

Whilst the present result seems to substantiate Graham's (2015) claim, the effect of (in)formality and sex of the addressee on monolingual pitch level expands the language-specific finding to include the role of gendered practices on the pitch level of Japanese *and* English monolinguals. Results revealed that the f0mean of both Japanese and English monolingual females, but not males, were impacted by the (in)formality and sex of addressees, whereas their f0min was impacted by variation in the sex of the addressee (Ohara, 1999, 2001, 2004). More precisely, the formal male addressee elicited a higher f0min than the formal female addressee and the informal male addressee in both groups of female monolinguals. In addition, the female addressees elicited a higher f0min than the male addressees in both groups of female monolinguals. It is suggested that the monolingual females modified their pitch level in line with the addressee to signal positive politeness (that is, acknowledging the interlocutor by creating a common conversational ground). The lack of substantial variation in the pitch level was used by the males to signal negative politeness (that is, acknowledging the interlocutor by maintaining social distance). This is in line with previous work indicating that females and males may use the same variable, pitch level in this case, strategically to signal different social moves in conversation (Levon, 2018; Holmes, 1998).

Surprisingly, this was not replicated in the analysis of 80%range of the monolinguals, which did not appear to be influenced by variation in the addressee. This is not in line with Yuasa (2008) who reported large variations in the pitch span of her Japanese female and male informants as a consequence of changes in the formality of their speaking partner. Given that Yuasa (2008) analysed spontaneous speech, it is here proposed that this discrepancy might be due to the present result focussing on read speech (see Chapter 6 for an analysis of semi-spontaneous speech).

Summarising, monolingual comparisons indicated that Japanese and English pitch range demonstrate language specificity, that is, Japanese f0max is significantly higher and 80%span significantly wider than English f0max and 80%span. Gender-specific conversational strategies were evidenced within both monolingual groups, that is, the Japanese and English female, but not male, monolinguals significantly modified their pitch level to reflect variation in the addressee.

Moving on, given that the predicted language-specific differences were confirmed only for f0max and 80%span, L1 attrition findings should be, strictly speaking, discussed only for these measurements. Inferential analysis for f0max and 80%span, however, did not reveal significant differences between the Japanese monolinguals and bilinguals. Notably, a restructuring of the L1 was evidenced on the f0min of the Japanese of the male bilinguals, which was significantly lower than that of the Japanese of the male monolinguals. This was not in line with hypothesis 1b and seems to suggest an effect the L2 (English) on the pitch level of the L1 of the male bilinguals. Indeed, monolingual comparisons indicated that Japanese was produced with a significantly higher pitch level than English, however, this was true with regard to f0max, and not f0mix. A closer look at the descriptive statistics for the f0min of both groups of monolinguals revealed that, on average, the f0min of the two groups of monolingual males were almost identical (i.e. 97 Hz for the Japanese males' fomf0minin and 95 Hz for the English males' f0min). Therefore, one could suggest that the Japanese bilingual males overshot *both* the f0min of the Japanese *and* the f0min of the English monolingual males in their Japanese; however, their English f0min was in line with the f0min of the English monolingual males. That the Japanese male overshot their native f0min, but not the f0min of their L2, given that the monolingual norms are very similar is curious. As detailed in Chapter 4, JML is characterized by a very low and almost monotonous pitch (Loveday, 1981); in addition, anecdotal evidence suggests that a high pitch level indexes gay speech in the English-speaking world (Podesva, 2007) and that Japanese males feel 'effeminate' when speaking politely in English (Loveday, 1981). It might be that male bilinguals reinforced their Japanese f0min to ensure they did not sound effeminate/gay in their L1, thus embodying the cool demeanour which is traditionally expected of males in the Japanese society (Loveday, 1981; Tsurutani & Shi, 2018).

In line with monolingual results, but contrary to hypothesis 1a, *only* the Japanese pitch level of the female bilinguals was affected by formality and sex of the addressee. Specifically, the formal male addressee elicited a significantly higher f0mean than the formal male and the informal male. Therefore, the bilingual females seemed to be replicating the gender norms observed in the Japanese monolinguals by adapting their speech to the addresees' (in)formality and sex and, likewise, the bilingual males were replicating the Japanese gender norms by *not* adapting their speech.

Summing up, comparisons between the pitch range of the Japanese of the bilingual and monolingual speakers indicated that the female bilinguals produced their L1 in line with the Japanese monolingual females (Ohara, 1992; Ohara, 1999); however, the male bilinguals showed restructuring of their L1 with regard to their f0min. Therefore, this work suggests that, at least with regard to this reading task, L1 attrition was gendered in these bilinguals.

Turning now to the results of the analysis of the L2 of the bilinguals, a significant difference was found between the English pitch level, but not the pitch span, of the bilingual and monolingual females. More precisely, the f0mean and the f0max of the English of the bilinguals was significantly higher than that of the English monolinguals, suggesting an influence from Japanese on English (Mennen et al., 2014; Ullakonoja, 2007). This was in line with the monolingual findings but at odds with work from Ohara (1992, 1999, 2001) which indicated that Japanese-English bilingual females do not transfer their normative high Japanese pitch level onto their English. Methodological differences between Ohara's work and the present study may account for this discrepancy. For example, in the project at hand, data was obtained from sequential bilinguals whereas, as argued in 4.4, Ohara's (1992, 1999, 2001) participants were most likely simultaneous bilinguals. In addition, Ohara compared pitch level between the two languages of the bilinguals, whereas here the pitch level of L1 and L2 of the bilinguals was compared to the pitch level of monolinguals of both languages. To substantiate this suggestion, a closer look was given to the descriptive statistics of the f0mean and f0max of the Japanese and the English of the female bilinguals and the English and Japanese of the female monolinguals. Unexpectedly, the English f0mean and f0max of the female bilinguals was higher than (1) the English f0mean and f0max of the English monolingual females, (2) the Japanese f0mean and f0max of the Japanese of the female monolinguals *and* (3) the Japanese f0mean and f0max of the bilingual females. This last observation is at odds with *all* previous work on similar populations (Graham, 2015; Loveday, 1981; Ohara, 1992, 1999, 2001) and corroborate the suggestion that the female bilinguals transferred the higher Japanese pitch level onto their English. As detailed elsewhere (see, Chapter 4), in Japanese, high pitch indexes femininity and, by extension, the characteristics of the ideal Japanese woman, such as politeness and softness (e.g. Ohara, 2019; Okamoto, 2018). It may be that the bilingual females overshot the English monolingual norms in their English to be perceived as feminine (and therefore as polite) as it is expected of Japanese women in the Japanese society. Therefore, this result suggests that, with regard to the reading task, Japanese bilingual females transferred JWL sociophonetic norms to their L2.

Turning now to pitch level variation elicited by the addressees, again only female speakers significantly varied their pitch level to accommodate variation in the formality of the addressee. More precisely, the female addressees elicited a significantly higher f0mean and f0max than English male addressees in the English of the female monolinguals and bilinguals. Therefore, in both their languages, the bilingual females maintained the same gender norms that were observed in the English monolinguals by adapting their speech to the addressee. Likewise, the bilingual males maintained gender norms by not adapting their speech to the addressee.

Summing up, comparisons between the pitch range of the English of the bilinguals and monolingual speakers indicated that the male bilinguals produced their L2 in line with the Japanese monolingual males (Loveday, 1981); however, the female bilinguals showed L1 sociophonetic transfer effects with regard to their English f0mean and f0max. Therefore, this work suggests that, with regard to the reading task, L2 acquisition was gendered in these bilinguals.

The last step of the analysis looked at the effect of individual variables, individual gender identity and bilingualism predictor variables, on the pitch range of the two languages of the bilinguals. Scores on the BRSI-short patterned with variation in the English f0mean of the both the female and male bilinguals. More precisely, a higher self-attribution of masculine traits on the BSRI-short patterned with lower f0mean among the female bilinguals, whereas a higher self-attribution of feminine traits patterned with lower f0mean among the male bilinguals. In other words, in English, the more masculine females and more feminine males produced the lowest f0means.

The link between enhanced masculinity and lower f0mean in female speakers has been proposed elsewhere (Biemans & Van Bezooijen, 1996; Weirich & Simpson, 2018) and this analysis provided quantitative evidence that more masculine gender identity correlated with a lower f0mean in the L2 of the bilingual females. On the contrary, the link between enhanced femininity and lower f0mean in the English of the male bilinguals appears counterintuitive, as a higher f0mean is normally assumed to correlate with a more feminine gender identity (Biemans & Van Bezooijen, 1996). Eckert's (2008) notion of *indexical field* may be of help in explaining this seemingly counterintuitive result. Eckert maintains that the meaning of a (phonetic) variant is not fixed and static, as it is traditionally believed, but is instead distributed over a fluid field of 'ideologically related meanings, any one of which may be activated in the situated use of the specific variable' (Eckert, 2008, p. 453). Thus, the use of a variable does not necessarily activate a unique and pre-determined indexical meaning, rather a variety of ideologically linked meanings.

Applying this model to the case of f0mean in the English of the bilinguals, it is here proposed that the mapping between form and function happens at the first indexical order, that is at the level of membership to a population (Silverstein, 2003), in this case at the level of signalling membership to the population *women*. The mapping between form and meaning, however, happens at the second lexical order, that is the level at which the linguistic form becomes a stylistic marker (Silverstein, 2003), in this case at the level of signalling *more/less politeness* and *more/less submissiveness* (i.e. traits which are traditionally attributed to the population *women* – see e.g. Cameron, 2014; Ohara, 2019). It is suggested that the variable *lower f0mean* activated different indexical meanings in the English of the bilingual females and males of the present sample. Specifically, in the speech of the bilingual females, it activated the first order indexical meaning of *decreased femininity* (or *increased masculinity*), whereas in the speech of the bilingual males, it activated the second order indexical meaning of *less polite* (and *less submissive*). Importantly, politeness is linked to friendliness in English (Pizziconi, 2007), thus it is not dependent on hierarchy, which could explain why no effect of formality of the imagined addressee was detected on the English of the male.

With regard to the bilingual predictor variables, it is surprising that results revealed that (1) variation in the Japanese f0min of the male bilinguals and (2) variation in the English f0mean and f0max of the female bilinguals were *not* explained by any of the variables taken into consideration in the present study (AoA, LoR, L1 use, L1/L2 proficiency). Research has reported that L1 and L2 prosodic variables are susceptible to attrition and acquisition effects (see Chapter 2), potentially due to L2 exposure (de Leeuw, 2019; de Leeuw et al., 2012; Mennen, 2004). Therefore, one might have expected Japanese pitch range to more resemble English pitch range in the bilinguals tested in London, and conversely English pitch range to more resemble to Japanese pitch range in the bilinguals tested in Tokyo, but this was not the case. However, as noted in Chapter 4, bilingual profiles were unusually similar, independently of the testing location (London vs Tokyo). It is here proposed that this lack of variation in the bilinguals' language background may have been the cause for this lack of correlations between pitch level and bilingualism predictor variables.

Summing up, the analysis of the reading task demonstrated language specificity with regard to Japanese and English f0max and 80%range. Interestingly, findings revealed gendered patterns of L1 attrition and L2 acquisition in this reading task. More precisely, the male bilinguals produced Japanese f0min significantly lower than the Japanese male monolinguals, and the female bilinguals produced English f0mean and f0max significantly higher than the English monolingual females. With regard to the effect of an imagined addressee, female monolinguals varied their pitch level to reflect variation in the addressee, but males did not, which revealed gendered conversational practices in the monolinguals. Specifically, Japanese and English monolingual females produced a higher f0mean when addressing the formal male than the formal female and the informal male and a higher f0min when speaking the female compared to the male addressees. This was reflected in the Japanese and the English of the bilingual females who seemed to maintain the gender norms observed in the monolinguals by adapting their speech to degree of formality and different sex of the addressee, and, likewise, the bilingual males were maintaining gender norms by *not* adapting their speech.

7 Pitch range variation in semi-spontaneous speech

7.1 Introduction

Chapter 7 documents the second production analysis of this study, that of pitch range in a voicemail task. Just like in the sentence reading task in Chapter 6, absolute differences in the realisation of pitch range in Japanese and English monolinguals, as well as differences due to variation in the addressee, formed the basis of this production analysis. In addition, the role of individual gender identity and the bilingualism predictor variables was also explored in an attempt to explain any potential variation in the data. Notably, with the present task, it was considered that a more ecologically valid type of speech was collected and analysed: semi-spontaneous speech.

The reader is reminded that results from the reading task indicated that (1) Japanese and English tend to language-specificity, at least in terms of f0max and 80%span, with f0max of Japanese monolinguals being significantly higher and 80%span wider than those of English bilinguals; and (2) in both languages *only* monolingual females modified their pitch level to respond to variation in the addressee (f0mean was higher when addressing the formal male compared to the formal female and the informal male and f0min significantly higher when addressing female compared to mal addressees), which suggests gender-specific patterns of variation in both Japanese and English. With regard to L1 attrition and L2 acquisition, findings indicated restructuring of the native language in the male, but not the female, bilinguals, whereas effects in the L2 were evidenced for the female, but not male, bilinguals. Specifically, the Japanese f0min of the male bilinguals was significantly lower than the f0min of the Japanese male monolinguals and the English f0mean and f0max of the female bilinguals were significantly higher than those of the English female monolinguals. This suggests that female and male bilinguals experience bilingualism differently (e.g., Wierzbicka, 2004). Lastly, both more masculine female bilinguals and more feminine male bilinguals produced English with lower f0mean than other bilinguals.

Whether similar results would be replicated in semi-spontaneous speech, as was the speech collected with the voicemail task, was considered important to assess. This is because read speech has been reported to have more formal intonation and careful articulation than spontaneous speech (Laan, 1992; 1997). In addition, Moyer (2004) reported that naïve native speakers rated bilingual spontaneous speech to be more native-like than bilingual read speech; she argued that this was due to the intonation of spontaneous speech being more reflective of everyday usage than read speech (Moyer, 2004). Importantly, as far as Japanese is concerned, there is empirical work indicating that spontaneous speech and read speech differ significantly in spectral distribution (which is reduced in spontaneous speech) and phonemic variance, which is increased in spontaneous speech (Nakamura et al., 2008). In addition, as noted in Chapter 4, previous work on Japanese monolinguals has reported discrepant results with regard to the effect of formality on pitch level; specifically work on controlled laboratory speech reported an increase in f0mean to signal formality (Ofuka et al., 2000), whereas work on spontaneous conversational speech has reported a decrease in f0mean to signal formality in Japanese (Guillemot & Sano, 2020; Sherr-Ziarko, 2019; Yuasa, 2008). Thus, eliciting a sample of semi-spontaneous speech was considered crucial for this project to obtain a full understanding of patterns of variation in the pitch range of Japanese-English sequential bilinguals. In addition, by testing the same predictions on two types of speech, it was possible to explore the question of whether pitch range differed across language tasks.

With respect to RQ 1 regarding the speech of the bilinguals, Is there a bidirectional interaction in the production of pitch range in the two languages of Japanese-English female and male bilinguals residing in London (UK) and Tokyo (JP)?, predictions were made for both L1 attrition and L2 acquisition. In terms of L1 attrition, (1a) the female bilinguals – especially those residing in the UK – were expected to produce Japanese with a significantly lower pitch level and narrower pitch span than the Japanese monolingual females, but (1b) this was not expected for male bilinguals (Ohara, 1999; Loveday, 1981). With regard to L2 acquisition, no significant differences were expected between (1c) the English of the female bilinguals and the English monolingual females (Ohara, 1999; 2001) nor between (1d) the English of the male bilinguals and the English monolingual males (Ohara, 1999; Loveday, 1981).

With respect to RQ2 , *Does individual gender identity explain variation in the pitch range of the two languages of the bilinguals?*, it was predicted that, irrespective of language spoken and sex of the speakers, (2a) a higher self-attribution of feminine traits in both female and male bilinguals would pattern with a higher pitch level and wider pitch span and, conversely, (2b) a higher self-attribution of masculine traits would pattern with lower pitch level and narrower pitch span (Biemans, 1999; Biemans & van Bezooijen, 1996).

With respect to RQ3, *Does language history explain variation in the pitch range of the two languages of the bilinguals?*, it was predicted that, irrespective of whether female or male, (3a) a later AoA would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Moreover, it was predicted that (3b) shorter LoR would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals. Finally, it was considered possible that an increased L1 use (3c) and higher L1 proficiency (3d) would correlate with a more Japanese native-like pitch range in the L1 of the bilinguals and a less English-like pitch range in the L2 of the bilinguals.

7.2 Methods

7.2.1 Participants

For information on the speakers, the reader is referred to Chapter 5.

7.2.2 Presentation

The voicemail task was always the third task of the experiment; thus, it always followed the sentence reading task (Chapter 6) and preceded the gender questionnaires (5.5.1). There was a short break of two minutes between the sentence reading task and the voicemail task. Just like in the reading task, in line with Grosjean's (2001b) description of language modes, the Japanese voicemail task took place in the Japanese half of the study, whilst the English voicemail task took place in the English half of the study. Language order was counterbalanced across participants to control for fatigue and learning effects.

The task was introduced by the animated character Blobby (Figure 7.1), who explained to participants that they had to leave four voicemails to four different people (see below for detail on the content of the voicemails).

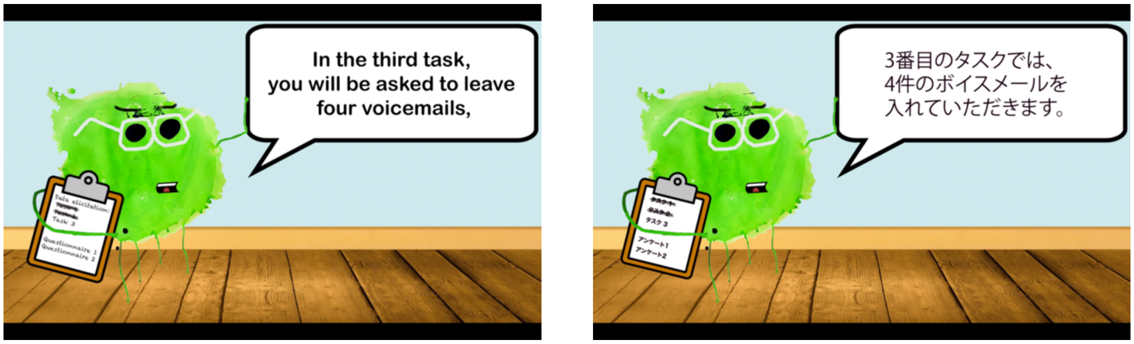


Figure 7.1 Blobby instructing participants for the voicemail task.
English on the left and Japanese on the right.

Participants were given time to gather their ideas and were allowed to take some notes on a pad of paper provided by the researcher. They were told however, not to write a full paragraph, so as to avoid collecting another sample of read speech. For the task to appear as natural as possible, when participants were ready, they were asked to dial a number on a dial pad created in PsychoPy (Peirce, 2007) and leave their voicemail after a tone.

No familiarisation trial was included in this step of the data collection, which led to speech from two individuals being discarded. In addition, speech from another six participants was discarded as they refused to leave the voicemails, or they had written a paragraph which they read out. In total, speech from eight individuals was discarded. Therefore, the analysis of the for semi-spontaneous speech was carried out on a total of 63 out of 71 speakers (Table 7.1).

The voicemail task took between 10 and 30 minutes (due to differing preparation times); the length of the voicemails varied from 30 seconds to 2.5 minutes.

Table 7.1 Table detailing distribution of the speech was removed from or retained for the analysis

Group	Participants removed		Participants analysed	
	F	M	F	M
All Japanese monolinguals	1	1	9	4
All English monolinguals	0	0	10	6
All bilinguals UK	1	1	11	6
All bilinguals JP	3	1	14	3
Total	5	3	44	19

7.2.3 Material

The voicemail task was loosely built on Ohara (1999, 2001) and Loveday (1981). Participants were asked to leave four voicemails to addressees varying in (in)formality and sex (as was the case for the reading task; see 6.2.3).

The topic of the voicemails was as similar as possible across formality conditions; specifically, participants were requested to tell the person they were calling why they thought they were the best possible candidates for (1) a job as a PA (formal condition), (2) as a travel companion for round-the-world trip (informal condition). In line with Loveday (1981), participants were asked to include politeness formulae, that is, opening and closing greetings and thanking at the end; however, they were not instructed on which specific words/expressions to use (Table 7.2).

Table 7.2 Content of the formal and informal voicemails

Formal voicemail	Informal voicemail
Mrs/Mr X, the CEO of Y* has advertised a job opportunity for ‘the best job in the world’ as their personal assistant. You applied for this position and have been shortlisted and have been asked to leave a voicemail message explaining why you are the best candidate for this job and what they would be missing out on if they were not to choose you. Please remember to introduce yourself, say the reason for which you are calling and that you are looking forward to the result of the selection. Please make sure you to greet and thank the listener. [*see Appendix I]	Your best female or male friend has just won two tickets for a dream round the world trip and is running a competition between friends to decide who is going to be the second person to join them. Call your friend to explain why you are the best person to travel with, and what they would be missing out on if they were not to choose you. Please remember to introduce yourself, the reason for which you are calling and that you are looking forward to the result of the selection. Please make sure you to greet and thank the listener.

In line with the reading task (Chapter 6), four addressees per language were chosen, two formals (i.e. the same older-looking addressees in business-like attire used for the reading task) and two informal (i.e. two of the participant’s friends). For the formal voicemail, an image that would be typically assumed to be of a female and an image that would be typically assumed to be of a male were chosen (Figure 7.2). For the informal voicemail, participants were instructed to leave a voice recording to their best female friend, as well as to their best male friend; therefore, no images of people were used for the informal voicemail, but an image of Winnie the Pooh and Piglet to signal friendship (Figure 7.3).

Portrait photo of a middle-aged British English female in business attire	Portrait photo of a middle-aged British English male in business attire	Portrait photo of a middle-aged Japanese female in business attire	Portrait photo of a middle-aged Japanese male in business attire

Figure 7.2 Description of the images of the formal addressees; the images have been removed due to copyright reasons.[7]

Aerial view of Winnie the Pooh and Piglet chilling in the park

Figure 7.3 Image of Winnie the Pooh and Piglet used to symbolise friendship; the image the image has been removed due to copyright reasons[8]

Examining the effects of (in)formality and sex of the addressee on pitch range in the voicemail task was considered important because it allowed to observe whether, for example, an even higher f0mean would be elicited by the bilinguals when addressing the formal male compared to addressing the formal female, and whether this effect might be more likely to be observed in in Japanese than in English. Importantly, it also allowed to assess whether the effect of the addressee would be similar across both read speech and semi-spontaneous speech. For example, would female, but not male, bilinguals significantly increase their pitch level when speaking to the female addressees? Would the Japanese formal male elicit the highest f0mean in the Japanese of the female, but not male, bilinguals? Or would both female and male modify their English pitch level to signal friendliness? For the workflow, the instructions for each type of voicemail (formal vs informal) were presented twice, once with reference to the female and once with reference to the male addressee (see Appendix I). The order of presentation was fully randomised.

Concluding, in line with the previous reading task, the purpose of the semi-spontaneous speech task was to investigate whether bilinguals' pitch range differed from that of the monolinguals in both of their languages and whether a higher pitched voice,

[7] Images were sourced from the internet, URLs can be found in the bibliography (*English Formal Female*, 2017; *English Formal Male*, 2017; *Japanese Formal Female*, 2017; *Japanese Formal Male*, 2017)
[8] Images were sourced from the internet, URLs can be found in the bibliography (*Friendship*, 2017)

potentially with a wider span, might have been more likely to be produced when leaving the voicemail to the formal interlocutors than when leaving to the informal interlocutors. Moreover, it was considered important to examine whether a higher pitch level when addressing formal males would be elicited by the Japanese female participants, but potentially not by the Japanese male participants. It might also have been the case that Japanese-English bilinguals living (longer) in the UK, who might have had higher English proficiency levels, and used more English in their daily lives, would have had more English-like pitch production than the Japanese-English bilinguals tested in Japan, both in English and Japanese.

In addition, it was of interest to compare the results from the reading task with the current results. As in the reading task, would the formal male elicit the highest pitch level in the Japanese (but not the English) of the bilingual females; and would the female addressees elicit a higher pitch level in the English (but not the Japanese) of the *female* and *male* bilinguals?

7.2.4 Annotation

Prior to the prosodic analysis, speech relevant to the task was separated from other speech (e.g. whispering when preparing for the voicemail task) and silence. Thereafter, in line with Ohara (1999, 2001), it was decided to split each voicemail into three sections according to their semantic content (i.e. opening/greetings, why you are the best candidate, closing/thank you salutations), rather than in IPs. This choice was borne out of practicality, each participant produced four voicemails in each of their languages, and to the fact that type of IP was not the focus of the analysis. Inevitably, each voicemail section varied in segmental variation, as well as in types and numbers of IPs; in line with Ohara (1999), this was not considered problematic for the analysis as such discrepancies are inevitable in spontaneous speech.

Impressionistic analyses from the main researcher indicated a general shift away from the more standard patterns of the formal voicemails into more colloquial patterns in the informal ones. For example, formal voicemails elicited use of honorifics and humbling forms in Japanese and passive forms in English, whereas the informal voicemails were characterised by the use of slang and colloquialisms in both languages. Phonetically, formal voicemails were characterised by carefully articulated, clear and slower speech, whereas, in informal ones, speech was faster, louder and pronunciation seemed more relaxed.

For details of the acoustic analysis the reader is referred to 6.2.4. None of the participants produced speech fully in creaky phonation; note, however, that a total of 76 subparts were removed from the analysis due to overwhelming presence of creaky voice (see Table 7.3)[9]. The subparts removed were all 'closing/salutations' subparts, that is they all occurred at the end of the voicemail, where f0 declination is expected (Liberman, 1975). A Chi-square test indicated that there was no significant association between proportion of subparts removed and subparts analysed; therefore, this was not considered a potential confound in the analysis.

Table.7.3 Table indicating number of tokens analysed per group in the voicemail task

Group	Subparts removed	Subparts analysed
All Japanese monolinguals	13 (9 IN	144
All English monolinguals	20	172
All bilinguals UK	22	408
All bilinguals JP	21	387
Total	76	1111

7.2.5 Measuring pitch range

For information regarding how pitch range was measured, the reader is referred to 6.2.5. In line with the previous task, f0mean, f0min and f0max were extracted for pitch level and 80%range was extracted to operationalise pitch span.

7.2.6 Statistical analysis

For information related to the statistical analysis, the reader is referred to 6.2.6. For this semi-spontaneous speech analysis, data from 63 participants were analysed for a total of 1111 tokens (Table 7.3).

[9] Note that mixed effect models can accommodate missing data (Hesselmann, 2018).

7.3 Results

Results from the analyses of the data collected for the voicemail task are reported below. Results from the analysis of pitch level are described initially. (7.3.1). Thereafter, results from the analysis of pitch span are presented (7.3.2).

7.3.1 Analysis of pitch level production in the voicemail task

This section presents the analysis of the pitch level of the two languages of the bilinguals. For all the analyses below, unless otherwise stated, LMERs were built for female and male speakers separately with group (English monolinguals, Japanese monolinguals; Japanese-English Male bilinguals UK; Japanese-English Male bilinguals JP), formality of the addressee (formal vs informal) and sex of the addressee (female vs male) and their interactions as fixed independent factors. Speaker was entered as a random intercept. Models including by-speaker random slope and by-token random intercept were tested but failed to converge. Only results for best-fit models are reported in each section of the results, firstly for female and thereafter for male speakers.

7.3.1.1 Monolingual pitch level comparisons in the voicemail task

As in the reading task, whether the pitch level of the monolinguals differed significantly across languages and whether variation in the addressee affected monolinguals' pitch range differently was assessed to characterise potential monolingual norms.

Based on previous research (Loveday, 1981; Ohara, 1999, 2001; Tsuji, 2004), it was considered possible that the pitch level of the Japanese female monolinguals would be significantly higher than that of the English female monolinguals, and that formal addressees would elicit a higher pitch level than informal addressees in the monolingual Japanese females, but not in the monolingual English females. In addition, male addressees were expected to elicit a significantly higher pitch level than female addressees both in speech of the Japanese and the English female monolinguals.

No overall differences were predicted between the pitch level of monolingual male speakers (Loveday, 1981). However, findings from the reading task indicated that the f0max of the Japanese female *and* male monolinguals was significantly higher than that of the

English female *and* male monolinguals. Therefore, it was considered possible that a similar result would also be evidenced in the present task.

7.3.1.1.1 Monolingual females

Descriptive statistics (mean and standard deviation) of pitch level measurements for both groups of monolingual females in the voicemail task are reported below by language (Table 7.4); by formality of the addressee (Table 7.5); and by sex of the addressee (Table 7.6).

Table 7.4 Descriptive statistics for pitch level of the female monolinguals by language in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Language	f0mean		f0min		f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Japanese	229	34	209	33	267	38
English female monolinguals	English	245	36	222	34	279	42

Table 7.5 Descriptive statistics for pitch level of the female monolinguals by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Language	Formality of the addressee	f0mean		f0min		f0max	
			$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Japanese	Informal	231	36	211	36	270	43
		Formal	225	32	207	29	264	32
English female monolinguals	English	Informal	253	35	231	32	285	43
		Formal	238	36	214	35	272	41

Table 7.6 Descriptive statistics for pitch level of the female monolinguals by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Language	Sex of the addressee	f0mean		f0min		f0max	
			$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Japanese	Females	232	36	211	35	268	38
		Males	227	32	206	30	266	38
English female monolinguals	English	Females	250	38	225	35	284	43
		Males	240	34	219	33	272	41

For f0mean, results from the LMERs indicated a significant main effect of formality of the addressee (p =.03) (Table 7.7). That is, surprisingly, irrespective of their L1 (Japanese vs English), females produced, on average, an f0mean 8.78 $\pm$ 4.05 Hz lower in the voicemails which were directed to the formal than those directed to the informal addressees (see Figure 7.4)

Table 7.7 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0mean of the female monolinguals in the voicemail task

Factor	Sum of squares	Mean square	F	*p*-value
Group	2196.9	2196.9	2.58	.124
Formality of the addressee	4031.7	4031.7	4.47	.030
Sex of the addressee	2610.1	2610.1	3.07	. 081
N=211, Random intercepts: Participant (19), Log likelihood: - 1027.4, Conditional R^2= 0.54; all interactions p>.05				

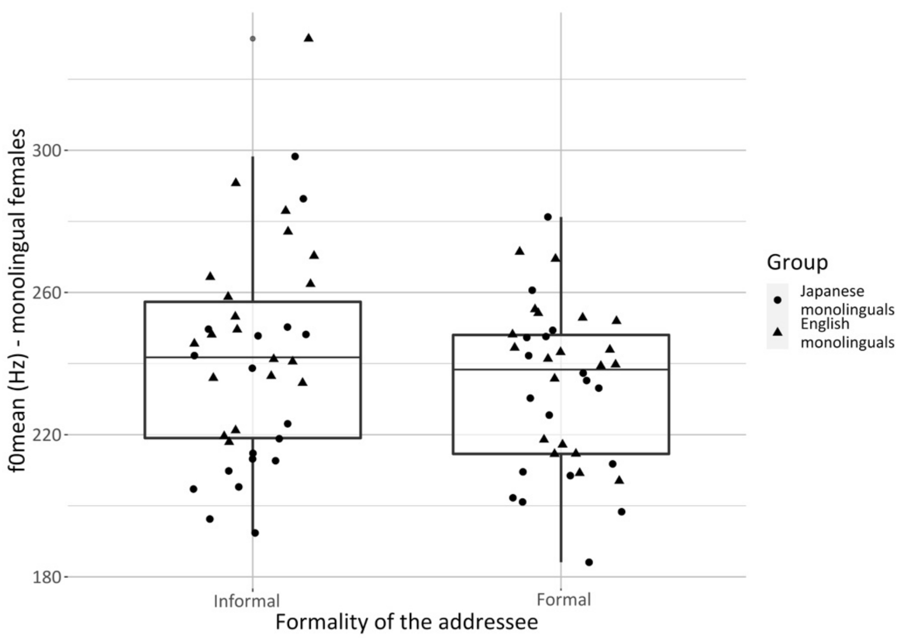


Figure 7.4 Boxplots depicting the significantly lower f0mean elicited by the formal compared to the informal addressees in the monolingual females. Values are averages for each participant.

Moving now to f0min, this LMER also indicated a significant main effect of formality of the addressee (p = .01) (Table 7.8). Similar to f0mean reported above, pairwise comparisons revealed that, irrespective of L1, monolingual females produced a significantly lower f0min in the voicemails directed to the formal addressees than in those directed to the informal addresses (ß = 9.9, SE = 3.85, p =.01) (Figure 7.5).

Table 7.8 Analysis of Variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0min of the female monolinguals in the voicemail task

Factor	Sum of squares	Mean square	F	p-value
Group	1602.3	1602.3	2.09	.164
Formality of the addressee	5127.2	5127.2	6.69	.010
Sex of the addressee	1506.1	1506.1	1.96	. 162
N=211, Random intercepts: Participant (19), Log likelihood: -1016.4, Conditional R2= 0.54; all interactions *p*>.05				

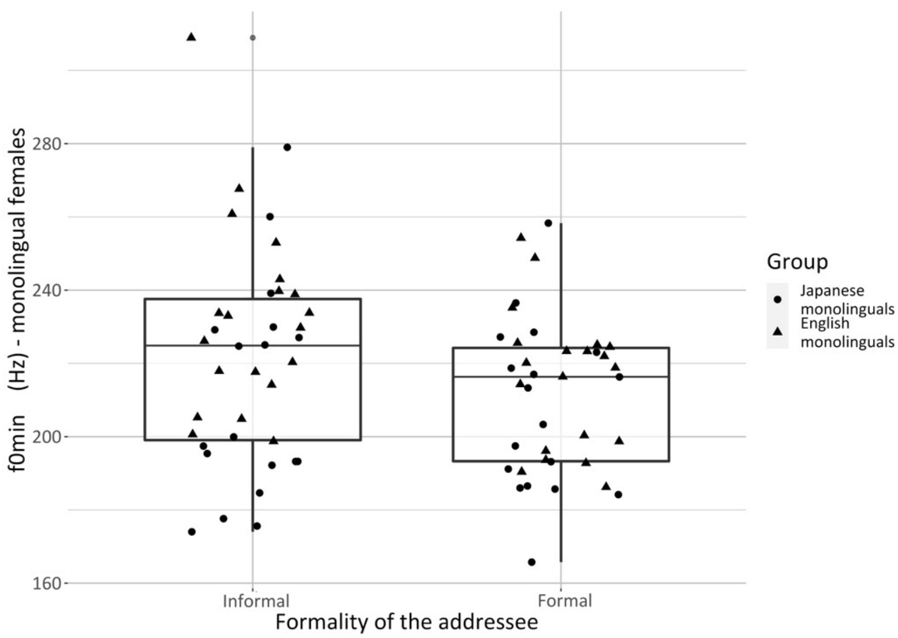


Figure 7.5 Boxplots depicting the significantly lower f0min elicited by the formal compared to the informal addressee in the speech of the English and Japanese monolingual females. Values are averages for each participant.

Results of the LMER for f0max of the female bilinguals did not reveal any significant main effects or interactions.

Summarising, thus far the results of the analysis of the pitch level of the monolingual females in the voicemail task have been reported. The most striking finding was that the pitch level of the female monolinguals did not appear to be language-specific, that is, no group differences were evidenced between the pitch level of the Japanese and English monolingual females. This finding this was somewhat in contrast to the results from the reading task, for which a significantly higher f0max was revealed in the speech of the Japanese monolingual females.

In addition, formal addressees elicited a significantly lower f0mean and significantly lower f0min in both Japanese and English female monolinguals; similarly to the reading task, these results were valid for both the speech of the Japanese and English female monolinguals. Surprisingly, no significant effect of sex of the addressee was evidenced on the pitch level of the monolingual females.

7.3.1.1.2 Monolingual males

Turning now to the results of the analysis of the pitch level of the monolingual males in the voicemail task, the reader is reminded that no noticeable differences were thought to be observable between Japanese and English monolingual males.

Descriptive statistics for the pitch level measurements of the two groups of male monolinguals are reported below. Specifically, Table 7.9 reports pitch level variation by group, whereas Tables 7.10 and 7.11 present the effect of formality and sex of the addressee respectively.

Table 7.9 : Descriptive statistics for pitch level of the male monolinguals by language in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Language	f0mean		f0min		f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Japanese	125	23	112	17	149	43
English male monolinguals	English	137	30	119	27	156	36

Table 7.10 Descriptive statistics for pitch level of the male monolinguals by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Language	Formality of the addressee	f0mean		f0min		f0max	
			$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Japanese	Informal	125	21	112	16	141	29
	English	Formal	126	26	114	18	150	45
English male monolinguals	Japanese	Informal	146	31	126	28	166	36
	English	Formal	139	27	121	24	157	35

Table 7.11 Descriptive statistics for pitch level of the male monolinguals by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Language	Sex of the addressee	f0mean		f0min		f0max	
			$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese male monolinguals	Japanese	Females	127	25	113	18	159	54
	English	Males	124	23	112	17	140	30
English male monolinguals	Japanese	Females	140	33	120	29	160	39
	English	Males	135	28	117	24	153	34

As expected, the pitch level (f0mean, f0min and f0max) of the monolingual males was not affected by any of the factors taken into consideration. This, however, was not in line with the results of the reading task which indicated that the f0max of the Japanese monolingual males was significantly higher than the f0max of the English monolingual males.

7.3.1.1.3 Summary of the comparisons between the pitch level of the monolinguals

The most striking finding was that contrary to expectations and results from the reading task, pitch level was *not* language specific; in other words, no significant differences were reported between the pitch level of the Japanese and the English of the monolinguals. This result is notable; that the pitch level of Japanese and English semi-spontaneous speech is not language specific implies that no L1 attrition and L2 acquisition effects *strictu senso* may be registered in the speech of the bilinguals. In addition, it shows that the pitch level of read and spontaneous speech differs because significant differences were found in the monolingual analysis of the reading task.

With regard to the addressee, the analysis revealed that the pitch level of the female, but not male, monolinguals varied significantly to reflect variation in the formality of the addressee. Specifically, formal addressees elicited, surprisingly, a significantly lower f0mean and lower f0min than informal addresses in the speech of both the Japanese and English monolingual females. This difference was not reported in the male monolingual analysis, therefore it seems that in both Japanese and English, females modify their pitch level depending on formality of the addressee, whereas males tend not to.

It is now of interest to examine how these findings will play out in the bilinguals. Particularly, how will variation elicited by the formality of the addressee be reflected in the L1 and L2 of the bilinguals, and will there be there gender-specific findings? Would residing in the L1- or L2- speaking country affect the pitch level of the bilinguals in this voicemail task, despite the lack of language-specific findings? These are some of the questions addressed in the next two sections in which the pitch level of both languages of the bilinguals was compared to the pitch level of the monolinguals.

7.3.1.2 Japanese of the monolinguals and bilinguals pitch level in the voicemail task

This section reports the analysis of the L1 of the bilinguals which was compared to the Japanese of the monolinguals. Initially, the results from the females are reported, followed by the results from the males.

Note that it was predicted that (1a) the pitch level of the female bilinguals – especially of those residing in London – would differ significantly from the pitch level of the Japanese monolingual females, as a consequence of acquiring English as an L2. However, given that monolingual comparisons did not reveal any language-specific findings, it might have been that the L1 pitch range of the female bilinguals would be produced similarly to the monolingual norm. No significant differences were predicted between the Japanese of the monolingual and bilingual male speakers (1b) and this was upheld in the monolingual comparison.

Recall that the bilinguals tested in London were significantly older of both the Japanese monolinguals and the bilinguals tested in Tokyo (5.5.3). Therefore, prior to comparing the pitch level of the Japanese of the bilinguals and monolinguals, a series of two-way ANOVAs was performed to rule out the potential confound of age of the speakers. No significant differences were detected, so age was not considered to be a potential confound in this research and removed from further analysis.

7.3.1.2.1 Japanese female monolinguals and bilinguals

Descriptive statistics (mean and standard deviation) for differences in the pitch level of the Japanese of the females are reported by language in Tables 7.12, 7.13 and 7.14.

Table 7.12 Descriptive statistics for the pitch level of the Japanese of the females by group in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Japanese f0mean		Japanese f0min		Japanese f0max	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	229	34	209	33	267	38
Female bilinguals UK	223	40	199	38	258	48
Female bilinguals JP	233	32	211	40	275	40

Table 7.13 Descriptive statistics for the pitch level of the Japanese of the females by group in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Informal	231	36	211	36	270	43
	Formal	225	32	206	29	264	32
Female bilinguals UK	Informal	228	41	203	40	263	51
	Formal	218	38	195	36	253	45
Female bilinguals JP	Informal	235	31	211	30	276	42
	Formal	230	22	208	31	275	39

Table 7.14 Descriptive statistics for the pitch level of the Japanese of the females by group in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese female monolinguals	Females	232	36	211	35	268	38
	Males	227	32	206	30	266	38
Female bilinguals UK	Females	225	43	201	40	261	55
	Males	222	37	198	36	255	42
Female bilinguals JP	Females	235	32	213	30	277	40
	Males	233	33	210	30	274	41

With regard with f0mean, results indicated a trend (p = .054) for formality of the addressee to predict variation in the speech of the Japanese of the female monolinguals and bilinguals (Table 7.15) irrespective of whether monolingual or bilingual. Specifically, the voicemails left to formal addressees were produced with a lower f0mean than the voicemails directed to informal addressees, which was in line with the monolingual analysis (Figure 7.6).

Table 7.15 Analysis of variance table (Satterthwaite approximations for degrees of freedom) for the linear mixed regression for f0mean of the Japanese of the females in the voicemail task

Factor	Sum of squares	Mean square	df	F value	*p*-value
Group	831.87	415.94	2	0.53	.592
Formality of the addressee	2196.43	2196.43	1	2.77	.054
Sex of the addressee	904.67	904.67	1	1.15	.282
N=374, Random intercepts: Participant (33), Log likelihood: -1810.3, Conditional R^2= 0.38; all interactions p>.05					

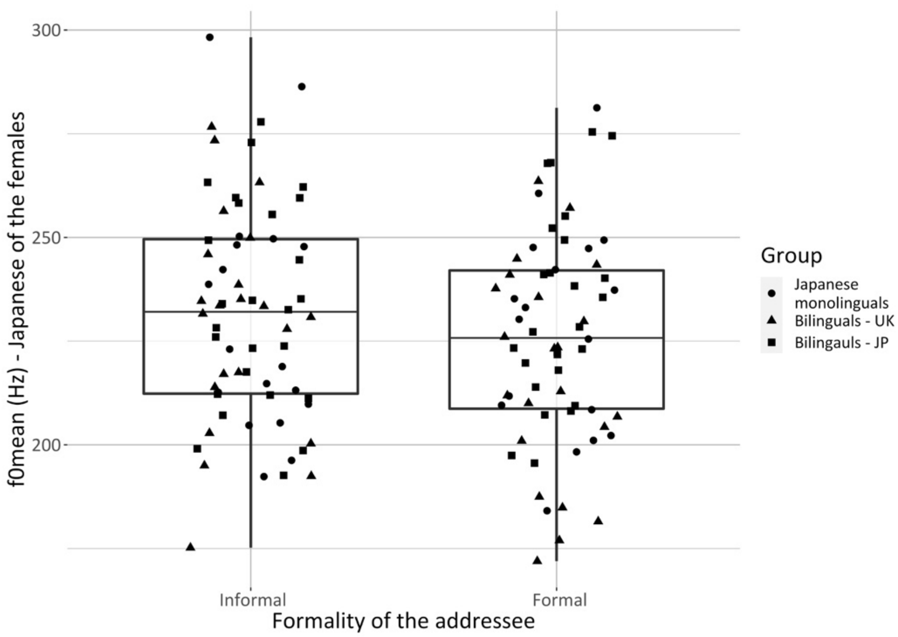


Figure 7.6 Boxplots depicting the lower f0mean elicited by the formal compared to the informal addressees in the speech of the Japanese female monolinguals and bilinguals. Values are averages for each participant.

An LMER comparing variation in the f0min and f0max of the Japanese of the females did not reveal any significant findings, which was not surprising considering the monolingual results reported in the previous section.

7.3.1.2.2 Japanese of the male monolinguals and bilinguals

Turning now to the analysis of the pitch level of the Japanese of the male bilinguals, the general prediction was that no differences would be reported between male monolinguals and bilinguals in Japanese. Inferential statistics substantiated this prediction.

Table 7.16 Descriptive statistics for the pitch level of the Japanese of the males by group in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Japanese f0mean		Japanese f0min		Japanese f0max	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese monolinguals	126	24	113	17	146	38
Male bilinguals UK	127	36	109	29	149	46
Male bilinguals JP	115	19	100	14	135	24

Table 7.17 Descriptive statistics for the pitch level of the Japanese of the males by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese monolinguals	Informal	125	21	112	16	141	29
	Formal	126	26	114	18	150	45
Male bilinguals UK	Informal	133	41	115	33	153	51
	Formal	121	30	103	24	145	40
Male bilinguals JP	Informal	114	17	102	15	129	21
	Formal	117	20	98	12	141	26

Table 7.18 Descriptive statistics for the pitch level of the Japanese of the females by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	Japanese f0mean		Japanese f0min		Japanese f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Japanese monolinguals	Females	128	25	115	17	153	46
	Males	123	23	112	17	140	30
Male bilinguals UK	Females	128	38	112	32	149	49
	Males	127	34	106	26	149	43
Male bilinguals JP	Females	115	19	100	13	134	24
	Males	114	20	101	15	135	24

Summing up, in line with predictions and monolingual findings, no significant differences were detected between the pitch level of the Japanese of the male bilinguals and monolinguals. This is different from what revealed by the analysis of the reading task which revealed that the male bilinguals produced Japanese f0min significantly lower than the male monolinguals.

7.3.1.2.3 Summary of the analysis of the pitch level of the Japanese of the bilinguals

Concluding, this step of the analysis did not reveal any significant changes in the L1 of the bilinguals. This was in line with monolingual findings. However, the findings from the semi-spontaneous speech elicitation task were not entirely aligned with the results from the reading task because the latter indicated L1 attrition effect in the speech of the monolingual males, that is, they produced f0min significantly lower than the monolingual males did.

In the next step of the analysis, the attention turns to the English of the bilinguals. Would L2 acquisition effects be revealed, despite the lack of significant differences between the monolingual norms? Would the bilingual females produce a significantly lower f0mean and f0min in the voicemails directed to the formal addressees as the English monolinguals did? Would residing in the L1- or L2- speaking country affect L2 pitch level differently? To answer these questions, the pitch level of the English of the bilinguals was compared to that of the English monolinguals.

7.3.1.3 English monolinguals and bilinguals pitch level in the voicemail task

Before reporting the results of the analysis of the English pitch level of the bilingual speakers, the reader is reminded that monolingual comparisons indicated that (1) pitch level was not language-specific; (2) only English females significantly modified their pitch level in response to variation in the addressee, that is, the f0mean and f0min of the speech directed to the formal addressees were significantly lower than those of the speech directed to the informal addressees.

In this section, whether the L2 of the bilingual females, especially those residing in London, was in line with the English of the monolingual females was assessed. It was predicted that (1c) the pitch level of the female bilinguals would not differ significantly from the pitch level of the English monolingual females. Similarly, no differences were predicted between the pitch level of the English monolinguals and bilingual male speakers in their L2 of English (1d).

7.3.1.3.1 English female monolinguals and bilinguals

Tables 7.19, 7.20, 7.21 present descriptive statistics (mean and standard deviation) of the English pitch level of female monolinguals and bilinguals by group, formality and sex of the addressee.

Table 7.19 Descriptive statistics for pitch level of the English of the females by group in the voicemail task. Average and SD for each measurement are reported in Hz

Group	English f0mean		English f0min		English f0max	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English female monolinguals	245	36	222	34	279	42
Female bilinguals UK	240	43	211	40	280	56
Female bilinguals JP	244	31	222	32	286	45

Table 7.20 Descriptive statistics for pitch level of the English of the females by formality of the addressee, in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	English f0mean		English f0min		English f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English female monolinguals	Informal	253	35	231	32	285	43
	Formal	238	36	214	35	272	41
Female bilinguals UK	Informal	249	45	220	39	289	56
	Formal	231	39	203	38	271	56
Female bilinguals JP	Informal	247	32	226	33	290	47
	Formal	241	31	218	31	283	42

Table 7.21 Descriptive statistics for pitch level of the English of the females by sex of the addressee, in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	English f0mean		English f0min		English f0max	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
English female monolinguals	Female	250	38	225	35	284	43
	Male	240	34	220	33	272	41
Female bilinguals UK	Female	241	43	211	42	281	43
	Male	239	43	212	38	280	60
Female bilinguals JP	Female	245	32	221	33	289	45
	Male	243	31	223	32	283	42

For f0mean, only formality of the addressee was found to have an impact on the English of the females (Table 7.22). Pairwise comparisons revealed that the f0mean elicited by the formal addressees was 12.4 ± 3.29 Hz lower than that elicited by the informal addressees (*p* = .0002) (Figure 7.7).

Table 7.22 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for f0mean in the English of the females

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	440.5	220.2	2	0.20	. 812
Formality of the addressee	15107.4	15107.4	1	14.29	. 0002
Sex of the addressee	1540.8	1540.8	1	1.45	.22
N= 624, Random intercept = Speaker (39), Log likelihood= -2577.8, Conditional R^2=0.58, all interactions *p*>.05					

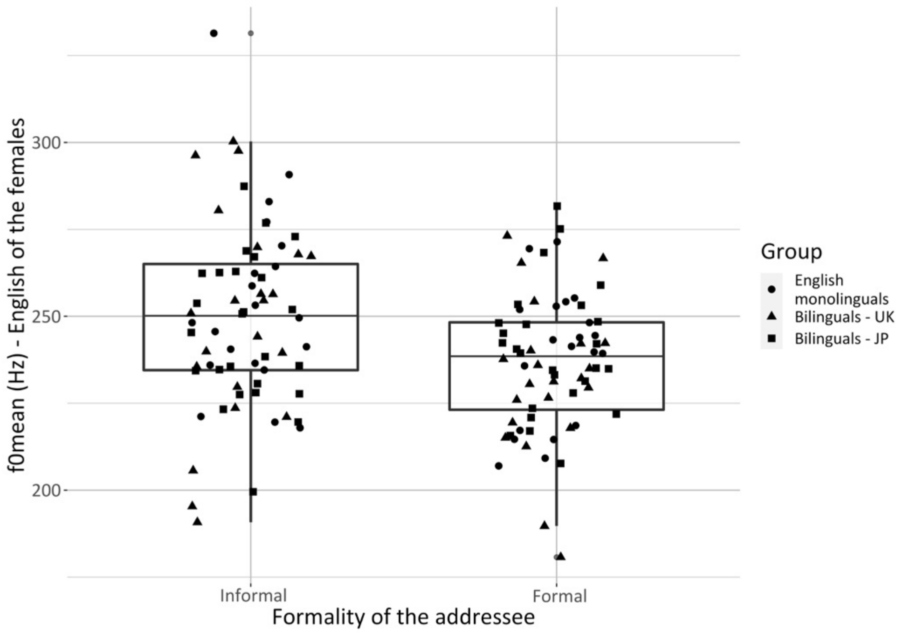


Figure 7.7 Boxplots depicting the significantly lower f0mean elicited by the formal compared to the informal addressees in the speech of the English female monolinguals and bilinguals. Values are averages for each participant.

Table 7.23 reports the results of the LMER for f0min of the English of the females. In line with the previous results, only a main effect of formality of the addressee was revealed. Specifically, the f0min elicited by formal addressees was 13±3 Hz lower than that elicited by the informal addressee (Figure 7.8).

Table 7.23 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for f0mean in the English of the females

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	2349.6	1174.8	2	1.22	.306
Formality of the addressee	17206.7	17206.7	1	17.92	<.0001
Sex of the addressee	9.4	9.4	1	0.01	.921
N= 624, Random intercept = Speaker (39), Log likelihood= -1920.3, Conditional R^2=0.54, all interactions p>.05					

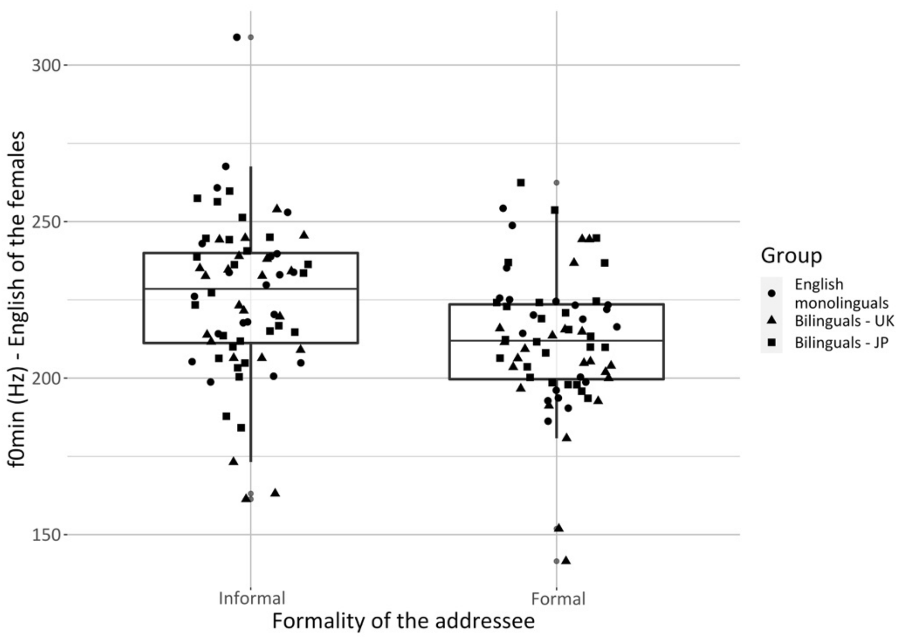


Figure 7.8 Boxplots depicting the significantly lower f0min elicited by the formal compared to the informal addressees in the speech of the English female monolinguals and bilinguals. Values are averages for each participant.

Finally, table 7.24 presents results from the last analysis performed on the English pitch level, that is, f0max, of the females in the voicemail task. Again, results only revealed a significant main effect of formality of the addressee. Pairwise comparisons indicated that the f0max elicited by formal addressees was 12$\pm$4 Hz lower than that elicited by the informal ones (p = .005) (Figure 7.9).

Table 7.24 Analysis of Variance table (Satterthwaite's approximations for degrees of freedom) for the linear mixed regression for f0max in the English of the females in the voicemail task

Factor	Sum of Squares	Mean Square	df	F-value	*p*-value
Group	1046.9	523.4	2	0.28	.754
Formality of the addressee	14487.0	14487.0	1	7.85	.005
Sex of the addressee	3690.1	3690.1	1	1.99	.158
N= 624, Random intercept = Speaker (39), Log likelihood= -2046.9, Conditional R^2=0.51, all interactions p>0.05					

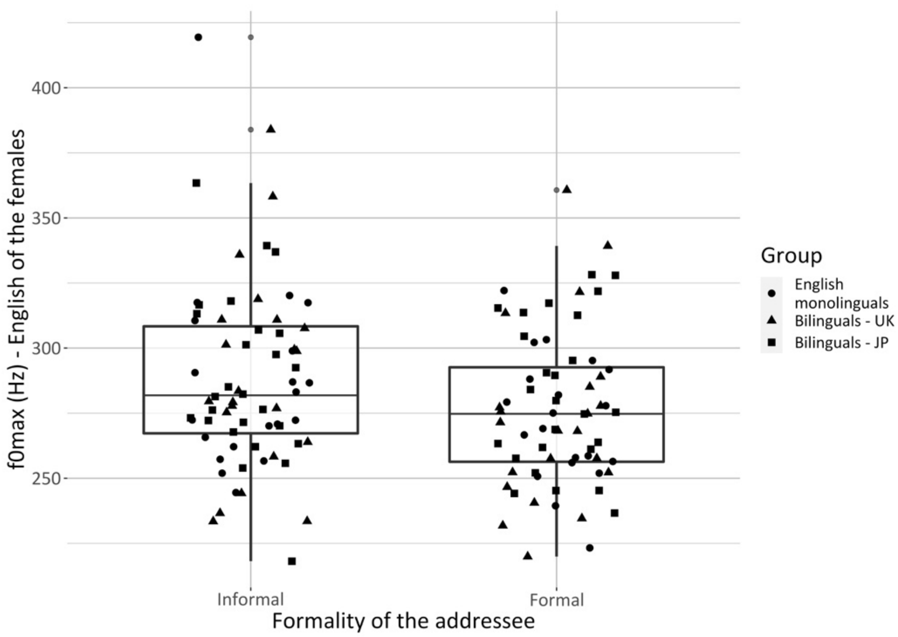


Figure 7.9 Boxplots depicting the significantly lower f0max elicited by the formal addressees compared to the informal addressees in the speech of the English female monolinguals and bilinguals. Values are averages for each participant.

To recap, results from the analysis of the variation in the English pitch level of the female bilinguals were in line with prediction (1c), that is, no differences were evidenced between the pitch level of the bilinguals and monolingual females. Notably, this was also in line with monolingual comparisons. In addition, in line with monolingual findings, English f0mean, f0min and f0max were significantly affected by variation in the formality dimension of the addressee. Specifically, formal addressees elicited a significantly lower f0mean, f0min and f0max than informal addressees in the English of the female bilinguals and monolinguals.

7.3.1.3.2 English male monolinguals and bilinguals

Turning now to the comparison between the pitch level of the English of the male monolinguals and bilinguals in the voicemail task, prediction (1d) and monolingual results indicated that they would not differ. This was confirmed by the inferential analysis.

Table 7.25 Descriptive statistics for pitch level of the English males by group in the voicemail task. Average and SD for each measurement are reported in Hz

Group	English f0mean		English f0min		English f0max	
	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
English monolinguals	137	30	119	27	156	36
Male bilinguals UK	136	39	113	28	159	47
Male bilinguals JP	127	28	112	22	147	36

Table 7.26 Descriptive statistics for pitch level of the English males by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in Hz

Group	Formality of the addressee	English f0mean		English f0min		English f0max	
		$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
English monolinguals	Informal	146	31	126	28	166	36
	Formal	139	27	121	24	157	35
Male bilinguals UK	Informal	135	23	98	13	181	49
	Formal	139	28	98	15	185	46
Male bilinguals JP	Informal	127	17	96	12	166	27
	Formal	128	16	96	12	174	26

Table 7.27 Descriptive statistics for pitch level of the English males by sex of the addressee in the reading task. Average and SD for each measurement are reported in Hz

Group	Sex of the addressee	English f0mean		English f0min		English f0max	
		$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
English monolinguals	Female	140	33	120	29	160	39
	Male	135	28	117	24	153	34
Male bilinguals UK	Female	134	39	110	28	159	51
	Male	137	39	115	29	159	44
Male bilinguals JP	Female	127	28	112	23	145	31
	Male	127	28	112	22	150	41

To recap, in line with the prediction and monolingual results, the pitch level of the English of the male bilinguals and monolinguals did not significantly differ. Notably, this was also found in the case of the reading task.

7.3.1.3.3 Summary of the analysis of the pitch level of the English of the bilinguals

In line with predictions and monolingual results, the pitch level of the English of the female and male bilinguals did not significantly differ from that of the monolinguals.

Interestingly, results substantiated that formality of the addressee affected only the pitch level of the females, which was in line with previous results for the voicemail and the reading tasks. More specifically, it was found that the formal addressees elicited a significantly lower f0mean, f0min and f0max than the informal ones. As discussed in 7.4, these findings seem to suggest that females are under larger constraints than males to modulate their pitch level in line with the perceived (in)formality of the speaking situation and that these constraints are present in speech of both monolinguals and bilinguals

7.3.1.4 Individual variation in the pitch level in the voicemail task

Thus far group comparisons for the pitch level of the monolingual and bilinguals have been reported; in this section the attention turns to the role of the individual variation on pitch level. As detailed in Chapter 3, pitch level has been reported to be affected by individual gender identity (Biemans & Van Bezooijen, 1996; Levon, 2011, 2016, 2018; Podesva, 2007) and as a consequence of the bilingual's language background (de Leeuw et al., 2012; Mennen et al., 2014); and both types of variables were taken into account in the project at hand.

Note that given the lack of L1 attrition and L2 acquisition findings for the pitch level of the bilinguals in the voicemail task, it was considered inappropriate to explain non-significant group effects through an analysis of predictor variables; thus, only the role of individual gender identity in both bilinguals and monolinguals was explored.

A series of mixed effects models were carried out on the monolingual and bilingual speakers separately, with significance level Bonferroni-adjusted for multiple comparisons to $p<.025$ (Hervé, 2010). Maximal models for both languages included group (Japanese monolinguals or English monolinguals or Bilinguals-UK vs. Bilinguals-JP), individual gender identity (i.e. scores on the feminine and masculine scales of the JGRI and BSRI-short) and their interactions as fixed independent factors. Speaker was entered as a random intercept. Importantly, analyses were carried out separately for monolinguals and bilinguals, as the scope here was to assess individual variation, rather than patterns of acquisition/attrition.

7.3.1.4.1 Individual gender identity

For information relative to how individual gender identity was operationalized, the reader is referred to 5.5.1. The general prediction was that, regardless of native language and sex of the speaker, (2a) enhanced endorsement of feminine gender stereotypes would pattern with a higher pitch level on the semi-spontaneous voicemail task and, conversely, that (2b) enhanced endorsement of masculine gender stereotypes would pattern with lower pitch levels.

Results of the LMERs indicated that individual gender identity as measured with the JGRI (Sugihara & Katsurada, 2002) and the BSRI-short (Bem, 1979) were not successful in predicting pitch level variation in the voicemail task.

7.3.1.4.2 Summary of the results of the analysis of individual variation in the pitch level in the reading task

Summing up, individual gender identity did not pattern with variation in the pitch level of the bilinguals. This was not in line with predictions (2a) and (2b), nor with results from the reading task (see 6.3.1.4), whereby the BSRI-short was found to explain variation in the English f0mean of the bilingual females and males. More precisely, a higher self-attribution of masculine traits patterned with lower f0mean in the female bilinguals, whereas a higher self-attribution of feminine traits patterned with lower f0mean in the male bilinguals.

7.3.1.5 General summary of the analysis of pitch level in the voicemail task

The most striking result from the analysis so far was that Japanese and English semi-spontaneous speech was not language specific. This was unexpected; previous work and results from the reading task suggested that there would be a significant difference in the pitch level of the two languages. As is detailed in the discussion (7.4), this discrepancy might be due read speech being more formal, thus elicit more a formal intonation, than semi-spontaneous speech (Laan, 1992; Moyer, 2004; Yaeger-Dror, 2002).

Interestingly, in line with the reading task, the female speakers, but not the males, modified their pitch level to accommodate variation in formality dimension of the addressee. More precisely, the formal addressees consistently elicited a lower pitch level (i.e. f0mean, f0min and f0max) than the informal ones. This held true for the pitch level of both groups of monolinguals and the L1 and L2 of the bilingual females. These results corroborate findings from the reading task which indicated that *only* females varied their f0mean and f0max due to formality and sex of the addressees. The finding that formal addressee elicited lower f0mean, despite at odds with the findings from the reading task which indicated that the formal male elicited a higher f0mean than the informal male, is in line with contemporary research on f0 and politeness in spontaneous speech (e.g. Guillemot & Sano, 2020; Sherr-Ziarko, 2019 for Japanese; Winter & Grawunder, 2012 for Korean; Hübscher et al., 2017 for Catalan).

In the next section, the analysis of the second dimension of pitch range, that is, pitch span, is reported. Here it was of interest was to assess whether pitch level results were replicated in the case of pitch span or whether this dimension of pitch range was constrained by other factors in this voicemail task.

7.3.2 Analysis of the pitch span in the voicemail task

In line with the reading task, this analysis follows the same structure as the analysis of pitch level reported in 7.3.1. For model syntax the reader is referred to 6.3.1.

7.3.2.1 Monolingual pitch span comparisons

Just like in the reading task, firstly, the questions of whether the pitch span of the monolinguals differed significantly across languages and whether variation in the addressee affected monolingual pitch range differently was explored.

It was expected that the pitch span of the Japanese females would be wider than that of the English females (e.g. Ohara, 2001) and that formal addressees would elicit a wider pitch span in the Japanese female speech than in the English female speech (e.g.

Ohara, 2001). No differences were predicted between the pitch span of the monolingual males (Loveday, 1981). However, it is important to note that the findings from the reading task indicated that Japanese pitch span was significantly wider than the English pitch span and this held true for both female *and male* monolinguals, thus it was of interest to determine whether a similar result would also be evidenced in the present task.

7.3.2.1.1 Monolingual females

Tables 7.28, 7.29, and 7.30 report descriptive statistics (mean and standard deviation) for the 80%span of the female monolinguals respectively by language, formality of the addressee and sex of the addressee.

Table 7.28 Descriptive statistics for pitch span of the monolingual females by language in the voicemail task. Average and SD for each measurement are reported in ST

Group	Language	80%span	
		$\bar{x}$	SD
Japanese monolingual females	Japanese	4.5	1.7
English monolingual females	English	3.9	2.4

Table 7.29 Descriptive statistics for pitch range of the monolingual females by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Language	Formality of the addressee	80%span	
			$\bar{x}$	SD
Japanese monolingual females	Japanese	Formal	4.4	1.4
	Japanese	Informal	4.3	2
English monolingual females	English	Formal	4.2	2.1
	English	Informal	3.6	1.7

Table 7.30 Descriptive statistics for pitch range of the monolingual females by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Language	Sex of the addressee	80%span	
			$\bar{x}$	SD
Japanese monolingual females	Japanese	Female	4.3	1.9
	Japanese	Male	4.4	1.5
English monolingual females	English	Female	4.1	2
	English	Male	3.8	1.9

Analysis revealed that none of the factors taken into consideration predicted pitch span variation between the two groups of female monolinguals.

7.3.2.1.2 Monolingual males

Just like the case of the female monolinguals, the pitch span of the male monolinguals was similar in Japanese and English (see Tables 7.31, 7.32, and 7.33) and no significant differences were evidenced.

Table 7.31 Descriptive statistics for pitch span of the monolingual males by language in the voicemail task. Average and SD for each measurement are reported in ST

Group	Language	80%span	
		$\bar{x}$	SD
Japanese monolingual males	Japanese	4.1	3.1
English monolingual males	English	4.3	2.0

Table 7.32 Descriptive statistics for pitch span of the monolingual males by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Language	Formality of the addressee	80%span	
			$\bar{x}$	SD
Japanese monolingual males	Japanese	Formal	3.8	2.4
	Japanese	Informal	4.4	3.7
English monolingual males	English	Formal	4.5	2.0
	English	Informal	4.9	1.9

Table 7.33 Descriptive statistics for pitch span of the monolingual males by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Language	Sex of the addressee	80%span	
			$\bar{x}$	SD
Japanese monolingual males	Japanese	Female	4.5	3.9
	Japanese	Male	3.7	2.3
English monolingual males	English	Female	4.6	2.0
	English	Male	4.6	2.0

7.3.2.1.3 Summary of the analysis of the pitch span of the monolinguals

The analysis of the pitch span of the monolinguals did not reveal any significant findings. This was not in line with the predictions, at least for the female speakers, nor with the results from the reading task pf the present research.

Despite the lack of differences across the pitch span of the monolinguals in this voicemail task, the pitch span of the two languages of the bilinguals was nevertheless compared to the pitch span of the monolinguals to investigate potential deviations from the monolingual norm. For example, would bilinguals show the overall narrower pitch span in their L2 which is claimed in the literature (Aoyama & Guion, 2007; Busà & Urbani, 2011) and would this be dependent on whether they identified as females or males?

7.3.2.2 Japanese monolinguals and bilinguals pitch span in the voicemail task

In this section, whether acquiring English as an L2 impacted the pitch span of the L1 Japanese of the bilinguals was explored by comparing the Japanese pitch span of the bilinguals to that of the Japanese of the monolinguals.

The general prediction was that the (1a) pitch span of the female bilinguals - especially those residing in London - would be narrower than that of the Japanese female monolinguals. This was not predicted to be replicated in male speech (1b). However, due to the lack of differences between monolinguals reported in section 7.3.2.1 above, it might have been that no differences would be evidenced between the Japanese of the monolingual and bilingual males and females, similarly to the reading task.

As in the other L1 analyses, whether age of the speaker predicted 80%span in this task was investigated with a series of one-way ANOVAs. Results indicated that age was not a predictor of pitch span, thus it was removed from further analyses.

7.3.2.2.1 Japanese female monolinguals and bilinguals

Descriptive statistics (mean and standard deviation) for the Japanese of the female monolinguals and bilinguals are reported in Tables 7.34, 7.35, and 7.36 below. As it appears in the descriptive tables, there were no significant differences between the Japanese

80%span of the female monolinguals and bilinguals. This was in contrast to the prediction (1a) and in line with the findings from the reading task.

Table 7.34 Descriptive statistics for pitch span of the Japanese of all females by group in the voicemail task. Average and SD for each measurement are reported in ST

Group	Japanese 80%span	
	$\overline{x}$	SD
Japanese monolinguals	4.4	1.7
Female bilinguals UK	4.5	1.9
Female bilinguals JP	4.6	1.8

Table 7.35 Descriptive statistics for pitch span of the Japanese of all females by formality of the speaker in the voicemail task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	Japanese 80%span	
		$\overline{x}$	SD
Japanese monolinguals	Formal	4.3	2
	Informal	4.4	1.4
Female bilinguals UK	Formal	4.5	2.0
	Informal	4.5	1.9
Female bilinguals JP	Formal	4.6	1.7
	Informal	4.6	1.8

Table 7.36 : Descriptive statistics for pitch span of the Japanese of all females by sex of the speaker in the voicemail task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	Japanese 80%span	
		$\overline{x}$	SD
Japanese monolinguals	Female	4.3	1.9
	Male	4.4	1.5
Female bilinguals UK	Female	4.5	2.0
	Male	4.5	1.8
Female bilinguals JP	Female	4.6	1.7
	Male	4.6	1.9

7.3.2.2.2 Japanese male monolinguals and bilinguals

In line with the previous analysis and prediction (1b), no significant differences were evidenced for the Japanese pitch span of the male monolinguals and bilinguals.

Table 7.37 Descriptive statistics for pitch span of the Japanese of the males by group in the voicemail task. Average and SD for each measurement are reported in ST

Group	Japanese 80%span	
	$\bar{x}$	SD
Japanese monolinguals	4.1	3.0
Male bilinguals UK	5.2	3.0
Male bilinguals JP	5	1.9

Table 7.38 Descriptive statistics for pitch span of the Japanese of the males by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	Japanese 80%span	
		$\bar{x}$	SD
Japanese monolinguals	Formal	3.9	2.4
	Informal	4.4	3.7
Male bilinguals UK	Formal	4.8	2.4
	Informal	5.7	3.4
Male bilinguals JP	Formal	4	1.1
	Informal	6.1	2

Table 7.39 Descriptive statistics for pitch span of the Japanese of the males by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	Japanese 80% span	
		$\bar{x}$	SD
Japanese monolinguals	Female	4.6	3.8
	Male	3.7	2.3
Male bilinguals UK	Female	4.8	2.9
	Male	5.7	2.9
Male bilinguals JP	Female	5	2.2
	Male	5.1	1.6

7.3.2.2.3 Summary of the analysis of the pitch span of the Japanese of the bilinguals

In this section, the Japanese pitch span of the bilinguals was investigated. Findings indicated that, in line with monolingual results, bilingual and monolingual speakers produced Japanese 80%span similarly in this voicemail task. With regard to the effect of the addressee, Japanese pitch span was not affected by the addressee, which is similar to what was reported in the reading task.

7.3.2.3 English monolinguals and bilinguals pitch span in the voicemail task

Turning now to the L2 of the bilinguals, the general prediction was that (1c) the pitch span of the female bilinguals was not predicted to be significantly different that of the English monolingual females. Furthermore, no significant differences were expected between the pitch span of the male bilinguals and monolinguals (1d).

7.3.2.3.1 English female monolinguals and bilinguals

Descriptive statistics (mean and standard deviation) for the pitch span of the English of the females are reported in Tables 7.40, 7.41, and 7.42. No differences were found to be statistically significant between the English of the bilinguals and the English monolinguals. In addition, the English pitch span of the females was not affected by formality nor sex of the addressee.

Table 7.40 Descriptive statistics for pitch span of the English of the females by group in the voicemail task. Average and SD for each measurement are reported in ST

Group	Japanese 80%span	
	$\overline{x}$	SD
English monolinguals	4.0	1.9
Female bilinguals UK	4.8	2.6
Female bilinguals JP	4.4	2.2

Table 7.41 Descriptive statistics for pitch span of the English of the females by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	Japanese 80%span	
		$\overline{x}$	SD
English monolinguals	Formal	3.6	1.7
	Informal	4.4	3.7
Female bilinguals UK	Formal	5.0	2.8
	Informal	4.7	2.5
Female bilinguals JP	Formal	4.6	2.2
	Informal	4.3	2.0

Table 7.42 Descriptive statistics for pitch span of the English of the females by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	Japanese 80%span	
		$\bar{x}$	SD
Japanese monolinguals	Female	4.0	1.9
	Male	3.8	1.9
Female bilinguals UK	Female	5.0	2.7
	Male	4.7	2.5
Female bilinguals JP	Female	4.7	2.5
	Male	4.1	1.9

7.3.2.3.2 English male monolinguals and bilinguals

Turning to the analysis of the pitch span of the English of the males, descriptive statistics for the English of the monolingual and bilingual males are reported in Tables 7.43, 7.44, and 7.45 below. There was no significant difference between the pitch span of the English monolingual males and the pitch span of the bilingual males in their English.

Table 7.43 Descriptive statistics for pitch span of the English of the males by group in the voicemail task. Average and SD for each measurement are reported in ST

Group	Japanese 80%span	
	$\bar{x}$	SD
English monolinguals	4.6	2.0
Male bilinguals UK	5.7	3.0
Male bilinguals JP	4.6	2.4

Table 7.44 Descriptive statistics for pitch span of the English of the males by formality of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Formality of the addressee	Japanese 80%span	
		$\bar{x}$	SD
English monolinguals	Formal	4.8	2.1
	Informal	4.5	1.9
Male bilinguals UK	Formal	5.2	2.4
	Informal	6.9	3.4
Male bilinguals JP	Formal	5.0	2.9
	Informal	4.3	1.9

Table 7.45 Descriptive statistics for pitch span of the English of the males by sex of the addressee in the voicemail task. Average and SD for each measurement are reported in ST

Group	Sex of the addressee	Japanese 80% span	
		$\overline{x}$	SD
English monolinguals	Female	4.6	2
	Male	4.6	2
Male bilinguals UK	Female	6.1	3.2
	Male	5.7	2.8
Male bilinguals JP	Female	4.5	1.8
	Male	4.8	3

7.3.2.3.3 Summary of the analysis of the pitch span of the English of the bilinguals

This section of the analysis investigated the pitch span of the L2 of the bilinguals in comparison to English monolinguals. The findings indicated that the pitch span of the English of the monolinguals and bilinguals did not significantly differ, which held true for both females and males. These findings are in line with findings from the reading task of the present research.

7.3.2.4 Individual variation in the pitch span in the voicemail task

No L1 attrition and L2 acquisition patterns were evidenced in the previous pitch span analysis; thus, it was considered inappropriate to explain non-significant group effects through an analysis of predictor variables; thus, here, only the role of individual gender identity on the pitch span in the present voicemail task was explored, both in monolinguals and bilinguals. For model syntax the reader is referred to 6.3.1.4.

7.3.2.4.1 Individual gender identity

For information relative to how individual gender identity was operationalised, see 5.5.1 The general prediction was that independent of L1 and the sex of the speaker, (2a) enhanced endorsement of feminine gender stereotypes would pattern with wider pitch span and, similarly, that (2b) enhanced endorsement of masculine gender stereotypes would pattern with narrower pitch span.

LMERs revealed that individual gender identity as measured with the JGRI questionnaire and the BSRI-short did not pattern with pitch span variation in any of the groups of participants. This is in line with results from the reading task of the current project.

7.3.2.5 General summary of the analysis of pitch span in the voicemail task

Summarising, this section has examined pitch span of the two languages of the bilinguals in the voicemail task, compared with the appropriate monolingual group. The lack of any significant pattern indicates that Japanese and English, at least with regard to pitch span in the semi-spontaneous speech task used here, are not language- nor gender-specific. This is partially at odds with results for the reading task, which revealed that span was language-specific, that is Japanese 80%span was wider than English 80%span and this was valid for both female and male monolinguals.

These different findings for the reading task and semi-spontaneous speech task are surprising and, at present, it is difficult to provide an explanation. Note that three Japanese monolinguals refused to complete this task, perhaps, overall, the Japanese monolingual speakers did not particularly like the voicemail task which may be reflected in a narrower (thus more monotonous) span compared to the reading task.

7.4 Discussion

Firstly, with regard to the comparison of the monolingual groups, the results indicated that neither pitch level nor pitch span significantly differed between the languages of the Japanese and English female and male monolinguals. In other words, Japanese and English did not demonstrate language-specificity in semi-spontaneous speech.

This finding was somewhat surprising because it was inconsistent with previous work examining pitch range in Japanese and English both in monolinguals and bilinguals. Such previous research has reported that Japanese is characterised by a higher pitch level and a wider pitch span than English, at least with regard to the speech of females (Ohara, 1999, 2001; Yamazawa & Hollien, 1992). Arguably, Ohara (1999, 2001) compared the pitch range of Japanese-English bilinguals and it may be that simply *because* they were bilingual that her participants differentiated their languages, although this would not clearly align with the findings from the bilingual analysis of the present study and with Yamazawa and Hollien's (1992) results.

It is worth noting that almost twenty, and thirty, years have passed since the above-mentioned studies, and it may be that Japanese (and English) language norms have changed since. Research has reported diachronic intonational change in Standard British English (Przedlacka & Baghai Ravary, 2015) and longitudinal work has found a consistent decrease in the pitch level of female speakers of Australian English between the 1950s and 1990s (Pemberton et al., 1998; Russell et al., 1995). With regard to Japanese, there is work which has indicated that high school students break normative gendered rules with regard to their use of personal pronouns (Miyazaki, 2004) and, with regard to intonation, there are anecdotal reports that the Japanese burikko falsetto has gone out of favour amongst women (Kristof, 1995).

Lastly, the present finding was also at odds with the monolingual findings reported for the reading task of the project at hand. For the reading task, it was found that Japanese and English demonstrated language-specificity, that is, Japanese f0max was significantly higher than English f0max and Japanese 80%span was significantly wider than English 80%span. As noted in the introduction to the present chapter, read speech has been reported to have more formal intonation than spontaneous speech (Laan, 1997, 1992; Yaeger-Dror, 2002). It is here suggested that the increased formality of read intonation likely upheld standard language norms in the reading task; and this may justify the reported discrepancy between the monolingual findings in the two tasks of the present project.

Moving on, a further important finding from the monolingual comparisons of the present task concerns the effect of the addressee on the pitch range of the Japanese and English monolinguals. Firstly, in line with the results of the reading task and Ohara (1999), only pitch level (specifically, f0mean and f0min) was significantly affected by variation in the addressee. The direction of the effect was, however, unexpected: formal addressees elicited a lower pitch level (f0mean and f0max) than informal addressees, which is at odds with Ohara (1999) and results of the reading task. Specifically, Ohara reported that the formal addressee (i.e. a professor) elicited a higher f0mean than the informal addressee (i.e. a student) in the Japanese, but not the English, of her bilinguals. In the present reading task, it was found that the male formal addressee elicited a higher f0mean than the formal male and the informal male.

It is worth noting that there is contemporary work which has looked at the role of f0 variation in expressing politeness in *spontaneous* Japanese, Korean and Catalan monolingual speech (Guillemot & Sano, 2020; Sherr-Ziarko, 2019; Yuasa, 2008 for Japanese; Winter & Grawunder, 2012 for Korean; and Hübscher et al., 2017 for Catalan). Very briefly, these studies have shown that formal speech is characterised by a significantly lower f0mean compared to informal speech. It is suggested that the discrepancy between the current results and previous work is, in essence, due to read speech being characterized by a more normative intonation than read speech. Coupled together, results from the reading task and the voicemail task of the current project offered further evidence to the claim that generalisations based on a single speech style (typically the reading of isolated sentences) cannot be blindly applied to other speech styles (for example, semi-spontaneous speech) (Keating & Kuo, 2012; Takano & Ota, 2017; Yaeger-Dror, 2002).

Continuing, 80%span was not affected by variation in the addressee. Ohara (2004) reported that Japanese monolingual females widen their pitch span when talking to customers compared to work colleagues; moreover Yuasa (2008) reported that Japanese female and male monolinguals produced a narrower span when talking with work superiors compared to work colleagues; thus, an effect of the addressee on the pitch span of, at least, the Japanese female monolinguals was expected. It is here tentatively suggested that this discrepancy might be due to methodological differences between the present study and the Ohara's (2004) and Yuasa's (2008) work. Firstly, Ohara (2004) and Yuasa (2008) analysed speech collected outside the laboratory in real-life conversations; it might be that their speakers were affected by variation in their interlocutors' pitch span (e.g. Giles et al., 1991), which was impossible in the present study. Secondly, Ohara (2004) and Yuasa (2008) did not perform statistical tests on the data and conclusions were drawn based on inference from descriptive statistics.

Thus, in line with the current reading task, only females decreased their f0mean and f0min to reflect increased formality in the addressee. This reinforced the claim that females and males use the same variable, pitch level in this case, strategically to signal different social moves in conversation (Levon, 2018, Holmes 1988). In this case, it was suggested that the monolingual females modified their pitch level in line with the addressee to signal positive politeness (that is, acknowledging the interlocutor by creating a common conversational ground). The lack of substantial variation in the pitch level was used by the males to signal negative politeness (that is, acknowledging the interlocutor by maintaining social distance). Moreover, this finding aligned with contemporary studies (Guillemot & Sano, 2020; Hübscher et al., 2017; Sherr-Ziarko, 2019; Winter & Grawunder, 2012) providing further evidence that, contrary to the assumptions of Ohala's Frequency Code (1984), politeness/formality may be expressed with a lowering of the pitch level in spontaneous speech.

Continuing with the comparison of the Japanese of the monolinguals and bilinguals, the inferential analysis indicated that neither the pitch level nor the pitch span of the Japanese of the bilinguals differed from that of the Japanese monolinguals. This was actually to be expected as the monolinguals in Japanese and English also did not significantly differ. In addition, and again in line with monolingual results, variation in the formality impacted *only* the Japanese pitch level of the females; specifically, formal addressees elicited a lower f0mean than with informal addressees. Turning now to the results of the analysis of the L2 of the bilinguals, again not surprisingly, no differences were found between the pitch range of English produced as an L1 and an L2. Again, with regard to the addressee, it was found that *only* female speakers significantly varied their pitch level to accommodate variation in the formality of the addressee, that is, they produced a significantly lower pitch level (f0mean, f0min and f0max) in the formal voicemails than the informal ones.

Summing up, it seemed that the bilingual females maintained the gender norms observed in both Japanese and English monolinguals by adapting their speech to degree of formality, and, likewise, the bilingual males were maintaining gender norms by *not* adapting their speech to degree of formality. Therefore, findings indicated that both female and male bilinguals of this study adhered to gender-specific monolingual norms (Adamson & Regan, 1991).

Continuing with the analysis of individual variables, individual gender identity did not pattern with the pitch range of neither the bilingual nor the monolingual speakers in the voicemail task. This is surprising given previous sociophonetic work indicating that individual gender identity is indexed in monolingual spontaneous speech (e.g. Levon, 2011;

Schmid & Bradley, 2019) and the results of the reading task (i.e. enhanced masculinity patterned with lower f0mean in the English of the bilingual females and enhanced femininity patterned with lower f0mean in the English of the bilingual males). The discrepancy between the present results and previous work may be due to methodological differences; for example, Schmid and Bradley's (2019) participants reported their individual gender identity, whereas here it was investigated with a psychological questionnaire measuring endorsement of gender stereotypes.

The discrepancy with the reading task is, however, more puzzling. Why would the bilinguals' English individual gender identity pattern clearly with their English f0mean in the read but not in the semi-spontaneous speech, considering that the latter is more representative of everyday life speech? At present it is impossible to provide a definite answer to this question as more research is needed, however, it is worth noting that, in the reading task, participants could only manipulate pitch range to express their gender identity. In the voicemail task, on the other hand, speakers were free to manipulate other dimensions of speech and, consequently, the role of pitch level may have become less prominent. For example, to signal a more feminine gender identity, speakers may have used hedges, fillers, intensifiers, hypercorrect grammar, emphatic stress, and discourse markers in their speech (e.g. Lakoff, 1973; Laserna et al., 2014; Coates, 1993 for a review).

Concluding, the two most striking results of the analysis of the voicemail task was that, firstly, Japanese and English did not demonstrate language specificity in semi-spontaneous speech. This was unexpected and, to my knowledge, has never been reported before. The second most striking finding was the effect of formality of the addressee on the pitch level of the Japanese and English monolingual females as well as on the pitch level of both languages of the bilingual females. Finding that females lower their pitch level when addressing formal addressees, is contrary to the Frequency Code's assumption that politeness is expressed with a higher f0mean. A similar finding has been reported for Japanese (Guillemot & Sano, 2020; Sherr-Ziarko, 2019), Korean (Winter & Grawunder, 2012) and Catalan (Hübscher et al., 2017). Notably, the present results offer further evidence for Japanese language and producing novel evidence on British English, at least with regard to female speech. In addition, in line with the reading task, bilingual females maintained the gender norms by adapting their speech to degree of formality, and, likewise, the bilingual males were maintaining gender norms by *not* adapting their speech to degree of formality. Therefore, clearly indicating that both the bilinguals of this study adhered to gender-specific conversational monolingual norms in both of their languages.

8 Conclusion

8.1 Introduction

This project set out to explore the effects of bilingualism on socially constrained attributes of pitch range in female *and* male Japanese L1 speakers who acquired English as an L2 post childhood. This specific language combination was chosen because previous research indicated that, in Japanese, *high pitch* level indexes femininity (and by extension politeness) (Ohara, 2019 for a review) whereas, in English, whilst females generally have a higher pitch level than males, *high pitch* level indexes friendliness in the speech of females and males alike. This difference indicates that, in order to convey friendliness in English, both females and males would need to learn to increase their pitch level, and this might have consequences on their L1 of Japanese.

In the following section, the main findings of this thesis are presented in relation to the research questions that informed the project, and the implications of these findings are discussed. Subsequently, the limitations of this work are presented. Suggestions for future research are presented thereafter. The chapter concludes with an account of the contributions of the present work.

8.2 Summary of results

This research explored the pitch range of the two languages of two groups of Japanese-English sequential bilingual, 19 living in London (UK) (N = 12 females, N = 7 males) and 21 living in Tokyo (JP) (N = 17 females, N = 5 males) with regard to L1 attrition and L2 acquisition. Two speech tasks were conducted, a reading task and a voicemail task; in both cases, speech was addressed to an imaginary addressee to try to elicit the same type of speech the bilinguals would use, had they spoken to these people in real life.

The following three main research questions guided the project:

- Is there a bidirectional interaction in the production of pitch range in the two languages of Japanese-English female and male bilinguals residing in London (UK) or Tokyo (JP)?

- Does individual gender identity influence variation in the pitch range of the two languages of female and male Japanese-English sequential bilinguals?
- Do bilingualism predictor variables explain variation in the L1 attrition and L2 acquisition findings?

With regard to the first research question, gender-specific patterns of L1 attrition and L2 acquisition were evidenced with regard to read speech, but not semi-spontaneous speech, suggesting that the formality of read speech might enhance the production of language and gender normative pitch range.

Japanese read speech, irrespective of the addressee, was produced with a significantly higher f0max and wider 80%span compared to English read speech by female *and* male monolinguals. In other words, Japanese read speech was characterised by higher peaks (f0max) and, potentially consequently, an upward expansion of the pitch span (80%span) in comparison to English read speech. That these results were confirmed both in the speech of female and male monolinguals was surprising; most literature indicates that Japanese and English pitch range differ *only* in the speech of women (Loveday, 1981; Ohara, 2019; Yuasa, 2008 and see Chapter 4) due to socio-cultural differences between the two languages. Arguably, the current findings are in line with Graham's (2015) small study on cross-language pitch range variation in Japanese-English simultaneous balanced bilinguals and seems to support the argument that differences between Japanese and English are, in fact, phonological in nature (Graham, 2015; Yamazawa & Hollien, 1992).

Regarding L1 attrition and L2 acquisition, results indicated (1) cross-language phonetic interactions between the L1 and the L2 of the bilinguals and (2) that gender of the speaker played an important role in explaining patterns of variation in the L1 and L2 bilinguals, which suggests that there is more to cross-language differences between the pitch range of the two languages of Japanese-English sequential bilinguals than mere linguistic constraints. More precisely, with regard to the L1 of the bilinguals, the current results revealed that the pitch level of the male bilinguals was significantly different from the pitch level of male monolinguals. This result has been interpreted as an indication of L1 attrition in the phonetic domain of the Japanese of the bilingual males (see below). Notably, the finding was confirmed for *both* the bilingual males tested in London and in Tokyo, indicating that attrition in the L1 sociophonetic competence is affected to a similar degree by the acquisition of the L2 in bilinguals residing in the L1- and the L2-speaking country alike.

With regard to the L2 of the bilinguals, results indicated that it was only the pitch level of the female bilinguals that significantly differed from that of English female monolinguals, suggesting a transfer from the L1 onto the L2. Again, this result was confirmed for the bilingual females in London and Tokyo, JP; suggesting that language interactions in bilinguals are not necessarily dependent on whether the bilingual resides in the L1- or L2-speaking country.

In line with Mennen's (2015) LiLt's assumption, the present results indicate that the L1 and L2 of a speaker co-exist within the same phonological space. Interestingly, the phonetic implementation of these interactions took the form of dissimilation effects in the case of the L1 of the male bilinguals and the L2 of the female bilinguals. Specifically, the male bilinguals overshot the monolingual norm in their L1, whereas the female bilinguals overshot the monolingual norm in their L2. Interpreting these results, one could argue that they indicate that male bilinguals were more successful than female bilinguals at acquiring their L2, whereas the female bilinguals were more successful at maintaining their L1. This explanation, however, fails to account for the reasons for which the males may have been more successful L2 learners and the females more successful at maintaining their L1. Bilinguals are active agents in their language use, choice and targets for acquisition (Hansen Edwards, 2008 and see chapter 2), and the present results provide empirical evidence to this claim. Patterns of L1 attrition and L2 acquisition in the present bilinguals appears to be constrained by and exploit Japanese gendered norms. By overshooting the f0min of the Japanese male monolinguals, the male bilinguals seemed to corroborate the traditional vocal image that the Japanese society expects of the Japanese man in their L1 (Loveday, 1981; Ohara, 1992), therefore ensuring they sounded cool and not effeminate. On the other hand, using the same phonetic strategy, the female bilinguals seemed to transfer the traditional vocal image that the Japanese society expects of the Japanese woman onto their L2 (Ohara, 2019; Okamoto, 2018). Whether this was done to ensure they sounded feminine in their L2, thus differentiating themselves from less-feminine English females, or to ensure that the virtues of politeness and softness of the Japanese woman were dutifully represented in their English is, however, impossible to say.

Concluding, these findings clearly indicated that the present bilinguals applied gender norms selectively to their L1 (in the case of the males) and their L2 (in the case of the females). Besides providing evidence to the claim that systematic variation in their speech is, at least partly, due to social variables (in this case gender), and thus highlighting the importance of implementing sociolinguistic variables in models of L2 speech, these results are also in line with previous work suggesting that Japanese females appear under social pressures to perform a normative gender in their speech (Ohara, 2004).

The above-mentioned findings were not replicated in the semi-spontaneous voicemail task. Firstly, monolingual comparisons did not reveal language-specific variation and, not surprisingly, bilinguals produced their L1 and L2 in line with monolinguals. This discrepancy between tasks has been explained by suggesting that that it was the increased formality of read speech which enhanced the production of language and gender normative pitch level of the present speakers (Laan, 1992; Takano & Ota, 2017; Yaeger-Dror, 2002). In line with Takano & Ota (2017), it was noted that such discrepancies highlighted the importance of taking into consideration different speaking styles in research on prosodic features of speech.

Regarding the imagined addressee, monolingual comparisons did not reveal language-specific findings in either of the tasks. Yet, in both tasks, the pitch level, but not the pitch span, of both groups of female monolinguals patterned with changes in the formality and sex of the imagined addressee. More precisely, regarding the pitch level of the female monolinguals, in the reading task, the formal male addressee elicited a higher f0mean than the formal female and the informal male (neither of these differences were replicated in the case of the female addressees). Moreover, female addressees elicited a higher f0min than male addressees on the part of the female monolinguals. In the voicemail task, formal addressees, irrespective of their sex, elicited a lower f0mean and a lower f0min than informal addressees on the part of the females. Monolingual males, on the other hand, did not vary their pitch level much to reflect variation in the addressee in neither task. In both tasks, bilingual females and males replicated the monolingual patterns in both of their languages; thus, replicating the observed gendered norms in both of their languages.

The finding that the monolingual (and bilingual) females, but not the monolingual (and bilingual) males, of the present sample significantly varied their pitch level to reflect the addressees' (in)formality and sex suggests gendered responses to variation in speech settings. This is in line with previous work indicating that females and males may use the same variable, pitch level in this case, strategically to signal different social moves in conversation (Levon, 2018; Holmes, 1998). In this case, it was suggested that the monolingual females modified their pitch level in line with the addressee to signal positive politeness (that is, acknowledging the in(formality) and sex of interlocutor by creating a common conversational ground). The lack of substantial variation in the pitch level was used by the males to signal negative politeness (that is, acknowledging the in(formality) and sex interlocutor by maintaining social distance).

Results also indicated that monolingual females expressed positive politeness differently across tasks (that is, by increasing in the pitch level in the reading task and decreasing in the pitch level in the voicemail task), whereas males expressed negative politeness by refraining to modify their pitch level in both tasks. This is notable and suggests that, in the present sample, the phonetic correlate of positive politeness is manipulation of the pitch level and that of negative politeness is lack of manipulation of the pitch level, rather than increase versus decrease of the pitch level as reported in previous work (Yuasa, 2008). A last interesting remark is the lack of cross-language differences across Japanese and English monolinguals which is at odds with *all* the previous research on these two languages detailed in Chapter 4. Whether this is due to a change in the Japanese and English language norms or to the current participants living in a highly interconnected and global world, and this finding being a sign of politeness strategies that go beyond language specificity, is impossible to say and more research is needed.

Moving on to the second research question, the data point to a number of valuable findings. Firstly, with respect to the English of the bilinguals in the reading task, results indicated that a higher self-attribution of masculine traits on the BSRI-short (Bem, 1979) patterned with lower mean F0s among the female bilinguals and, somehow surprisingly, a higher self-attribution of feminine traits patterned with lower mean F0s among the males. In other words, more masculine females and more feminine males produced the lowest mean F0s in English. The link between enhanced masculinity and lower mean F0s in female speakers has been hypothesized elsewhere (Biemans & Van Bezooijen, 1996). Our analysis provided quantitative evidence that, among these female bilinguals, a more masculine gender identity is correlated with lower mean F0s (Weirich & Simpson, 2018). On the contrary, the link between enhanced femininity and lower mean F0s in the English of the male bilinguals appears counterintuitive, as a higher mean F0 is normally assumed to index a more feminine gender identity (Biemans & Van Bezooijen, 1996). Eckert's (2008) notion of *indexical field* was used to account for both results. Specifically, it was suggested that *lower f0mean* activated different indexical meanings in the bilingual females and males of the present sample. In the speech of the bilingual females, it activated the first order indexical meaning of *decreased femininity* (or *increased masculinity*), thus mapping a one-to-one correspondence between form and meaning of this variable. In the speech of the bilingual males, on the contrary, *lower f0mean* activated the second order indexical meaning, thus becoming a stylistic marker, used to signalling *reduced politeness*.

Secondly, with respect to the voicemail task, individual gender identity was unsuccessful at explaining pitch range patterns in both English and Japanese. This has been tentatively explained by suggesting that, in the voicemail task, where speakers could manipulate any aspect of their speech to express their individual gender identity, the role of pitch level may have become less prominent.

Thirdly, Japanese gender identity did not pattern with pitch range in any of the tasks. Whether this was due to a shortcoming of the questionnaire used (JGRI: Sugihara & Katsurada, 2002) or to specific characteristic of the speakers of the project at hand is, at present, impossible to say. There is work suggesting that traditional gender roles may have changed in Japanese society since the 1980s (Sugihara & Katsurada, 2002), that is, since equal education opportunities for females and males were introduced. More women became part of the workforce and eventually kept working outside the house after getting married (Sugihara & Katsurada, 2002). As a consequence, it is argued, females may have embraced more traditionally masculine gender traits, that is traits which relate to working outside the house (Sugihara & Katsurada, 2002). Thus, it may be that some of the traits in the JGRI were simply no longer reflective of gender norms in Japanese society. For example, average females' and males' ratings for the traditionally male trait 'have leadership abilities' and the traditionally feminine trait 'polite' were identical (specifically, 5.2/10 for the former and 4.7/10 for the latter). Moreover, it is worth noting that most of the Japanese monolinguals and bilinguals, especially those residing in Japan, were studying traditionally masculine academic disciplines (such as engineering and law) at Sophia University in Tokyo, that is a high profile traditionally male university, and in the UK. It is tentatively suggested that this may have impacted how the Japanese females of the present sample ratified traditionally feminine gender traits which attribute the woman to the role of the 'good wife and wise mother'.

It is interesting that the English questionnaire appeared to be more effective in describing the bilinguals' individual gender identity. This is surprising, especially because scores on the BSRI-short did not predict variation in the pitch range of the English monolinguals. There is some evidence that a speaker's pitch range does not necessarily pattern with a speaker's gender identity in gender-egalitarian societies (e.g. Moore, 1995; Weirich & Simpson, 2018). Assuming the English society to be more gender-egalitarian than the Japanese one and considering gender-specific norms to be more prominent in Japanese than English, it is suggested that the bilinguals felt free to use their pitch range to express their individual gender identity in their L2, as opposed to the normative gender identity they are expected to express in their L1, and therefore did not hesitate to do so.

Lastly, the question of whether language background influenced L1 attrition and L2 acquisition in these two groups of bilingual females and males was explored. Surprisingly, the data revealed that none of the variables taken into consideration in the present study (i.e. AoA, LoR, L1 use, L1/L2 proficiency) were able to further characterise the L1 attrition and L2 acquisition findings. In addition, residing in either the L1 or the L2- speaking country did not have an effect on the pitch range of the two languages of the bilinguals. This was unexpected (see, e.g. de Leeuw et al., 2012; Mennen & de Leeuw, 2014; Ullakonoja, 2007), and this result was tentatively attributed to the bilinguals' language profiles being very homogeneous, at least with regards to AoA, LoR, L1 use, L1/L2 proficiency and language dominance. At a group level, gender specific L1 attrition and L2 acquisition was observed with bilingual males evidencing a significantly lower minf0 than Japanese monolingual males and bilingual females evidencing a significantly higher f0mean and f0max than Japanese monolingual females. However, surprisingly, the bilingual background data did not prove to be explanatory in describing any potential variation between bilinguals. It seems, therefore, that gender identity was the most significant predictor variable in explaining interpersonal variation observed in the bilingual group. Therefore, this study shows that the study of traditional bilingual predictor variables can be enhanced through a more nuanced investigation of social identities (Hansen Edwards, 2006; Ohara, 2001), such as it is delivered here through the English and Japanese individual gender questionnaires.

To conclude, in Chapter 4, it was proposed that it is only by taking into consideration sociolinguistic factors that cross-language pitch range differences can be fully explained. The results of the present study provide clear evidence that this is the case. The Japanese female *and* male monolingual speakers produced higher peaks and a larger span compared to the English female *and* male monolinguals, and this is likely due to the pitch accent nature of Japanese. However, the findings that only the female speakers systematically manipulated their pitch level to reflect variation in the addressee, and that L1 attrition and L2 acquisition were gendered, clearly indicate that to fully appreciate prosodic variation, sociolinguistic factors must be accounted for.

8.3 Limitations

This research inevitably presents limitations; some were derived from the experimental design, and some were unavoidable consequences of human research. In the present sections the limitations of this study are briefly presented and suggestions for improvement are provided.

First, it must be noted that laboratory speech will never truly correspond to real life speech. While steps were taken to ensure that the tasks elicited natural speech and that the presence of the researcher was not felt, it is not possible to completely eliminate the effect of being in a laboratory setting. As discussed in the methodology, a laboratory approach was adopted to ensure high quality in the speech recordings, however, one needs to consider the advantage of maximising experimental control and the disadvantage of minimising authenticity. This was the first exploration of the effect of L1 attrition and L2 acquisition of a gendered variable, and so it was decided to prioritise the former, and conduct the study in controlled conditions. It is suggested that further research should be carried out by marrying laboratory and ethnographic data collection.

Second, with regards to the experimental set-up, every effort was made to ensure the speakers were not influenced by the researcher’s presence by automatising the data collection. Yet, it is important to recognise the limitations of the strategy used, which tried to balance automatization with possible human interference. For example, the microphone was adjusted by the present author, who also monitored the data collection from the main room of the laboratory. It has been argued that it is the very presence of a researcher that affects speech (Rosenthal, 1976); thus in future studies, it may be advantageous to fully automatise the data collection.

Third, any study which examines human behaviour should be short enough to ensure fatigue and boredom are kept to a minimum. The present study was quite long, partly because it comprised three tasks, and partly because the bilinguals did the study in both of their languages on the same day. These choices were informed by the desire to explore both pitch production and perception in the same participants, and partly to avoid drop-outs. Future studies may benefit from reducing the number of tasks and allowing participants to do the experiment in the two languages on two different days. If some participants may not return for the second part, the advantage is that those who do return will be likely less tired and conditioned by the experience of having already done the task once in the same day. Arguably, this would lead to more authentic data.

Fourth, to fully comment on the effect of gender on speech, data from a comparable number of female and male speakers should be collected. As detailed in the methods, all efforts were made to recruit more male speakers, however this was ultimately impossible, and the number of males was roughly a third of the females. This is a well-known problem of linguistic research (Clopper et al., 2011; Porter & Whitcomb, 2005) and not necessarily a fault of the present experimental design. However, sample size does affect results of inferential analyses, and ultimately the generalisability of the findings. Consequently, despite most of the present findings on male speech aligning with previous work on similar issues, whether they are fully generalisable to the general population of Japanese-English males bilinguals is unsure. Therefore, with regard to the male bilinguals, this study should be viewed as an exploratory investigation, which, it is hoped, has shown the complexity of gender-driven patterns on pitch range.

Continuing, in this study, individual gender was operationalised through two gender identity questionnaires. However, other operationalisations are conceivable. An example is Tielen (1992), who included individuals in her research from different professions in which women or men are unevenly represented. Schmid & Bradley (2019) asked the participants to self-report their gender identity. As noted elsewhere, the questionnaires chosen probably did not cover all aspects of gender identity that are relevant in present-day Japanese and English societies, and interactions of gender characteristics with the age of the participants are to be expected (see Biemans, 2000 for a similar argument). In addition, several, if not all, questions of both questionnaires were built around a heterosexual cisgender viewpoint, whereas femininity and masculinity differences also play a role for homosexual and gender binary individuals. Whether this has impacted the results of the present study is impossible to say, however, for future research it is recommended to couple psychological measures with self-reported classifications of gender identity. Arguably, this may offer a more encompassing picture of the effect of this variable on pitch range.

A last important issue is the language proficiency of the participants. As detailed in the methods, it was initially hoped to collect an objective measure of language proficiency, but for practical reasons this was not possible. As a consequence, L1 and L2 proficiency were self-reported. Whilst previous work has suggested that self-reported proficiency matches proficiency obtained with grammar placement tests (Marian et al., 2007), the rather high L1 and L2 proficiencies of the present bilinguals is puzzling, especially in light of an impressionistic analysis of their L2 speech. This is not to suggest that the bilinguals lied with regard to their proficiency, rather that perhaps only bilinguals who really believed they had a high L1 and L2 proficiency responded to the call for participants. Consequently, the potential role of proficiency to predict pitch patterns in the present bilinguals was somehow lost. For further research it is recommended to couple self-reported proficiency with results from a foreign accent rating experiment for the speech to obtain a more valid measure of L1 and L2 proficiency in bilinguals.

8.4 Future research

Aside from replicating the research with the above-mentioned recommendations in place, many questions remain unanswered and much related and additional work needs to be done to fully understand the effect of gender on the pitch range of the two languages of bilingual speakers.

The study of how pitch patterns reflect gender in the two languages of bilinguals cannot be based on one language combination alone. Sociolinguistic research has clearly indicated that whilst gender may be a universal construct, each language and society ratify it differently. It was decided to focus on Japanese-English bilinguals because in Japanese there exists a specific variety for women and men; however, it is not assumed that the same results will necessarily be found in other language combinations.

Sociolinguistics has also shown that gender intersects with other social variables such as age, race, social class and sexuality. In the present study, social variation was reduced to a minimum by carefully selecting speakers; however, it is possible that had the speakers been teenagers, different results would have arisen (see Eckert, 2017 for a review). It is therefore suggested that the same questions should be applied to other social groups to investigate whether the same speech strategies will be replicated.

Communicative strategies between speakers are affected by the precise social situation that a conversation takes place in, as well as the topic of the conversation (Lewis, 2002). In the present study, the social situation was determined by showing images of addressees and that the topic of conversation was determined by the instructions given. However, it is beyond doubt that addressing to an imaged person is different from having an actual conversation and that a singular topic of conversation is far from enough to account for real life variation in speech. To uncover the situated meaning of pitch range variation in the speech of bilinguals, ethnographic studies, such as Eckert (2000) are needed to obtain a fuller and more nuanced picture. In addition, it is also worth noting that the present study has explored global changes in the pitch range of the bilinguals over a sentence or sections of a voicemail; the next step would be to explore the specific changes within IPs to determine the extent to which these vary according to the gender of the speaker, to potential stance taken and the addressee.

Concluding, it is noted that while speakers' intentions are interesting regardless of their communicative effects, a crucial part of the communicative puzzle lies in discovering (and describing) the effects of their communicative efforts. Perhaps the most important sociophonetic ramification of an indexical feature of speech such as pitch range is its effect on the hearers. What do the pitch patterns employed by the speakers convey? Are the bilinguals' pitch patterns perceived similarly to monolinguals' pitch patterns in their two languages? These are all very interesting and unanswered questions; coupling production and perception studies investigating expression of social meaning in bilingual speech is therefore recommended for future research.

8.5 Implications

Despite its limitations, this research has far-reaching implications for the fields of sociophonetics, bilingualism, and gender and language studies. It is a first concrete step towards understanding how a gendered L1 variable affects and is affected by the acquisition of an L2 with regard to L1 attrition and L2 acquisition and, to my knowledge, among some of the very few experimental works that has shown a clear effect of gendered norms on the pitch range of the two languages of female and male bilinguals.

First and foremost, this research expanded on existing L1 attrition and L2 acquisition laboratory research by including a social variable – gender – in the experimental design. Notably, gender was investigated at group level by comparing differences across the factors that affected pitch range in self-reported female and male bilinguals, and at individual level by investigating the role of individual gender identity, as operationalised with the BSRI-short and the JGRI questionnaires, on the speech of the bilinguals. Understanding the role of social factors in determining speech production in bilinguals has theoretical implications for the study of bilingualism and sociophonetics. By acknowledging that bilinguals are more than 'passive vessels for [language] input and output' (Piller & Pavlenko, 2006, p. 231), many of the incongruent findings of existing research on L1 attrition and L2 acquisition of speech may be clarified. As noted in 8.1, current theoretical models of L2 acquisition (and L1 attrition) of speech would have not been able to account for the gender-specific results evidenced in this research, and it was only by invoking Japanese gendered language norms that patterns of L1 attrition and L2 acquisition could be fully understood. As such, the results of the present study have far reaching consequences; by describing gendered L1 attrition and L2 acquisition of pitch range in this sample, they clearly indicate the importance of accounting for sociolinguistic factors when assessing bilingual speech and the relevance of implementing sociolinguistic variables in L2 speech models.

Secondly, the present results add to existing evidence that sequential bilinguals realise pitch range differently in their two languages. Surprisingly, there were no noteworthy differences between the two testing locations, that is London, UK and Tokyo, Japan. This was unexpected as an effect of increased exposure to the L2 has been reported on the L1 and the L2 of the bilinguals (e.g., Köpke & Schmid, 2004; de Leeuw, 2019a; Piske et al., 2001). However, there were no differences between AoA, LoR and L1/L2 proficiency between the two groups of female and male bilinguals and this may have led to the reported similar pitch ranges. Interestingly, a social variable, gender, proved to be more meaningful in describing individual variation in the L2 of the bilinguals than any of the traditional variables examined in bilingualism research. AoA, LoR, L1 use, L1/L2 proficiency and language dominance were all found to be not significant in predicting individual variation in L1 attrition and L2 acquisition, however, individual gender identity was significant in predicting individual variation in the English of these Japanese-English bilinguals. This finding further corroborates the suggestion that L2 speech models need to be expanded to account for sociolinguistic variation in the two languages of the bilinguals and, importantly, provides some of the first laboratory evidence that sequential bilinguals are active agents in their speech choices and that they implement pitch range to make social moves and express individual gender identity.

Concluding, the present research adds to previous work indicating that L2 learners can acquire L2 sociolinguistic variation (Drummond 2011, 2012) and use L2 variants to express individual identity (Nance et al, 2016). In addition, and importantly, this work expands on these findings by indicating that (1) sociophonetic competence in the L1 of bilinguals may be affected by acquiring an L2, and (2) bilingual females and males express different gendered identities through pitch range in their two languages.

Moving on, regarding the two languages object of this research, the present findings suggest that differences between normative Japanese and English pitch ranges are both phonological and phonetic. On the one side, the finding that Japanese is produced with a significantly higher f0max and significantly wider 80%span than English is in line with work indicating that Japanese is characterized by an intrinsically higher pitch range than English

(Graham, 2005; Yamazawa & Hollien, 1992). At the same time, the gender-specific patterns of L1 attrition and L2 acquisition revealed in the speech of the current bilinguals are a testimony to the important role that language-specific socio-cultural norms play in the phonetic implementation of pitch range in Japanese and English (Loveday, 1981; Ohara, 1992; Ohara, 1999). Specifically, the current results suggest that both Japanese-English female *and* male bilinguals are constrained by and exploit gendered norms in their speech to make social moves and style identities (Morimoto & Okamoto, 2021). Interestingly, the present bilinguals appeared to use normative JWL and JML prosodic features, perhaps as a way to embody traditional Japanese identities, whilst, at the same time, they did not hesitate to express individual gender identity through pitch range in English. It may be that they felt less pressured to perform a normative identity in their L2, however, further research marrying experimental methods and sociolinguistic interviews is needed to support this claim. Again, these results clearly highlight the importance of taking into account social variables in general, and gender in particular, when assessing patterns of variation between and within the two languages of bilingual females and males.

Practically, these findings are also consequential. Bilinguals make up more than half of the world population, therefore understanding patterns of variation in their languages is relevant to our understanding of the human capacity for language and speech more generally. In addition, bilinguals and bilingual migrants in particular, may experience a number of issues due to navigating two languages as this may impact their daily life in their two languages as well as their sense of identity (see, for example, Mori, 1997).

Finally, the present research also contributes to the field of experimental phonetics at large. Gender-linked variability has thus far been relatively understudied in laboratory-based studies of L1 attrition and L2 acquisition of prosody; it is hoped that the present study provides a valuable methodology to do so. Furthermore this study clearly highlights the importance of taking into consideration different speaking styles in research on pitch range.

Concluding it is hoped that the present work has been successful in showing the importance of taking into consideration sociolinguistic factors when addressing variation in bilingual speech, thus paving the way for a ‘sociophonetic turn’ in research on L1 attrition and L2 acquisition of speech.

Bibliography

Adamson, H. D., & Regan, V. M. (1991). The Acquisition of Community Speech Norms by Asian Immigrants Learning English as a Second Language: A Preliminary Study. *Studies in Second Language Acquisition*, *13*(1), 1–22. https://doi.org/10.1017/S0272263100009694

Adank, P., Stewart, A. J., Connell, L., & Wood, J. (2013). Accent imitation positively affects language attitudes. *Frontiers in Psychology*, *4*. https://doi.org/10.3389/fpsyg.2013.00280

Addington, D. W. (1968). The relationship of selected vocal characteristics to personality perception. *Speech Monographs*, *35*(4), 492–503. https://doi.org/10.1080/03637756809375599

Adobe. (2017). *Adobe Character Animator CC* (Beta) [Computer software]. Adobe Systems incorporated. https://www.adobe.com

Altenberg, E. P., & Ferrand, C. T. (2006). Fundamental Frequency in Monolingual English, Bilingual English/Russian, and Bilingual English/Cantonese Young Adult Women. *Journal of Voice*, *20*(1), 89–96. https://doi.org/10.1016/j.jvoice.2005.01.005

Aoyama, K., & Guion, S. G. (2007). Prosody in second language acquisition: Acoustic analyses of duration and F0 range. In O.-S. Bohn & M. J. Munro (Eds.), *Language Learning & Language Teaching* (Vol. 17, pp. 281–297). John Benjamins Publishing Company. https://doi.org/10.1075/lllt.17.24aoy *Average sizes of men and women*. (2020). WorldData.Info. https://www.worlddata.info/average-bodyheight.php

Babel, M. (2009). *Phonetic and Social Selectivity in Speech Accommodation* [University of California, Berkely]. http://www.communicationcache.com/uploads/1/0/8/8/10887248/phonetic_and_social_selectivity_in_speech_accommodation.pdf

Babel, M. (2012). Evidence for phonetic and social selectivity in spontaneous phonetic imitation. *Journal of Phonetics*, *40*(1), 177–189. https://doi.org/10.1016/j.wocn.2011.09.001

Baken, R. J., & Orlikoff, R. F. (2000). *Clinical measurement of speech and voice* (2nd ed). Singular Thomson Learning.

Baken, Ronald J., & Orlikoff, R. F. (2000). *Clinical Measurement of Speech and Voice*. Cengage Learning.

Baker, C. (2001). Foundations of bilingual education and bilingualism (3rd ed). Multilingual Matters.

Barry, A. S. (2007). The form, function, and distribution of high rising intonation in Southern Californian and Southern British English. University of Sheffield.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using **lme4**. *Journal of Statistical Software*, *67*(1).

Beckman, M. (1986). *Stress and non-stress accent*. Foris Publ.

Beckman, M. E., & Pierrehumbert, J. B. (1986). Intonational structure in Japanese and English. *Phonology Yearbook*, *3*, 255–309.

Beebe, L. M. (1980). SOCIOLINGUISTIC VARIATION AND STYLE SHIFTING IN SECOND LANGUAGE ACQUISITION [1]. *Language Learning*, *30*(2), 433–445. https://doi.org/10.1111/j.1467-1770.1980.tb00327.x

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and Clinical Psychology*, *42*(2), 155–162. https://doi.org/10.1037/h0036215

Bem, S. L. (1979). Theory and measurement of androgyny: A reply to the Pedhazur-Tetenbaum and Locksley-Colten critiques. *Journal of Personality and Social Psychology*, *37*(6), 1047–1054. https://doi.org/10.1037/0022-3514.37.6.1047

Best, C. T. (1995). A direct realist view of cross-language speech perception. In W. Strange (Ed.), *Speech Perception and Linguistic Experience: Issues in Cross-Language Research* (pp. 171–204). York Press.

Best, C. T., & Tyler, M. D. (2007). Nonnative and second-language speech perception: Commonalities and complementarities. In O.-S. Bohn & M. J. Munro (Eds.), *Language Learning & Language Teaching* (Vol. 17, pp. 13–34). John Benjamins Publishing Company. https://doi.org/10.1075/lllt.17.07bes

Bhatia, T. K. (2017). Bilingualism and Multilingualism from a Socio-Psychological Perspective. In T. K. Bhatia, *Oxford Research Encyclopedia of Linguistics*. Oxford University Press. https://doi.org/10.1093/acrefore/9780199384655.013.82

Bidelman, G. M., Gandour, J. T., & Krishnan, A. (2011). Cross-domain Effects of Music and Language Experience on the Representation of Pitch in the Human Auditory Brainstem. *Journal of Cognitive Neuroscience*, *23*(2), 425–434. https://doi.org/10.1162/jocn.2009.21362

Biemans, M. (1998). The Effect of Biological Gender (Sex) and Social Gender (Gender Identity) on Three Pitch Measures. *Linguistics in the Netherlands*, *15*, 41–52. https://doi.org/10.1075/avt.15.06bie

Biemans, M. (2000). *Gender variation in voice quality*. Landelijke Onderzoekschool Taalwetenschap.

Biemans, M., & Van Bezooijen, R. (1996). *The effect of masculinity and femininity on pitch* (N. Warner, J. Ahlers, L. Bilmes, M. Oliver, S. Wertheim, & M. Chen, Eds.; pp. 25–36). Berkeley Women and Language Group.

Birdsong, D., & Molis, M. (2001). On the Evidence for Maturational Constraints in Second-Language Acquisition. *Journal of Memory and Language*, *44*(2), 235–249. https://doi.org/10.1006/jmla.2000.2750

Bloomfield, L. (1933). *Language*. Holt.

Boersma, P., & Weenink, D. (2016). *Praat: Doing phonetics by computer.* (6.0.26) [Computer software]. http://www.praat.org/

Bogulski, C. A., Rakoczy, M., Goodman, M., & Bialystok, E. (2015). Executive control in fluent and lapsed bilinguals. *Bilingualism: Language and Cognition*, *18*(03), 561–567. https://doi.org/10.1017/S1366728914000856

Baladzhaeva, L., & Laufer, B. (2018). Is first language attrition possible without second language knowledge? *International Review of Applied Linguistics in Language Teaching*, *56*(2), 103–136. https://doi.org/10.1515/iral-2016-0066

Bolinger, D. (1986). Intonation and its parts: Melody in spoken English. Stanford University Press.

Bolinger, D. (1989). Intonation and its uses: Melody in grammar and discourse. Stanford University Press.

Bongaerts, T. (2005). Introduction: Ultimate attainment and the critical period hypothesis for second language acquisition. *IRAL - International Review of Applied Linguistics in Language Teaching*, *43*(4), 259–267. https://doi.org/10.1515/iral.2005.43.4.259

Bongaerts, T., van Summeren, C., Planken, B., & Schils, E. (1997). AGE AND ULTIMATE ATTAINMENT IN THE PRONUNCIATION OF A FOREIGN LANGUAGE. *Studies in Second Language Acquisition*, *19*(4), 447–465. JSTOR.

Borkowska, B., & Pawlowski, B. (2011). Female voice frequency in the context of dominance and attractiveness perception. *Animal Behaviour*, *82*(1), 55–59. https://doi.org/10.1016/j.anbehav.2011.03.024

Brislin, R. W. (1970). Back-Translation for Cross-Cultural Research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Britain, D., & Newman, J. (1992). High Rising Terminals in New Zealand English. *Journal of the International Phonetic Association*, *22*(1–2), 1. https://doi.org/10.1017/S0025100300004540

Brown, P., & Levinson, S. C. (1987). *Politeness: Some universals in language usage*. Cambridge University Press.

Busà, M. G., & Urbani, M. (2011). A cross linguistic analysis of pitch range in English L1 and L2. *Proc. 17th International Congress of Phonetic Sciences (ICPhS XVII), Hong Kong*, 380–383. http://www.academia.edu/download/30919823/Busa.pdf

Butler, Y. G. (2012). Bilingualism/Multilingualism and Second-Language Acquisition. In *The Handbook of Bilingualism and Multilingualism* (pp. 109–136). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118332382.ch5

Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafò, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, *14*(5), 365–376. https://doi.org/10.1038/nrn3475

Cameron, D. (2003). Gender and Language Ideologies. In J. Holmes & M. Meyerhoff (Eds.), *The Handbook of Language and Gender* (pp. 447–467). Blackwell Publishing Ltd. https://doi.org/10.1002/9780470756942.ch19

Cameron, D. (2014). Gender and Language Ideologies. In S. Ehrlich, M. Meyerhoff, & J. Holmes (Eds.), *The Handbook of Language, Gender, and Sexuality* (pp. 279–296). John Wiley & Sons, Inc.

Camp, M. (2009). *Japanese lesbian speech: Sexuality, gender identity, and language* [University of Arizona].

https://repository.arizona.edu/bitstream/handle/10150/195371/azu_etd_10574_sip1_m.pdf?sequence=1&isAllowed=y

Carrie, E., & Drummond, R. (2017). *The Accent Van; Methods in community-oriented linguistics research.* (pp. 1–14). Manchester Metropolitan University.

Carroll, J. B., Carton, A. S., & Wilds, C. (1959). An investigation of" cloze" items in the measurement of achievement in foreign languages. ERIC Clearinghouse.

Cartei, V., Cowles, H. W., & Reby, D. (2012). Spontaneous Voice Gender Imitation Abilities in Adult Speakers. *PLoS ONE*, *7*(2), e31353. https://doi.org/10.1371/journal.pone.0031353

Celata, C. (2019). Phonological Attrition. In M. S. Schmid & B. Köpke (Eds.), *The Oxford Handbook of Language Attrition* (pp. 217–227). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198793595.013.18

Chang, C. (2019). Phonetic Drift. In M. S. Schmid & B. Kopke (Eds.), *The Oxford Handbook of Language Attrition* (pp. 191–203). Oxford University Press.

Chang, C. B. (2012). Rapid and multifaceted effects of second-language learning on first-language speech production. *Journal of Phonetics*, *40*(2), 249–268. https://doi.org/10.1016/j.wocn.2011.10.007

Chen, A., Gussenhoven, C., & Rietveld, T. (2004). Language-Specificity in the Perception of Paralinguistic Intonational Meaning. *Language and Speech*, *47*(4), 311–349. https://doi.org/10.1177/00238309040470040101

Chen, Aoju, Rietveld, T., & Gussenhoven, C. (2001). Language-specific effects of pitch range on the perception of universal intonational meaning. *Seventh European Conference on Speech Communication and Technology*. http://www.mirlab.org/conference_papers/International_Conference/Eurospeech%202001/papers/page1403.pdf

Chen, S. X., & Bond, M. H. (2010). Two Languages, Two Personalities? Examining Language Effects on the Expression of Personality in a Bilingual Context. *Personality and Social Psychology Bulletin*, *36*(11), 1514–1528. https://doi.org/10.1177/0146167210385360

Cherciov, M. (2011). Between Attrition and Acquisition: The Dynamics between Two Languages in Adult Migrants. Toronto.

Clark, J., Yallop, C., & Fletcher, J. (2007). *An introduction to phonetics and phonology* (3rd ed). Blackwell Pub.

Clopper, C. G., Hay, J., & Bartłomiej, P. (2011). Experimental Speech Perception and Perceptual Dialectology. In M. Di Paolo & Yaeger-Dror, Malcah (Eds.), *Sociophonetics: A student's guide*. Routledge.

Clopper, C. G., & Smiljanic, R. (2011). Effects of gender and regional dialect on prosodic patterns in American English. *Journal of Phonetics*, *39*(2), 237–245. https://doi.org/10.1016/j.wocn.2011.02.006

Coates, J. (1993). Women, men, and language: A sociolinguistic account of gender differences in language (2nd ed). Longman.

Cook, V. J. (1992). Evidence for Multicompetence. *Language Learning*, *42*(4), 557–591. https://doi.org/10.1111/j.1467-1770.1992.tb01044.x

Cook, V. (Ed.). (2004). *Portraits of the L2 user* (reprinted). Multilingual Matters.

Cooper, W. E., & Sorensen, J. M. (1981). *Fundamental Frequency in Sentence Production*. https://doi.org/10.1007/978-1-4613-8093-1

Cruttenden, A. (1997). *Intonation* (2nd ed). Cambridge University Press.

Crystal, D. (1975). The English tone of voice: Essays in intonation, prosody and paralanguage. Edward Arnold.

Crystal, D. (2012). *English as a global language*. Cambridge University Press.

Cutler, A., Dahan, D., & van Donselaar, W. (1997). Prosody in the Comprehension of Spoken Language: A Literature Review. 40(2), 141–201.

Dalola, A., & Bullock, B. E. (2017). ON SOCIOPHONETIC COMPETENCE: Phrase-final Vowel Devoicing in Native and Advanced L2 Speakers of French. *Studies in Second Language Acquisition*, *39*(4), 769–799. https://doi.org/10.1017/S0272263116000309

Daly, N., & Warren, P. (2001). Pitching it differently in New Zealand English: Speaker sex and intonation patterns. *Journal of Sociolinguistics*, *5*(1), 85–96. https://doi.org/10.1111/1467-9481.00139

de Leeuw, E. (2009). *When your native language sounds foreign: A phonetic investigation into first language attrition.* [Queen Margaret University].

https://eresearch.qmu.ac.uk/bitstream/handle/20.500.12289/7436/119.pdf?sequence=1&isAllowed=y

de Leeuw, E. (2019a). Native speech plasticity in the German-English late bilingual Stefanie Graf: A longitudinal study over four decades. *Journal of Phonetics*, *73*, 24–39. https://doi.org/10.1016/j.wocn.2018.12.002

de Leeuw, E. (2019b). Phonetic Attrition. In M. S. Schmid & B. Köpke (Eds.), *The Oxford Handbook of Language Attrition* (pp. 203–217). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198793595.013.17

de Leeuw, E. (2020). The Frequency Code and gendered attrition and acquisition in the German-English heritage language community in Vancouver, Canada. In B. Brehmer & J. Treffers-Daller (Eds.), *Lost in Transmission. The role of attrition and input in heritage language development*. John Benjamins.

de Leeuw, E., & Bogulski, C. A. (2016). Frequent L2 language use enhances executive control in bilinguals. *Bilingualism: Language and Cognition*, *19*(05), 907–913. https://doi.org/10.1017/S1366728916000201

de Leeuw, E., & Celata, C. (2019). Plasticity of native phonetic and phonological domains in the context of bilingualism. *Journal of Phonetics*, *75*, 88–93. https://doi.org/10.1016/j.wocn.2019.05.003

de Leeuw, E., Mennen, I., & Scobbie, J. M. (2012). Singing a different tune in your native language: First language attrition of prosody. *International Journal of Bilingualism*, *16*(1), 101–116. https://doi.org/10.1177/1367006911405576

DeKeyser, R., & Larson-Hall, J. (n.d.). What does the critical period really mean? In *Handbook of Bilingualism: Psycholinguistic Approaches.* (J.F.Kroll & A.M.B. De Groot). Oxford University Press.

Deutsch, D. (1992). Some new pitch paradoxes and their implications. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, *336*(1278), 391–397. https://doi.org/10.1098/rstb.1992.0073

Deutsch, D., Le, J., Shen, J., & Henthorn, T. (2009). The pitch levels of female speech in two Chinese villages. *The Journal of the Acoustical Society of America*, *125*(5), EL208–EL213.

D'Imperio, M., & Sneed, J. (2015). Phonetic detail and the role of exposure in dialect imitation. *18 Th International Congress of Phonetic Sciences*. https://hal.archives-ouvertes.fr/hal-01191881/

Dolson, M. (1994). The Pitch of Speech as a Function of Linguistic Community. *Music Perception: An Interdisciplinary Journal*, *11*(3), 321–331. https://doi.org/10.2307/40285626

Dowd, J., Zuengler, J., & Berkowitz, D. (1990). L2 Social Marking: Research Issues1. *Applied Linguistics*, *11*(1), 16–29. https://doi.org/10.1093/applin/11.1.16

Drummond, R. (2011). Glottal variation in /t/ in non-native English speech: Patterns of acquisition. *English World-Wide. A Journal of Varieties of English*, *32*(3), 280–308. https://doi.org/10.1075/eww.32.3.02dru

Drummond, R. (2012). Aspects of identity in a second language: ING variation in the speech of Polish migrants living in Manchester, UK. *Language Variation and Change*, *24*(1), 107–133. https://doi.org/10.1017/S0954394512000026

Dufter, A., & Reich, U. (2015). Rhythmic differences within Romance: Identifying French, Spanish, European and Brazilian Portuguese. *ICPhs-15*, 2781–2784.

Eckert, P. (2008). Variation and the indexical field. *Journal of Sociolinguistics*, *12*(4), 453–476. https://doi.org/10.1111/j.1467-9841.2008.00374.x

Eckert, P. (2017). Age as a Sociolinguistic Variable. In F. Coulmas (Ed.), *The Handbook of Sociolinguistics* (pp. 151–167). Blackwell Publishing Ltd. https://doi.org/10.1002/9781405166256.ch9

Eckert, P. (2019). The limits of meaning: Social indexicality, variation, and the cline of interiority. *Language*, *95*(4), 751–776. https://doi.org/10.1353/lan.2019.0072

Eckert, P., & Labov, W. (2017). Phonetics, phonology and social meaning. *Journal of Sociolinguistics*, *21*(4), 467–496. https://doi.org/10.1111/josl.12244

Eckert, P., & McConnell-Ginet, S. (2003). *Language and gender*. Cambridge University Press.

Edwards, J. (2006). Foundations of Bilingualism. In *The Handbook of Bilingualism* (pp. 7–31). John Wiley & Sons, Ltd. https://doi.org/10.1002/9780470756997.ch1

Ehrlich, S. (1997). Gender as social practice: Implications for second language acquisition. *Studies in Second Language Acquisition*, *19*, 421–446.

Elliott, A. R. (1995). Field Independence/Dependence, Hemispheric Specialization, and Attitude in Relation to Pronunciation Accuracy in Spanish as a Foreign Language. *The Modern Language Journal*, *79*(3), 356–371. https://doi.org/10.1111/j.1540-4781.1995.tb01112.x

Endo, O. (1995). Aspects of Sexism in Language. In K. Fujimura-Fanselow & A. Kameda (Eds.), *Japanese women: New feminist perspectives on the past, present, and future* (pp. 29–42). The Feminist Press.

English formal female. (2017). https://www.thegrocer.co.uk/Pictures/web/u/g/p/kate-swan_420.jpg

English formal male. (2017). https://static.cgidigital.org/events/public/prg_files/form_95/files/element_42_2d3f933eaecd00ff9567adfeee7d837f-67-Mcfarlane%2C-John.jpg

English schoolboy. (2017). https://i.pinimg.com/originals/24/13/74/24137430b002cca6d56e0e836af25968.jpg

English schoolgirl. (2017). http://sc01.alicdn.com/kf/HTB1OEmnKFXXXXcCXXXXq6xXFXXXR/new-style-school-uniform-for-girls-001.jpg

Fabbro, F. (2001). The Bilingual Brain: Bilingual Aphasia. *Brain and Language*, *79*(2), 201–210. https://doi.org/10.1006/brln.2001.2480

Ferguson, C. A. (1991). Social issues associated with language loss due to neurological impairment. In F. Lovejoy (Ed.), *Studies in Language Loss: Theoretical Intragenerational, Pathological*. Holborn Press.

Field, A. P., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. Sage.

Fitch, W. T., & Giedd, J. (1999). Morphology and development of the human vocal tract: A study using magnetic resonance imaging. *The Journal of the Acoustical Society of America*, *106*(3 Pt 1), 1511–1522.

Flege, J. E. (1987). The Instrumental Study of L2 Speech Production: Some Methodological Considerations*. *Language Learning*, *37*(2), 285–296. https://doi.org/10.1111/j.1467-1770.1987.tb00569.x

Flege, J. E. (1995). Second Language Speech Learning: Theory, Findings, and Problems. In W. Strange (Ed.), *Speech Perception and Linguistic Experience: Issue in Cross-Language Research* (pp. 233–277). York Press.

Flege, J. E., & Fletcher, K. L. (1992). Talker and listener effects on degree of perceived foreign accent. *The Journal of the Acoustical Society of America*, *91*(1), 370–389. https://doi.org/10.1121/1.402780

Flege, J. E., Yeni-Komshian, G. H., & Liu, S. (1999). Age constraints on second-language acquisition. *Journal of Memory and Language*, *41*(1), 78–104.

Foulkes, P., & Docherty, G. (2006). The social life of phonetics and phonology. *Journal of Phonetics*, *34*(4), 409–438. https://doi.org/10.1016/j.wocn.2005.08.002

Foulkes, P., & Hay, J. B. (2015). The Emergence of Sociophonetic Structure. In B. MacWhinney & W. O'Grady (Eds.), *The Handbook of Language Emergence* (pp. 292–313). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118346136.ch13

Friendship. (2017). http://data.pixiz.com/output/user/frame/preview/normal/6/8/7/0/1980786_b12e9.jpg

Gal, S. (1978). Peasant men can't get wives: Language change and sex roles in a bilingual community. *Language in Society*, *7*(1), 1–16. https://doi.org/10.1017/S0047404500005303

Gelfer, M. P., & Bennett, Q. E. (2013). Speaking Fundamental Frequency and Vowel Formant Frequencies: Effects on Perception of Gender. *Journal of Voice*, *27*(5), 556–566. https://doi.org/10.1016/j.jvoice.2012.11.008

Giles, H., Coupland, J., & Coupland, N. (Eds.). (1991). *Contexts of accommodation: Developments in applied sociolinguistics*. Cambridge University Press ; Editions de la Maison des science de l'homme.

Goldstein, E. B. (Ed.). (2010). *Encyclopedia of perception*. SAGE.

Grabe, E., Post, R., & Nolan, F. (2001). Modelling intonational variation in english. The IViE system.

Grabe, Esther, Post, B., Nolan, F., & Farrar, K. (2000). Pitch accent realization in four varieties of British English. *Journal of Phonetics*, *28*(2), 161–185. https://doi.org/10.1006/jpho.2000.0111

Graddol, D., & Swann, J. (1983). Speaking fundamental frequency: Some physical and social correlates. *Language and Speech*, *26*(4), 351–366.

Graddol, D., & Swann, J. (1989). *Gender voices*. B. Blackwell.

Graham, C. (2015). Fundamental Frequency Range in Japanese and English: The Case of Simultaneous Bilinguals. *Phonetica*, *71*(4), 271–295. https://doi.org/10.1159/000381627

Graham, C., & Post, B. (2018). Second language acquisition of intonation: Peak alignment in American English. *Journal of Phonetics*, *66*, 1–14. https://doi.org/10.1016/j.wocn.2017.08.002

Grice, H. P. (1975). *Logic and conversation* (p. 732). MIT Press.

Grice, M., German, J. S., & Warren, P. (2019). *Intonation Systems Across Varieties of English* [Preprint]. PsyArXiv. https://doi.org/10.31234/osf.io/tnv8d

Grosjean, François. (1998). Studying bilinguals: Methodological and conceptual issues. *Bilingualism: Language and Cognition*, *1*(2), 131–149. https://doi.org/10.1017/S136672899800025X

Grosjean, François. (2001a). *Life with two languages: An introduction to bilingualism*. Harvard University Press.

Grosjean, François. (2001b). The bilingual's language modes. *One Mind, Two Languages: Bilingual Language Processing*, *7*(11), 1–22.

Grosjean, François. (2010). *Bilingual: Life and reality*. Harvard University Press.

Guillemot, C., & Sano, S. (2020). Gender- and register-biased patterns in f0 use: How does prosody contribute to (in)formality in Japanese? *10th International Conference on Speech Prosody 2020*, 725–729. https://doi.org/10.21437/SpeechProsody.2020-148

Gumperz, J. (1987). Foreword to Brown and Levinson, 1987. In *Politeness: Some universals in language usage*. Cambridge University Press.

Gussenhoven, C. (2002). Intonation and interpretation: Phonetics and phonology. *Speech Prosody 2002: Proceedings*, 47–75.

Guy, G., Horvath, B., Vonwiller, J., Daisley, E., & Rogers, I. (1986). An intonational change in progress in Australian English. *Language in Society*, *15*(01), 23. https://doi.org/10.1017/S0047404500011635

Hackshaw, A. (2008). Small studies: Strengths and limitations. *European Respiratory Journal*, *32*(5), 1141–1143. https://doi.org/10.1183/09031936.00136408

Hagerman, C. (2009). English language policy and practice in Japan. *Osaka Jogaku in College Kiyo Journal*, 47–64.

Hakuta, K., Bialystok, E., & Wiley, E. (2003). Critical Evidence: A Test of the Critical-Period Hypothesis for Second-Language Acquisition. *Psychological Science*, *14*(1), 31–38. https://doi.org/10.1111/1467-9280.01415

Hanley, T. D., & Snidecor, J. C. (1967). Some Acoustic Similarities among Languages. *Phonetica*, *17*(3), 141–148. https://doi.org/10.1159/000258584

Hanley, T. D., Snidecor, J. C., & Ringel, R. L. (1966). Some Acoustic Differences among Languages. *Phonetica*, *14*, 97–107.

Hansen Edwards, J. G. (2006). *Acquiring a Non-Native Phonology: Linguistic Constraints and Social Barriers.* Bloomsbury Publishing. https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=436536

Hansen Edwards, J. G. (2008). Social factors and variation in production in L2 phonology. In J. G. Hansen Edwards & M. L. Zampini (Eds.), *Studies in Bilingualism* (Vol. 36, pp. 251–279). John Benjamins Publishing Company. https://doi.org/10.1075/sibil.36.12han

Hao, Y.-C. (2012). Second language acquisition of Mandarin Chinese tones by tonal and non-tonal language speakers. *Journal of Phonetics*, *40*(2), 269–279. https://doi.org/10.1016/j.wocn.2011.11.001

Harries, M. L., Walker, J. M., Williams, D. M., Hawkins, S., & Hughes, I. A. (1997). Changes in the male voice at puberty. *Archives of Disease in Childhood*, *77*(5), 445–447.

Haugen, E. (1953). The Norwegian Language in America: A study in bilingual behaviour (University of Pennsylvania Press).

Hay, J., & Drager, K. (2007). Sociophonetics. *Annual Review of Anthropology*, *36*(1), 89–103. https://doi.org/10.1146/annurev.anthro.34.081804.120633

Henton, C. (1995). Pitch dynamism in female and male speech. *Language & Communication*, *15*(1), 43–61.

Henton, C. G. (1989). Fact and fiction in the description of female and male pitch. *Language & Communication*, *9*(4), 299–311.

Herdina, P., & Jessner, U. (2002). A dynamic model of multilingualism: Perspectives of change in psycholinguistics. Multilingual Matters.

Hermes, D. J., & van Gestel, J. C. (1991). The frequency scale of speech intonation. *The Journal of the Acoustical Society of America*, *90*(1), 97–102. https://doi.org/10.1121/1.402397

Hervé, A. (2010). Holm's Sequentila Bonferroni Procedure. In N. Salkind (Ed.), *Encyclopedia od Research Design*. SAGE.

Hesselmann, G. (2018). Applying Linear Mixed Effects Models (LMMs) in Within-Participant Designs With Subjective Trial-Based Assessments of Awareness—A Caveat. *Frontiers in Psychology*, *9*, 788. https://doi.org/10.3389/fpsyg.2018.00788

Hewlett, N., & Beck, J. M. (2010). Phonation. In *An introduction to the science of phonetics*. Routledge.

Hilton, K. (2014). How character types mediate the effect of gender on pitch and /s/ variation. Department of Linguistics Stanford University.

Hiramoto, M. (2010). Utterance Final Position and Projection of Femininity in Japanese. *Gender and Language*, *4*(1), 99–124. https://doi.org/10.1558/genl.v4i1.99

Hoffman, R. M., & Borders, L. D. (2001). Twenty-five years after the Bem Sex-Role Inventory: A reassessment and new issues regarding classification variability. *Measurement and Evaluation in Counseling and Development*, *34*, 39–55.

Hollien, H. (1960). Some Laryngeal Correlates of Vocal Pitch. *Journal of Speech Language and Hearing Research*, *3*(1), 52. https://doi.org/10.1044/jshr.0301.52

Holmes, J. (1988). Paying compliments: A sex-preferential politeness strategy. *Journal of Pragmatics*, *12*(4), 445–465. https://doi.org/10.1016/0378-2166(88)90005-7

Holmes, J. (1995). *Women, men, and politeness*. Longman.

Huang, B. H., & Jun, S.-A. (2011). The Effect of Age on the Acquisition of Second Language Prosody. *Language and Speech*, *54*(3), 387–414. https://doi.org/10.1177/0023830911402599

Hübscher, I., Borràs-Comes, J., & Prieto, P. (2017). Prosodic mitigation characterizes Catalan formal speech: The Frequency Code reassessed. *Journal of Phonetics*, *65*, 145–159. https://doi.org/10.1016/j.wocn.2017.07.001

Ide, S. (1982). Japanese sociolinguistics politeness and women's language. *Lingua*, *57*(2–4), 357–385. https://doi.org/10.1016/0024-3841(82)90009-2

Ide, S. (1989). Formal forms and discernment: Two neglected aspects of universals of linguistic politeness. *Multilingua - Journal of Cross-Cultural and Interlanguage Communication*, *8*(2–3), 223–248. https://doi.org/10.1515/mult.1989.8.2-3.223

Idemaru, K., Winter, B., & Brown, L. (2015). THE ROLE OF PITCH IN PERCEIVING POLITENESS IN KOREAN. *Proceedings of the 18th International Congress of Phonetic Sciences.* ICPhS2015, Glasgow, UK: the University of Glasgow.

Igarashi, Y. (forthcoming). Intonation in Japanese dialects. In N. Kibe, T. Nitta, & K. Sasaki (Eds.), *Handbook of Japanese dialects*. De Gruyter Mouton.

Ikegashira, A., Matsumoto, Y., & Morita, Y. (2009). English education in Japan: From kindergarten to university. *Into the next Decade with (2nd) FL Teaching Rudolf Reinelt Research Laboratory EU Matsuyama*, 16–40.

Inoue, M. (2003). Speech without a speaking body: "Japanese women's language" in translation. *Language & Communication*, *23*(3–4), 315–330. https://doi.org/10.1016/S0271-5309(03)00011-9

Inoue, M. (2004). Gender, Language, and Modernity: Toward an Effective History of 'Japanese Women's Language'. In *Japanese Language, Gender and Ideology: Cultural Models and Real People* (Okamoto S., Shibamoto J. S., pp. 57–75). Oxford University Press.

Inoue, M. (2006). Vicarious language: Gender and linguistic modernity in Japan. University of California Press.

Japanese formal female. (2017). https://www.leoc-j.com/en/aboutus.php

Japanese formal male. (2017). https://www.leoc-j.com/en/aboutus.php

Japanese schoolboy. (2017). http://www.dmzx.com/d/file/201410/762fd22bc562c8f0695d96a81c08c370.jpg

Japanese schoolgirl. (2017). https://imgur.dcard.tw/cvNVEwk.jpg

Japan-Open_Doors-2015. (2015). https://jp.usembassy.gov/our-relationship/official-reports/open-doors-report-highlights-japan-u-s-student-exchange/

Järvinen, K., Laukkanen, A.-M., & Aaltonen, O. (2013). Speaking a foreign language and its effect on F0. *Logopedics Phoniatrics Vocology*, *38*(2), 47–51. https://doi.org/10.3109/14015439.2012.687764

Jas, Y. (2020). Sexuality in a non-binary world: Redefining and expanding the linguistic repertoire, INSEP – Journal of the International Network for Sexual Ethics & PoliticsINSEP – Journal of the International Network for Sexual Ethics & Politics, 8, 71–92.

Jaspaert, K., & Kroon, S. (1989). Social Determinants of Language Loss. *ITL - International Journal of Applied Linguistics*, *83–84*, 75–98. https://doi.org/10.1075/itl.83-84.07jas

Jessen, M. (2008). Forensic Phonetics. *Language and Linguistics Compass*, *2*(4), 671–711. https://doi.org/10.1111/j.1749-818X.2008.00066.x

Jiang, X., & Pell, M. D. (2017). The sound of confidence and doubt. *Speech Communication*, *88*, 106–126. https://doi.org/10.1016/j.specom.2017.01.011

Johnstone, T., & Scherer, K. R. (2000). Vocal Communication of Emotion. In *The Handbook of Emotion* (M Lewis&J. Haviland). Guilford.

Jun, S.-A., & Oh, M. (2011). Acquisition of Second Language Intonation.

Kajino, S. (2014). Sociophonetic variation at the intersection of gender, region and style in Japanese females speech. Georgetown University.

Kameda, A. (1996). Sexism and gender in stereotyping in schools. In Y. Ueda, K. Fujimura-Fanselow, & A. Kameda (Eds.), *Japanese women: New feminist perspectives on the past, present & future* (Vol. 25).

Kan, R. T. Y., & Schmid, M. S. (2019). Development of tonal discrimination in young heritage speakers of Cantonese. *Journal of Phonetics*, *73*, 40–54. https://doi.org/10.1016/j.wocn.2018.12.004

Kaźmierski, K. (2015a). The relationship between gender identity and six f0 measures in Polish. *Proceedings of the 18th International Congress of Phonetic Sciences.* ICPhS-18, Glasgow, UK: the University of Glasgow.

Kaźmierski, K. (2015b). The relationship between gender identity and six f0 measures in Polish. *Baghai Ravary*. International Congress of Phonetic Sciences, Glasgow.

https://www.internationalphoneticassociation.org/icphs-proceedings/ICPhS2015/Papers/ICPHS0721.pdf

Keating, P. A. (2006). Phonetic encoding of prosodic structure. In *Speech production: Models, phonetic processes and techniques.* (pp. 167–186). Psychology Press.

Keating, P., & Kuo, G. (2012). Comparison of speaking fundamental frequency in English and Mandarin. *The Journal of the Acoustical Society of America*, *132*(2), 1050–1060.

Kitamura, C., Panneton, R., & Best, C. T. (2013). The Development of Language Constancy: Attention to Native Versus Nonnative Accents. *Child Development*, *84*(5), 1686–1700. https://doi.org/10.1111/cdev.12068

Klapuri, A., & Davy, M. (Eds.). (2006). *Signal processing methods for music transcription*. Springer.

Köpke, B., & Schmid, M. S. (2004). First language attrition: The next phase. In *First language attrition: Interdisciplinary perspectives on methodological issues* (M. S. Schmid, B. Köpke, M. Keijzer, M. & L. Weilemar, pp. 1–43). John Benjamins.

Kramer, C. (1977). Perceptions of Female and Male Speech. *Language and Speech*, *20*(2), 151–161.

Kristof, N. D. (1995). Japan’s Feminine Falsetto Falls Right Out of Favor. *New York Times*.

Künzel, H. J. (1989). How well does average fundamental frequency correlate with speaker height and weight? *Phonetica*, *46*(1–3), 117–125.

Kuppens, A. H. (2010). Incidental foreign language acquisition from media exposure. *Learning, Media and Technology*, *35*(1), 65–85. https://doi.org/10.1080/17439880903561876

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). **lmerTest** Package: Tests in Linear Mixed Effects Models. *Journal of Statistical Software*, *82*(13). https://doi.org/10.18637/jss.v082.i13

Laan, G. P. M. (1997). The contribution of intonation, segmental durations, and spectral features to the perception of a spontaneous and a read speaking style. *Speech Communication*, *22*(1), 43–65. https://doi.org/10.1016/S0167-6393(97)00012-5

Laan, G. P. M. (1992). Perceptual Differences Netween Spontaneous and Read Aloud Speech. *Proceedings 16*, 65–80.

Ladd, D. Robert. (2008). *Intonational Phonology* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9780511808814

Ladd, D.R. (2008). *Intonational phonology*. Cambridge University Press.

Ladefoged, P. (1996). *Elements of acoustic phonetics* (2nd ed). University of Chicago Press.

Ladefoged, P. (2001). *A course in phonetics* (4th ed). Harcourt College Publishers.

Lakoff, R. (1973). Language and Woman's Place. *Language in Society*, *2*(1), 45–80. JSTOR.

Laserna, C. M., Seih, Y.-T., & Pennebaker, J. W. (2014). *Um* . . . Who Like Says *You Know*: Filler Word Use as a Function of Age, Gender, and Personality. *Journal of Language and Social Psychology*, *33*(3), 328–338. https://doi.org/10.1177/0261927X14526993

Lass, N. J., Hendricks, C. A., & Iturriaga, M. A. (1980). The consistency of listener judgments in speaker height and weight identification. *Journal of Phonetics*, *8*(4), 439–448. https://doi.org/10.1016/S0095-4470(19)31499-8

Laver, J. (1994). *Principles of phonetics*. Cambridge University Press.

Leftkowitz, D., & Sicoli, M. (2007). Creaky voice: Constructions of gender and authority in American English conversation.

Lehiste, I. (1970). *Suprasegmentals*. M.I.T. Press.

Lenth, R., & Love, J. (2017). *Emmeans*. https://cran.r-project.org/web/packages/emmeans/emmeans.pdf

Levon, E. (2011). Teasing Apart To Bring Together: Gender and Sexuality in Variationist Research. *American Speech*, *86*(1), 69–84. https://doi.org/10.1215/00031283-1277519

Levon, E. (2016). Gender, interaction and intonational variation: The discourse functions of High Rising Terminals in London. *Journal of Sociolinguistics*, *20*(2), 133–163.

Levon, E. (2018). Same difference: The phonetic shape of High Rising Terminals in London. *English Language and Linguistics*, 1–25. https://doi.org/10.1017/S1360674318000205

Lewis, J. (2002). *Social Influence on Female Speakers' Pitch.* [University of California, Berkely]. https://escholarship.org/uc/item/5zw611pm

Li Wei. (2009a). Dimensions of bilingualism. In *The Bilingualism Reader* (2nd ed). Routledge.

Li Wei. (2009b). *The bilingualism reader* (2. ed). Routledge.

Lieberman, P. (1975). *Intonation, perception, and language* (3. printing). MIT Press.

Lieberman, P. (2007). The Evolution of Human Speech: Its Anatomical and Neural Bases. *Current Anthropology*, *48*(1), 39–66. https://doi.org/10.1086/509092

Linville, S. E. (1996). The sound of senescence. *Journal of Voice*, *10*(2), 190–200. https://doi.org/10.1016/S0892-1997(96)80046-4

Long, M. H. (1990). Maturational Constraints on Language Development. *Studies in Second Language Acquisition*, *12*(03), 251. https://doi.org/10.1017/S0272263100009165

Loveday, L. (1981). Pitch, politeness and sexual role: An exploratory investigation into the pitch correlates of English and Japanese politeness formulae. *Language and Speech*, *24*(1), 71–89.

Macnamara, J. (1966). *Bilingualism and primary education: A study of irish experience*. Edinburgh University Press. https://books.google.co.uk/books?id=2zUMAQAAIAAJ

Major, R. C. (1992). Losing English as a First Language. *The Modern Language Journal*, *76*(2), 190–208. https://doi.org/10.2307/329772

Marcell, A. V. (2011). Adolescence. In R. Kliegman & W. E. Nelson (Eds.), *Nelson textbook of pediatrics* (19th ed). Elsevier/Saunders.

Marian, V., Blumenfeld, H. K., & Kaushanskaya, M. (2007). The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language, and Hearing Research*, *50*(4), 940–967. https://doi.org/10.1044/1092-4388(2007/067)

Mattingly, I. G. (1966). Speaker Variation and Vocal-Tract Size. *The Journal of the Acoustical Society of America*, *39*(6), 1219–1219. https://doi.org/10.1121/1.1942689

Mehler, J., Jusczyk, P., Lambertz, G., Halsted, N., Bertoncini, J., & Amiel-Tison, C. (1988). A precursor of language acquisition in young infants. *Cognition*, *29*(2), 143–178.

Mehrabi, A. (2018). *Vocal imitation for query by vocalisation*. Queen Mary University of London.

Méndez Seijas, J. (2019). SECOND LANGUAGE SPANISH INTONATION: SYSTEMIC AND REALIZATIONAL DIMENSIONS OF ITS ACQUISITION. Georgetown University.

Mendoza-Denton, N. (2011). The Semiotic Hitchhiker's Guide to Creaky Voice: Circulation and Gendered Hardcore in a Chicana/o Gang Persona. *Journal of Linguistic Anthropology*, *21*(2), 261–280. JSTOR.

Mennen, I. (2004). Bi-directional interference in the intonation of Dutch speakers of Greek. *Journal of Phonetics*, *32*(4), 543–563. https://doi.org/10.1016/j.wocn.2004.02.002

Mennen, I. (2015). Beyond Segments: Towards a L2 Intonation Learning Theory. In E. Delais-Roussarie, M. Avanzi, & S. Herment (Eds.), *Prosody and Language in Contact* (pp. 171–188). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-45168-7_9

Mennen, I., Chen, A., & Karlsson, F. (2010). Characterising the internal structure of learner intonation and its development over time. *Proceedings of The 6th International Symposium on the Acquisition of Second Language Speech*. Newsounds, Poznan.

Mennen, I., & Chousi, D. (2018). Prosody in first-generation adult immigrants and second-generation heritage-language users: The timing of prenuclear rising accents. *9th International Conference on Speech Prosody 2018*, 828–832. https://doi.org/10.21437/SpeechProsody.2018-167

Mennen, I., & de Leeuw, E. (2014a). Beyond Segments. *Studies in Second Language Acquisition*, *36*(02), 183–194. https://doi.org/10.1017/S0272263114000138

Mennen, I., & de Leeuw, E. (2014b). BEYOND SEGMENTS. *Studies in Second Language Acquisition*, *36*(02), 183–194. https://doi.org/10.1017/S0272263114000138

Mennen, I., Schaeffler, F., & Dickie, C. (2014). SECOND LANGUAGE ACQUISITION OF PITCH RANGE IN GERMAN LEARNERS OF ENGLISH. *Studies in Second Language Acquisition*, *36*(2), 303–329. https://doi.org/10.1017/S0272263114000023

Mennen, I., Schaeffler, F., & Docherty, G. (2008). A methodological study into the linguistic dimensions of pitch range differences between German and English. *Proceedings of the 4th Conference on Speech Prosody, Campinas*. http://eresearch.qmu.ac.uk/id/eprint/2008

Mennen, I., Schaeffler, F., & Docherty, G. (2012). Cross-language differences in fundamental frequency range: A comparison of English and German. *The Journal of* *the Acoustical Society of America*, *131*(3), 2249–2260. https://doi.org/10.1121/1.3681950

Miller, L. (2004). You Are Doing Burikko! In *Japanese Language, Gender, and Idelogy: Cultural Models and Real People* (S. Okamoto, J. S. Shibamoto Smith, pp. 148–165). Oxford University Press.

Miyazaki, A. (2004). Japanese junior high school girls' and boys' first-person pronoun use and their social world. In J. S. Shibamoto Smith & S. Okamoto (Eds.), *Japanese language, gender, and ideology: Cultural models and real people* (pp. 256–274). Oxford University Press.

Montrul, S. (2008). Incomplete acquisition in bilingualism: Re-examining the age factor. John Benjamins Pub.

Moore, K. (1995). Dentification of male and female voice qualities in pre-pubescent children. *Proceedings of the 13th International Conference of the Phonetic Sciences*. ICPhS-13, Stockholm.

Mori, K. (1997). Polite lies: On being a woman caught between cultures (1st ed). Henry Holt & Co.

Morimoto, M., & Okamoto, S. (2021). Are Young Japanese Women's and Men's Speech Becoming Less Gendered? A Multi-Level Approach.

Morton, E. S. (1977). On the Occurrence and Significance of Motivation-Structural Rules in Some Bird and Mammal Sounds. *The American Naturalist*, *111*(981), 855–869. https://doi.org/10.1086/283219

Moyer, A. (2004). Age, accent, and experience in second language acquisition: An integrated approach to critical period inquiry. Multilingual Matters.

Mougeon, R., Rehner, K., & Nadasdi, T. (2004). The learning of spoken French variation by immersion students from Toronto, Canada: Learning of Variation by Immersion Students. *Journal of Sociolinguistics*, *8*(3), 408–432. https://doi.org/10.1111/j.1467-9841.2004.00267.x

Müllensiefen, D., Gingras, B., Musil, J., & Stewart, L. (2014). The Musicality of Non-Musicians: An Index for Assessing Musical Sophistication in the General Population. *PLOS ONE*, *9*(2), e89642. https://doi.org/10.1371/journal.pone.0089642

Muñoz, C., & Singleton, D. (2011). A critical review of age-related research on L2 ultimate attainment. *Language Teaching*, *44*(1), 1–35. https://doi.org/10.1017/S0261444810000327

Munro, M. J., Flege, J. E., & Mackay, I. R. A. (1996). The effects of age of second language learning on the production of English vowels. *Applied Psycholinguistics*, *17*(03), 313. https://doi.org/10.1017/S0142716400007967

Munson, B., & Babel, M. (2019). The phonetics of sex and gender. In W. F. Katz & P. F. Assmann (Eds.), *The Routledge Handbook of Phonetics* (1st ed., pp. 499–525). Routledge. https://doi.org/10.4324/9780429056253-19

Nakamura, M., Iwano, K., & Furui, S. (2008). Differences between acoustic characteristics of spontaneous and read speech and their effects on speech recognition performance. *Computer Speech & Language*, *22*(2), 171–184. https://doi.org/10.1016/j.csl.2007.07.003

Nance, C., Kirkham, S., & Groarke, E. (2018). Studying Intonation in Varieties of English: Gender and Individual Variation in Liverpool. In N. Braber & S. Jansen (Eds.), *Sociolinguistics in England* (pp. 275–295). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-56288-3_11

Nance, C., McLeod, W., O'Rourke, B., & Dunmore, S. (2016). Identity, accent aim, and motivation in second language users: New Scottish Gaelic speakers' use of phonetic variation. *Journal of Sociolinguistics*, *20*(2), 164–191. https://doi.org/10.1111/josl.12173

Nelder, J. A. (1977). A Reformulation of Linear Models. *Journal of the Royal Statistical Society. Series A (General)*, *140*(1), 48. https://doi.org/10.2307/2344517

Nikitovic, D. (2018). Sexual dimorphism (humans). In W. Trevathan, M. Cartmill, D. Dufour, C. Larsen, D. ORourke, K. Rosenberg, & K. Strier (Eds.), *The International Encyclopedia of Biological Anthropology* (pp. 1–4). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118584538.ieba0443

Nishi, K., & Kewley-Port, D. (2008). Nonnative Speech Perception Training Using Vowel Subsets: Effects of Vowels in Sets and Order of Training. *Journal of Speech, Language, and Hearing Research*, *51*(6), 1480–1493. https://doi.org/10.1044/1092-4388(2008/07-0109)

Ochs, E. (1992). Indexing gender. In A. Duranti & C. Goodwin (Eds.), *Rethinking Context: Language as an Interactive Phenomenon* (pp. 335–358). Cambridge University Press.

Ofuka, E., McKeown, J. D., Waterman, M. G., & Roach, P. J. (2000). Prosodic cues for rated politeness in Japanese speech. *Speech Communication*, *32*(3), 199–217. https://doi.org/10.1016/S0167-6393(00)00009-1

Ohala, J. J. (1983). Cross-Language Use of Pitch: An Ethological View. *Phonetica*, *40*(1), 1–18. https://doi.org/10.1159/000261678

Ohala, J. J. (1984). An ethological perspective on common cross-language utilization of F0 of voice. *Phonetica*, *41*(1), 1–16.

Ohala, J. J. (1996). Ethological theory and the expression of emotion in the voice. *ICSLP 96*. International Conference on SpokenLanguage Processing, Philadelphia, PA.

Ohala, J. J., & Gilbert, J. B. (1981). Listeners' ability to identify languages by their prosody. *Studia Phonetica*, *18*, 123–132.

Ohara, Y. (1992). Gender-dependent pitch levels: A comparative study in Japanese and English. In K. Hall, M. Bucholtz, & B. Moonwomon (Eds.), *Locating Power: Proceedings of the Second Berkeley Women and Language Conference, April 4 and 5, 1992*. Berkeley Women and Language Group, University of California, Berkeley.

Ohara, Y. (1999). Performing gender through voice pitch: A cross-cultural analysis of Japanese and American English. In U. Pasero & F. Braun (Eds.), *Wahrnehmung und Herstellung von Geschlecht: Perceiving and Performing Gender* (pp. 105–116). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-322-89014-6_8

Ohara, Y. (2001). Finding one's voice in Japanese: A study of the pitch levels of L2 users. In A. Pavlenko, A. Blackledge, I. Piller, & M. Teutsch-Dwyer (Eds.), *Multilingualism, Second Language Learning, and Gender*. De Gruyter Mouton.

Ohara, Y. (2004). Prosody and Gender in Workplace Interaction: Exploring Constraints and Resources in the Use of Japanese. In J. S. Shibamoto Smith & O. Shigeko (Eds.), *Japanese Language, Gender, and Ideology: Cultural Models and Real People* (pp. 222–239). Oxford University Press.

Ohara, Y. (2019). Gendered speech. In P. Heinrich & Y. Ohara (Eds.), *Routledge Handbook of Japanese Sociolinguistics* (pp. 279–295). Routledge.

Okamoto, S. (1995). ‘Tasteless’ Japanese: Less ‘Feminine’ Speech Among Young Japanese Women. In *Women and language: Gender articulate; language and the socially constructed self* (K. Hall, M. Bucholtz). Routledge.

Okamoto, S. (2018). Language, gender, and sexuality. In Y. Hasegawa (Ed.), *The Cambridge handbook of Japanese linguistics* (pp. 678–697). Cambridge University Press.

Okamoto, S., & Shibamoto Smith, J. S. (2007). Constructing Linguistic Femininity in Contemporary Japan: Scholarly and Popular Representations. *Gender and Language*, *2*(1). https://doi.org/10.1558/genl.v2i1.87

Opitz, C. (2011). First language attrition and second language acquisition in a second language environment [Trinity College]. http://hdl.handle.net/2262/78154

Ordin, M., & Mennen, I. (2017). Cross-Linguistic Differences in Bilinguals’ Fundamental Frequency Ranges. *Journal of Speech Language and Hearing Research*, *60*(6), 1493. https://doi.org/10.1044/2016_JSLHR-S-16-0315

Pardo, J. S., Gibbons, R., Suppes, A., & Krauss, R. M. (2012). Phonetic convergence in college roommates. *Journal of Phonetics*, *40*(1), 190–197. https://doi.org/10.1016/j.wocn.2011.10.001

Passoni, E., Mehrabi, A., Levon, E., & de Leeuw, E. (2018). Bilingualism, pitch range and social factors: Preliminary results from sequential Japanese-English bilinguals. *9th International Conference on Speech Prosody, Poznań, Poland, 2018*, 384–388. https://doi.org/10.21437/SpeechProsody.2018-78

Peirce, J. W. (2007). PsychoPy—Psychophysics software in Python. *Journal of Neuroscience Methods*, *162*(1–2), 8–13. https://doi.org/10.1016/j.jneumeth.2006.11.017

Pemberton, C., McCormack, P., & Russell, A. (1998). Have women’s voices lowered across time? A cross sectional study of Australian women’s voices. *Journal of Voice: Official Journal of the Voice Foundation*, *12*(2), 208–213.

Peppé, S. J. E. (2009). Why is prosody in speech-language pathology so difficult? *International Journal of Speech-Language Pathology*, *11*(4), 258–271. https://doi.org/10.1080/17549500902906339

Pierrehumbert, J. B. (1980). The phonology and phonetics of English intonation. MIT.

Pierrehumbert, J., & Hirschberg, J. B. (1990). *The Meaning of Intonational Contours in the Interpretation of Discourse*. https://doi.org/10.7916/D8KD24FP

Pike, K. L. (1979). *The intonation of American English*. Greenwood Press.

Piller, I. (2002). Passing for a native speaker: Identity and success in second language learning. *Journal of Sociolinguistics*, *6*(2), 179–208. https://doi.org/10.1111/1467-9481.00184

Piller, I., & Pavlenko, A. (2006). Bilingualism and Gender. In T. K. Bhatia & W. C. Ritchie (Eds.), *The Handbook of Bilingualism* (pp. 489–511). Blackwell Publishing Ltd. https://doi.org/10.1002/9780470756997.ch19

Piller, I., & Pavlenko, A. (2001). Introduction: Multilingualism, second language learning, and gender. In A. Pavlenko, A. Blackledge, I. Piller, & M. Teutsch-Dwyer (Eds.), *Multilingualism, Second Language Learning, and Gender* (pp. 1–14). DE GRUYTER MOUTON. https://doi.org/10.1515/9783110889406.1

Piske, T., MacKay, I. R. A., & Flege, J. E. (2001). Factors affecting degree of foreign accent in an L2: A review. *Journal of Phonetics*, *29*(2), 191–215. https://doi.org/10.1006/jpho.2001.0134

Pizziconi, B. (2007). The lexical mapping of politeness in British English and Japanese. *Journal of Politeness Research. Language, Behaviour, Culture*, *3*(2). https://doi.org/10.1515/PR.2007.010

Plant, E. A., Hyde, J. S., Keltner, D., & Devine, P. G. (2000). The gender stereotyping of emotions. *Psychology of Women Quarterly*, *24*(1), 81–92.

Podesva, R. (2007). Phonation type as a stylistic variable: The use of falsetto in constructing a persona. *Journal of Sociolinguistics*, *11*(4), 478–504.

Podesva, R. (2011). Salience and the Social Meaning of Declarative Contours: Three Case Studies of Gay Professionals. *Journal of English Linguistics*, *39*(3), 233–264. https://doi.org/10.1177/0075424211405161

Podesva, R. J., & Callier, P. (2015). Voice Quality and Identity. *Annual Review of Applied Linguistics*, *35*, 173–194. https://doi.org/10.1017/S0267190514000270

Podesva, R. J., & Kajino, S. (2014). Sociophonetics, Gender, and Sexuality. In S. Ehrlich, M. Meyerhoff, & J. Holmes (Eds.), *The Handbook of Language, Gender, and Sexuality* (pp. 103–122). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118584248.ch5

Porter, S. R., & Whitcomb, M. E. (2005). Non-response in student surveys: The Role of Demographics, Engagement and Personality. *Research in Higher Education*, *46*(2), 127–152. https://doi.org/10.1007/s11162-004-1597-2

Przedlacka, J., & Baghai Ravary, L. (2015). Pitch and duration in RP: A corpus-based historical exploration. In The Scottish Consortium for ICPhS 2015 (Ed.), *Proceedings of the 18th International Congress of Phonetic Sciences.* https://www.internationalphoneticassociation.org/icphs-proceedings/ICPhS2015/Papers/ICPHS0902.pdf

Puts, D. A., Gaulin, S. J. C., & Verdolini, K. (2006). Dominance and the evolution of sexual dimorphism in human voice pitch. *Evolution and Human Behavior*, *27*(4), 283–296. https://doi.org/10.1016/j.evolhumbehav.2005.11.003

R Core Team. (2019). *R: A language and environment for statistical computing.* R Foundation for Statistical Computing. https://www.R-project.org/

Result of an annual survey of international students in Japan 2017. (2017). https://www.jasso.go.jp/en/about/statistics/intl_student_e/2017/__icsFiles/afieldfile/2018/02/23/data17_e.pdf

Revelle, W. (2018). *psych: Procedures for Psychological, Psychometric, and Personality Research*. Northwestern University. https://CRAN.R-project.org/package=psych

Reynolds, K. A. (1990). Female Speakers of Japanese in Transition. In S. Ide & N. McGoin (Eds.), *Aspects of Japanese Women's Language* (pp. 129–146). Kuroshio Shuppan.

Rieder-Bünemann, A. (2012). Second Language Learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 2980–2983). Springer US. https://doi.org/10.1007/978-1-4419-1428-6_826

Rindal, U. (2010). Constructing identity with L2: Pronunciation and attitudes among Norwegian learners of English [1]: CONSTRUCTING IDENTITY WITH L2. *Journal of Sociolinguistics*, *14*(2), 240–261. https://doi.org/10.1111/j.1467-9841.2010.00442.x

Ritchard, A., & Arvaniti, A. (2014). *The form and use of uptalk in Southern California English.* Speech Prosody 7, Dublin.

Romaine, S. (1999). *Communicating gender*. L. Erlbaum Associates.

Rosenthal, R. (1976). Experimenter effects in behavioral research, Enlarged ed. Irvington.

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, *48*(2), 1–36.

Russell, A., Penny, L., & Pemberton, C. (1995). Speaking Fundamental Frequency Changes Over Time in Women: A Longitudinal Study. *Journal of Speech, Language, and Hearing Research*, *38*(1), 101–109. https://doi.org/10.1044/jshr.3801.101

Sachs, C. (1975). Cues to the identification of sex in children's speech. In *Language and Sex: Difference and Dominance* (B. Thorne and Nancy H., pp. 152–171). Newbury House Publishers.

Santiago, F., & Delais-Roussarie, E. (2015a). The Acquisition of Question Intonation by Mexican Spanish Learners of French. In E. Delais-Roussarie, M. Avanzi, & S. Herment (Eds.), *Prosody and Language in Contact* (pp. 243–270). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-45168-7_12

Santiago, F., & Delais-Roussarie, E. (2015b). What motivates extra-rising patternsin L2 French: Acquisition factors or L1 Transfer? *ICPhs-15*.

Saville-Troike, M. (2003). *The ethnography of communication: An introduction* (3rd ed). Blackwell Pub.

Scherer, K. (2003). Vocal communication of emotion: A review of research paradigms. *Speech Communication*, *40*(1–2), 227–256. https://doi.org/10.1016/S0167-6393(02)00084-5

Schmid, M, & de Leeuw, E. (2019). Introduction to Linguistic Factors in Language Attrition. In M. S. Schmid & B. Köpke (Eds.), *The Oxford Handbook of Language Attrition* (pp. 179–190). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198793595.013.15

Schmid, M. S. (2002). First language attrition, use and maintenance: The case of German Jews in anglophone countries. J. Benjamins Pub.

Schmid, M. S. (2007). The role of L1 use for L1 attrition. In *Language Attrition. Theoretical perspectives* (B. Köpke, M.S. Schmid, M. Keijzer and S. Dostert, pp. 1–8). John Benjamins.

Schmid, M. S. (2010). Languages at play: The relevance of L1 attrition to the study of bilingualism. *Bilingualism: Language and Cognition*, *13*(01), 1. https://doi.org/10.1017/S1366728909990368

Schmid, M. S., & Köpke, B. (2017). The relevance of first language attrition to theories of bilingual development. *Linguistic Approaches to Bilingualism*, *7*(6), 637–667. https://doi.org/10.1075/lab.17058.sch

Schmid, Maxwell, & Bradley, E. (2019). Vocal pitch and intonation characteristics of those who are gendernon-binary. In S. Calhoun, P. Escudero, M. Tabain, & P. Warren (Eds.), *Proceedings of the 19th International Congress of Phonetic Sciences* (pp. 2685–2689).

Schroeder, S. R., Lam, T. Q., & Marian, V. (2015). Linguistic Predictors of Cultural Identification in Bilinguals. *Applied Linguistics*, amv049. https://doi.org/10.1093/applin/amv049

Shattuck-Hufnagel, S., & Turk, A. E. (1996). A prosody tutorial for investigators of auditory sentence processing. *Journal of Psycholinguistic Research*, *25*(2), 193–247.

Sherr-Ziarko, E. (2017). Prosodic properties of formality in spoken Japanese. University of Oxford.

Sherr-Ziarko, E. (2019). Prosodic properties of formality in conversational Japanese. *Journal of the International Phonetic Association*, *49*(3), 331–352. https://doi.org/10.1017/S0025100318000117

Shevchenko, T. I. (1999). THE SOCIOCULTURAL VALUE OF FO-VARIATIONIN BRITISH AND AMERICAN ENGLISH. *Proceedings of the 14th International Congress of Phonetic Sciences*, 1609–1612.

Siegal, M. (1996). The role of learner subjectivity in second language sociolinguistic competency: Western women learning Japanese. *Applied Linguistics*, *17*(3), 356–382.

Silverstein, M. (2003). Indexical order and the dialectics of sociolinguistic life. *Language & Communication*, *23*(3–4), 193–229. https://doi.org/10.1016/S0271-5309(03)00013-2

Skutnabb-Kangas, T. (1981). *Bilingualism or not: The education of minorities*. Multilingual Matters.

Slevc, L. R., & Miyake, A. (2006). Individual Differences in Second-Language Proficiency: Does Musical Ability Matter? *Psychological Science*, *17*(8), 675–681. https://doi.org/10.1111/j.1467-9280.2006.01765.x

Smiler, A. P., & Epstein, M. (2010). Measuring Gender: Options and Issues. In J. C. Chrisler & D. R. McCreary (Eds.), *Handbook of Gender Research in Psychology* (pp. 133–157). Springer New York. https://doi.org/10.1007/978-1-4419-1465-1_7

So, C. K. (2010). Categorizing Mandarin tones into Japanese oitch-accent categories: The role of phonetic properties. *Proceedings of Interspeech 2010 Satellite Workshop on Second Language Studies, Tokyo*. Interspeech 2010, Tokyo, Japan.

So, C. K. (2012). Cross-language categorization of monosyllabic foreign tones: Effects of phonological and phonetic properties of native language. In T. Stolz, N. Nau, & C. Stroh (Eds.), *Monosyllables: From phonology to typology* (pp. 55–69). Akademie Verlag.

So, C. K., & Best, C. T. (2010). Cross-language Perception of Non-native Tonal Contrasts: Effects of Native Phonological and Phonetic Influences. *Language and Speech*, *53*(2), 273–293. https://doi.org/10.1177/0023830909357156

So, C. K., & Best, C. T. (2011). Categorizing Mandarin tones into listeners' native prosodic categories: The role of phonetic properties. *Poznań Studies in Contemporary Linguistics*, *47*. https://doi.org/10.2478/psicl-2011-0011

So, C. K., & Best, C. T. (2008). Do English speakers assimilate Mandarin tones to English prosodic categories? *Proceedings of the Annual Conference of the International Speech Communication Association*, 1120.

Stevens, G. (1999). Age at immigration and second language proficiency among foreign-born adults. *Language in Society*, *28*(04). https://doi.org/10.1017/S0047404599004030

Stevens, S. S., Volkmann, J., & Newman, E. B. (1937). A Scale for the Measurement of the Psychological Magnitude Pitch. *The Journal of the Acoustical Society of America*, *8*(3), 185–190. https://doi.org/10.1121/1.1915893

Streeter, L. A., Krauss, R. M., Geller, V., Olson, C., & Apple, W. (1977). Pitch changes during attempted deception. *Journal of Personality and Social Psychology*, *35*(5), 345–350.

Sturtz Sreetharan, C. (2004). Japanese men's linguistic stereotypes and realities: Conversations from the Kansai and Kanto regions. In J. S. Shibamoto Smith & S. Okamoto (Eds.), *Japanese language, gender, and ideology: Cultural models and real people* (pp. 275–289). Oxford University Press.

Sugihara, Y., & Katsurada, E. (2002). Gender Role Development in Japanese Culture: Diminishing Gender Role Differences in a Contemporary Society. *Sex Roles*, *47*(9), 443–452. https://doi.org/10.1023/A:1021648426787

Sunaoshi, Y. (2004). Farm women's professional discourse in Ibaraki. In S. Okamoto & J. S. S. Smith (Eds.), *Japanese language, gender, and ideology: Cultural models and real people* (pp. 187–204). Oxford University Press.

Tagliamonte, S. A. (2013). Comparative Sociolinguistics. In J. K. Chambers & N. Schilling (Eds.), *The Handbook of Language Variation and Change* (pp. 128–156). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118335598.ch6

Takano, S., & Ota, I. (2017). A sociophonetic approach to variation in Japanese pitch realizations: Region, age, gender and stylistic parameters. *Asia-Pacific Language Variation*, *3*(1), 5–40. https://doi.org/10.1075/aplv.3.1.02tak

Titze, I. R. (1989). Physiologic and acoustic differences between male and female voices. *The Journal of the Acoustical Society of America*, *85*(4), 1699–1707. https://doi.org/10.1121/1.397959

Titze, I. R. (1994). *Principles of voice production*. Prentice Hall.

Top ten non-European Union countries of domicile in 2016/17 for HE student enrolments. (2018). [UK data analysit for higher eduction]. HESA. https://www.hesa.ac.uk/data-and-analysis/sfr247/figure-11

Trofimovich, P., & Baker, W. (2006). Learning Second Language Suprasegmentals: Effect of L2 Experience on Prosody and Fluency Characteristics of L2 Speech. *Studies in Second Language Acquisition*, *28*(01). https://doi.org/10.1017/S0272263106060013

Trudgill, P. (1974). *The social differentiation of English in Norwich*. Cambridge University Press.

Tsuji, A. (2004). The case study of high pitch register in English and in Japanese: Does high pitch register relate to politeness? *Seijo English Monographs*, *37*, 227–260.

Tsurutani, C., & Shi, S. (2018). How native speakers of Japanese try to sound polite. *Journal of Japanese Linguistics*, *34*(1), 127–155. https://doi.org/10.1515/jjl-2018-0007

Turner, J. C. (1999). Some Current Issues in Research on Social Identity and Self Categorisation Theories. In N. Ellemers, R. Spears, & B. Doosje (Eds.), *Social identity: Context, commitment, content*. Blackwell.

UK Department of Education. (2016). *Schools, pupils and their characterisitcs: January 2016* (SFR20/2016). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/552342/SFR20_2016_Main_Text.pdf

Ullakonoja, R. (2007). Comparison of Pitch Range in Finnish (L1) and Russian (L2). *Proceedings of the 16th International Congress of the Phonetic Sciences, Saarbrcken, Germany*, 1701–1704. www.icphs2007.de

Urbani, M. (2012). Pitch range in L1/L2 English. An analysis of F0 using LTD and linguistic measures. *Papers from ML2P 2012*, 79–83.

Van Bezooijen, R. (1995). Sociocultural aspects of pitch differences between Japanese and Dutch women. *Language and Speech*, *38 (3)*, 253–265.

Van Lancker, & Canter, G. J. (1981). Idiomatic versus literal interpretations of ditropically ambiguous sentences. *Journal of Speech and Hearing Research*, *24*(1), 64–69.

Van Lancker, D., & Sidtis, J. (2003). Auditory recognition of idioms by native and nonnative speakers of English: It takes one to know one. *Applied Psycholinguistics*, *24*(01). https://doi.org/10.1017/S0142716403000031

Vincent, B. (2018). Transgender health: A practitioner's guide to binary and non-binary trans patient care. Jessica Kingsley Publishers.

Voigt, R., Jurafsky, D., & Sumner, M. (2016). Between-and Within-Speaker Effects of Bilingualism on F0 Variation. *Interspeech 2016*, 1122–1126.

Volín, J., Poesová, K., & Weingartová, L. (2015). Speech Melody Properties in English, Czech and Czech English: Reference and Interference. *Research in Language*, *13*(1). https://doi.org/10.1515/rela-2015-0018

Warner, N., & Arai, T. (2001). Japanese Mora-Timing: A Review. *Phonetica*, *58*(1–2), 1–25. https://doi.org/10.1159/000028486

Weatherall, A. (2002). *Gender, language and discourse*. Routledge.

Wennerstrom, A. K. (2001). The music of everyday speech: Prosody and discourse analysis. Oxford University Press.

Wierzbicka, A. (2004). Preface: Bilingual Lives, Bilingual Experience. *Journal of Multilingual and Multicultural Development*, *25*(2–3), 94–104. https://doi.org/10.1080/01434630408666523

Willems, N. (1982). *English Intonation from a Dutch Point of View:* DE GRUYTER MOUTON. https://doi.org/10.1515/9783110853469

Willemsen, T. M., & Fisher, A. H. (1996). Femininiteit en masculiniteit: De ontwikkeling van de NederlandseSekse-Identiteit Vragenlijst (NSIV) [Unpublished manuscript].

Winter, B., & Grawunder, S. (2012). The phonetic profile of Korean formal and informal speech registers. *Journal of Phonetics*, *40*(6), 808–815. https://doi.org/10.1016/j.wocn.2012.08.006

Wray, A., & Bloomer, A. (2006). *Projects in linguistics: A practical guide to researching language* (2nd ed). Hodder Arnold ; Distributed in the United States of America by Oxford University Press.

Yaeger-Dror, M. (2002). Register and prosodic variation, a cross language comparison. *Journal of Pragmatics*, *34*(10–11), 1495–1536. https://doi.org/10.1016/S0378-2166(02)00069-3

Yamazawa, H., & Hollien, H. (1992). Speaking Fundamental Frequency Patterns of Japanese Women. *Phonetica*, *49*(2), 128–140. https://doi.org/10.1159/000261907

Yuasa, I. (1999). The effect of an interlocutor's gender on pitch-ranges employed by Japanese men. *ICPhs -14*, 1605–1608.

Yuasa, I. P. (1998). Politeness strategies observed in pitch-ranges employed by Japanese men and women. In *Crossroads of Language, Interaction, and Culture I: Vol. I* (pp. 27–42). the Regents of the University of California.

Yuasa, I. P. (2008). Culture and gender of voice pitch: A sociophonetic comparison of the Japanese and Americans. Equinox.

Zimmerer, F., Jügler, J., Andreeva, B., Möbius, B., & Trouvain, J. (2014). Too cautious to vary more? A comparison of pitch variation in native and non-native productions of French and German speakers. *SP-7*, 1037–1041.

Zwicker, E. (1961). Subdivision of the Audible Frequency Range into Critical Bands (Frequenzgruppen). *The Journal of the Acoustical Society of America*, *33*(2), 248–248. https://doi.org/10.1121/1.1908630

Appendix

Appendix A

Ethical approval QMUL

Queen Mary, University of London
Room W117
Queen's Building
Queen Mary University of London
Mile End Road
London E1 4NS

Queen Mary Ethics of Research Committee
Hazel Covill
Research Ethics Administrator
Tel: +44 (0) 20 7882 7915
Email: h.covill@qmul.ac.uk

c/o Dr Esther de Leeuw
Arts One 1.09
Department of Linguistics
Queen Mary University of London
Mile End Road
London

15th March 2017

To Whom It May Concern:

Re: QMREC1947a – L1 attrition and L2 acquisition of pitch in Japanese-English late sequential bilinguals as a function of gender.

I can confirm that Ms Elisa Passoni has completed a Research Ethics Questionnaire with regard to the above research.

The result of which was the conclusion that her proposed work does not present any ethical concerns; is extremely low risk; and thus does not require the scrutiny of the full Research Ethics Committee.

Yours faithfully

Ms Hazel Covill – QMERC Administrator

Ethical Approval Sophia University Tokyo

件名: Re: Queen Mary University of London大学院生が日本での音声収集を希望

英語学科
北原　先生

研究推進センターの新井です。
この度はご連絡を頂戴しありがとうございました。

お問い合わせいただきました件につきまして、次のとおり回答申し上げます。

– 倫理委員会においてどのような手続き・プロセスが必要か

今回は上智大学の学生・院生に協力を要請するとのことですが、倫理委員会に申請することは、申請者（この場合研究者として、本学で研究活動に従事する全ての者を含む）の任意となっております。
まずは、研究内容に応じてご判断をお願い申し上げます。

– 私との共同研究という形をとることが必要か否か

実質的なものでないのであれば、北原先生との共同研究という形をとる必要はございません。
ただし、他大学の大学院生の研究ですので、指導教員（受入教員）として、北原先生には関与いただきたく、宜しくお願い申し上げます。

– その他留意すべき事項はあるか

本学の倫理委員会への申請可否に関わらず、研究対象者への倫理的配慮をした上で研究実施していただくことに変わりはないですので、その点ご指導の程何卒よろしくお願い申し上げます。

・・
上智大学　学術情報局　研究推進センター
新井　朋子　––Tomoko Arai––
〒102-8554　東京都千代田区紀尾井町7-1
TEL : 03-3238-3173　 FAX : 03-3238-4116
MAIL : Tomoko_Arai@cl.sophia.ac.jp
・・

Information Sheet and Consent Form - English

Information for participants

Queen Mary
University of London

Multilingual diversity in London

We would like to invite you to be part of this research project being conducted in the Department of Linguistics at Queen Mary University of London. Participation is entirely voluntary: you should only agree to take part if you want to. If you choose not to take part there will not be any disadvantages for you and you will hear no more about it.

Please read the following information carefully before you decide to take part; this will tell you why the research is being carried out and what you will be asked to do if you take part. Please ask if there is anything unclear or if you would like more information.

If you decide to take part you will be asked to sign a consent form to say that you agree. You are still free to withdraw at any time during or after your involvement without providing a reason.

Aim of the study

Research in bilingualism indicates that it is possible to acquire a second language (L2) in adulthood, but very little is known about how individuals learn one or more specific varieties of their L2. Acquiring an L2 has normally been seen as the acquisition of a homogeneous system, despite sociolinguistics showing that languages are comprised of numerous varieties. With this research, I will try to account for whether and how bilinguals acquire a specific variety of their L2. Furthermore, I will also look at how the acquisition of a specific variety of an L2 may affect the native language of the speaker.

The precise research questions and lines of enquiry can be disclosed following data collection at the end of your involvement with the research. You will be entirely free to withdraw your data at any point during or after data collection without providing a reason.

Your involvement

I will ask you to complete three short tasks, to fill in two questionnaires and a placement test. I will ask you to go through the experiment twice, with a 30-minute break in between the two parts of the experiment. Each half of the experiment will take maximum 45 min. The tasks are really simple and do not require any previous knowledge: you will have to listen to some voices and rate them, read some sentences, leave a short message on an answer phone. Please, remember that there is no write and wrong answer and that we are not testing you knowledge of languages. Afterwards, I will ask you to fill in two questionnaires and a placement test. If you feel unable to answer any of the questions for any reason, please ask the investigator.

Your participation in the study would present minimal risk to you and it is up to you to decide whether or not to take part. If you choose not to participate it will not disadvantage you in any way. If you decide to take part you will be given this information sheet to keep and be asked to sign a consent form.

If you decide to take part you are still free to withdraw at any time and without giving a reason. If you complete the whole study, you will be compensated for you time and travel expenses with £20.

Storage and use of your data

Data will be stored in a password-protected cloud account and in a safe location, accessible only to the researcher and her supervisors. A randomly allocated number will be used to refer to you in marking up data and in any discussion, so that you will be unidentifiable. If I present any data at academic conferences or in journal articles it will be anonymized so that you are not identifiable to anyone else as a participant. I might use some audio clips (with any reference to names or other identifiable information obscured) in teaching, conference presentations or online publications. Your data may also be made available on the UK Data Service, a repository of social, economic and population data for researchers, students and teachers. You are free opt out of any or all of these uses of your data if you consent to participate in this research.

Next steps

As already mentioned, it is up to you to decide whether to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form.

If you have any questions or concerns about the manner in which the study was conducted please, in the first instance, contact the researcher responsible for the study: Elisa Passoni, e.passoni@qmul.ac.uk.

You can also contact the researcher's first supervisor, Dr Esther de Leeuw, at e.deleeuw@qmul.ac.uk, on 0207 882 5911, or at Department of Linguistics, Queen Mary University of London, Mile End Road, London E1 4NS.

If this is unsuccessful or inappropriate, please contact the Secretary at the Queen Mary Ethics of Research Committee, Room W104, Queen's Building, Queen Mary University of London, Mile End Road, London, E1 4NS or research-ethics@qmul.ac.uk

Consent form

Queen Mary
University of London

Please complete this form after you have read the information sheet and/or listened to an explanation about the research.

Title of study: **Multilingual Diversity in London**

Queen Mary Ethics of Research Committee Ref: QMREC1947a

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the information sheet or explanation already given to you, please ask the researcher before you decide whether to take part. You will be given a copy of this consent form to keep and refer to at any time.

I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers and my data and involvement will be withdrawn immediately.

I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Please tick where appropriate:

I consent to my anonymized data and short sections of my recording being used for teaching purposes. ☐

I consent to my anonymized data and short sections of my recording being used for public engagement purposes. ☐

I consent to audio clips of my voice being made available in online publications and via the UK Data Service. ☐

I consent to be contacted for a second stage in this study, if there is a follow-up. I would only be contacted for this reason. ☐

Participant’s statement:

I ____ agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the information sheet about the project, and understand what the research study involves.

Signature: Date:

Investigator’s Statement:

I ____ confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the volunteer.

Signature: Date:

Information sheet and consent form - Japanese

参加者控え

同　意　書

上智大学 SOPHIA UNIVERSITY　Queen Mary University of London

私は、下記の内容について説明を受け、了承の上で実験に参加します。

研究テーマ
東京における多言語の多様性

目的

本研究は個人が母語を習得した後でどのように第二言語を学ぶのかについて、調査することを目的としています。また、第二言語の習得が話者の母語に影響を与えるのか、どのように影響するのかについての説明も試みます。
本実験の実施にあたり、QMUL と上智大学倫理委員会の承認を得ております(QMREC1947a) 。

内容
上智大学内の防音室にて、PC 上で実験を行います。実験ではいくつかの短いタスクを行っていただきます。その後、2 種類のアンケートにお答えいただきます。

実験協力者として選定される理由
成人の、日本語を母語とする者と認められた場合 。(20≤年齢≤39)

所要時間と謝礼
本実験の所要時間は 1 時間 15 分程度(休憩含む)を予定しています。途中、休憩や中断を希望する場合にはすぐに申し出てください。なお、本実験への参加に同意をした後も、口頭により同意を撤回することができます。
同意を撤回しても参加者の方が不利益を被ることはありません。また、実験への参加に対して、謝礼を差し上げます。

危険性
本実験に参加することによる身体・精神への危険性は極めて低いですが、考え得る最大リスクとしては、倦怠感や疲労が挙げられます。もし、実験の途中でストレスや負担を感じ、実験の中止を希望する場合は、我慢せずにすぐに申し出てください。速やかに実験を中止します。なお、実験の中止に伴う参加者の方への不利益は生じません。

参加について
本実験への参加は、参加者の自由です。仮に実験にご参加いただけなかったり、途中で実験を中止されても、いかなる不利益も被ることはありません。本実験は参加者に個人的な恩典を与えるものではありませんが、バイリンガリズムに関して何かしらの貢献がもたらされることが期待されます。

機密保持とデータ保存
本実験で収集されたデータや個人情報は、研究目的のみで使用し、第三者に公開されることはありません。個人情報は、記号、あるいは、参加者管理番号によって管理・保存されるため、個人が特定されることはありません。なお、本実験で収集したデータは、パスワード付きの電子ファイル、もしくは、鍵のかかる保管庫内に保存されます。本実験で得られた情報やデータの保存期間は、研究成果を論文等にて公表後 10 年までとし、その後研究責任者が破棄します。

本実験で得られた結果は、学会誌への投稿論文・記事として報告される可能性があります。また、国内での学会や研究会で報告する可能性もあります。しかし、研究結果の報告にあたり、研究対象者の個人情報を公開することはなく、研究対象者が特定されることはありません。
これは 1998 年英国データ保護法に従って行われます。

参加者控え

当てはまるものにチェックを入れてください:

私は、私の匿名のデータ及び録音を教育目的で使用することに同意します。 ☐

私は、私の匿名のデータ及び録音をパブリックエンゲージメント(研究者が一般の人々と相互利益を目的として知見を共有すること)目的で使用することに同意します。 ☐

私は、私の声の音声クリップがオンライン刊行物またUK Data Serviceを通じて入手可能になることに同意します。 ☐

私は、フォローアップがあった場合には本研究の第二段階のために連絡を受けることに同意します。連絡を受けるのはこの目的のみとします。 ☐

その他
本実験への参加は、大学の授業における評価や成績とは一切関係がなく、実験参加は義務ではありません。また必要に応じて、支障のない範囲で研究計画書及び方法に関する資料の入手、閲覧ができます。なお、実験終了後も同意を撤回することができます。同意を撤回する場合も、不利益を被ることはありません。

問い合わせ先
研究実施者(Elisa)、及び、研究責任者(Dr. Esther de Leeuw) はいつでもご質問、ご相談をお受けいたします。メールあるいは直接口頭で、ご自由にご相談ください。

- PhD student, Elisa Passoni: e.passoni@qmul.ac.uk, +44 7928642119
  [Queen Mary University of London, Department of Linguistics, E1 4NS.
  Visiting researcher at: Sophia University, Graduate School of Science and Technology & Graduate School of Linguistics 7-1 Kioi-cho, Chiyoda-ku, Tokyo, 102-8554 JAPAN (B229 Phonetics Laboratory & 4-295c Arai laboratory)]

- Dr. Esther de Leeuw: e.deleeuw@qmul.ac.uk, +44 2078825911
  [Queen Mary University of London, Department of Linguistics, Mile End Road, E1 4NS]

参加者署名:

私、 ______________________________ は、上記研究プロジェクトについて十分に説明を受け、本研究に参加することに同意致します。私は上記の説明文を全て読み、本研究に何が含まれているのかを理解しました。

記入日： ____________年__________月__________日

氏名（自筆）： ______________________________

研究者署名:

私、______________________________ は、本研究がどういったもので何が求められているか、また考えられるリスクについて(該当するもの)、志願者に対して注意深く説明致しました。

記入日： ____________年__________月__________日

氏名（自筆）： ______________________________

Appendix B

Call for participants – Bilinguals in London

Hello!

I am looking for Japanese-English bilinguals who live and study/work in London to take part in a study that investigates Multilingual Diversity in London.

Who can take part?

Japanese-English bilinguals who:

Are not bilingual from birth (i.e., did not learn English and Japanese at the same time);

Are over 18 years of age;

Are under 40 years of age.

What will you have to do?

I will ask you to come and meet me at Queen Mary University of London, (nearest tube station: Mile End) where you will complete 3 short tasks and fill in 2 questionnaires.

The testing session will last for about 1.5 hour, with a 30-min break during there will be coffee, tea and yummy cakes provided ☺ I will start testing in September 2017.

I will refund your travel expenses and be able to offer a small compensation for your time. And I will be grateful for your help forever!

If you are interested or have any questions, please contact me via email at: e.passoni@qmul.ac.uk

Looking forward to hearing from you!

Elisa

Call for participants – Southern Standard British English

Hello!

I am looking for Southern British English speakers who **do not** speak Japanese to take part in a study that investigates *Multilingual Divers*ity in London.

Who can take part?

Southern British English speakers who:

Are not bilingual from birth (i.e. did not learn English and another language at the same time);

Do not speak Japanese, no matter what level;

Are over 18 years of age;

Are under 40 years of age.

What will you have to do?

I will ask you to come and meet me at Queen Mary University of London where you will complete 3 short tasks and fill in 2 questionnaires.

The testing session will last for about 45 minutes, after which there will be coffee, tea and yummy cakes provided ☺ I will start testing in Septemebr 2017.

I will refund your travel expenses and be able to offer a small compensation for your time. And I will be grateful for your help forever!

If you are interested or have any questions, please contact me via email at: e.passoni@qmul.ac.uk

Looking forward to hearing from you!

Elisa

Call for participants – Japanese-English bilinguals (Tokyo)

Hello!

My name is Elisa Passoni and I am a second year PhD student at Queen Mary University of London (UK). I am now a visiting researcher at Sophia University (Tokyo), both at the Arai-sensei and Kithahara-sensei Labs, and I am here to collect data for my PhD project.

I am looking for Standard Japanese – English bilinguals, between the ages of 18 and 39, and who are not bilingual from birth.

Here some more information about the project and a few screening questions:

Experiment: some very simple speaking and listening tasks (no previous knowledge is required about anything!) and 3 short questionnaires.

Where: Sophia Phonetics Lab, Building 2, room B229

How long: ca. 2 hours, comprising 30-min break

Contribution to you for your time: 円 2100 & refreshments

My availability: any time and day of the week from Tuesday the 3th of April till Sunday the 3rd of June.

Ethical approval: My project was granted Ethical approval from the Ethics committees of both Queen Mary and Sophia University.

Researchers' contact details: Elisa Passoni, e.passoni@qmul.ac.uk

Call for participants –Japanese monolinguals

私は、イギリスのロンドンにある Queen Mary 大学で博士後期課程に
所属しております Elisa Passoni と申します。私は今、実験のデータを
収集するために、上智大学の荒井先生および北原先生の研究室におります。

実験詳細

内容：簡単なスピーキングとリスニングのタスクを 3 問行っていただきます
（事前の知識等は必要ありません）。また、3 つの質問に答えていただきます。

場所：上智大学音声学研究所 2 号館 B 教室

所要時間：1 時間 15 分以内（間に休憩を挟みます）

謝金：1350 円

いつ：2018 年 4 月 4 日～2018 年 6 月 3 日

参加者：バイリンガルではなく、また英語や英文学を研究していない日本語
母語話者（標準アクセント）

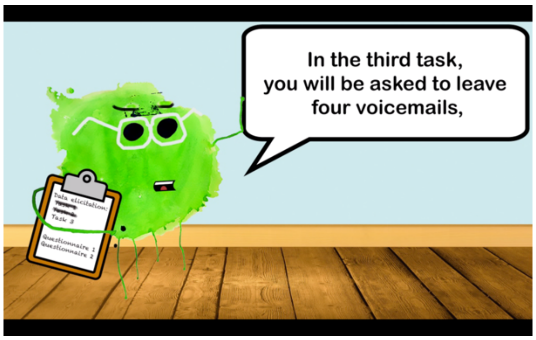
実験にご協力いただける場合には、以下のメールアドレスまでご連絡いただきたく
(Elisa Passoni，e.passoni@qmul.ac.uk) 存じます。

ありがとうございます ☺
Elisa

Appendix C

Script for experiment – English Version

[the animation appears on the screen holding in its hand a clipboard, similarly to in the picture below]



Words on the clipboard

Task 1

Task 2

Task 3

Questionnaire 1

Questionnaire 2

<u>Animation 1</u>

Hi, my name is Blobby and I am the Lab Assistant.

Welcome to the QMUL /Sophia University Phonetics Lab

Today I will guide you through the various tasks of this experiment.

The tasks are very simple and short.

Please, remember that you are not being tested on your knowledge of languages,

and that there are no right or wrong answers.

You will receive more detailed instructions during the experiment.

In the first task, you will be asked to listen to some voices and rate them in terms of some personality adjectives.

Now, sit comfortably and relax.

Please, wear the headphones provided.

Press the space bar when you are ready.

Experiment - general introduction

Thank you for your interest in participating in this study, which is conducted by PhD candidate, Elisa Passoni, in the Department of Linguistics at Queen Mary University of London.

During this experiment, you are going to be asked to complete a few short tasks, followed by a questionnaire and a placement test. You will be asked to do the experiment twice, with a 30-minute break in between. The whole experiment should take maximum 2 hours to complete.

We will not collect any identifying information about you. It is entirely up to you to decide whether to take part in this study or not. If you choose not to take part, there will be no disadvantages to you and you will not be penalized in any way. You are also free to withdraw your agreement to participate at any time (even after the experiment has begun).

Press the space bar on the keyboard when you are ready to begin. By pressing the space bar, you will begin the experiment, and provide your consent to participate in this research.

Perception task (not analysed here due to space constraints)

Instruction

It is common to get first impressions about people just from hearing them speak. In this part of the experiment, we are interested in your initial impressions.

You will hear a short "beep" followed by a recording of a voice telling a fable.

Once the fable is done, you will be asked to rate the voice in terms of some binary personality characteristics on a 7-point scale.

There are no right or wrong answers. We are just interested in knowing what your first impression of the speaker is.

You will be asked to repeat the task 18 times, with 18 different recordings.

Before starting the actual task, you will do a short trial.

If you have any questions, please ask the researcher in the main room of the Lab now.

To adjust the volume, click on the speaker icon at the bottom right corner of the screen and drag the cursor left or right.

Once you are ready, press the space bar to begin this part of the experiment.

Trial

Q: How did that voice sound?

Rate the voice on the scale and then press the space bar to confirm your answer.

Adjectives

1=young, 7=old

1=energetic, 7=lazy

Instruction

Now it's time for the real task.

Press the space bar when you are ready to begin the task.

Task

Q: How did that voice sound?

Rate the voice on the scale and then press the key button to confirm your answer.

Adjectives

1=weak; 7=strong

1=short; 7=tall

1=unattractive; 7=attractive

1=modest; 7=arrogant

1=feminine; 7=masculine

1=dependent; 7=independent

1=childlike; 7=adult

1=small; 7=large

1=traditional; 7=modern

1=emotional; 7=rational

1=ordinary; 7= strange

You have completed task 1. Thank you very much ☺

Animation 2

[the animation comes in again and says]

Hello again, and well done!

Now you can take the headphones off.

In the second task, you will be asked to address some sentences to people you see on the screen.

Please, do not change the content of the sentences in any way.

Please use the microphone provided.

The microphone should be roughly 25 cm from your mouth,

And slightly to the side.

As in this picture.

Great! Now relax and press the space bar when you are ready.

Reading Task

Instructions

It is common to modify our voice depending on whom we are speaking to. In this part of the experiment, we are interested in your voice.

You will see an image of a person accompanied by a sentence.

Read the sentence as if you are speaking to the person in the image.

Please do not change the content of the sentence in any way.

Read the sentence to yourself first and then read it out loud. Read each sentence out loud twice, with a short pause in between.

If you make a mistake while reading a sentence, stop, relax and re-read the sentence from the beginning.

Before starting the actual task, you will do a short trial.

Once you are ready, press the space bar to begin this part of the experiment.

Trial

Read this sentence out loud twice with a short pause in between.

Address the sentence to the person you see on the screen.

When you are done, press the space bar.

Instruction 2

Now it’s time for the real task.

Press the space bar when you are ready to begin the task.

Task

Read this sentence out loud twice with a short pause in between.

Address the sentence it to the person you see on the screen.

When you are done, press the space bar.

Stimuli [Appendix H]

You have completed task 2. Thank you very much ☺

Animation 3

[the animation comes in again and says]

Me again!

In the third task, you will be asked to leave two voicemails,

one for a friend and one for a person you will see on the screen.

You will be given directions on the content of the voicemails and a few minutes to prepare them.

You can take some notes on the paper provided.

Please do not write out everything you are going to say.

In this part of the experiment, we are interested in running speech.

Please, wear the headphones again.

And speak into the microphone provided.

Great! Now relax and press the space bar when you are ready.

Voicemail task

Instructions

It is common to have a slightly different voice when we talk compared to when we read. In this part of the experiment, we are interested in your voice when you speak without reading.

You will be asked to leave two voicemails, one for a friend and one for to a person you will see on the screen.

For each voicemail, you will be given some directions on what to include. Please make sure you include all the points required.

You will be given a few minutes to prepare the voicemail. You can make some notes on the paper provided to help you remember what you are going to talk about, but please do not write down the whole message.

There are no right or wrong ways of leaving the voicemails. We are just interested in how you do it.

Please try to speak for about 3 minutes.

Once you are ready, press the space bar to begin this part of the experiment.

Stimuli [Appendix I]

Now it’s time to leave the voicemail.

Dial the number 0123 and leave your voicemail after the beep.

When you are finished, please press the space bar.

You have completed task 3. Thank you very much ☺

Animation 4

Hello again! Well done, you are nearly finished ☺

Now you will be asked to complete a last questionnaire.

Elisa will show it here.

[here the experiment ends for the monolinguals; the first half of the experiment ends for the bilinguals]

Thanks! Bye ☺

Animation 1/b

[Introduction two the second half of the experiment. The language changes here.]

Hi! Welcome back.

I hope you had a nice break.

Now we start the second half of the experiment.

In the first task, you will be asked to listen to some voices and rate them in terms of some personality adjectives.

Now, sit comfortably and relax.

Please, wear the headphones provided.

Press the space bar when you are ready.

[the experiment continues with Animation 2, in the new language]

Script for experiment -Japanese version

<u>Animation 1</u>

こんにちは。ブロビーと言います。この研究室のアシスタントです。

QMUL /SOPHIA 音声学研究室へようこそ。

今日は、実験の間、私がご案内します。

タスクは簡単で短いものばかりです。

言語の知識をテストするわけではありません。

答えには正解も不正解もありません。

詳しい説明は実験の間にお伝えします。

最初のタスクでは、何人かの声を聴いて、人の性質を表す言葉で声を評価していただきます。

では、ゆったり座ってリラックスしてください。

備え付けのヘッドホンをつけてください。

準備ができたらスペースキーを押してください。

Experiment - general introduction

ご協力いただきありがとうございます。本研究は、ロンドン・クイーンメアリー大学言語学部所属の博士課程学生、エリザ・パッソーニによるものです。

実験ではいくつかの短いタスクを行っていただきます。その後、アンケート、テストと続きます。実験は、間に 30 分の休憩をはさんで、2 回行われます。全てが終了するまでの時間は、2 時間弱を予定しています。

個人を特定する情報は収集しません。研究にご参加いただくかどうかはご自身でお決めください。参加しないからといって、不利になることやペナルティはありません。参加同意はいつでも取り下げることができます。（実験開始後でも構いません。）

始める準備ができたらキーボードのスペースキーを押してください。スペースキーを押すことで実験が始まります。同時に、研究への参加に同意したことになります。

Perception task

Instruction

人が話すのを聞いて第一印象が決まるということがよくあります。このセクションは、第一印象についてです。

ピーッという短い音の後に、人の声で物語が流れます。

物語を聞きながら、人の性質を表す、相対する言葉で話し手の声を評価していただきます。

配られた用紙に、7 段階で記入してください。

話し手にどのような第一印象を持つかについてですので、解答に正解も不正解もありません。

18 件の異なる録音に対して、このタスクを繰り返していただきます。

実際のタスクの前に、例題があります。

質問がありましたら、研究室のメインルームにいる研究員に今聞いてください。

準備ができたら、スペースキーを押してこのセクションを開始してください。

<u>Trial & task</u>

この声はどのように聞こえますか？

声の評価を、配られた用紙に記入してください。

音声が終わり、評価し終わったら、スペースキーを押して先に進んでください。

Adjectives for trial

1=若い　7=年を取っている

1=エネルギッシュ　7=怠惰

<u>Adjectives for task</u> 1

1=弱い；　7=強い

1=背が低い；　7= 背が高い

1=魅力的でない；7=魅力的

1=慎み深い；7=横柄

1=女性的；7=男性的

1=依存している；7=自立している

1=子供っぽい；　7=大人

1=明るい；　7=落ち込んでいる

1=古風；　7=現代的

1=感情的；7=理性的

1=普通；7=　変わっている

では、本番です。

タスクを始める準備ができたら、スペースキーを押してください。

軽い休憩を取ってください。準備ができましたら、スペースキーを押して再開してください。

<u>Animation 2</u>

[the animation comes in again and says]

お疲れさまでした！

ヘッドホンを外してください。

2番目のタスクでは、画面に映った人に向かって文章を読んでいただきます。

文章の中身は変えないでください。

備え付けのマイクを使ってください。

図のようにしてください。

はい、結構です。ではリラックスして、準備ができたらスペースキーを押してください。

Task 2

Instructions

誰に話しかけているかによって声が変わることがよくあります。このセクションは、声についてです。

人の写真と文章が映し出されます。

写真の人に話しかけているつもりで、文章を読んでください。

文章の中身は変えないでください。

まずは文章を心の中で読んでみて、それから声に出して読んでください。一つの文章を、間に短いポーズをはさんで、二回読んでください。

間違えてしまったときは、いったん止まってリラックスして、文章の初めからやり直してください。

実際のタスクの前に、短い例題があります。

質問がありましたら、研究室のメインルームにいる研究員に今聞いてください。

準備ができたら、スペースキーを押してこのセクションを開始してください。

Trial & Task

この文章を、間に短いポーズを入れて二回、声に出して読んでください。

文章を画面の人物に対して伝えてください。

終わりましたら、スペースキーを押してください。

Instruction

では本番です。

タスクを始める準備ができたら、スペースキーを押してください。

Animation 3

[the animation comes in again and says]

またお会いしましたね！

4 件のボイスメールを入れていただきます。

2 件は 2 人の友人に、もう 2 件は画面に映る 2 人の人物に対してです。

ボイスメールの中身についての指示があり、準備する時間が数分間与えられます。

配布された紙にメモを取って構いません。

ただし、言おうとする内容全てを書くことはしないでください。

このセクションは、自然に流れる発話についてです。

もう一度、ヘッドホンをつけてください。

備え付けのマイクに向かって話してください。

はい、結構です。ではリラックスして、準備ができたらスペースキーを押してください。

Task 3

Instruction

読んでいるときと話しているときでは声が少し変わることがよくあります。このセクションは、読むのではなく、話しているときの声についてです。

4 件のボイスメールを入れていただきます。2 件は 2 人の友人に、もう 2 件は画面に映る 2 人の人物に対してです。

それぞれのボイスメールに対して、どのような内容を入れるのかの指示があります。全てのポイントが含まれるようにしてください。

ボイスメールを準備する時間が数分間与えられます。何を話すかを忘れないように、配布されている紙にメモを取って構いません。ただし、メッセージの全部を書くことはしないでください。

どのように話すかについてですので、ボイスメールの入れ方に正解も不正解もありません。

3 分程度、話すようにしてください。

質問がありましたら、研究室のメインルームにいる研究員に今聞いてください。

準備ができたら、スペースキーを押してこのセクションを開始してください。

Instruction

では、ボイスメールを入れましょう。

0123 の番号にかけて、発信音の後にボイスメールを入れてください。

<u>Animation 4</u>

お疲れさまでした。もうすぐ終了です

今から、アンケートとグループ分けテストを行います。

このセクションは研究室のメインルームで行いますので、移動してください。

エリザが準備をして待っています。

<u>Animation 1/b</u>

<u>[Introduction two the second half of the experiment]</u>

おかえりなさい！

よく休めましたか？

では実験の後半を開始します。

最初のタスクでは、話す声を聞いて、人の性質を表す言葉で声を評価していただきます。

では、ゆったり座ってリラックスしてください。

備え付けのヘッドホンをつけてください。

準備ができたら、スペースキーを押してください。

Appendix D

Background questionnaire – Bilinguals EN

Multilingual diversity in London

Thanks for agreeing to take part in this study. The purpose of this questionnaire is to gather some extra information about factors which have been shown to have an effect on speech.

PLEASE NOTE: the questionnaire is anonymous but I need to retrieve your information somehow, that is why I allocated to you a three-digit 'PROVISIONAL PARTICIPANT NUMBER', which you can find in the email I sent you with this link.

* Required

This research is kindly supported by

General Information

1. Provisional Participant Number *

   It is the 3-digit number I sent you in the email along with a link to this questionnaire.

2. Age *

3. Place of birth *

   e.g. London, UK

4. Gender *

   Check all that apply.

   - [ ] Female
   - [ ] Male
   - [ ] Neither female not male
   - [ ] Prefer not to say

Skip to question 5

Language background - Part 1

In the following section, you are asked to list and describe the language background of each language you know. There is the option to report on five languages, but if you only speak two languages, only fill in the questions related to your first language (L1) and second language (L2).

5. Please state what is your native language (L1). *
   This is usually the language you learned at birth.

6. Age when you began acquiring your L1. *
   e.g. 0 years of age

7. Age when you became fluent in your L1. *
   e.g. 3 years of age

8. Age when you began reading in your L1. *
   e.g. 6 years of age

9. Age when you became fluent reading in your L1. *
   e.g. 7 years of age

10. Please list the number of years and months you spent in a country where your L1 is spoken. *
    e.g. 3 years and 5 months

11. Please list the number of years and months you spent in a family where your L1 is spoken. *
    e.g. 3 years and 5 months

12. Please list the number of years and months you spent in a school and/or working environment where your L1 is spoken. *
    e.g. 3 years and 5 months

13. Please rate your level of proficiency in SPEAKING your L1. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

14. Please rate your level of proficiency in UNDERSTANDING your L1. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

15. Please rate your level of proficiency in READING your L1. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

16. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L1. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

17. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L1. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

18. Please rate how much READING contributed to your proficiency in your L1. *
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	most important contributor

19. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L1. *
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	most important contributor

20. Please state what is your second language (L2). *
This is usually a language you learned after your L1, but you may also have learned it from birth.

____

21. Age when you began acquiring your L2. *
e.g. 5 years of age

____

22. Age when you became fluent in your L2. *
e.g. 8 years of age

____

23. Age when you began reading in your L2. *
e.g 10 years of age

____

24. Age when you became fluent reading in your L2. *
e.g. 12 years of age

____

25. Please list the number of years and months you spent in a country where your L2 is spoken. *
e.g. 3 years and 5 months

____

26. Please list the number of years and months you spent in a family where your L2 is spoken. *
e.g. 3 years and 5 months

27. Please list the number of years and months you spent in a school and/or working environment where your L2 is spoken. *
e.g. 3 years and 5 months

28. Please rate your level of proficiency in SPEAKING your L2. *
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

29. Please rate your level of proficiency in UNDERSTANDING your L2. *
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

30. Please rate your level of proficiency in READING your L2. *
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

31. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L2. *
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

32. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L2. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	most important contributor

33. Please rate how much READING contributed to your proficiency in your L2. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	most important contributor

34. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L2. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	most important contributor

35. Please state what is your third language (L3).

This is usually a language you learned after your L1 and L2, although it is also possible that you learned it at the same time of your L1 or L2.

36. Age when you began acquiring your L3.

e.g. 12 years of age

37. Age when you became fluent in your L3.

e.g. 15 years of age

38. Age when you began reading in your L3.

e.g. 12 years of age

39. Age when you became fluent reading in your L3.
e.g. 16 years of age

40. Please list the number of years and months you spent in country where your L3 is spoken.
e.g. 3 years and 5 months

41. Please list the number of years and months you spent in a family where your L3 is spoken.
e.g. 3 years and 5 months

42. Please list the number of years and months you spent in a school/working environment where your L3 is spoken.
e.g. 3 years and 5 months

43. Please rate your level of proficiency in SPEAKING your L3.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

44. Please rate your level of proficiency in UNDERSTANDING your L3.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

45. Please rate your level of proficiency in READING your L3.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

46. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L3.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

47. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L3.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

48. Please rate how much READING contributed to your proficiency in your L3.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

49. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L3.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

50. Please state what is your fourth language (L4).
This is usually a language you learned after your L3, although it is also possible that you learned it at the same time of other languages you speak.

51. Age when you began acquiring your L4.
e.g. 12 years of age

52. Age when you became fluent in your L4.
e.g. 17 years of age

53. Age when you began reading in your L4.
e.g. 12 years of age

54. Age when you became fluent reading in your L4.
e.g. 16 years of age

55. Please list the number of years and months you spent in a country where you L4 is spoken.
e.g. 3 years and 5 months

56. Please list the number of years and months you spent in a family where you L4 is spoken.
e.g. 3 years and 5 months

57. Please list the number of years and months you spent in a school and/or working environment where you L4 is spoken.
e.g. 3 years and 5 months

58. Please rate your level of proficiency in SPEAKING your L4.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

59. Please rate your level of proficiency in UNDERSTANDING your L4.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

60. Please rate your level of proficiency in READING your L4.
0=none; 1=very low; 2=low; 3=fair; 4=slighlty less than adequate; 5=adequate; 6=slighlty more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

61. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L4.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

62. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L4.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

63. Please rate how much READING contributed to your proficiency in your L4.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

64. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L4.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

65. Please state what is your fifth language (L5).
This is usually a language you learned after your L4, although it is also possible that you learned it at the same time of other languages you speak.

66. Age when you began acquiring your L5.
e.g. 12 years of age

67. Age when you became fluent in your L5.
e.g. 14 years of age

68. Age when you began reading in your L5.
e.g. 12 years of age

69. Age when you became fluent reading in your L5.
e.g. 15 years of age

70. Please list the number of years and months you spent in a country where your L5 is spoken.
e.g. 3 years and 5 months

71. Please list the number of years and months you spent in a family where your L5 is spoken.
e.g. 3 years and 5 months

72. Please list the number of years and months you spent in a school and/or work environment where your L5 is spoken.
e.g. 3 years and 5 months

73. Please rate your level of proficiency in SPEAKING your L5.

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

74. Please rate your level of proficiency in UNDERSTANDING your L5.

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

75. Please rate your level of proficiency in READING your L5.

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

76. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L5.

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

77. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L5.

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

78. Please rate how much READING contributed to your proficiency in your L5.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

79. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L5.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

Language Background - Part 2

The following questions enquire about the languages you know, when you learned those languages, and how often you use those languages. There is the option to report on five languages, but if you only speak two languages, only fill in the questions related to your first language (L1) and second language (L2).

80. Please list all the languages you know in order of acquisition (i.e. starting with your native language). *
Please list not more than 5 languages.

81. Please list what percentage of time you currently, and on average, are exposed to your native language (L1). *
For example, if on average you are exposed to your L1 60% of the time, choose '6' from the options below. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

82. Please list what percentage of time you currently, and on average, are exposed to your second language (L2). *

For example, if on average you are exposed to your L2 60% of the time, choose '6' from the options below. Your percentage should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

83. Please list what percentage of time you currently, and on average, are exposed to your third language (L3).

For example, if on average you are exposed to your L3 60% of the time, choose '6' from the options below. Your percentage should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

84. Please list what percentage of time you currently, and on average, are exposed to your fourth language (L4).

For example, if on average you are exposed to your L4 60% of the time, choose '6' from the options below. Your percentage should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

85. Please list what percentage of time you currently, and on average, are exposed to your fifth language (L5).

For example, if on average you are exposed to your L5 60% of the time, choose '6' from the options below. Your percentage should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

86. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L1? Assume that the original was written in another language, which is unknown to you. *
Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

87. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L2? Assume that the original was written in another language, which is unknown to you. *
Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

88. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L3? Assume that the original was written in another language, which is unknown to you.
Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

89. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L4? Assume that the original was written in another language, which is unknown to you.
Please report percent of total time. Your percentages should add up to 100%

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

90. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L5? Assume that the original was written in another language, which is unknown to you.
Please report percent of total time. Your percentages should add up to 100%

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

91. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L1? *
Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

92. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L2? *
Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

93. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L3?
Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

94. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L4?

Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

95. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L5?

Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

96. Please list all the languages you know in order of dominance (i.e. starting with the one you generally feel more comfortable at speaking). *

Please list not more than 5 languages.

Cultural background

The following four questions enquire about the cultures you identify with.

97. On a scale from zero to ten, please rate the extent to which you identify with Japanese culture. *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
no identification												complete identification

98. On a scale from zero to ten, please rate the extent to which you identify with British culture. *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
no identification												complete identification

99. On a scale from zero to ten, please rate the extent to which you identify with Japanese-British culture. *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
no identification												complete identification

100. Do you identify with any another culture? *

Mark only one oval.

- Yes
- No

101. If yes, please state which culture you identify with. *

102. On a scale from zero to ten, please rate the extent to which you identify with the culture you stated above.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
no identification												complete identification

Other questions

The following questions enquire about more general factors that have been found to have an effect on speech.

103. How many years of formal education do you have? *

e.g. 21

104. Please check your highest education level (or the approximate British equivalent to a degree obtained in another country) *

Check all that apply.

- [ ] Less than A-levels
- [ ] A-levels
- [ ] Vocational training
- [ ] Some University
- [ ] Bachelor degree
- [ ] Some Postgraduate education
- [ ] Master degree
- [ ] PhD/MPhil

Other: [ ] ____________________

105. If you selected other, please specify:

____

106. Did you grow up in an urban area (city) or rural area (countryside)? *

Mark only one oval.

( ) Urban area
( ) Rural area

107. In which prefectures of Japan have you lived? And how many years? *
e.g. Tokyo, 4 years, 1981-1985; Osaka, 10 years, 1985-1995.

____

108. When did you move to the United Kingdom? *
e.g. 01/03/1991; or March 1991; or 1991

____

109. How long have you been living in the UK for? *
e.g. 5 years 6 months

____

110. Have you ever lived in countries other that the UK and your native country? *

Mark only one oval.

- Yes
- No

111. If yes, where, for how long and when?
e.g. Brazil, 6 months, September 2009- March 2010

112. Occupational status: *
Please, select maximum 2 options

Check all that apply.

- [ ] Student
- [ ] Full-time/Part-time job
- [ ] Homeworker
- [ ] Unemployed
- [ ] Retired

113. If student, what is your area of studies?
e.g. Mathematics

114. If employed, what is your job?
e.g. Nurse

115. Do you play any instruments? *

Mark only one oval.

- Yes
- No

116. If yes, how often do you play per week?
1=never; 3=seldom; 5=often; 7=always

Mark only one oval.

	1	2	3	4	5	6	7	
never	◯	◯	◯	◯	◯	◯	◯	always

117. Have you ever received formal musical training? *

Mark only one oval.

◯ Yes
◯ No

118. If yes, how many years?
e.g. 3

____

119. Do you consider yourself a musician? *

Mark only one oval.

◯ Yes
◯ No

120. Have you ever had any of the following? *
Please, check all applicable.

Check all that apply.

☐ vision problems
☐ hearing imparement
☐ language disability
☐ learning disability
☐ none of the above

121. If yes, please give more details (including any corrections)

____
____
____
____
____

Thank you very much :)

Thank you very much for completing the questionnaire. I will be in touch within a few days to find a suitable time to meet and carry out the experiment. Elisa

Background questionnaire – Monolinguals EN

Multilingual diversity in London

Thanks for agreeing to take part in this study. The purpose of this questionnaire is to gather some extra information about factors which have been shown to have an effect on speech.

PLEASE NOTE: the questionnaire is anonymous but I need to retrieve your information somehow, that is why I allocated to you a three-digit 'PROVISIONAL PARTICIPANT NUMBER', which you can find in the email I sent you with this link.

* Required

Queen Mary University of London

This research is kindly supported by

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

The Great Britain SASAKAWA FOUNDATION グレイトブリテン・ササカワ財団

General Information

1. Provisional Participant Number *

   It is the 3-digit number I sent you in the email along with a link to this questionnaire.

   ____

2. Age *

   ____

3. Place of birth *

   e.g. London, UK

   ____

4. Gender *

   Check all that apply.

   - [ ] Female
   - [ ] Male
   - [ ] Neither female nor male
   - [ ] Prefer not to say

Skip to question 5

Language background - Part 1

In the following section, you are asked to list and describe the language background of each language you know. There is the option to report on two languages, but if you only speak one language, only fill in the questions related to your first language (L1).

5. Please state what is your native language (L1). *
   This is usually the language you learned at birth.

6. Age when you began acquiring your L1. *
   e.g. 0 years of age

7. Age when you became fluent in your L1. *
   e.g. 3 years of age

8. Age when you began reading in your L1. *
   e.g. 5 years of age

9. Age when you became fluent reading in your L1. *
   e.g. 7 years of age

10. Please list the number of years and months you spent in a country where your L1 is spoken. *
    e.g. 3 years and 5 months

11. Please list the number of years and months you spent in a family where your L1 is spoken. *
    e.g. 3 years and 5 months

12. Please list the number of years and months you spent in a school and/or working environment where your L1 is spoken. *
    e.g. 3 years and 5 months

13. Please rate your level of proficiency in SPEAKING your L1. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

14. Please rate your level of proficiency in UNDERSTANDING your L1. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

15. Please rate your level of proficiency in READING your L1. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

16. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L1. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

17. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L1. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

18. Please rate how much READING contributed to your proficiency in your L1. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

19. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L1. *

0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

20. Please state what is your second language (L2).

This is usually the language you learned after your L1, but you may have also learned it from birth.

21. Age when you began acquiring your L2.

e.g. 4 years of age

22. Age when you became fluent in your L2.

e.g. 7 years of age

23. Age when you began reading in your L2.

e.g. 6 years of age

24. Age when you became fluent reading in your L2.

e.g. 8 years of age

25. Please list the number of years and months you spent in a country where your L2 is spoken.

e.g. 3 years and 5 months

26. Please list the number of years and months you spent in a family where your L2 is spoken.
e.g. 3 years and 5 months

27. Please list the number of years and months you spent in a school and/or working environment where your L2 is spoken.
e.g. 3 years and 5 months

28. Please rate your level of proficiency in SPEAKING your L2.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

29. Please rate your level of proficiency in UNDERSTANDING your L2.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

30. Please rate your level of proficiency in READING your L2.
0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

31. Please rate how much INTERACTING WITH FRIENDS contributed to your proficiency in your L2.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

32. Please rate how much INTERACTING WITH FAMILY contributed to your proficiency in your L2.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

33. Please rate how much READING contributed to your proficiency in your L2.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

34. Please rate how much LANGUAGE COURSE/SELF-INSTRUCTION contributed to your proficiency in your L2.
0 = not a contributor; 1 = minimal contributor; 5 = moderate contributor; 10 = most important contributor

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
not a contributor												most important contributor

Language Background - Part 2

The following questions enquire about the languages you know, when you learned those languages, and how often you use those languages. There is the option to report on two languages, but if you only speak one language, only fill in the questions related to your first language (L1).

35. Please list all the languages you know in order of acquisition (i.e. starting with your native language). *

36. Please list what percentage of time you currently, and on average, are exposed to your native language (L1). *

For example, if on average you are exposed to your L1 60% of the time, choose '6' from the options below. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

37. Please list what percentage of time you currently, and on average, are exposed to your second language (L2).

For example, if on average you are exposed to your L2 60% of the time, choose '6' from the options below. Your percentage should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

38. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L1? Assume that the original was written in another language, which is unknown to you. *

Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

39. When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in your L2? Assume that the original was written in another language, which is unknown to you.

Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

40. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L1? *

Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

41. When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak your L2?

Please report percent of total time. Your percentages should add up to 100%.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%												100%

42. Please list all the languages you know in order of dominance (i.e. starting with the one you generally feel more comfortable at speaking). *

Cultural background

The following questions enquire about the cultures you identify with.

43. On a scale from zero to ten, please rate the extent to which you identify with British culture. *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
no identification												complete identification

44. Do you identify with any another culture? *

Mark only one oval.

- Yes
- No

45. If yes, please state which culture you identify with. *

46. On a scale from zero to ten, please rate the extent to which you identify with the culture you stated above.

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
no identification												complete identification

Other questions

The following questions enquire about more general factors that have been found to have an effect on speech.

47. How many years of formal education do you have? *
e.g. 21

48. Please check your highest education level (or the approximate British equivalent to a degree obtained in another country) *

Check all that apply.

- [ ] Less than A-levels
- [ ] A-levels
- [ ] Vocational training
- [ ] Some University
- [ ] Bachelor degree
- [ ] Some Postgraduate education
- [ ] Master degree
- [ ] PhD/MPhil

Other: [ ]

49. If you selected other, please specify:

50. Did you grow up in an urban area (city) or rural area (countryside)? *

Mark only one oval.

- ( ) Urban area
- ( ) Rural area

51. When did you move to the United Kingdom? *
e.g. 01/03/1991; or March 1991; or 1991

52. How long have you been living in the UK for? *
e.g. 5 years 6 months

53. Have you ever lived in countries other that the UK and your native country? *

Mark only one oval.

- Yes
- No

54. If yes, where, for how long and when?
e.g. Brazil, 6 months, September 2009- March 2010

55. Occupational status: *
Please, select maximum 2 options

Check all that apply.

- [ ] Student
- [ ] Full-time/Part-time job
- [ ] Homeworker
- [ ] Unemployed
- [ ] Retired

56. If student, what is your area of studies?
e.g. Mathematics

57. If employed, what is your job?
e.g. nurse

58. Do you play any instruments? *

Mark only one oval.

- Yes
- No

59. If yes, how often do you play per week?
1=never; 3=seldom; 5=often; 7=always

Mark only one oval.

	1	2	3	4	5	6	7	
never								always

60. Have you ever received formal musical training? *

Mark only one oval.

- Yes
- No

61. If yes, how many years?
e.g. 3

62. Do you consider yourself a musician? *

Mark only one oval.

- Yes
- No

63. Have you ever had any of the following? *
Please, check all applicable.

Check all that apply.

- [ ] vision problems
- [ ] hearing imparement
- [ ] language disability
- [ ] learning disability
- [ ] none of the above

64. If yes, please give more details (including any corrections)

Thank you very much :)

Background questionnaire – Monolinguals JP

東京における多言語の多様性

本研究にご参加いただきありがとうございます。このアンケートの目的は、発話に影響があることが明らかになった要因について、追加情報を収集することにあります。

本アンケートは匿名ですが、参加者の情報を検索する必要性から、3桁の暫定参加者番号を振らせていただいております。番号はリンクをお送りしたメールの中に記載されています。予めご了承ください。

* Required

上智大学
SOPHIA UNIVERSITY

Queen Mary
University of London

プロジェクトのスポンサー

The Great Britain SASAKAWA FOUNDATION グレイトブリテン・ササカワ財団

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

一般事項

1. 暫定参加者番号 *
   3桁の番号番号はリンクをお送りしたメールの中に記載されています。

2. 年齢 *

3. 出身地 *
   例)東京、日本

4. 性別 *

Check all that apply.

- [ ] 女性
- [ ] 男性
- [ ] どちらでもない
- [ ] 答えたくない

Skip to question 5

言語のバックグラウンド-1

次のセクションでは、あなたが知っている言語それぞれのバックグラウンドについてお尋ねします。2つの言語について回答するオプションがありますが、一つの言語しか話さないという方は、第一言語(L1)についての質問にだけお答えください。

5. あなたの母語(L1)を教えてください。 *
通常は、生まれたときから習得した言語です。

6. L1を習得し始めた年齢。 *
例)0歳

7. L1が流暢になった年齢。 *
例)3歳

8. L1で読むことを始めた年齢。 *
例)5歳

9. L1での読解が容易になった年齢。 *
例)7歳

10. L1が話されている国で何年何カ月過ごしたか教えてください。 *
例)3年5カ月

11. L1が話されている家庭で何年何カ月過ごしたか教えてください。 *
例)3年5カ月

12. L1が話されている学校/職場環境で何年何カ月過ごしたか教えてください。 *
例)3年5カ月

13. あなたのL1のスピーキング(発話)能力のレベルを選んでください。 *
0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない												完璧にできる

14. あなたのL1の、口語の理解力のレベルを選んでください。 *
0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない												完璧にできる

15. あなたのL1の読解力のレベルを選んでください。 *
0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない												完璧にできる

16. 友達との交流があなたのL1の習得にどの程度貢献したか教えてください。 *
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない												最大限の貢献をした

17. 家族との交流があなたのL1の習得にどの程度貢献したか教えてください。 *
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない												最大限の貢献をした

18. 読書があなたのL1の習得にどの程度貢献したか教えてください。 *
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない	○	○	○	○	○	○	○	○	○	○	○	最大限の貢献をした

19. 語学教室/独学があなたのL1の習得にどの程度貢献したか教えてください。 *
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない	○	○	○	○	○	○	○	○	○	○	○	最大限の貢献をした

20. あなたの第二言語(L2)を教えてください。
通常はL1より後に習得した言語ですが、生まれたときから習得した言語であることもあります。

____

21. L2を習得し始めた年齢。
例)4歳

____

22. L2が流暢になった年齢。
例)7歳

____

23. L2で読むことを始めた年齢。
例)6歳

____

24. L2での読解が容易になった年齢。
例)8歳

____

25. L2が話されている国で何年何カ月過ごしたか教えてください。
例)3年5カ月

____

26. L2が話されている家庭で何年何カ月過ごしたか教えてください。
例)3年5カ月

____

27. L2が話されている学校/職場環境で何年何カ月過ごしたか教えてください。
例)3年5カ月

28. あなたのL2のスピーキング(発話)能力のレベルを選んでください。
0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=e非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

29. あなたのL2の、口語の理解力のレベルを選んでください。
0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=e非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

30. あなたのL1の読解力のレベルを選んでください。
0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=e非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

31. 友達との交流があなたのL2の習得にどの程度貢献したか教えてください。
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	最大限の貢献をした

32. 家族との交流があなたのL2の習得にどの程度貢献したか教えてください。
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	最大限の貢献をした

33. 読書があなたのL2の習得にどの程度貢献したか教えてください。
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	最大限の貢献をした

34. 語学教室/独学があなたのL2の習得にどの程度貢献したか教えてください。
0 = 全く貢献していない; 1 = 最低限の貢献はした; 5 = まあまあ貢献した; 10 = 最大限の貢献をした

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く貢献していない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	最大限の貢献をした

言語のバックグラウンド-2

以下の質問ではあなたが知っている言語について、それらをいつ習得したか、どのくらいの頻度で使用するかについてお尋ねします。2つの言語について回答するオプションがありますが、一つの言語しか話さないという方は、第一言語(L1)についての質問にだけお答えください。

35. あなたが習得した言語を全て、習得した順に挙げてください。(母語からお答えください) *

36. 今現在、母語(L1)に平均してどのくらいの時間接しているか教えてください。 *
例えば、接する時間の割合が60%でしたら下の選択肢から「６」を選んでください。全ての合計が100%になるようにしてください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

37. 今現在, L2に平均してどのくらいの時間接しているか教えてください。
例えば、接する時間の割合が60%でしたら下の選択肢から「６」を選んでください。全ての合計が100%になるようにしてください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

38. あなたが習得した全ての言語に翻訳された文章を読む場合、どのくらいの割合でL1で読むことを選択しますか？原著はあなたの知らない原語で書かれたと仮定します。 *

全ての合計が100%になるようにしてください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

39. あなたが習得した全ての言語に翻訳された文章を読む場合、どのくらいの割合でL2で読むことを選択しますか？原著はあなたの知らない原語で書かれたと仮定します。

全ての合計が100%になるようにしてください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

40. あなたが習得した全ての言語に堪能な人と会話をするための言語を選ぶ場合、どのくらいの割合でL1で話すことを選択しますか？ *

全ての合計が100%になるようにしてください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

41. あなたが習得した全ての言語に堪能な人と会話をするための言語を選ぶ場合、どのくらいの割合でL2で話すことを選択しますか？

全ての合計が100%になるようにしてください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
0%	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	100%

42. あなたが習得した言語を全て、言語能力の優位な順に挙げてください。(ほとんどの場合で話していて楽な言語からお答えください) *

文化的バックグラウンド

以下の質問では あなたが文化にどの程度一体感を抱いているか。

43. あなたが日本文化にどの程度一体感を抱いているか、0から10でお答えください。 *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く一体感を抱いていない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完全に一体感を抱いている

44. 他の文化に一体感を抱いていますか？ *

Mark only one oval.

◯ はい
◯ いいえ

45. はいと答えた方は、どの文化か教えてください。

46. 上でお答えいただいた文化にどの程度一体感を抱いているか、0から10でお答えください。

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全く一体感を抱いていない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完全に一体感を抱いている

その他

ここから先の質問は、発話に影響があると分かっているより一般的な要因についてお聞きします。

47. あなたの正規就学年数を教えてください。 *
例)21

48. 貴方の最終学歴にチェックを入れてください。 *

Check all that apply.

☐ 中学校卒業
☐ 高等学校卒業
☐ 専門学校
☐ 大学在学中あるいは中退
☐ 大学卒業
☐ 大学院在学中あるいは中退
☐ 大学院修士課程卒業
☐ 大学院博士課程卒業
☐ その他

49. その他とお答えいただいた場合、具体的に教えてください

50. 都会と田舎、どちらで育ちましたか？ *

Mark only one oval.

- 都会
- 田舎

51. 今までに住んだことのある都道府県をと居住期間を教えてください。 *
例)東京都、10年間、1997 から2007; 千葉県、10年間、2008から現在

52. 日本以外の国に住んだことがありますか *

Mark only one oval.

- はい
- いいえ

53. はいと答えた方は、国名、期間、時期を教えてください。
例)ブラジル、6か月間、2009年9月から2010年3月

54. ご職業: *
最大2つのオプションを選択してください

Check all that apply.

- 学生
- フルタイム/パートタイム勤務
- 在宅勤務
- 無職
- 引退している

55. 学生の方は、専門分野を教えてください。
例)数学

56. 就業中の方は、ご職業を教えてください。
例)看護師

57. 楽器を演奏しますか？ *

Mark only one oval.

- はい
- いいえ

58. はいと答えた方は、１週間にどのくらい演奏するか教えてください

1=全くしない; 3=ごくたまに; 5=よく演奏する; 7=いつも演奏している

Mark only one oval.

	1	2	3	4	5	6	7	
全くしない								いつも演奏している

59. 正式な音楽のトレーニングを受けたことがありますか？ *

Mark only one oval.

- はい
- いいえ

60. はいと答えた方は、年数を教えてください。

例) 3

61. ご自分を音楽家であると思いますか？ *

Mark only one oval.

- はい
- いいえ

62. 以下を経験したことはありますか？ *

当するものをすべて選択してください。

Check all that apply.

- [ ] 視力障害
- [ ] 聴覚障害
- [ ] 言語障害
- [ ] 学習障害
- [ ] 該当なし

63. １つでもチェックされた方は、詳細を教えてください (矯正の有無など)。

ありがとございます：）

Appendix E

Opening Questionnaire – EN

Multilingual diversity in London

* Required

スポンサー

1. 参加者番号 *

2. 今日の日付 *

   Example: January 7, 2019

3. 年齢 *

4. 今日は何時に起きましたか？

   Example: 8:30 AM

5. Today, have you spoken to anybody else before meeting the main researcher? *

Mark only one oval.

- Yes
- No

6. If yes, in which language(s) and with whom?
e.g. French with my flatmate, English with a policeman

7. How do you feel today? *
Please, select maximum 2 options.

Check all that apply.

- [ ] Happy
- [ ] Sad
- [ ] Peaceful
- [ ] Stressed
- [ ] Other

8. If other, please specify:

9. Are you hungry? *

Mark only one oval.

- Yes
- No

Thank you! Now experiment time :)

Opening Questionnaire – JP

Multilingual diversity in London

* Required

スポンサー

1. 参加者番号 *

2. 今日の日付 *

   Example: January 7, 2019

3. 年齢 *

4. 今日は何時に起きましたか？

   Example: 8:30 AM

5. 今日起きてから研究員に会うまでに、誰かと話しましたか？ *

Mark only one oval.

- ( ) はい
- ( ) いいえ

6. はいと答えた方、それはどの言語で、誰とでしょうか。

例)フラットメイトとフランス語、警官と英語

7. 今日の気分はいかがですか？ *

該当するものを、２つまで選んでください。

Check all that apply.

- [ ] 幸せである
- [ ] 悲しい
- [ ] 穏やかだ
- [ ] ストレスを感じている
- [ ] その他

8. その他を選んだ方は、具体的に教えてください。

9. 空腹ですか？ *

Mark only one oval.

- ( ) はい
- ( ) いいえ

ありがとうございました。では実験に移ります。 :)

Closing Questionnaire – EN

Multilingual Diversity in Tokyo

Thank you very much carrying out the whole experiment. These are just a few closing questions.

* Required

Sponsors

1. Participant number *

2. Please rate your level of proficiency in SPEAKING English. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

3. Please rate your level of proficiency in UNDERSTANDING English. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

4. Please rate your level of proficiency in READING English. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

5. Please rate your level of proficiency in SPEAKING Japanese. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none												perfect

6. Please rate your level of proficiency in READING Japanese. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	perfect

7. Please rate your level of proficiency in UNDERSTANDING Japanese. *

0=none; 1=very low; 2=low; 3=fair; 4=slightly less than adequate; 5=adequate; 6=slightly more than adequate; 7=good; 8=very good; 9=excellent; 10=perfect

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
none	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	perfect

The variable under scrutiny in this research is pitch. Previous research has postulated a link between size of the speaker and pitch (i.e. the bigger the speaker, the lower the pitch). This is a very controversial topic in research, and also a potential confound for the present work. Hence, I need to ask you to report your height and weight, for me to rule out the possibility of a link between your pitch and your size.

8. Height (in cm) *

Please select the option that applies to you.

Mark only one oval.

- 140 cm - 144 cm
- 145 cm - 149 cm
- 150 cm - 154 cm
- 155 cm - 159 cm
- 160 cm - 164 cm
- 165 cm - 169 cm
- 170 cm - 174 cm
- 175 cm - 179 cm
- 180 cm - 184 cm
- 185 cm - 189 cm
- 190 cm - 194 cm
- 195 cm - 199 cm
- ≥ 200 cm

Potential further research

9. If we had any follow-up questions, would it be fine if we contacted you? *

Mark only one oval.

- Yes
- No

10. If yes, could you please reconfirm your name, surname and email address?

11. Were we to have a follow-up experiment, would you consider taking part in it? *

Mark only one oval.

- Yes
- No
- Maybe

12. If yes or maybe, could you please reconfirm your name, surname and email address?

13. Would you be interested in knowing about the results of the research? *

Mark only one oval.

- Yes
- No

14. If yes, could you please reconfirm your name, surname and email address?

Thank you :)

Thank you very much for being a participant in my experiment. I appreciate the effort you put into it. Your help is really precious to me. Thanks again.

Closing Questionnaire – JP

東京における多言語の多様性

ここまで全てお答えいただき、ありがとうございます。最後にいくつか質問があります。

* Required

プロジェクトのスポンサー

1. 参加者番号 number *

2. あなたの日本語のスピーキング(発話)能力のレベルを選んでください。 *

0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

3. あなたの日本語の、口語の理解力のレベルを選んでください。 *

0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

4. あなたの日本語の読解力のレベルを選んでください。 *

0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

5. あなたの英語のスピーキング(発話)能力のレベルを選んでください。 *

0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

6. あなたの英語の、口語の理解力のレベルを選んでください。 *

0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
全くできない	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	完璧にできる

7. あなたの英語の読解力のレベルを選んでください。 *

0=全くできない; 1=極めて低い; 2=低い; 3=まあまあ; 4=ほぼ適切にできる; 5=適切にできる6=充分にできる; 7=良くできる; 8=かなり良くできる; 9=非常に優れている; 10=完璧にできる

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
全くできない	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	完璧にできる

このリサーチは声の高さについての調査です。これまでの研究では、話者の体格と声の高さの関連を前提としていました(体が大きい人は声が低い、など)。これは非常に議論を呼ぶ話題であり、現在の研究を混乱させる可能性があります。そのため、身長と体重をお聞きして、体格と声の高さの関連の可能性を排除したいと思います。

8. 身長(cm) *

Mark only one oval.

- 140 cm - 144 cm
- 145 cm - 149 cm
- 150 cm - 154 cm
- 155 cm - 159 cm
- 160 cm - 164 cm
- 165 cm - 169 cm
- 170 cm - 174 cm
- 175 cm - 179 cm
- 180 cm - 184 cm
- 185 cm - 189 cm
- 190 cm - 194 cm
- 195 cm - 199 cm
- ≥ 200 cm

今後の研究について

9. 今後、追加の質問が出てきた場合、ご連絡してよろしいでしょうか？ *

Mark only one oval.

- はい
- いいえ

10. はいと答えた方は、お手数ですがお名前とメールアドレスを再度ご確認いただきますようお願いいたします。

アリガとございまうす：）

Appendix F

Gender questionnaire BSRI short (English)

BSRI - short

Bem , S. L. (1979). Theory and measurement of androgyny: A Reply to the Pedhazur-Tetenbaum and Locksley- Colten Critiques. Journal of Personality and Social Psychology, 37, 1047.

* Required

This research is kindly supported by

1. Participant number *

Rate yourself on each item of this questionnaire by selecting the number 1 (almost never true) to 7 (almost always true) which best corresponds to your personality. Please, give an answer for each item, trying not to take too much time to think about your answer.

2. Defend my own beliefs *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

3. Affectionate *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

4. Conscientious *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

5. Independent *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

6. Sympathetic *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

7. Moody *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

8. Assertive *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

9. Sensitive to others' needs *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

10. Reliable *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

11. Strong personality *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

12. Understanding *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

13. Jealous *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

14. Forceful *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

15. Compassionate *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

16. Truthful *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

17. Have leadership abilities *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

18. Eager to soothe feelings *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

19. Secretive *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

20. Willing to take risks *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

21. Warm *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

22. Adaptable *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

23. Dominant *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

24. Tender *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

25. Conceited (= vain/ proud) *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

26. Willing to take a stand *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true	◯	◯	◯	◯	◯	◯	◯	almost always true

27. Love children *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true	◯	◯	◯	◯	◯	◯	◯	almost always true

28. Tactful *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true	◯	◯	◯	◯	◯	◯	◯	almost always true

29. Aggressive *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true	◯	◯	◯	◯	◯	◯	◯	almost always true

30. Gentle *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

31. Conventional *

1 = almost never true, 2 = rarely true, 3 = less than half time true, 4 = neutral, 5 = more than half of the times true, 6 = often true, 7 = almost always true

Mark only one oval.

	1	2	3	4	5	6	7	
almost never true								almost always true

Thanks

Thank you for completing the questionnaire :)

Gender questionnaire JGRI (Japanese)

JGRI

Sugihara, Y., & Katsurada, E. (2002). Gender Role Development in Japanese Culture: Diminishing Gender Role Differences in a Contemporary Society. Sex Roles, 47(9), 443–452.

* Required

スポンサー

1. 参加者番号 *

これはあなたの性格特性の一部を測るものです。それぞれの特徴があなた自身にどのくらいあてはまるか、７段階の程度であてはまる数字に○をつけて下さい。一つ一つの項目に余り時間をかけすぎないようにして、すべての項目に答えて下さい。

2. 純粋 *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

3. リーダーシップを取る能力がある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

4. 向上心のある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

5. しとやか *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

6. 意志が強い *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

7. 根気強い *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

8. 愛情ぶかい *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

9. 行動力がある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

10. 仕事熱心 *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

11. かわいい *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

12. 視野の広い *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

13. 努力家 *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

14. 良く気がつく *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

15. 皆をまとめることができる *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

16. 社交的 *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

17. ていねい *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

18. 根性がある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

19. 計画性のある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

20. おだやか *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

21. 自立した *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

22. 親孝行 *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

23. 子供好き *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

24. 説得力がある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

25. 人の助けになる *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない	◯	◯	◯	◯	◯	◯	◯	非常にあてはまる

26. 世話好き *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

27. 人から頼りにされる *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

28. 誠意がある *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

29. きれい好き *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

30. 正々堂々とした *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

31. 誠実 *

1 = 少しもあてはまらない , 3 = ややあてはまる, 5 = かなりあてはまる, 7 = 非常にあてはまる

Mark only one oval.

	1	2	3	4	5	6	7	
少しもあてはまらない								非常にあてはまる

Analysis tables for Gender questionnaires

Factor loading for BSRI-short

Latent Factor	Indicator	B	SE	Z	p-value	Beta
Masculine	Defend my own beliefs	1	0	NA	NA	0.68
Masculine	Independent	0.797	0.198	4.03	0	0.543
Masculine	Assertive	1.392	0.225	6.194	0	0.812
Masculine	Strong personality	1.151	0.185	6.209	0	0.706
Masculine	Have leadership abilities	1.446	0.215	6.734	0	0.834
Masculine	Willing to take risks	0.735	0.209	3.52	0	0.458
Masculine	Dominant	0.567	0.236	2.406	0.016	0.429
Masculine	Willing to take a stand	1.106	0.182	6.079	0	0.744
Feminine	Affectionate	1	0	NA	NA	0.6
Feminine	Sympathetic	1.39	0.33	4.206	0	0.726
Feminine	Sensitive to others' needs	0.956	0.385	2.484	0.013	0.592
Feminine	Compassionate	1.014	0.246	4.128	0	0.697
Feminine	Eager to soothe feelings	1.1	0.282	3.897	0	0.761
Feminine	Warm	1.13	0.21	5.392	0	0.822
Feminine	Tender	0.831	0.275	3.023	0.002	0.569
Feminine	Gentle	1.043	0.288	3.62	0	0.702

Factors loading for JGRI.

Latent Factor	Indicator	B	SE	Z	p-value	Beta
Masculine	Have a leadership ability	1	0	NA	NA	0.527
Masculine	Ability to implement action of one's own accord	1.143	0.304	3.759	0	0.586
Masculine	Have a broad perspective	0.474	0.253	1.871	0.061	0.259
Masculine	Ability to bring others together	1.125	0.389	2.89	0.004	0.601
Masculine	Have guts	0.954	0.356	2.677	0.007	0.461
Masculine	Persuasive	0.857	0.333	2.576	0.01	0.353
Masculine	Relied on by others	1.297	0.398	3.255	0.001	0.671
Masculine	Upstanding	1.012	0.334	3.033	0.002	0.51
Feminine	Graceful	1	0	NA	NA	0.61
Feminine	Affectionate	0.895	0.268	3.334	0.001	0.488
Feminine	Have charm	0.827	0.195	4.236	0	0.507
Feminine	Polite	0.928	0.284	3.266	0.001	0.507
Feminine	Calm	1.082	0.276	3.928	0	0.625
Feminine	Love children	1.171	0.261	4.495	0	0.715
Feminine	Like to care for others	1.316	0.287	4.592	0	0.769
Feminine	Have neat habits	1.243	0.332	3.742	0	0.712

Appendix G

Gender traits attribution task

The perceptual task of the present study was at aimed investigating the participant's perception of gender traits linked to pitch range. Participants were presented with the passage The North Wind and the Sun (International Phonetic Association, 2010) in English and in its official Japanese version (北風と太陽, Kitakaze to Taiyoo, International Phonetic Association, 2010). The passage was originally read by one female and one male speaker of Southern Standard British English (SSBE) and one female and one male speaker of Standard Japanese. The pitch range of these natural productions were manipulated both in level and span in Praat (Boersma & Weenink, 2016) following van Bezooijen (1995) for pitch level and Levon (2006) for pitch span. After manipulation, there were a total of 9 stimuli per speaker, arising to a total of 18 stimuli per language (i.e. 18 recordings in English and 18 recordings in Japanese).

Participants listened and rated all the stimuli on 11 semantic differential scales adapted from van Bezooijen (1995) and Addington (1968). Bilinguals rated Japanese and English stimuli separately to account for language modes; the presentation order of the languages was counterbalanced across participants.

Appendix H

Tokens - Reading task

English and Japanese stimuli paired with imagined addressees

English	Japanese	Addressee
When will you be in Ealing?	いついいリングにいる? [itsu iiringu-ni iru?]	**Female formal**
Where is the manual?	マヌあるわどこにある? [manuaru-wa doko-ni aru?]	**Male formal**
Why is he on the bed?	なんで彼わベッドの上にいる [nande kare-wa beddo-no ue-ni iru?]	**Female informal**
Why are we in a limousine?	なんでリイムジンの中にいる? [nande rimujin-no naka-ni iru?]	**Male informal**
You remembered Lil?	リルのことを思い出した？[riru-no koto-wo omoida-shita?]	**Female formal**
You will lose Billy?	ビリーを失うことになる? [birii-wo ushinau koto ni naru?]	**Male formal**
You remembered Lillian?	ビルを失うことになる? [biru-wo ushinau koto ni naru?]	**Female informal**
You will lose Bill?	ビルを失うことになる? [biru-wo ushinau koto ni naru?]	**Male informal**
Did you say mellow or yellow?	メローとイエローのどっちをいったの？ [meroo to ierro no dochi-wo itta no?]	**Female formal**
Is his name Miller or Mailer?	彼の生瀬わミラーと,マイラーのどっちなの？ [kare-no namae-wa miraa to mairaa no dochi nano?]	**Male formal**
Are you growing limes or lemons?	ライムとレモンのどっちーを育てるの？ [raimu to remon no dochi-wo sodata-re no?]	**Female informal**
Did he say red or bed?	レッドとベッドのどっちを行ったの？ [reddo to beddo no dochi-wo itta no?]	**Male informal**
We remembered Lillian.	リリアンことを思い出し。 [ririan-no koto-wo omoidashita.]	**Female formal**
We remembered Lil.	リルのことを思い出した。 [riru-no koto-wo omoida-shita.]	**Male formal**
We will lose Billy.	ビルを失うことになる。 [biru-wo ushinau koto-ni naru.]	**Female informal**
We will lose Bill.	ビリーを失うことになる。 [birii wo ushinau koto ni naru.]	**Male informal**

Appendix I

Instructions - Voicemail task

English and Japanese stimuli paired with imagined addressees

English	Japanese	Addressee
Ms Kate Swann, executive of SSP Group, has advertised a job opportunity as her personal assistant. You have applied for this position and have been shortlisted. You have been asked to leave a voicemail message to explain: (1) why you are the best candidate for this job, (2) what she would be missing out on if she were not to choose you. In the voicemail, you have to state: 1) Your name 2) The reason for which you are calling 3) That you are looking forward to the result of the selection. Please make sure you greet and thank the listener Now prepare your voicemail. You can take some notes, but please do not to write down the content of the whole voicemail. When you are done, press the space bar. ****** Now it's time to leave the voicemail. Dial the number 0123 and leave your voicemail after the beep. When you are finished, please press the space bar.	パーソルホールディングス株式会社の名誉会長、篠原欣子(よしこ)氏が、自身の個人アシスタントを募集しています。 あなたはこの仕事に応募し、選考に残りました。 あなたはボイスメールで以下のことを説明するよう言われています。 1.何故あなたがこの職に最も適任であるか 2.あなたを選ばないと何が損なのか ボイスメールには、次の内容が含まれるようにしてください。 1. 氏名 2. 今こうして連絡している理由 3. 選考結果を楽しみにしているということ ボイスメールの準備をしてください。 メモを取って構いませんが、ボイスメールの中身の全てを書くことはしないでください。 終了したら、スペースキーを押してください。 ****** では、ボイスメールを入れましょう。 0123 の番号にかけて、発信音の後にボイスメールを入れてください。	Female formal
Mr John MacFarlane, chairman of Barclays, has advertised a job opportunity as his personal assistant. You have applied for this position and have been shortlisted. You have been asked to leave a voicemail message to explain: 1. why you are the best candidate for this job, 2. what she would be missing out on if she were not to choose you. In the voicemail, you have to state: 1. Your name 2 The reason for which you are calling 3 That you are looking forward to the result of the selection. Please make sure you greet and thank the listener Now prepare your voicemail. You can take some notes, but please do not to write down the content of the whole voicemail. When you are done, press the space bar. *********** Now it's time to leave the voicemail. Dial the number 0123 and leave your voicemail after the beep. When you are finished, please press the space bar.	株式会社 LEOC の代表取締役会長兼社長、小野寺裕司(ひろし)氏が、自身の個人アシスタントを募集しています。 あなたはこの仕事に応募し、選考に残りました。 あなたはボイスメールで以下のことを説明するよう言われています。 1.何故あなたがこの職に最も適任であるか 2.あなたを選ばないと何が損なのか ボイスメールには、次の内容が含まれるようにしてください。 1. 氏名 2. 今こうして連絡している理由 3. 選考結果を楽しみにしているということ ボイスメールの準備をしてください。 メモを取って構いませんが、ボイスメールの中身の全てを書くことはしないでください。 終了したら、スペースキーを押してください。 ****** では、ボイスメールを入れましょう。 0123 の番号にかけて、発信音の後にボイスメールを入れてください。	Male Formal

Your closest English female friend has just won two tickets for a 'dream round the world trip'. Your friend is running a competition to decide who is going to join her. Leave a voicemail to your friend to explain: 1) why you are the best person to travel with, 2) what she would be missing out if you were not the chosen one. Please make sure that you greet and thank the listener Now prepare your voicemail. You can take some notes, but please do not to write down the content of the whole voicemail. When you are ready, press the space bar. *********** Now it's time to leave the voicemail. Dial the number 0123 and leave your voicemail after the beep. When you are finished, please press the space bar.	あなたの最も親しい日本人の女友達が二人分の「夢の世界一周旅行」のチケットを当てました その女友達は、行きたい人の中で一番いい人を連れていくと言っています。 彼女にボイスメールで以下を説明してください。 1）一緒に旅行するのに、何故あなたが一番適しているか 2）あなたを選ばないと何が損なのか ボイスメールには、次の内容が含まれるようにしてください。 1）氏名 2）今こうして連絡している理由 3）選考結果を楽しみにしているということ ボイスメールの準備をしてください。 メモを取って構いませんが、ボイスメールの中身の全てを書くことはしないでく さい。 終了したら、スペースキーを押してください。 ********** では、ボイスメールを入れましょう。 0123 の番号にかけて、発信音の後にボイスメールを入れてください。	Informal Female
Your closest English male friend has just won two tickets for a 'dream round the world trip'. Your friend is running a competition to decide who is going to join him. Leave a voicemail to your friend to explain: 1) why you are the best person to travel with, 2) what he would be missing out if you were not the chosen one. Please make sure that you greet and thank the listener Now prepare your voicemail. You can take some notes, but please do not to write down the content of the whole voicemail. When you are ready, press the space bar. *********** Now it's time to leave the voicemail. Dial the number 0123 and leave your voicemail after the beep. When you are finished, please press the space bar.	あなたの最も親しい日本人の男友達が二人分の「夢の世界一周旅行」のチケットを当てました。 あなたの最も親しい日本人の女友達が二人分の「夢の世界一周旅行」のチケットを当てました その女友達は、行きたい人の中で一番いい人を連れていくと言っています。 彼女にボイスメールで以下を説明してください。 1）一緒に旅行するのに、何故あなたが一番適しているか 2）あなたを選ばないと何が損なのか ボイスメールには、次の内容が含まれるようにしてください。 1）氏名 2）今こうして連絡している理由 3）選考結果を楽しみにしているということ ボイスメールの準備をしてください。 メモを取って構いませんが、ボイスメールの中身の全てを書くことはしないでく さい。 終了したら、スペースキーを押してください。 ********** では、ボイスメールを入れましょう。 0123 の番号にかけて、発信音の後にボイスメールを入れてください。	Informal Male