Phonological Interaction between L1 Japanese and L2 English Vowels

by

Kana Suzuki

A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements of the degree of

MASTER OF ARTS

Department of Linguistics

University of Manitoba

Winnipeg

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Of

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Abstract

This study investigated whether L1 and L2 interact with each other, and if so, how the two languages influence one another. Japanese and English vowels produced by bilingual speakers with different English proficiencies were examined. Japanese monolinguals also participated in this experiment as a control group. It was hypothesized that higher-level learners would be likely to be more native-like in production of English vowels and these learners would pronounce Japanese vowels differently from the monolingual speakers. The Japanese and English vowels were analyzed in terms of four measures: frequencies of the first three formants and duration. Most of the English vowels produced by the bilingual subjects were differentiated from each other, which implies that their English becomes more native-like as their English level becomes higher. As for Japanese vowels, against the predictions, the English effect on Japanese started occurring even among the elementary-level students. In addition, lower-level students were sometimes more different from the control speakers than higher-level learners. However, there appears to be an interaction between L1 Japanese and L2 English; when a new English category was established, or an English vowel was merged into its Japanese counterpart, the Japanese vowel was pronounced differently. Therefore, it is likely that L1 influence on L2 is not the only thing that happens in L2 acquisition; in addition L2 affects L1.

Acknowledgements

This project would not have been possible without the support of many people. I would like to begin by thanking my advisor, Dr. Robert Hagiwara for all the guidance and supervision of this work. To my committee members, Dr. Kevin Russell and Dr. William Lee, I would like to thank you for your contribution to this piece of work. To all my friends, especially to Mika, Viha, Erin, Sheri, and Mayumi, I would like to thank you for all the support and help. This was such a long journey to complete and not always easy, but I am very fortunate and grateful to take this journey with you all. This work would have not been completed without the help and encouragement of my writing tutor, Monique. You gave me confidence in my writing and made me believe in myself. My siblings, Takayuki and Mikan, I would like to say thank you for your encouragement. Last but not least, I would like to thank my parents, Mr. Seizou Suzuki and Mrs. Emiko Suzuki, for your support, encouragement, patience and belief in my abilities.

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1: Introduction

Many previous studies support the hypothesis that a first language (L1) affects second language (L2) learning. Under the influence of their L1, L2 learners experience difficulty in perceiving and producing some of the sounds of the target language (Flege & MacKay, 2004; Munro & Derwing, 1995). Native Japanese speakers learning English as their L2 are just one example. In particular, they may have trouble with English vowels in perception and/or production. However, the degree of the L1 influence on L2 and how the L1 affects the L2 seem to change, depending on a learner's L2 competence.

In addition, the L1 influence on L2 is not the only thing that can affect the learner. In fact, L2 can affect L1 production as well (Guion, 2003). The current study investigates the possibility of interaction between L1 and L2 by analysing speech sounds produced by Japanese-English bilinguals with different English proficiency levels. More specifically, the acoustic properties of Japanese and English vowels pronounced by Japanese speakers learning English at the elementary, intermediate, and advanced levels are examined. This thesis will begin with an introduction to the Japanese and English vowel inventories, then introduce several different theoretical models that examine possible factors causing Japanese speakers difficulty with English vowels and possible explanations for the changes in L1 Japanese. Empirical studies will follow in order to test the predictions of theoretical models.

1.1. Previous research

1.1.1. The Japanese and English vowel inventories

Japanese has five short vowels, /i, e, a, u, o/ and five long vowels, /i:, e:, a:, u:, o:/ (Shibatani, 1990). The long vowels are differentiated from the corresponding short

vowels only by duration, and not by formant frequencies (Akamatsu, 1997). The language has also pre-geminate vowels, /iQ, eQ, aQ, uQ, oQ/, which are said to fall between their long and short counterparts. The long-short distinction is not contrastive before geminating.

English has six lax vowels, /ɪ, ɛ, ʊ, ɔ, ɑ, ʌ/ and six tense vowels, / i, e, æ, u, o, ɹ/. The English tense vowels tend to be longer than the lax vowels, although these vowels are differentiated from one another by formant frequencies as well (Rogers, 1991).

The difference in number of vowels, their distribution in the vowel space and their relationship with phonological duration may present a problem for the mastery of English L2 vowels for the Japanese L1 learner. Several models have been proposed which attempt to capture and/or predict adjustments which will be made by the L2 speaker.

1.1.2. The Contrastive Analysis Hypothesis

Lado (1957) proposed the Contrastive Analysis Hypothesis (CAH), which postulates that comparing the L1 and L2 of a particular language will enable the prediction of difficulties that will be encountered in the acquisition of the L2. Lado states that "the adult speaker of one language cannot easily hear language sounds other than those of his/her native language" (p.11). In other words, the greatest difficulty lies in assigning L2 phonemes to the allophones that belong to the same category in their L1.

Lado gave the example of the Thai aspirated and unaspirated /p/s. English speakers do not hear the phonemic difference in the two Thai /p/s because these two sounds are allophones in English.

1.1.3. The Crucial Similarity Measure

Although the CAH fell into disrepute among some researchers in the 1950s and 1960s, several speech perception models based on similarities, not differences, between the L1 and L2 emerged in the area of L2 phonology. Wode (1976) proposed the Crucial Similarity Measure (CSM) as a basis for L1 transfer. The CSM claims that there are identifiable similarity requirements that must occur, at least in the mind of the L2 learner, for the L1 to interfere with the acquisition of the L2.

Young-Scholten (1985) examined twelve first and second grade Swabian-speaking children learning Standard German at school. Swabian German and Standard German are considered very similar, although speakers of these two dialects do not have high-mutual intelligibility. Even though they had been taught by a Standard German-speaking teacher since they started schooling, the Swabian learners continued to produce errors in morphology and phonology. Most of the errors made by the subjects were not developmental, but they were caused by the L1 transfer to the L2 because of the similarities between them. This result led Young-Scholten to conclude that similarities between an L1 and an L2 may explain errors in L2 acquisition better than differences between these two languages. In other words, the CSM could account for a number of phonological and morphological errors to a greater degree than the CAH.

1.1.4. The Perceptual Assimilation Model

One of the prominent speech perception models currently is the Perception Assimilation Model (PAM) proposed by Best and Strange (1992). According to this model, there are five patterns of assimilation. In *two categories*, two L2 phones are perceived as two different L1 categories and discrimination will be excellent. For example, Spanish /i/ and /e/ may be perceived by English speakers as English /i/ and /e/.

No difficulty in distinguishing /i/ and /e/ will occur in either language, although L2 production may not sound 'native'. In *category goodness*, two different L2 phones are assimilated into the same L1 category but with different degrees of 'fit' or prototypicality in the L1, which results in moderate to good discrimination. English /e/ and /æ/ may be assimilated by the L1 Spanish learner as Spanish /e/ but with English /e/ being a 'good' /e/ and /æ/ being a bad one. In *single category*, two L2 phones are assimilated into the same L1 category and the discrimination will be bad. For instance, if English /æ/ and /ʌ/ are both assimilated to Spanish /a/. In *uncategorizable*, two L2 categories are unlike any L1 category and the discrimination will be good. In *non-assimilable*, two L2 categories are so unlike any L1 category that they are even perceived as non-speech sounds and discrimination is predicted to be good to very good.

Best and Strange also stated the effect of L2 experience on these patterns of perceptual assimilation: "Increased L2 experience may foster improved recognition of the discrepancies between the L1 and L2 phones" (p.307). This could lead to a decreased amount of assimilation of L2 phones to L1 categories, and eventually would result in establishing a new L2 category within the learner's perceptual system.

Flege and Bohn (1989) examined the perception of English vowels by L1 Spanish speakers. The subjects listened to the words *beat*, *bit*, *bet*, and *bat*, with the respective English vowels, /i, ɪ, ɛ, æ/, and answered whether or not they heard one of the Spanish vowels, /i, e, a, o/ or /u/. If they did not hear any Spanish vowels, they were to respond 'none'. In general, the subjects answered Spanish /i/ for English /i/ and /ɪ/, Spanish /e/ for English /ɛ/, and Spanish /a/ for English /æ/, which appears to support the prediction of PAM. However, participants who could speak English answered 'none' significantly

more often than those who could not. This indicates that those who spoke English may have started creating distinct phonetic categories in their perceptual vowel systems, as the researchers predicted.

In the second experiment, Flege and Bohn (1989) asked the same subjects to listen to vowels that varied on a continuum based on spectral quality and vowel length. For instance, one continuum ranged from /bɛt/ to /bæt/, while another ranged from /bit/ to /bɪt/. For the first continuum, the L1 Spanish speakers showed a clear perceptual crossover from /ɛ/ to /æ/. In contrast, for the /bit/ to /bɪt/ continuum, only 30% of the listeners were able to detect the distinction as the spectral quality and duration of the vowel shifted from one end to the other. This result shows that the English vowels, /ɛ/ and /æ/ are assimilated into two categories, Spanish /e/ and /a/, which makes it easy for the native Spanish speakers to distinguish between these two English vowels. On the contrary, the English /i/ and /I/ both merge into the single category, Spanish /i/. This makes it difficult for the L1 Spanish speakers to hear the difference between English /i/ and /ɪ/.

The difficulty in discriminating between two speech sounds that belong to the same category can be explained more precisely by the Perceptual Magnet Effect, introduced by Kuhl (1992).

1.1.5. The Perceptual Magnet Effect

If an L1 learner is immersed in a particular language for a certain period of time, he/she will reduce the capability of perceiving difference between speech sounds that do not cause any differences in word meaning in the language. Kuhl (1992) states that "phonetic prototypes", which are speech sounds that are perceived by adult listeners of a

certain language as ideal representatives of a particular phonetic category, function as "perceptual magnets" in speech perception. The magnet effect leads other non-prototypical members of the category to be perceived as more similar to the category prototype than each other, even though these speech sounds are at the same perceptual distance.

Kuhl, Williams, Lacerda, Stevens, and Lindblom (1992) tested thirty-two 6-month-old American and Swedish infants. In each country, 16 of the infants were tested with the American English /i/ prototype and the other half were with the Swedish /y/ prototype, after being trained to produce a head-turn, when they heard a change in category. The American infants perceived the Swedish /y/ prototype as identical to its variants significantly less frequently than they did the American /i/ as identical to its variants. In contrast, the Swedish subjects perceived the Swedish /y/ prototype as identical to its variants significantly more often.

The authors concluded that a prototype pulls its variants toward itself and reduces the perceptual distance between them, which makes it challenging for L2 learners to differentiate phonemes that are similar to their native languages.

1.1.6. The Speech Learning Model

Perhaps, the most influential model of speech perception and production is the Speech Learning Model (SLM) (Flege, 1992b), which predicts that if an L2 learner perceives an L2 speech sound as "similar" to an L1 speech sound, the L2 category will merge into the L1 category. The realization in production of the merged category will be intermediate between the L1 and L2. In contrast, if the L2 sound is perceived as "new", a new category for the L2 will be established. If the L1 and L2 categories are phonetically

close, the speaker may exaggerate the differences between the L1 and L2 in order to keep these two distinct. These phenomena are called category assimilation and category dissimilation respectively. Which a learner will obtain depends on how old the learner was when he/she began learning the L2 and how phonetically close the original L1 and L2 categories are, although Rochet (1995) points out that the precise criteria to determine similarity have not been made.

Flege, Mackay, and Meador (1999) divided Italian participants into two groups based on their age of arrival (AOA) in Canada. After three sounds were played, the subjects were asked to determine which one of the three sounds was different from the others, or all of them were identical. Flege et al. found that the participants' accuracy decreased as the age of arrival increased, and that the main effect of vowel contrast was significant. There was not any difference between the two groups in the Italian-Italian vowels contrast. There was, however, a difference in English-Italian vowels. Participants in the "early" (mean age of 7 years) AOA group, regardless of their continued use of Italian, performed as well as the English monolingual speakers in discriminating between English-English vowels and English-Italian vowels. In contrast, participants who had arrived "late" (mean age of 19 years) obtained lower discrimination scores. The researchers concluded that the age at which L2 learning in the L2 environment begins had a profound effect on adult L2 vowel perception, which supports the SLM. This result also suggests that category assimilation occurred in late L2 learners; in other words, the English vowel categories merged into Italian vowel categories, which led the learners not to hear the difference between the vowels of the two languages.

The L2 influence on L1 also occurs in production. Guion (2003) examined Quichua-Spanish bilinguals in South America. Spanish has five vowels, /i, e, a, u, o/, while Quichua has only three, /i, u, o/. The researcher found that while later learners did not acquire the Spanish vowels and tended to substitute their L1 vowels for L2 vowels, simultaneous bilinguals had separate vowel systems for each language. The case of the early and some mid bilinguals was far more complicated; these participants used the same /i/ for both Quichua and Spanish, although they created a new category for Spanish /e/. Some of the early and mid bilinguals used the same /u/ for both Quichua and Spanish, while the others used the same /u/ for Quichua /u/ and Spanish /o/. Another important finding from this experiment is that the Quichua vowels were pronounced higher by the native Quichua speakers who had acquired Spanish vowels than by those who had not. These results led Guion to conclude that as the vowel space is fixed and cannot be expanded, even if a speaker learns more than one language, the space for an L1 vowel has to move to the space that is not occupied by another vowel.

However, age is not the only factor that affects L2 learning. Flege and Mackay (2004) obtained different results. The authors divided native Italian speakers into four groups, early high, early low, late high, and late low, based on their age of arrival in Canada and the amount of L1 usage (high or low). The participants were tested on their English vowel perception. The early low bilinguals (i.e. those who used more English from an earlier age) identified English vowels as accurately as native speakers. The early high group, however, scored significantly lower than the controls. Moreover, L1 Italian speakers who arrived in Canada later with high usage of English obtained significantly higher scores than those who used Italian more frequently.

1.2. Predictions based on the models

The CHA, which postulates that L2 learners have the greatest difficulty in assigning L2 phonemes to the allophones that belong to the same category in their L1, might be usefully applied to the very beginning-level L1 Japanese learners of English. These beginners would perceive both the English tense and lax vowels as either the Japanese short or long correspondences. As long as both the tense and lax vowels are put into the category of one Japanese phone, these vowels are treated as allophones of the single phone, and it is difficult to tell one from the other. At this level, the Japanese speakers are not aware of the differences between English tense and lax vowels, which prevents them from producing English vowels accurately. Instead, they would substitute either the Japanese short or long counterpart for both of the English tense and lax vowels. As Morrison (2006) points out, durational difference seems relatively easy for L2 learners to recognize, compared to spectral differences. What is more, because Japanese vowels have a short/pre-geminate/long distinction, which makes L1 Japanese listeners more sensitive to the durational differences, it may not take a native Japanese speaker a long time to start perceiving the differences between English tense and lax vowels, relying on duration. Thus, according to the CAH, this sensitivity will lead the student to produce English vowels by making differences in length.

The very early stage of language acquisition may be explained more clearly by the CSM, which claims that if an L2 sound is similar to one of the learner's L1 sounds, the L1 sound is transferred to the L2 sound. The Japanese long and English tense vowels, and Japanese short and English lax vowels are similar to each other in terms of length, although they are not in position. Therefore, Japanese speakers at the low-elementary

level are predicted to transfer Japanese vowels to English counterparts, which makes it challenging for them to produce English vowels accurately, although these learners produce a consistent distinction in duration. For instance, the Japanese vowel /i:/ is recognized as close to the English vowel /i/, and Japanese speakers would treat these two vowels in the same way because of the L1 transfer to the L2.

However, the PAM may explain the behavior of beginning-level Japanese learners better than the other two models introduced above. If a Japanese learner's English competence is very low, single-category assimilation, where two L2 phones are assimilated into the same L1 category and the poor discrimination between the L2 phones is predicted. At this stage, the Japanese learner cannot distinguish an English tense vowel from the lax counterpart in either perception or production. However, as Best and Strange argue, the experience in the target language can change learners' perceptions. Thus, if this learner obtains more English experience, the assimilation type will change from single category to category goodness. With this assimilation pattern, the Japanese student can detect the difference between English tense and lax vowels, although the difference that he/she can hear is not large enough to separate these two English vowels. Therefore, even at this level, both English tense and lax vowels merge into one category, which causes the learner trouble with both perception and production in English. However, when the learner's English competence reaches a higher level (high-elementary or low-intermediate), his/her assimilation pattern may change from category goodness to two categories, where two L2 phones are perceived as two different L1 categories and discrimination is excellent. Now this Japanese student does not have difficulty in discriminating between English tense and lax vowels, but this assimilation pattern causes

the learner a great deal of trouble distinguishing an English tense vowel from a Japanese long vowel, and an English lax vowel from a Japanese short vowel, because an English tense vowel and a Japanese long vowel merge into one category, while an English lax vowel and a Japanese short vowel merge into another. Presumably, in the vowel space of the Japanese speakers at the high-elementary/low-intermediate level, the influence of the L2 on the L1 does not take place, although the influence of L1 on L2 is significant, as at the lower levels.

The behavior and the vowel space of bilingual speakers may be best-illustrated by the SLM, which states that how an L2 learner perceives an L2 speech sound depends on closeness of the learner's L1 sound and the age of learning. This model also predicts realization of L1 and L2 production. If an L2 phone is merged into the L1 category, the realization of the production will be intermediate between L1 and L2, and may or may not be the same as that of the L1 monolingual speakers. If a new category for an L2 sound is successfully established and the L1 and L2 categories are close enough phonetically, the differences between L1 and L2 vowels will be exaggerated in order to keep them distinct. Because most learners in Japan start studying English at the age of 12 or 13, and they do not immerse themselves in English, the SLM predicts that these native Japanese learners of English tend to perceive English vowels as similar to Japanese vowels, which keeps these learners from forming new categories for English. This low-exposure (a couple of lessons a week, taught primarily in Japanese) teaching style may actually inhibit the students from establishing new categories for English phones.

However, the experience in the target language and competence in the language seem to influence the learners' perceptions. If a native Japanese learner's English

proficiency is at the elementary or intermediate level, he/she may perceive an English tense vowel as similar to a Japanese long vowel, and an English lax vowel as similar to a Japanese short vowel. As the English vowels are merged into the Japanese categories, this learner will produce both English and Japanese vowels differently from the monolinguals of these languages. Even if a learner perceives L1 and L2 speech sounds as similar in the beginning, there is a possibility that he/she will recognize the differences between L1 and L2 sounds. Once the student perceives these two sounds as distinct, a new category for the L2 phone will be established. Hence, the L1 Japanese leaner at the advanced level should have separate categories for all the English and Japanese vowels.

Because the student now has more vowels in the same vowel space, the spaces for Japanese vowel categories are shifted to new positions, and the student would start pronouncing the Japanese vowels differently. Additionally, as the SLM predicts, there is a possibility that this learner will exaggerate the differences between English and Japanese vowels so that these vowels can be kept clearly separate in the grammars of the speaker. This phenomenon may start to occur at a slightly lower level of mastery, although the L2 learners likely have fewer English vowels than advanced students, because not all the categories for English vowels may be established at once.

The Perceptual Magnet Effect appears to explain why some L1 Japanese learners of English have difficulty in discriminating between English and Japanese vowels. This theory claims that an adult L1 speaker of a particular language has "phonetic prototypes", which are the sounds that are perceived as ideal representatives of a certain phonetic category. A prototype functions as "perceptual magnet" and leads other non-prototypes in the category to be perceived as more similar to the category prototype

than to each other. Low-elementary-level L1 Japanese learners might use only one Japanese prototype for both English tense and lax vowels; therefore, these learners cannot hear the differences between these English vowels nor between English and Japanese vowels. For instance, both the English /i/ and /ɪ/ are pulled toward either the Japanese /i:/ or /i/. To Japanese speakers whose English competence is higher than low-elementary or is intermediate, the English tense and lax vowels do not share the same prototype, which is why these students can tell the differences between these vowels. Each of the English vowels is pulled toward the different Japanese prototype. For example, the English /i/ is pulled toward the Japanese /i:/, and the English /ɪ/ is pulled toward the Japanese /i/. Thus, the learners at this level can distinguish an English tense vowel from the corresponding lax one, whereas they have trouble discriminating between English tense and Japanese long vowels and between English lax and Japanese short vowels. In contrast, at the advanced level, learners are anticipated to have prototypes for English vowels as well as those for Japanese vowels, and English vowels are no longer pulled toward Japanese vowel prototypes. This is why advanced learners can distinguish not only between English tense and lax vowels, but also between English tense and Japanese long vowels and between English lax and Japanese short vowels, which enables advanced Japanese speakers to produce English vowels more accurately than lower-level students.

The present study examined Japanese and English vowels produced by L1 Japanese speakers learning English in order to investigate how these L1 and L2 vowels affect each other in the single vowel space. Unlike the previous research introduced above, this study focuses on how the learners' L2 competence, not their AOA, influences

their L1 and L2 productions. Therefore, the participants were divided into three groups depending on their English proficiency: elementary, intermediate and advanced.

In Chapter 2, the method of the study used, including speaker selection, recording materials and analysis technique are shown. In the following section results of the study are presented and evaluated with respect to the predictions of the various models.

2: Methodology

The aim of this experiment is to investigate whether L1 Japanese and L2 English vowels influence on each other, whether the amount of interaction changes through L2 experience and whether students utilize different cues to represent distinct vowel categories depending on their L2 proficiency. In this chapter, participants, speech materials, and procedures used in this study are introduced.

2.1. Participants

Twenty native Japanese adults learning English as their second language participated in this study. All of them were recruited from the same English school in Aichi, Japan and divided into three categories: elementary (3 women, 3 men), intermediate (4 women, 3 men), and advanced (3 women, 4 men), depending on their English proficiency. The elementary group had a mean age of 37 (range 18-58). The intermediate group had a mean age of 29.7 (range 26-42) and the advanced group had a mean age of 37.9 (range 30-46). All of the participants but two were born and grew up in the region where the school is located and share the same dialect, which is spoken in the east part of Aichi prefecture. One remaining subject is from Kansai, where people speak a different dialect, and came to the city four years before the experiment. Another is from the city where the school lies, but she had spent most of her life in the Kansai area as well and shares the same dialect with the other exceptional participant. Six Japanese monolinguals, whose mean age was 34.5 years old (range 27-53), were also recorded as a control group. English is a compulsory subject at junior high school and high school in Japan. Therefore, even controls had taken English education for at least six years. However, only the participants who had never learned English outside of school, which

means that they had never learned spoken English (only written English was taught in Japan when they were students) and had not studied English for at least 10 years since they left school, were chosen for this experiment.

2.2. Speech materials

The participants read from two scripts, English and Japanese. The English script consisted of monosyllable words containing the target vowels, / i, ɪ, e, ɛ, æ, u, ʊ, o, ɔ, ɑ, ʌ, ɹ /. These words were put in the frame, "Say _____, again." The framing allows the test to be conducted in a more consistant situation. The Japanese script consisted of two-syllable words containing the five short vowels, / i, e, a, u, o /, the five long vowels. , / i:, e:, a:, u:, o: /, and the five pre-geminate vowels, / iQ, eQ, aQ, uQ, oQ /. These Japanese vowels were also put in the frame, "mo:ichido _____to ittekudasai" (Japanese for "Say _____, again") for the same reason. The test words were selected for their phonological shape and represent the English vowels in /hVd/ and Japanese vowels in /h(f)Vto/ contexts. The subjects were asked to put stress on the first syllable in every word when reading the Japanese script. The scripts were not randomized for each subject. Instead, the same scripts were used for all the speakers (See Appendix A). Each sentence was presented in Times New Roman, 14-point font, 1.5 spaced, and appeared three or four times in random order in both languages. The three sentences from the bottom on each page of the script were excluded from the analysis.

2.3. Procedure

All the instruction and questions were provided in Japanese for the participants. These subjects were then shown the word lists, and asked to check if there was a word that they did not know how to pronounce. If there was, the researcher taught the

pronunciation of the word, using a different word that had the target vowel in it in order to minimize the risk that the participants would imitate the researcher's pronunciation. For example, when a subject asked how to pronounce 'hoed' and 'hawed', the words 'low' and 'law' were used to show the contrast between the target vowels. (This question was frequently asked, which may be because most of the subjects were not receiving formal instructions for the pronunciation.) Participants were allowed to read the scripts and practice before the recording. All the bilingual participants were asked to read the Japanese script first, and then move on to the English one, while the monolingual Japanese speakers were asked to read only the Japanese script. When all of the participants were reading these scripts, they were recorded. When a subject mispronounced a word during the recording, the experimenter stopped the recording, and asked the subject to read the sentence again.

The subjects were recorded on a Marantz professional solid state recorder PMD 660 with a Shure KSM 109 microphone in a quiet room at the English school. The recorded data were digitized on a personal computer. In total, 2,574 words (42 English words x 20 talkers + 54 Japanese words x 26 talkers) were recorded. Only 1,560 out of these 2,574 words, however, were used for the analysis because the last three sentences on each page of the scripts were excluded because the participants might have changed their intonation at the end of each page. The recordings were analyzed using standard acoustic analysis techniques with Praat (Boersma, 2001), which include the use of spectograms and LPC analysis in order to measure the formant frequencies of the first three formants at 25%, 50%, and 75% across the length of the vowel. The average of these three points were utilized for the analyses.

As the research questions here deal with perceptual distances, formant frequencies were converted from Hz to the auditory Bark scale.

The Scheffe tests were conducted and the level of significance was 5%, but no methods for correcting for Type I and Type II errors were used here.

3: Results

Two kinds of analyses were conducted in order to examine L2 competence effects on production of Japanese and English vowels and the results of these analyses were merged to investigate the interaction between the Japanese and English vowel systems. First, within-group analyses were carried out in order to investigate how the vowel systems of the two languages were categorized in the participants' speech. In these analyses, differences in the degree of independence of the vowels among the bilinguals with three different L2 competences were investigated. Second, between-group analyses were performed for English and Japanese vowels separately so that differences among the vowels produced by the three groups and the monolingual controls could be investigated. Then, the results of the within-group and between-group analyses were merged in order to investigate whether the changes in Japanese vowels were conditioned by English acquisition.

All the numeric values are shown in Appendix B. The text analyzes vowel sounds exhibiting significant statistical differences.

3.1. L2 effects on the degree of independence between Japanese and English vowel system and cue shifts: Within-group analyses

This section addresses two questions: Does changing L2 competence influence the extent to which phonological systems are held separate from each other in the F1 x F2 formant space and in duration? Do L2 learners use different cues to distinguish vowels in production, depending on their English proficiency? To this end, the dispersion of vowels in the vowel spaces of Japanese and English and the cues that the L2 students use to represent distinctive categories are examined as a function of L2 English level. For each

group, analyses of high-front, mid-front, high-back, mid-back and low and central vowels were carried out separately.

It is expected that the Japanese long vowels will be differentiated from the corresponding short vowels only by their duration, but not by formant frequency (Akamatsu, 1997). The pre-geminate vowels are expected to fall between their long and short counterparts. Rogers (1991) states that the English tense vowels should tend to be longer than the lax vowels, although native speakers (and presumably 'successful' L2 learners) will differentiate from one another by formant frequencies as well.

The Speech Learning Model (Flege, 1995) predicts that if L1 and L2 sounds are perceived to be similar by L2 learners, category assimilation occurs, and the L2 category will merge into the L1 category. On the contrary, if the L2 sound is considered as a new sound, a new category for the L2 sound will be established. However, if the L1 and L2 phones are phonetically close, category dissimilation occurs, which will cause L2 students to exaggerate the difference between the L1 and L2 in order to keep these two sounds distinct. According to Morrison (in press), Japanese students identified English /i/ and /ɪ/ by relying on temporal properties more characteristic of the Japanese long-short vowel distinction. Based on the SLM and Morrison's research, a hypothesis can be proposed: the elementary learners in this study may categorize the English tense vowels as the Japanese long vowels and the English lax vowels as the Japanese short vowels, utilizing the Japanese durational system. In other words, the elementary group will not establish new categories for English and will use Japanese vowels for English vowels.

However, Flege and Mackay's (2004) research implies that the experience of and the amount of exposure to the target language help learners to create new categories. The

experiment conducted by Escudero and Boersma (2004) also suggests that L2 experience changes cues on which L2 learners rely. Therefore, the intermediate group should have more distinct vowels than the elementary level, and the intermediate students may start paying attention to spectral cues when producing English vowels. The reliance on the spectral cues may affect Japanese production; the intermediate learners may use these cues as well as durational cues even when they differentiate Japanese vowels, because L1 productions will be influenced by L2 when dissimilation occurs, according to the SLM. The advanced-level students are expected to create more categories for English than the intermediate-level students, and utilize spectral cues more frequently in producing Japanese vowels as wells as English vowels.

The results are presented by category of L2 English competence, and in each section the results for female and male speakers were shown separately.

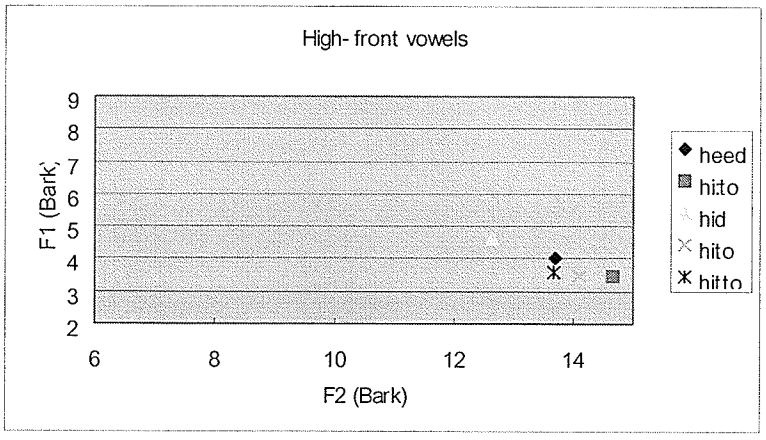
3.1.1. Elementary level

3.1.1.1. Female speakers

The description of vowels was carried out in terms of duration (measured in msec) and in spectral prominences (formant frequencies, expressed in Bark). As seen in Fig. 1, the Japanese high-front short and long vowels are well-separated from each other by duration, but not in formant frequencies (Bark). Similarly, the Japanese long and pre-geminate vowels are significantly different in duration. However, the high-front short and pre-geminate vowels are not distinguished from one another by any domain, which means that these two vowels are merged into a single category.

As summarized in Fig. 1, the English high-front tense and lax vowels are differentiated in terms of length, although there is no significant difference between these

two vowels' formants in Barks. Thus, it would seem that these speakers are substituting the Japanese long-short /i/ for the English tense-lax distinction. However, moving to the Japanese-English vowel comparisons, the Japanese high-front long vowel and the English high-front tense vowel are differentiated from one another by B3 and length, while the Japanese long and English lax are significantly different in all the domains. The Japanese short vowel /i/ is distinguished from the English high-front tense vowel in terms of duration, and the Japanese vowel is also differentiated from the English lax vowel by B1 and B2. The Japanese pre-geminate /iQ/and the English high-front tense vowel /i/ are different from each other in duration, while the Japanese vowel is distinguished from the English lax vowel /ɪ/ by B1. In summary, the elementary female bilinguals have four distinct high-front vowels in their combined Japanese-English systems. The Japanese long, short/pre-geminate, English tense, and lax vowels are held independent from each other, although with a combination of durational and spectral cues.



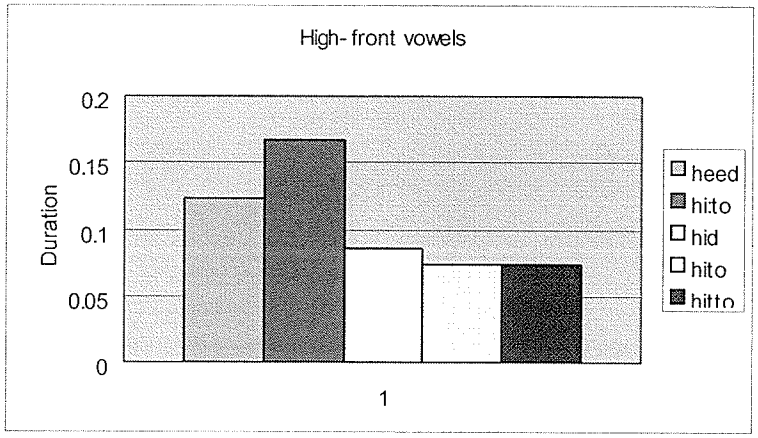


Fig. 1. The female elementary group's production of high-front vowels

The results revealed that three mid-front vowels were held distinct: the English tense/the English lax, the Japanese long, and the short/pre-geminate vowels. The Japanese mid-front long and short/pre-geminate vowels are statistically different in length, as seen in Fig. 2. The Japanese short and pre-geminate vowels, in contrast, are not significantly different in any domain. Therefore, these two vowels /e/ and /eQ/ may be contained in the same vowel category. As for the English vowels, the mid-front tense and lax vowels are distinguished only by duration. These two vowels are also held separated from all the Japanese mid-front vowels by duration. These results suggest that new categories for the English vowels /e/ and /ɛ/ have been established and that they are not merged into the spaces for the Japanese counterparts. But nonetheless, four distinct durational categories may be in use.

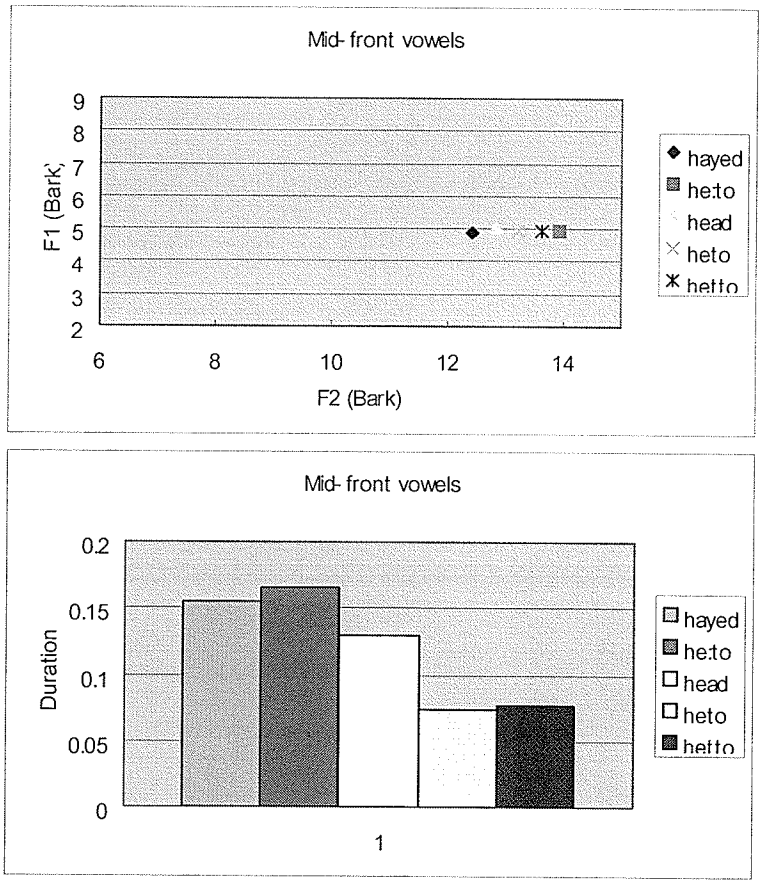


Fig. 2. The female elementary group's production of mid-front vowels

The results of the high-back vowels revealed no statistical difference between the Japanese short vowel /u/ and pre-geminate vowel /uQ/ in any domain (see Fig. 3). This suggests that the elementary learners put these two Japanese vowels in the same vowel category. On the contrary, the Japanese high-back long and short vowels, and the Japanese long and pre-geminate vowels are differentiated by duration.

As summarized in Fig. 3, the English high-back tense and lax vowels are distinguished in terms of B2 (the second formant) and duration. Therefore, these two English vowels are not merged into the same space. In addition, the Japanese-English vowel comparisons show that these English high-back vowels are not merged into the categories of the Japanese counterparts, either; the Japanese long vowel is held separated

from the English tense vowel /u/ by B2 and duration, and the Japanese short/pre-geminate vowel is different form the English lax vowel /ʊ/ only in B1. As expected, the Japanese high-back short vowel and the English tense vowel have a significant difference in B2 and length, and the Japanese vowel is statistically different from the English lax vowel in B1; the Japanese pre-geminate vowel /uQ/ is distinguished from the English tense vowel /u/ by B2 and length; the Japanese pre-geminate vowel and the English lax vowels are distinguished from each other by B1. Thus, it can be inferred that these bilinguals have four distinct high-back vowels: the Japanese long, short/pre-geminate, English tense and lax vowels.

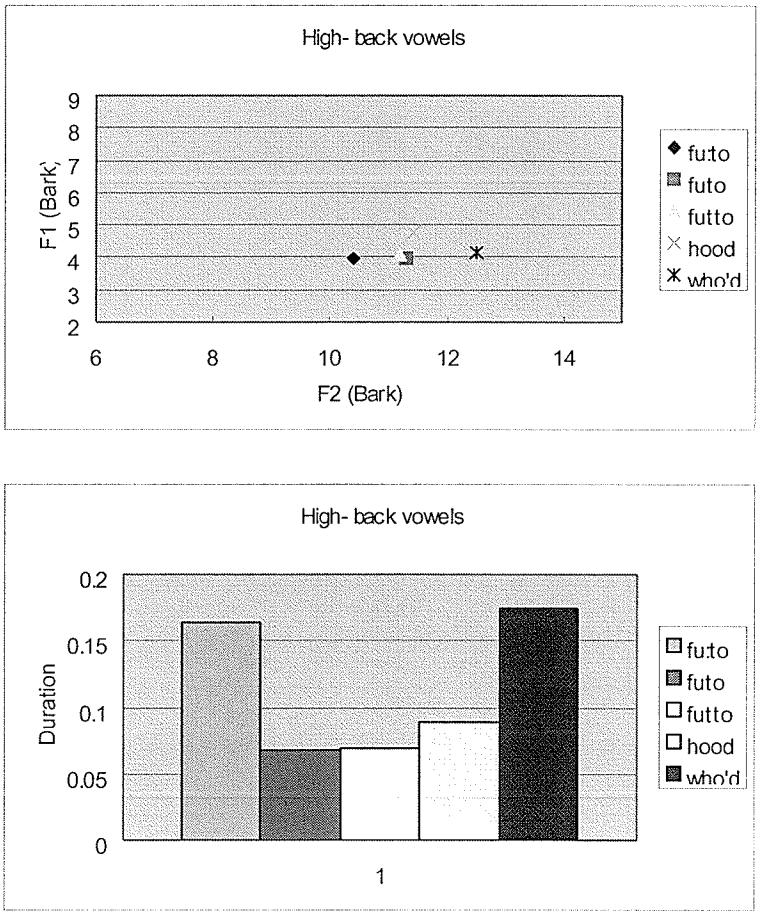


Fig. 3. The female elementary group's production of high-back vowels

Figure 4 displays that the Japanese mid-back long and short vowels, and the long and pre-geminate vowels are statistically different from one another in length. In contrast, the short and pre-geminate vowels are differentiated neither in Barks nor duration. These phenomena indicate that the long vowel /o:/ is obviously independent from the other two, but the short and pre-geminate vowels are not. In other words, the mid-back long vowel has its own space, while the other two share a single category.

As seen in Fig. 4, the English /o/ and /ɔ/ are not distinguished from each other by any domain, while /ɑ/ and these two vowels are significantly different in terms of B1 and length. These results show that /o/ and /ɔ/ are merged into the same vowel space, and that /ɑ/ is independent from the other two vowels. Moving to English and Japanese comparisons, the Japanese long vowel and the English /ɑ/ are well-distinguished from each other by B1, B2 and duration. The Japanese long vowel and the English /ɔ/ are significantly different from one another in B2, while the Japanese /o:/ and the English /o/ are not statistically different in any domain. The Japanese short and pre-geminate vowels and English /o/ and /ɔ/ are differentiated by duration, while these Japanese vowels and the English /ɑ/ are distinguished by B1. These results show that the English mid-back lax vowel is completely independent from all the Japanese vowels, and that the English /o/ and /ɔ/ are merged into neither the Japanese short nor pre-geminate vowels. It seems that the English /ɔ/ and the Japanese long vowel lie in separate spaces, while English /o/ seems to be merged into the category of the Japanese long vowel. However, there is no significant difference between /o/ and /ɔ/, which may mean that these bilinguals have a

new category for these English vowels that share some space with the Japanese long vowel.

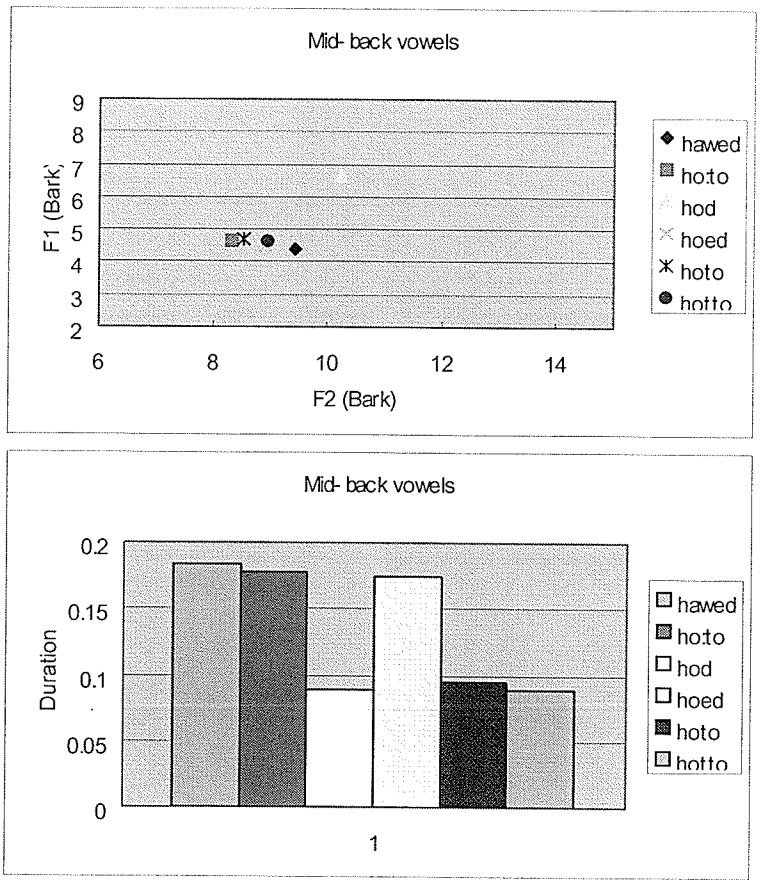


Fig. 4. The female elementary group's production of mid-back vowels

As shown in Fig. 5, the Japanese low long and short vowels and the long and pre-geminate vowels are differentiated from each other only by length, while the short and pre-geminate vowels are not statistically different in any measure. These results again mean that the long vowel is independent from the other two vowels, while the short and pre-geminate vowels exist in the same vowel space.

Figure 5 also indicates that English /æ/ and /ʌ/ have no significant difference in any domain, while /æ/ and /ə/, and /ʌ/ and /ə/ are distinguished from one another in terms of duration. Therefore, it is likely that /æ/ and /ʌ/ are merged into the same category and

that /ɚ/ is independent from the other two vowels. Moving to English and Japanese comparisons, all the English vowels are differentiated from the Japanese long vowel; /æ/ is different in B2 and duration; /ɚ/ is different in B1 and B2; /ʌ/ is different in B3 and duration. Similarly, /æ/ is differentiated from the Japanese short and pre-geminate vowels by B2; /ɚ/ is significantly different from the Japanese short vowel in B1 and duration; /ɚ/ is also different from the Japanese pre-geminate vowel in B1 and duration. Further /ʌ/ is distinguished from the Japanese short vowel by B3, but not significantly different from the pre-geminate vowel. These results reveal that none of the English vowels is put into the Japanese long vowel category, and that /æ/ and /ɚ/ are independent from the other two types of Japanese vowels as well. On the contrary, /ʌ/ does not seem to be completely independent from the Japanese pre-geminate vowel, while it is separate from the short vowel, which lies in the same vowel space as the pre-geminate vowel. This may mean that these learners are establishing a new category for /ʌ/ and /æ/, but this category shares some space with the category for the Japanese short and pre-geminate vowels. The Japanese long, the Japanese short/pre-geminate vowels which is partially shared by /ʌ/ and /æ/, and /ɚ/ exist in the students' minds.

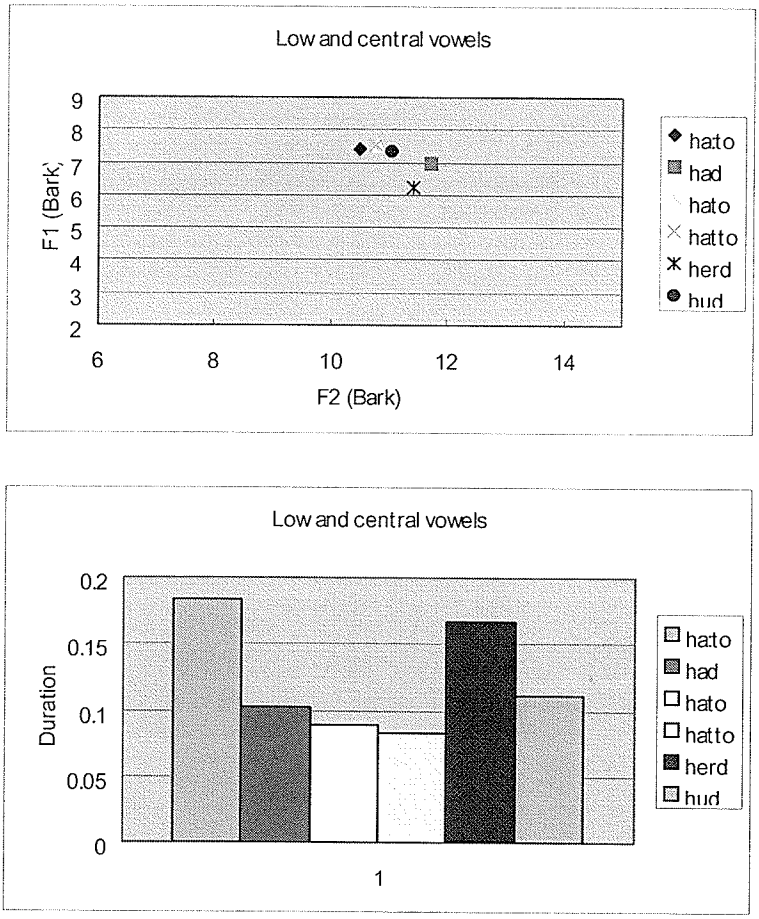


Fig. 5. The female elementary group's production of low and central vowels

Generally, the results contradict the expectations. Unexpectedly, the results indicate that the elementary female students merge all Japanese short and pre-geminate vowels into one category. This merger may be caused by English learning, because monolingual Japanese speakers tend to distinguish these two vowels by length. The results also show that the elementary female learners have established new categories for English /i/, /ɪ/, /u/, /ʊ/, /ɑ/, /æ/, and /ə/, although it was predicted that English vowels would be categorized as Japanese vowel categories at this level. In addition, some of the English vowels are merged into one category, instead of being merged into Japanese vowel categories; /e/ and /ɛ/, /o/ and /ɔ/, and /æ/ and /ʌ/ lie in the same categories. In

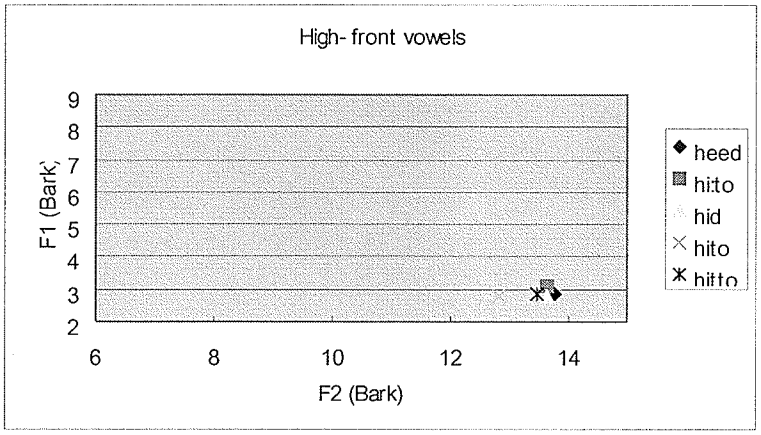
comparison, English /o/ and /ʌ/ share some space with Japanese /o:/ and /aQ/ respectively. The merger of English /o/ into Japanese /o:/ supports the hypothesis based on the SLM, but /ʌ/ was expected to be merged into Japanese /a/, not /aQ/. Additionally, against the prediction, these learners frequently utilize spectral cues to differentiate a Japanese vowel from an English vowel and sometimes to distinguish two English vowels. The reliance on spectral cues was not predicted to occur at the elementary level, but at the higher levels. Hence, this phenomenon also contradicts the hypothesis. Because spectral cues are not used by monolingual Japanese speakers, it can be inferred that English learning leads the elementary students to pay attention to formant frequencies. However, as far as Japanese vowels, these bilingual speakers behave as predicted; they rely only on durational cues in order to differentiate Japanese vowels.

3.1.1.2. Male speakers

There are statistical differences between the Japanese high-front long and short vowels in B1 and duration. Contrary to their female counterparts, these male subjects seem to distinguish the long and short vowels in Japanese spectrally (in vowel height) as well as duration, as seen in Fig. 6. There is also statistical difference in duration of the high-front long and pre-geminate vowels. The short and pre-geminate vowels are differentiated by B2. Therefore, it is likely that all the Japanese vowels are somewhat independent from each other.

As for English, the high-front tense vowel is significantly different from the lax vowel only in length (see Fig. 6). However, it seems that these bilinguals have two distinct English vowels in their minds. There are no statistical differences between the Japanese long vowel and the English tense vowel, which may mean that the new category

for the English vowels has not been established and that these learners substitute the Japanese vowel for the English one. There are also statistical differences between the Japanese high-front short and the English tense vowels and between the Japanese short vowel and the English lax vowel in B2 and duration. On account of these differences, both of the English vowels are distinct from the Japanese short vowel. The Japanese pre-geminate vowel is differentiated from the English tense vowel in duration, while the Japanese vowel and the English lax vowel are significantly different in B2. Hence, it can be said that neither of the English high-front vowels is merged into the Japanese pre-geminate vowel. These results suggest that the male elementary learners have four separate categories for high-front vowels: the Japanese long/the English tense, the Japanese short, the Japanese pre-geminate and the English lax vowels.



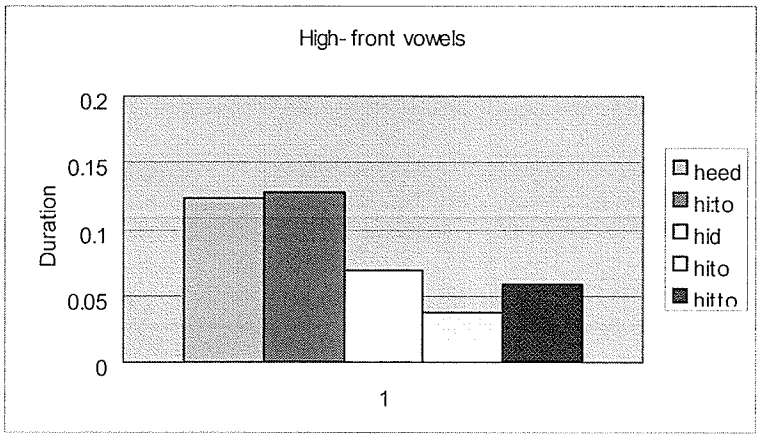


Fig. 6. The male elementary group's production of high-front vowels

The Japanese mid-front long and short vowels have statistical differences in B2 and duration (see Fig. 7). In addition, the long vowel /e:/ is also distinguished from the pre-geminate vowel /eQ/ by the same domains. However, the short and pre-geminate vowels are not differentiated from each other. These results suggest that these male learners at the elementary level have only two distinct Japanese mid-front vowels, the long and short/pre-geminate vowels.

Figure 7 also displays that the English mid-front tense vowel is distinguished from the lax vowel only by duration, which shows that there are two separate mid-front vowel categories in these bilinguals' minds: the tense and lax vowels. Moving to Japanese and English combinations, the Japanese long and the English tense vowels are statistically different in B2, while the Japanese vowel is distinguished from the English lax vowel by duration. There is a significant difference in B2 and length between the short Japanese vowel and the English tense vowel and between the Japanese vowel and the English lax vowel. The pre-geminate vowel is distinguished from the English tense vowel by B2 and length, and the Japanese vowel and the English lax vowel have the same differences. The results above suggest that there are four independent mid-front vowel categories for the elementary learners: the Japanese long, short/pre-geminate, the English tense and lax vowels.

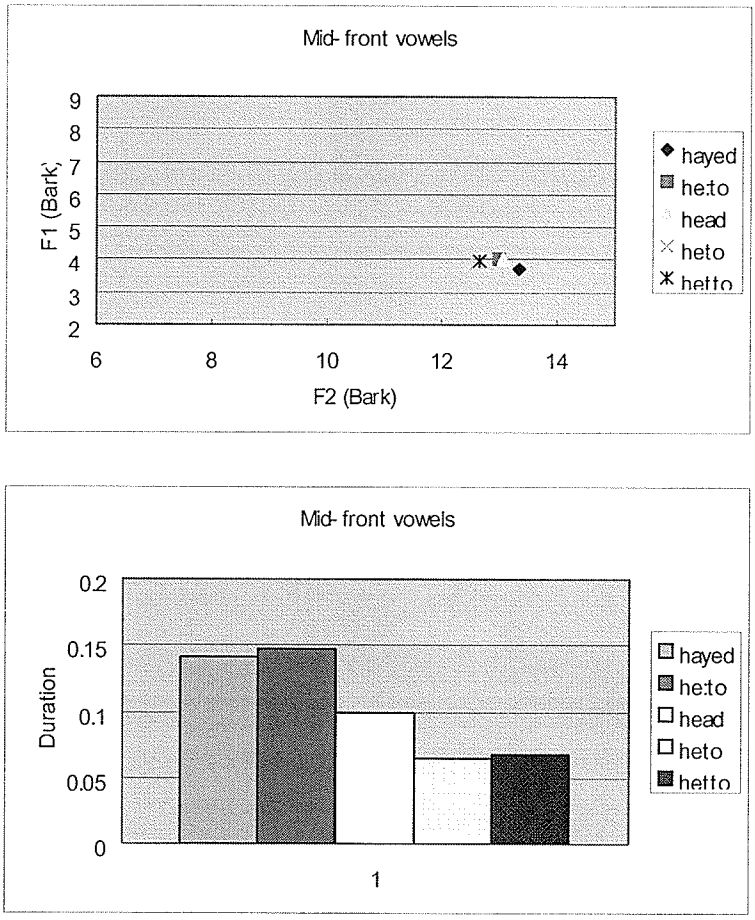
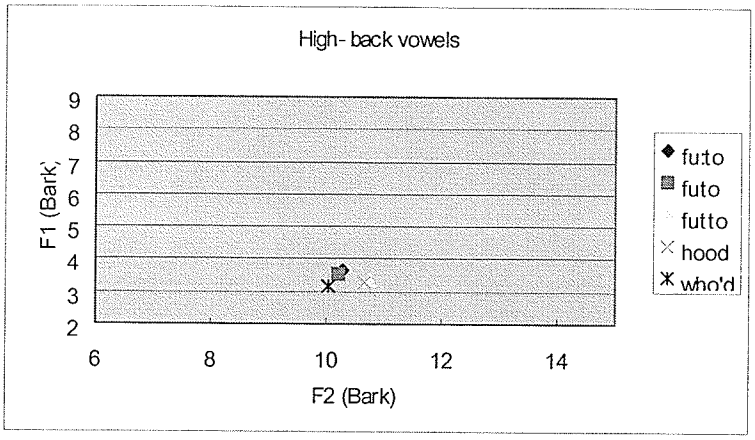


Fig. 7. The male elementary group's production of mid-front vowels

There is a significant difference in duration between the Japanese high-back long and short vowels and between the long and pre-geminate vowels, although the short vowel is not differentiated from the pre-geminate vowel, as seen in Fig. 8. These bilinguals have only two independent Japanese high-back vowels, because the short and pre-geminate vowels are mixed together in one category. Moving to English vowels, the high-back tense and lax vowels are statistically different in duration, which implies that these two vowels are held distinct. Since the Japanese long vowel /u:/ is differentiated from the English tense vowel /u/ by B2 and from the English lax vowel /ʊ/ by length, it can be inferred that the English vowels are not merged into the Japanese long vowel. As

summarized in Fig. 8, The Japanese short vowel /u/ is distinguished from the English tense vowel /u/ by duration, while the Japanese vowel is not statistically different from the English lax vowel. These results mean that the English lax and the Japanese short vowels are not held separate, but that the English tense vowel is independent from the Japanese vowel. The Japanese pre-geminate and the English lax vowels have no significant differences in any domain. In contrast, the Japanese pre-geminate vowel /uQ/ is statistically different from the English tense vowel /u/ in B3 and duration. Therefore, it is likely that the English long vowel is kept independent from the Japanese vowel, while the English lax vowel is not.

In brief, the male learners with elementary English competence have three high-back vowels in this space: the Japanese long, the Japanese short/pre-geminate/English lax and the English tense vowels.



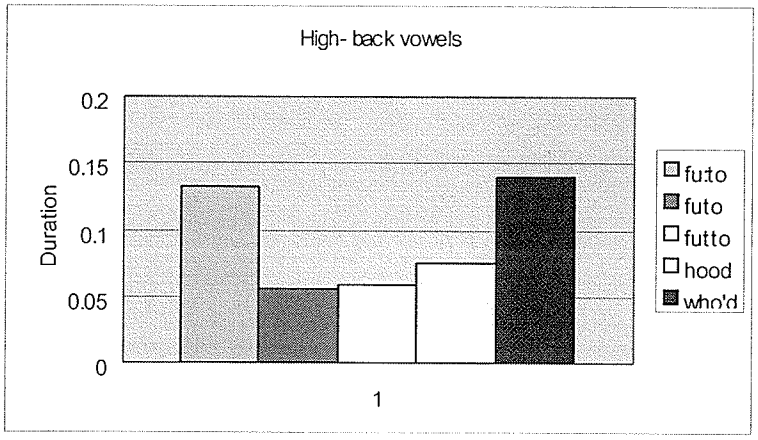


Fig. 8. The male elementary group's production of high-back vowels

As seen in Fig. 9, there are duration differences between the Japanese mid-back long and short vowels and between the long and pre-geminate vowels. The short and pre-geminate vowels, however, are not significantly different in any measure. These results imply that there are only two separate mid-back vowel categories, the long and short/pre-geminate vowels. Moving to English vowels, /ɔ/, /o/ and /ɑ/ are statistically different from one another in length, which implies that they lie in different categories (refer to Fig. 9). As for Japanese and English combinations, there are not any significant differences between the Japanese long vowel and /ɔ/ and between the Japanese vowel and /o/. On the contrary, the Japanese long vowel is distinguished from /ɑ/ in duration. All the English vowels are statistically different from the Japanese short vowel by duration, which suggests that none of the English vowels is merged into the Japanese short vowel. The Japanese pre-geminate vowel and all English vowels have a durational difference. The results above indicate that the English vowels /o/ and /ɔ/ are not kept separate from the Japanese long vowel, but that all the English vowels are distinct from the other Japanese

vowels. Hence, these subjects have three independent vowels, the Japanese long vowel /o///ɔ/, the Japanese short/pre-geminate vowel and /ɑ/.

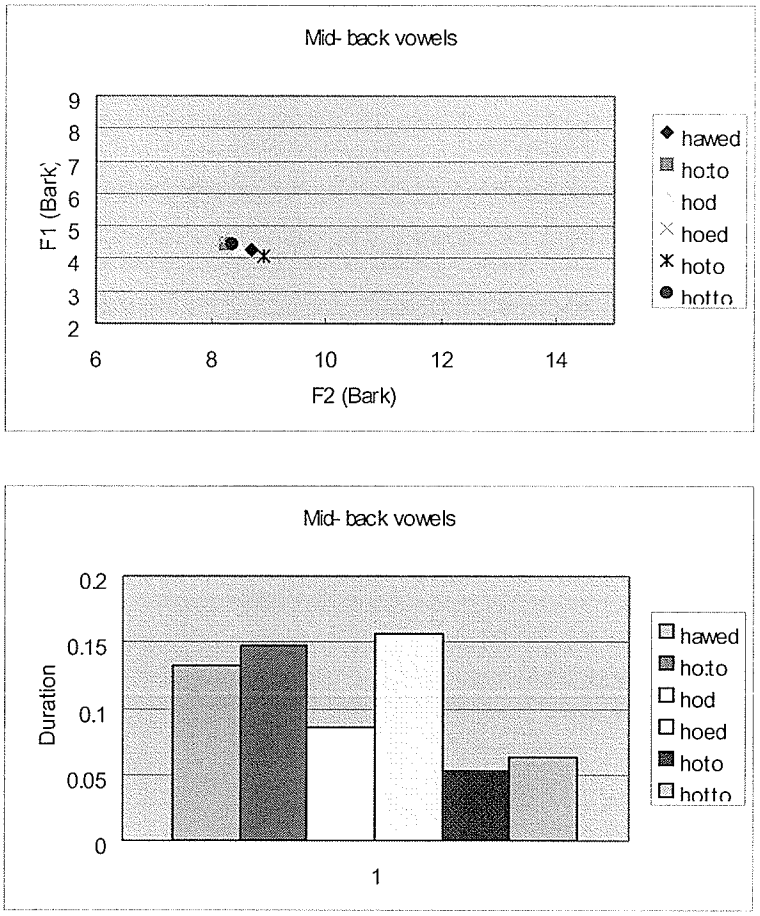
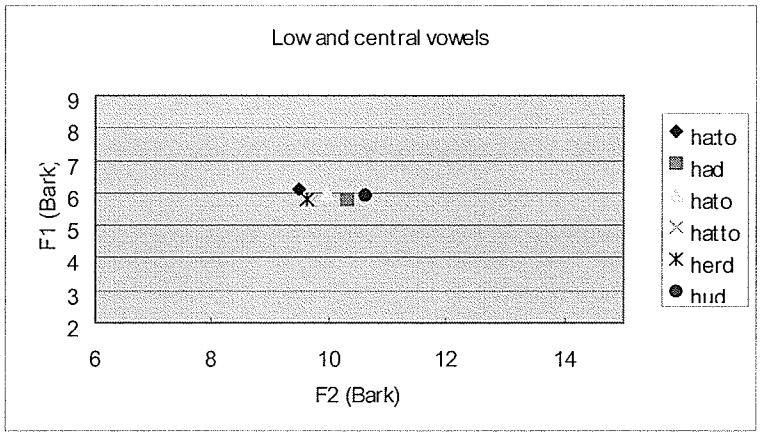


Fig. 9. The male elementary group's production of mid-back vowels

There are no statistical distinctions between the Japanese low short and pre-geminate vowels, but these vowels are distinguished from the Japanese long vowel /a:/ by duration, as summarized in Fig.10. Therefore, there are two independent low vowel categories: the long and the short/pre-geminate vowels. Because /æ/ and /ʌ/ are not distinguished from one another by any domain, it can be inferred that these two vowels are merged into one category. In contrast, these two English vowels are statistically different from /ə/; /ʌ/ is different in duration; /æ/ is different in duration and B2. Thus, /ə/

is held separate from the other vowels, while /æ/ and /ʌ/ are not. Moving to Japanese and English pairs, /æ/ and /ʌ/ are significantly different from the Japanese long vowel in B2 and duration, while the Japanese vowel and /ə-/ have no significant distinction at all, as shown in Fig. 10. The Japanese short vowel is differentiated from all the English vowels by length. The Japanese pre-geminate vowel and /ə-/ are differentiated from each other by length, while the Japanese vowel is differentiated from /ʌ/ by B2. However, /æ/ is not statistically different from the pre-geminate vowel in any domain. These results suggest that these bilingual participants substitute the Japanese long vowel for /ə-/, without having established a new category for the English vowel, and that the Japanese short and pre-geminate vowels share some space and are not completely independent from each other. This combined category also shares some space with /æ/, and this is why there is no significant difference between the pre-geminate vowel and /æ/. Additionally, /æ/ and /ʌ/ overlap one another as well.



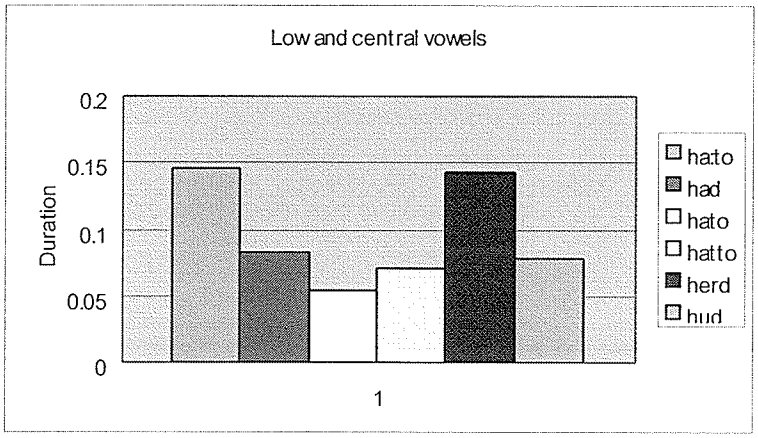


Fig. 10. The male elementary group's production of low and central vowels

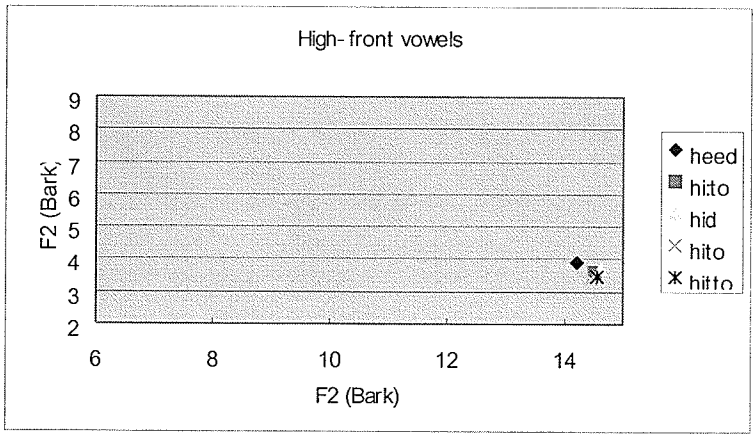
Again, with the male subjects, the results do not entirely follow the expectations. Although the male participants do distinguish the Japanese short /i/ from pre-geminate vowel /iQ/ in accordance with the prediction, they tend to merge the short and pre-geminate vowels into one category, which is against the prediction. In addition, although it is hypothesized that the elementary learners utilize only temporal cues, these male students rely on spectral cues as well as durational cues even in discriminating Japanese vowels. This reliance on spectral cues seems to be English influence. Another result against the hypothesis is that the elementary male speakers have formed new categories for English /ɪ/, /e/, /ɛ/, /u/ and /ɑ/, and one category where both /ʌ/ and /æ/ lie. Also against the hypothesis, the English /ʊ/ is merged into both Japanese /u/ and /uQ/. The English vowel was expected to be mixed together only with the Japanese short vowel. However, there are results that follow the SLM prediction: the English /i/ is merged into the Japanese /i:/, the English /o/ and /ɔ/ are merged into the Japanese /o:/, and the English /ɚ/ is merged into the Japanese /a:/.

Against the expectations, both of the elementary female and male bilinguals tend to merge Japanese short and pre-geminate vowels into one category and have established new categories for some English vowels. In addition, these bilingual speakers frequently rely on spectral cues as well as durational cues. However, only male subjects utilize formant frequencies in order to distinguish one Japanese vowel from another.

3.1.2. Intermediate level

3.1.2.1. Female speakers

Figure 11 indicates that nothing is significantly different in Barks, but all the high-front vowels are distinguished from each other by duration. Hence, it can be said that all of the five vowels are kept independent in the high-front vowel space in these learners' minds, but only using durational cues.



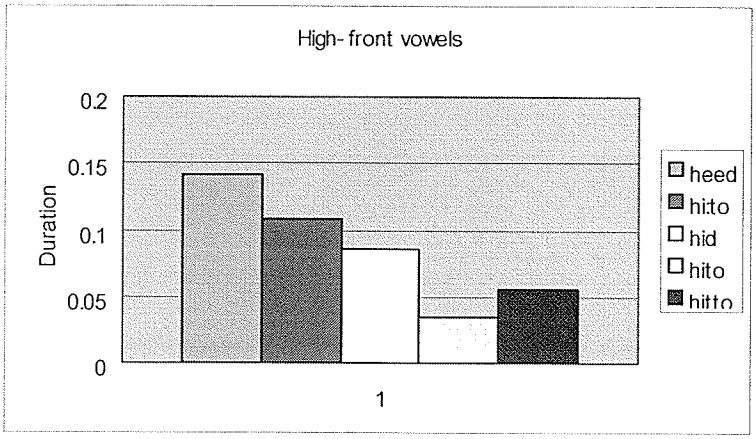


Fig. 11. The female intermediate group's production of high-front vowels

When it comes to the Japanese mid-front vowels, all of the three vowels are distinguished from each other only by duration, as displayed in Fig. 12. This implies that they are all independent, and the distinct long, short, and pre-geminate vowels exist in the space for Japanese mid-front vowels. As for the English mid-front vowels, the tense and lax vowels are significantly different from one another in B1 and duration (see Fig. 12). Hence, they are not merged into a single category, but they lie in two different spaces. Moving to English and Japanese comparisons, all the combinations but the Japanese mid-front long and the English lax are differentiated by length. In addition, the Japanese short and the English tense are significantly different in B2. Therefore, it can be said that the English lax is merged into the Japanese long vowel category, although a new category for the English tense has been obtained by the female learners at this level.

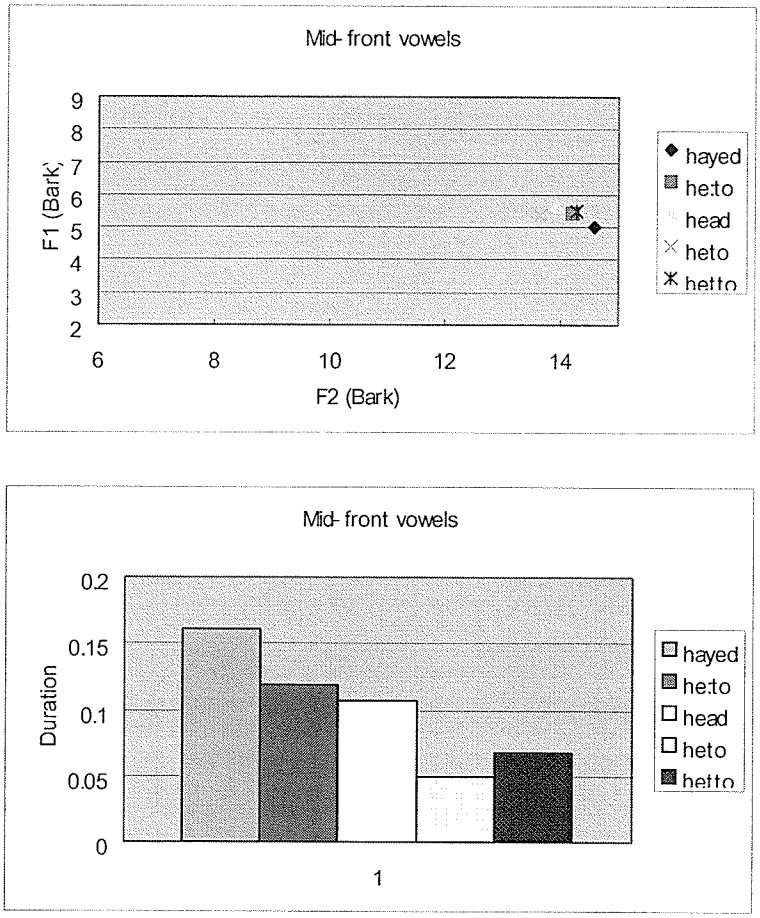


Fig. 12. The female intermediate group's production of mid-front vowels

As summarized in Fig. 13, all of the three Japanese high-back vowels are distinguished by duration. There are also significant differences between the Japanese long and short vowels and between the long and pre-geminate vowels in B2. These results suggest that all the Japanese vowels are independent and these learners have three distinct vowels in the high-back vowel space. Figure 13 indicates that there are statistical differences between the English high-back tense and lax vowels in B2 and length. This means that these two English vowels are kept separate, without being merged into one category at all. As for English and Japanese comparisons, the Japanese long and the English lax vowels are differentiated by B2 and duration. The Japanese short and pre-

geminate vowels are distinguished from the English tense vowel by B2 and length. As seen in Fig. 13, there are also differences between the Japanese long and the English tense vowels and between the Japanese short and the English lax vowels in duration. These results indicate that these bilinguals have five separate vowel categories for high-back vowels: the Japanese long, short, pre-geminate, the English tense and lax vowels.

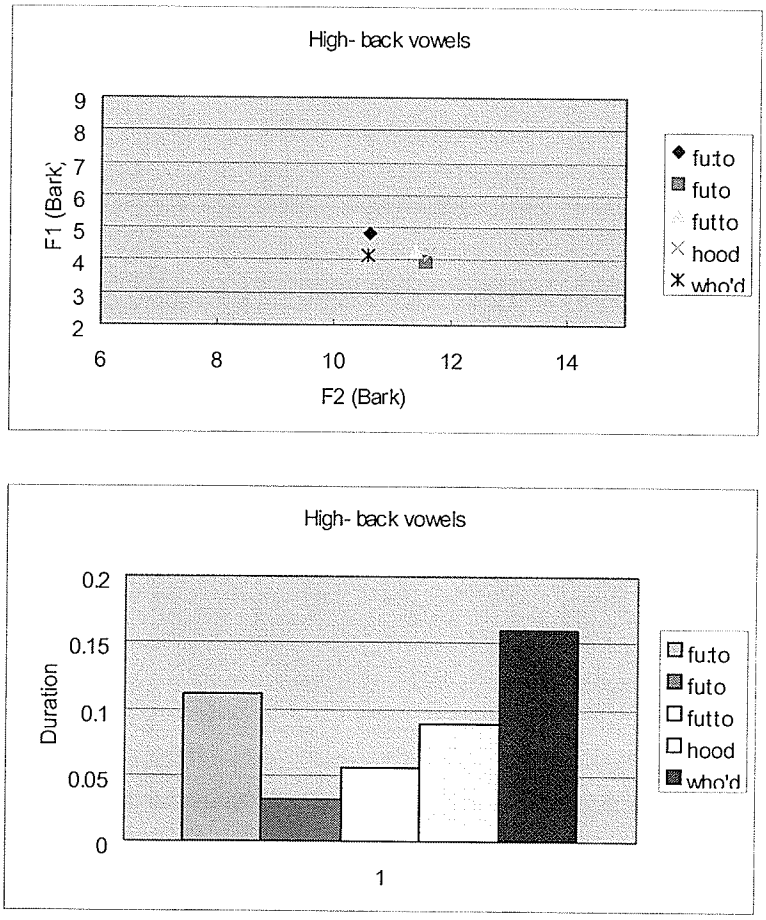
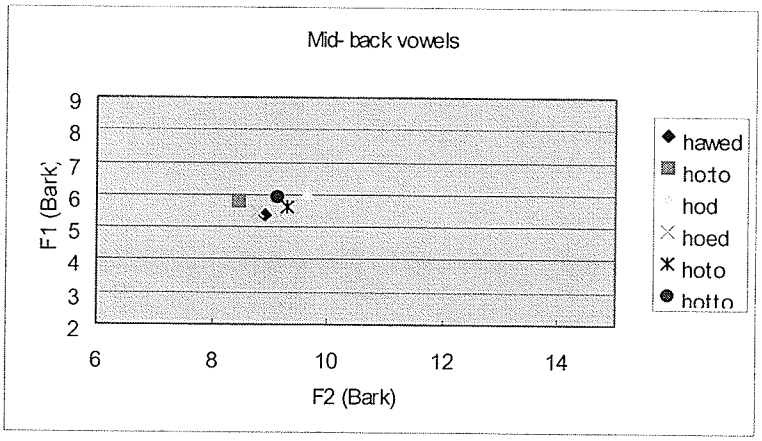


Fig. 13. The female intermediate group's production of high-back vowels

There are statistical differences between the Japanese mid-back long and short vowels and between the long and pre-geminate vowels in duration, as shown in Fig. 14. On the contrary, the short and pre-geminate vowels have no significant difference in any domain. Hence, it can be inferred that the long vowel is held independent from the other

two vowels, while the short and pre-geminate vowels are merged into the same category. Moving to English mid-back vowels, all of the three vowels are significantly different from one another in length (see Fig. 14). Additionally, /ɑ/ and /o/ are distinguished by B2 as well. Therefore, it is likely that these three English vowels are all independent from each other. As summarize in Fig. 14, all the English vowels are differentiated from the Japanese long vowel by duration. In addition, the English /ɑ/ is significantly different from the Japanese vowel in B2 as well. The Japanese short vowel and the three English vowels are distinguished from each other by length. There are also durational differences between the Japanese pre-geminate vowel and all the English vowels. These results suggest that none of the English vowel is merged into a Japanese vowel category. Hence, these learners have five vowels in their minds: the Japanese long, the Japanese short/pre-geminate vowels, the English /ɔ/, /ɑ/ and /o/.



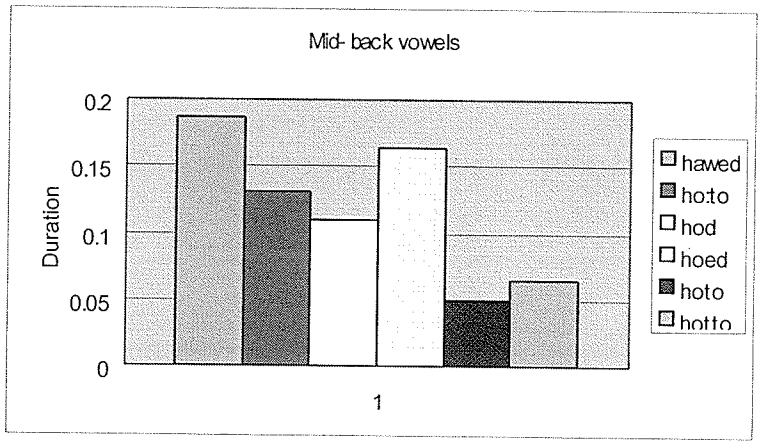
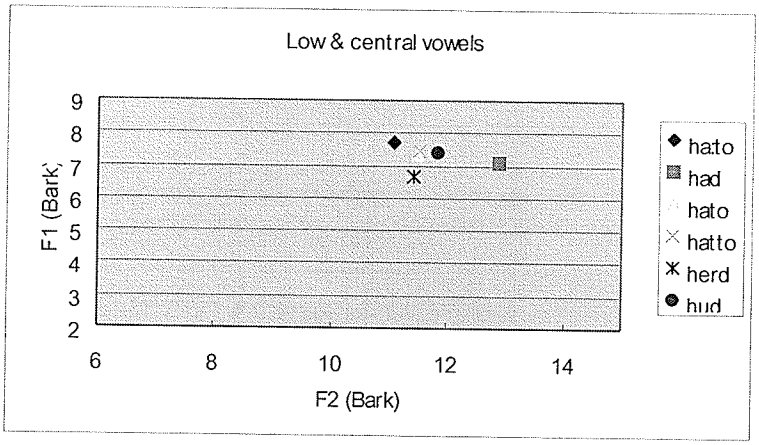


Fig. 14. The female intermediate group's production of mid-back vowels

As seen in Fig. 15, all the Japanese low vowels are differentiated by duration, but not by formant frequencies at all. Hoever, this result shows that these Japanese vowels are independent from each other. Therefore, it is likely that these bilinguals have three different vowels. Statistically, /æ/ and /ɚ/ are different from each other in B2, B3 and duration, while /æ/ and /ʌ/ are different only in B2. There are significant differences between /ʌ/ and /ɚ/ in B1, B2, and length. Hence, all the three English vowels are held independent. The results also suggest that the Japanese long vowel and English /æ/ are distinguished by B1 and B2. The long vowel is also different from /ɚ/ in B1, B3 and duration. In addition, there is a statistical difference between the Japanese vowel and /ʌ/ in B2. The Japanese short vowel is distinguished from the English /æ/ by B2 and length, while the Japanese short vowel is differentiated from the English /ɚ/ by B1, B3 and duration. The results also indicate that there is also a difference between the short vowel and the English /ʌ/ in length. The Japanese pre-geminate vowel and /æ/ are distinguished from one another by duration, and the Japanese vowel is also different from /ɚ/ in B1, B3

and length. Additionally, the Japanese pre-geminate vowel and the English /ʌ/ are differentiated from each other by duration.



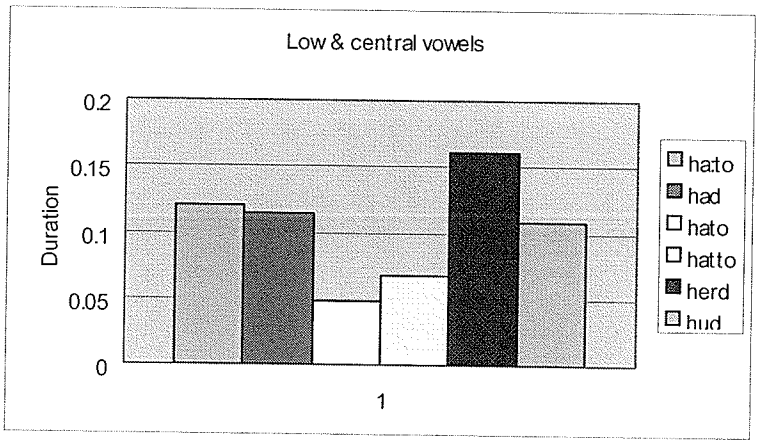


Fig. 15. The female intermediate group's production of low and central vowels

The results for the female intermediate learners mostly follow the hypotheses. As expected, these intermediate subjects separate all Japanese vowels, although there is one exception, /o/ and /oQ/. Additionally, these subjects sometimes rely on spectral cues as well as durational cues in order to differentiate Japanese vowels as well as English vowels, and Japanese and English vowels. All the English vowels but /ɪ/ seem to have obtained their own spaces, which may be the cause for cue shifts among the female intermediate students. These cue changes were also expected and support the hypothesis.

The results also show the female intermediate group has more distinct vowel categories than the female elementary group, which also follows the hypothesis. However, there is an interesting finding: the female intermediate learners merge the English /ɛ/ into the Japanese /e:/. This phenomenon goes against the SLM hypothesis, which predicts that the English lax vowel will be merged into the Japanese short vowel /e/.

3.1.2.2. Male speakers

As for the Japanese high-front vowels, there are durational differences between the long and short vowels and between the long and pre-geminate vowels, as seen in Fig. 16. The short and pre-geminate vowels, however, have no statistical distinction at all. From these results, it can be inferred that only the long vowel is independent from the other two, and that the short and pre-geminate vowels are merged into a single category. Figure 16 also displays that the English high-front tense vowel is significantly different from the lax vowel in length, which suggests that these two vowels are independent from each other. As shown in Fig. 16, the Japanese long vowel and the English tense vowel are not significantly different from one another. Therefore it is likely that these two vowels are mixed together in one category. On the contrary, the English lax vowel is significant different from the Japanese long vowel in duration. Thus, the learners have an independent category for the English high-front vowel. The English lax vowel seems to be merged into the Japanese short vowel, since there are no clear distinctions between these two vowels. However, the English tense vowel and the Japanese short vowel are different in length, and these vowels are independent from each other. There are significant differences between the Japanese pre-geminate and the English tense vowels in B2 and length, while no difference between the Japanese and English lax vowels can

be found (see Fig. 16). These results imply that the English tense vowel is distinct from the Japanese pre-geminate, and that the Japanese pre-geminate and the English lax vowels lie in the same category. Taking account of the results above, it can be said that these participants have only two high-front vowel categories: the Japanese long/English tense and the Japanese short/pre-geminate/English lax vowels.

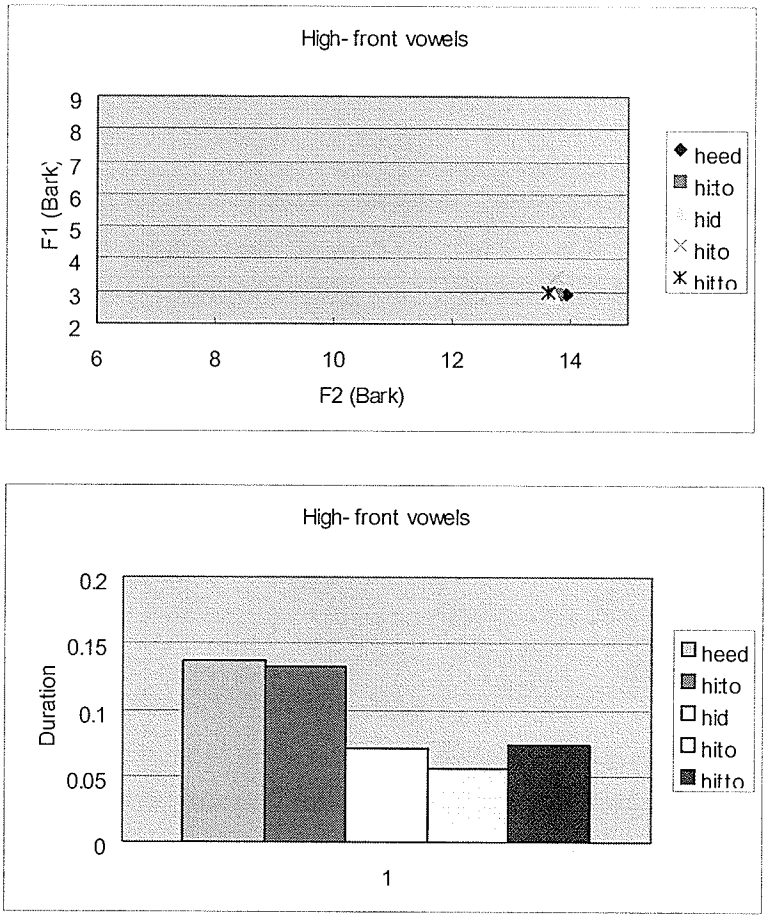
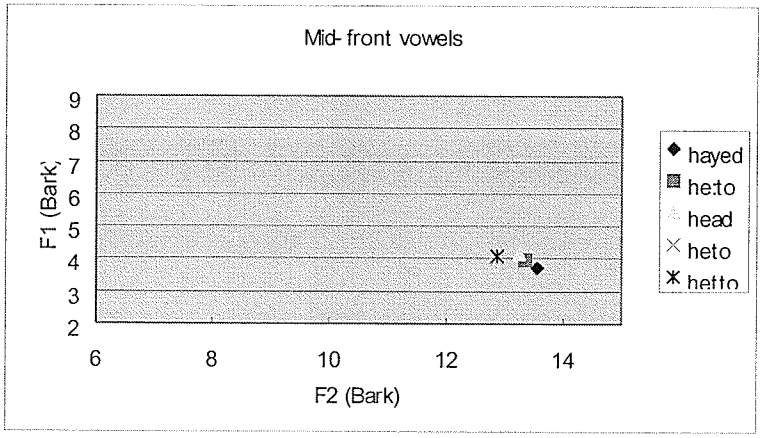


Fig. 16. The male intermediate group's production of high-front vowels

As summarized in Fig. 17, both the Japanese mid-front long and short vowels, and the long and pre-geminate vowels are distinguished from each other in B2 and length. The short and pre-geminate vowels, however, are not distinct from one another. Therefore, the long vowel seems independent from the other two vowels, while the short

and pre-geminate vowels are likely to be mixed together in a single space. The English tense vowel is differentiated from the lax vowel by B2 and length (see Fig. 17), which implies that these mid-front vowels exist in separate vowel categories. There are statistical differences between the Japanese long and the English tense vowels in B2 and B3, and between the Japanese vowel and the English lax vowels in duration. It appears that both English vowels are kept apart from the Japanese long vowel. Figure 17 also indicates that the Japanese short vowel is significantly different from the English tense vowel in B2, B3 and duration. In addition, the Japanese vowel is also held separated from the English lax vowel in B2 and length. These English mid-front vowels are not substituted by the Japanese category and are held separate. The English tense vowel differs from the Japanese pre-geminate vowel in B2, B3 and duration, while the English lax vowel is distinguished from the Japanese vowel by B2, as shown in Fig. 17. Thus, the Japanese pre-geminate vowel is not combined with these two English vowels.

In summary, four independent mid-front vowels exist in the male learners' minds: the Japanese long, short/pre-geminate, English tense and lax vowels.



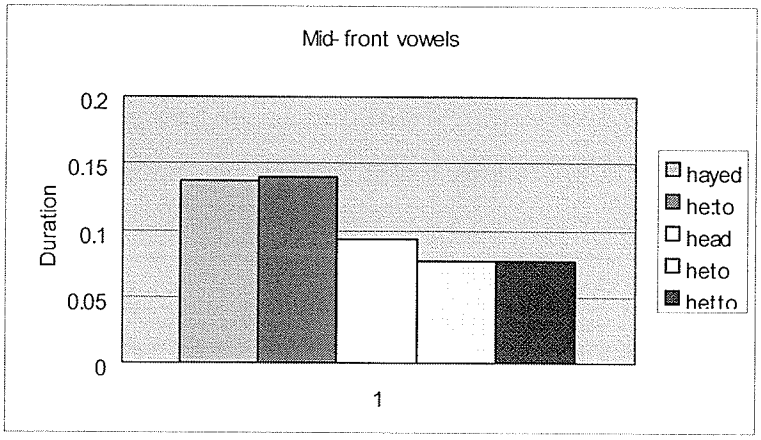


Fig. 17. The male intermediate group's production of mid-front vowels

Figure 18 shows that the Japanese high-back short and pre-geminate vowels are not significantly different form each other in any domain, although there is a durational difference between the long and short vowels as well as between the long and pre-geminate vowels. These learners seem to have two Japanese high-back categories, the long and short /pre-geminate vowels, in their minds. Moving to English high-back vowels, there is a durational difference between the English vowels (see Fig. 18), which shows that the English tense and lax vowels are independent from each other. As for Japanese and English pairs, it seems that the English lax vowel is independent from the Japanese long vowel because of the durational difference between them, as displayed in Fig. 18. In comparison, there are no significant differences between the English tense and the Japanese vowels, and it is likely that these two are not separated from one another. The English tense vowel is distinct from both Japanese short and pre-geminate vowels in length, while the English lax vowel is not. Hence, the English tense vowel is kept apart from the Japanese vowels, while the English lax vowel is merged into the Japanese vowels. The results above imply that there are only two high-back vowel categories in

these bilinguals' minds: the Japanese long/English tense vowel, and the Japanese short/pre-geminate/English lax vowel.

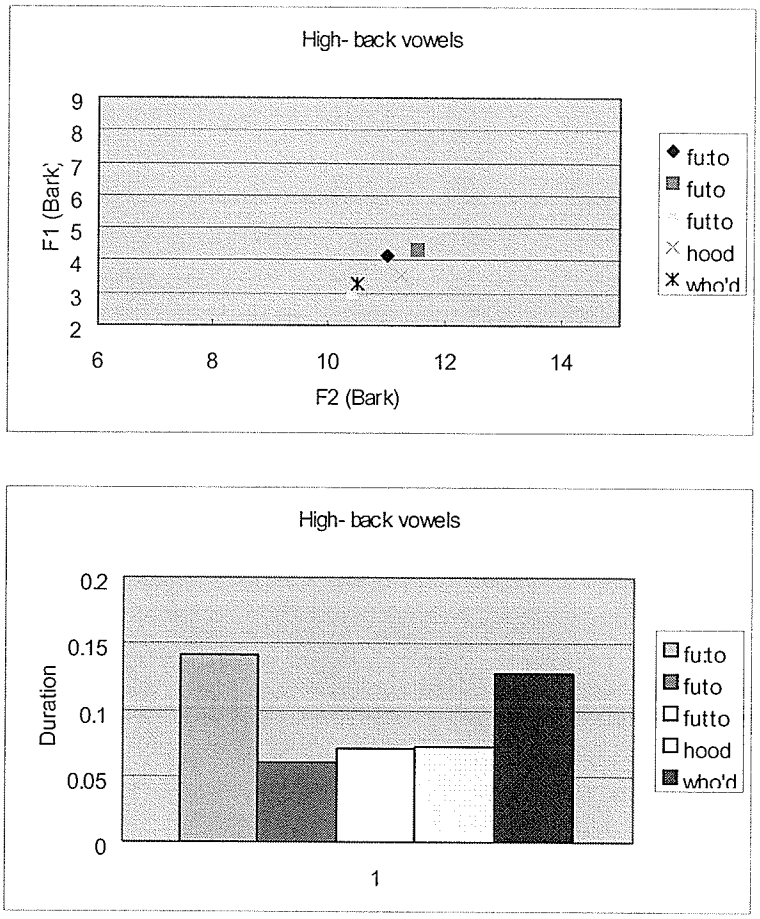
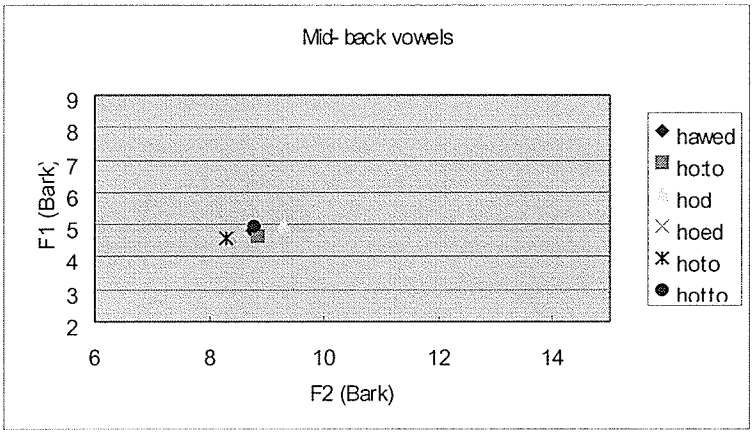


Fig. 18. The male intermediate group's production of high-back vowels

Figure 19 shows that there is no significant distinction between the Japanese mid-back short and pre-geminate vowels, while the long vowel is differentiated from these vowels in duration. Therefore, there seem to be two independent mid-back vowels, the long and short/pre-geminate vowels. As for the English vowels, it is likely that /ɔ/ and /o/ are mixed together in one category, because no differences between these vowels can be found in any domain (refer to Fig 19). In contrast, there is a durational difference between /ɔ/ and /ɑ/ and between /o/ and /ɑ/, which implies that they are separate from

each other. English /o/ and /ɔ/ are not significantly different from the Japanese long vowel at all, while /ɑ/ is clearly distinguished from the Japanese vowel by duration. As summarized in Fig. 19, all of the English vowels are differentiated from the Japanese short vowel by length, which shows that none of the English vowels is substituted by the Japanese vowel. The pre-geminate vowel and /ɑ/ seem to exist in the same category, because no significant distinctions can be found between them. On the contrary, the other two English mid-back vowels are distinct from the pre-geminate vowel in length and are held independent.



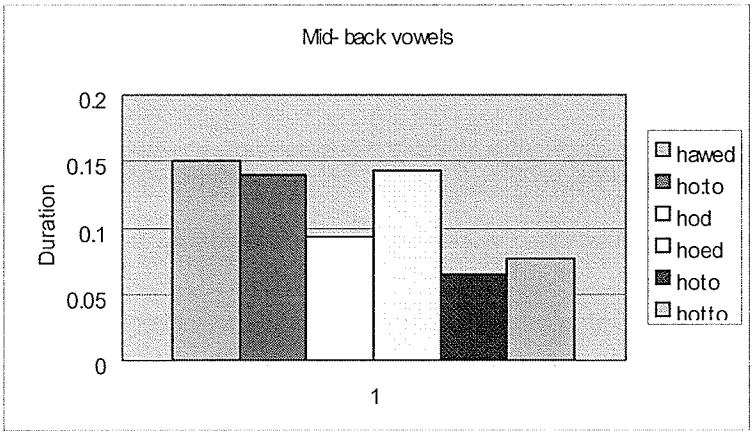


Fig. 19. The male intermediate group's production of mid-back vowels

As for Japanese low vowels, the short vowel is statistically different from the long vowel in B1 and duration, while the pre-geminate and the long vowels are distinguished from one another only by length, as seen in Fig. 20. However, no differences can be found between the short and pre-geminate vowels. Hence, there seem to be two Japanese low vowel categories, the long and short/pre-geminate vowels. Figure 20 also indicates that English /æ/ and /ə/ are differentiated by B2 and duration, while no significant differences can be found between /æ/ and /ʌ/. There is a durational difference between /ə/ and /ʌ/. It seems that these subjects merge /æ/ and /ʌ/ into a single category and /ə/ is independent from the other two vowels. In other words, the bilinguals have two categories: /æ///ʌ/ and /ə/. For the combinations of Japanese and English vowels, all the English vowels are differentiated from the Japanese long vowel (refer to Fig. 20); /ə/ is different in B2, and /æ/ and /ʌ/ are different in B2 and duration. In comparison, it seems that a new category for /ʌ/ has not formed and it is substituted by the Japanese short/pre-geminate vowel. However, the Japanese vowel is distinguished from /æ/ by length and B3, and from /ə/ by length. Thus, only /æ/ and /ə/ are independent from the Japanese short/pre-geminate vowel, while /ʌ/ is merged into the Japanese vowel. These results indicate that not all the six low and central vowels are held separate; the Japanese short, pre-geminate vowels and /ʌ/ and /æ/ share some space, while the Japanese long and English /æ/ are completely independent from the others.

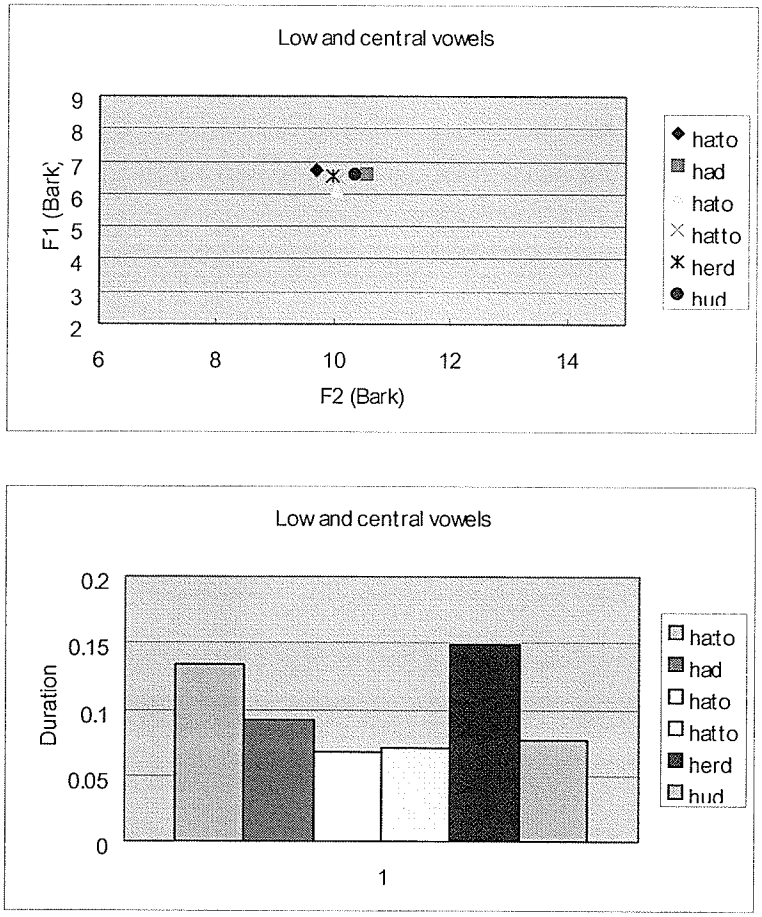


Fig. 20. The male intermediate group's production of low and central vowels

As with the male intermediate learners, the results generally fail to follow the expectations. Against the hypothesis that Japanese long, short and pre-geminate vowels are differentiated from each other by duration, the differences between the short and pre-geminate vowels are not statistically significant. However, these learners use spectral cues in discriminating a Japanese long vowel from short and pre-geminate vowels as well as in discriminating English vowels, as expected. Also supporting the hypothesis, the results imply that the male participants have established new categories for /e/, /ɛ/ and /ə/, and that these categories are completely distinct from the Japanese counterparts. In comparison, the category for English /æ/ and /ʌ/ seems to share some space with

Japanese /a/ and /aQ/, and these bilingual participants also merge some English vowels into Japanese vowels: English /i/ is merged into Japanese /i:/, English /ɪ/ into Japanese /i/ and /iQ/, English /u/ into Japanese /u:/, English /ʊ/ into Japanese /u/ and /u:/, English /ɔ/ and /o/ into Japanese /o:/, English /ɑ/ into Japanese /oQ/ and English /ʌ/ into Japanese /a/ and /aQ/. These category assimilations of English into Japanese can be explained by SLM, but the hypothesis for this experiment is that category dissimilation starts occurring at this level and the intermediate learners should have more distinct vowel categories than the elementary students. The results, however, show that the intermediate group has fewer vowel categories than the elementary group, and fail to support the hypothesis.

Unlike the elementary-level students, the intermediate female learners separate all the Japanese vowels with one exception. However, for the intermediate male speakers, the differences between the short and pre-geminate vowels are not statistically significant. As expected, both female and male speakers at the intermediate level rely on spectral cues in discriminating Japanese vowels as well as English vowels, which implies that relied cues have been shifted. The gender difference appears in the number of distinct vowel categories. Expectedly, the intermediate female students have more distinct categories than the elementary female speakers while the intermediate male bilinguals have fewer categories than the lower-level male students.

3.1.3. Advanced level

3.1.3.1. Female speakers

As summarized in Fig. 21, all the Japanese high-front vowels are distinguished from each other by duration, although there is no statistical difference among these vowels in Barks. This suggests that the Japanese long, short and pre-geminate vowels are

kept independent. Like the Japanese vowels, the English high-front tense and lax vowels are significantly different only in length (see Fig. 21), which indicates that these vowels are not merged into one category, but that they lie in two separate spaces. As for Japanese and English combinations, the differences between the Japanese long and the English tense vowels are not statistically significant, as seen in Fig 21. Hence, it is likely that the English tense vowel is substituted by the Japanese long vowel, and that a new category for the English vowel has not been established. The Japanese long vowel is significantly different from the English lax vowel in length, which suggests that the English vowel is not merged into the Japanese category. The Japanese short vowel and the English tense vowels have clear differences in B2, B3 and duration, while the Japanese vowel and the English lax vowel are different only in duration, as seen in Fig. 21. These findings imply that neither of the English vowels is substituted by the Japanese short vowel and are held independent. The Japanese pre-geminate vowel and the English tense vowels are distinguished by B3 and duration, while no differences can be found between the Japanese vowel and the English lax vowel. Therefore, it seems that the English lax vowel is merged into the Japanese pre-geminate vowel category, although the English tense vowel is independent from the Japanese vowel. These results suggest that the bilingual speakers have three distinct high-front vowels: the Japanese long/the English tense, the Japanese short, the Japanese pre-geminate/the English lax.

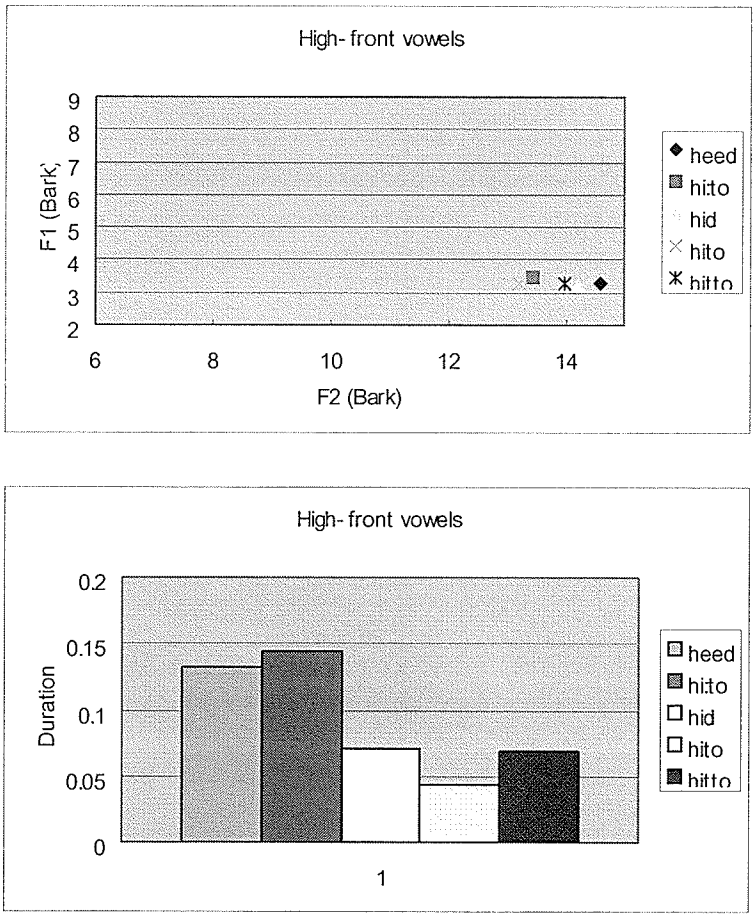
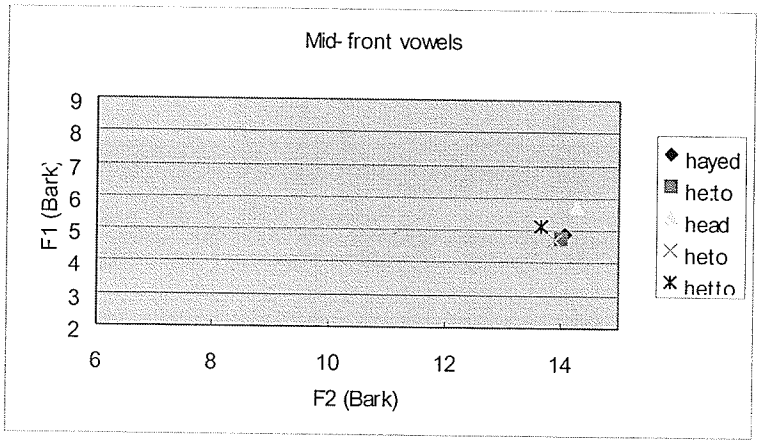


Fig. 21. The female advanced group's production of high-front vowels

Figure 22 shows that the Japanese mid-front long and short vowels are differentiated by duration, but not by formant frequencies. In contrast, the short and pre-geminate vowels are not significantly different from each other in any domain. Therefore, these bilingual speakers have two independent mid-front vowels in their minds: the long and the short/pre-geminate vowels. Moving to the English mid-front vowels, the tense and lax vowels are distinguished by duration, as are the Japanese vowels. Hence, it can be inferred that these two vowels are distinct and are not merged into one category. As for the English and Japanese combinations, as summarized in Fig. 22, there is no significant difference between the Japanese long and the English tense, while there are statistical

differences between the Japanese and the English lax vowels in B1 and duration. It is likely that the English tense vowel is replaced with the Japanese long vowel and that these vowels are put in the same vowel category. On the contrary, the English lax vowel is independent from the Japanese vowel. The Japanese short and the English tense have a significant difference only in length, although there are statistical differences between the Japanese vowel and the English lax vowel in B1 and duration (see Fig. 22). These results suggest that the two English vowels are not substituted by the Japanese vowel and that they are independent. The Japanese pre-geminate vowel is differentiated from the English tense vowel by duration, while there are not any statistical differences between the Japanese vowel and the English lax vowel. Hence, it is likely that the English tense vowel is distinct from the Japanese vowel and that the English lax vowel is merged into the Japanese pre-geminate vowel category.

In summary, these learners have the Japanese long/the English tense vowel, and the Japanese short/pre-geminate vowel, which is partially shared with the English lax vowel.



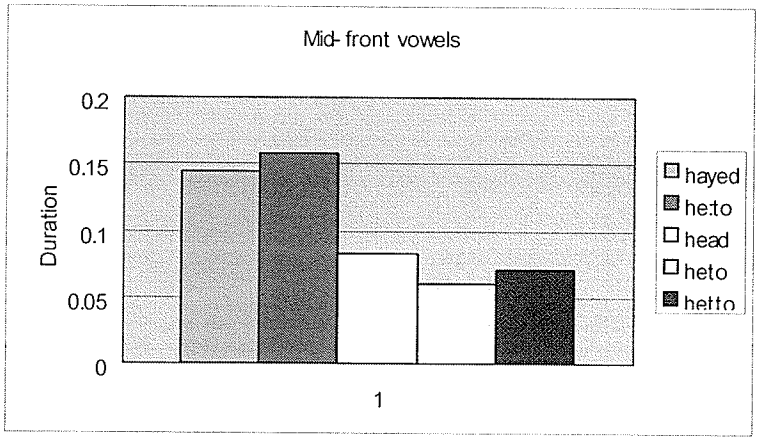


Fig. 22. The female advanced group's production of mid-front vowels

All the Japanese high-back vowels are significantly different from one another in length, which means that they are all in distinct categories (see Fig. 23). Moving to English, as displayed in Fig. 23, there is a statistical difference between the high-back tense and lax vowels in length, just like the Japanese vowels. This result suggests that these two English vowels are distinct from one another. All the combinations of a Japanese vowel and an English vowel are distinguished from each other by duration, as seen in Fig. 23. Additionally, the Japanese pre-geminate and the English short vowels are differentiated by B3 as well. The results above imply that all the Japanese and English vowels are independent from each other. In other words, the female bilinguals at the advanced level have five distinct high-back vowel categories in their minds.

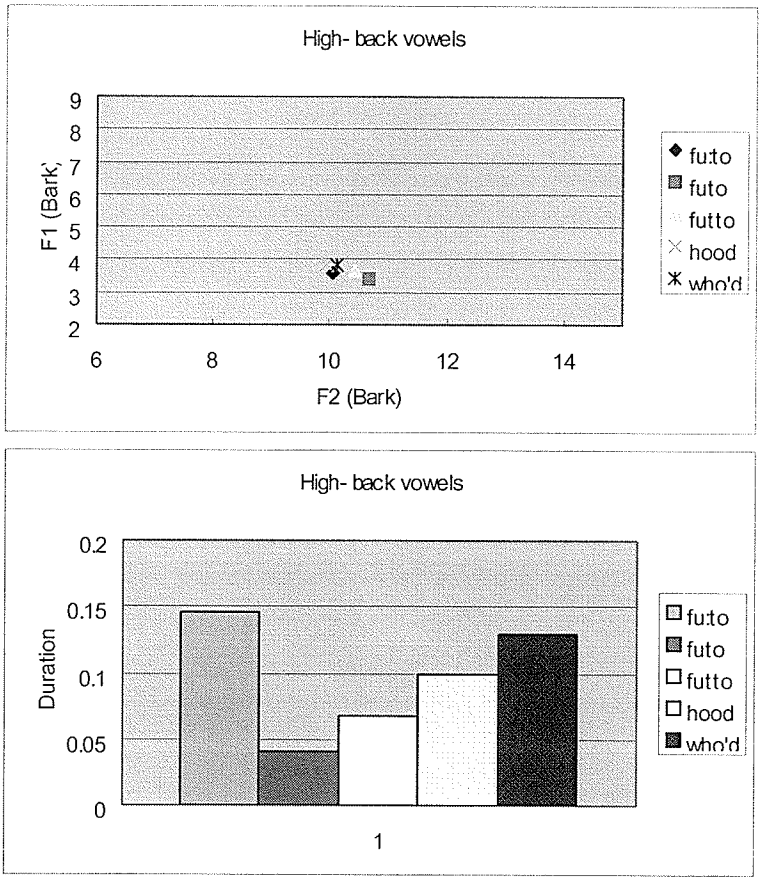
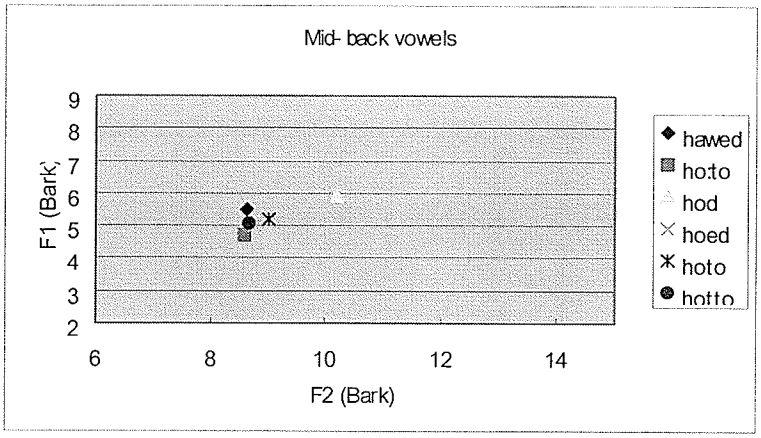


Fig. 23. The female advanced group's production of high-back vowels

There is a statistical difference between the Japanese mid-back long and short vowels and between the long and pre-geminate vowels, while no differences can be found between the short and pre-geminate vowels, as shown in Fig. 24. Therefore, there are two distinct Japanese mid-back vowel categories: the long and the short/pre-geminate vowels. As indicated in Fig. 24, the English mid-back vowels /ɔ/ and /ɑ/ are significantly different from one another in B2 and length, while the differences between /ɔ/ and /o/ are not statistically significant. English /ɑ/ and /o/ are differentiated by B2 and duration, similar to /ɔ/ and /ɑ/. These results suggest that /ɔ/ and /o/ are merged into a single category, while /ɑ/ is held independent from the other two English vowels. No significant

differences can be found between the Japanese long and the English /ɔ/ and between the Japanese vowel and the English /o/ (see Fig. 24). In contrast, the Japanese long vowel and the English /ɑ/ are well-distinguished by all the domains except B3. There are significant differences between the Japanese short vowel and /ɔ/ as well as between the short vowel and the English /o/ in B3 and duration, as summarized in Fig. 24. On the contrary, there are no clear differences between the short Japanese vowel and the English /ɑ/. Therefore, there is a possibility that the English /ɑ/ is merged into the Japanese short vowel category. The Japanese pre-geminate vowel is distinguished from /ɔ/ by B2 and length, from /o/ by B3 and duration and from /ɑ/ by B2. It seems that all the English vowels are held separate from the Japanese pre-geminate vowel. These results indicate that these bilingual speakers have two distinct categories in this space: the Japanese long vowel into which the English vowels, /ɔ/ and /o/, are merged, and the Japanese short/pre-geminate vowel which shares some space with /ɑ/.



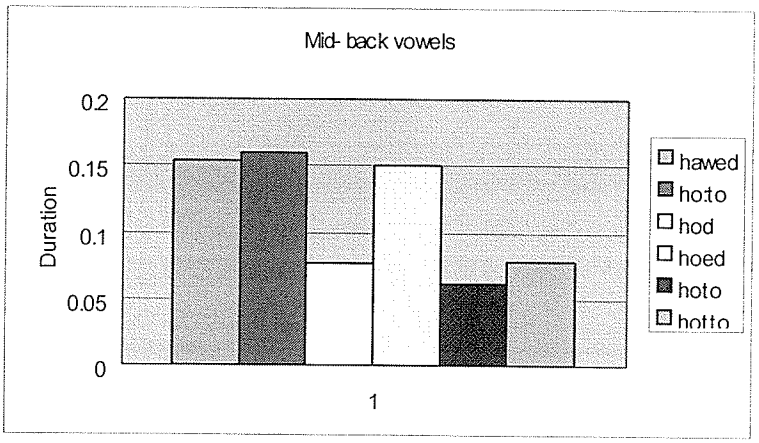


Fig. 24. The female advanced group's production of mid-back vowels

Figure 25 displays that all the Japanese low vowels are distinguished from one another by duration, which suggests that these vowels are all kept distinct. English vowels /æ/ and /ə/ are significantly different in all the domains, while /æ/ is differentiated from /ʌ/ only by duration. There are also statistical differences between /ʌ/ and /ə/ in B1, B3 and length. Hence, it is likely that the female bilingual learners at the advanced level have three distinct English vowels: /æ/, /ə/ and /ʌ/. Moving to combinations of Japanese and English vowels, the Japanese long vowel is distinguished from the English vowels /æ/ by B2 and length, from /ə/ by B1 and B3, and from /ʌ/ by B3 and length, as seen in Fig. 25. There are significant differences between the Japanese short vowel and /æ/ in duration as well as between the Japanese vowel and /ə/ in B1, B3 and duration, while the difference between the short vowel and /ʌ/ is not statistically significant. The Japanese pre-geminate vowel is distinguished from /æ/ by B1, from /ə/ by B3 and length and from /ʌ/ by B3. These results implies that all the English vowels are independent from the Japanese pre-geminate and long vowels and are not merged into the Japanese vowels, but

that a new category for /ʌ/ has not been established and the English vowel is merged into the Japanese short vowel.

In summary, in these bilinguals' minds, there are five distinct low and central vowels: the Japanese long, short, pre-geminate vowels, /æ/ and /ə/. The English /ʌ/ is not independent and it lies in the Japanese vowel category /a/.

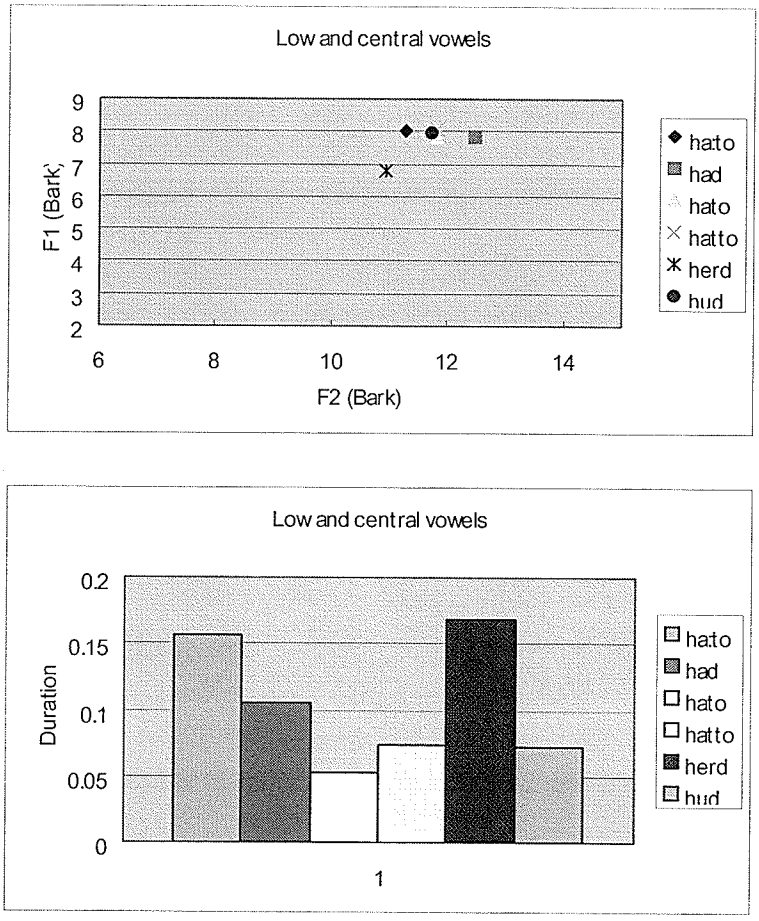


Fig. 25. The female advanced group's production of low and central vowels

Here again, the results generally fail to follow the predictions. As hypothesized, most of the Japanese vowels are differentiated from one another, but the differences between /e/ and /eQ/ and between /o/ and /oQ/ are not statistically significant. As with monolingual Japanese speakers, the female advanced students rely only on durational

cues to differentiate one Japanese vowel from another, although the bilinguals were hypothesized to rely on spectral cues as well. Predictably, new categories for some of the English vowels have been created: /u/, /ʊ/, /æ/ and /ə/. However, the female subjects mixed together English /i/ with Japanese /i:/, English /ɪ/ with Japanese /iQ/, English /e/ with Japanese /e:/, English /ɛ/ with Japanese /eQ/, English /ɔ/ and /o/ with Japanese /o:/, English /ɑ/ with Japanese /o/, and English /ʌ/ with Japanese /a/. Thus, the advanced group has fewer independent vowel categories than the lower-level groups. This finding also contradicts the hypothesis that the higher L2 proficiency they have, the more distinct vowel categories learners have.

3.1.3.2. Male speakers

As summarized in Fig. 26, all the Japanese high-front vowels are differentiated from each other. The long vowel is different from the short vowel in B1, B2 and length. The long vowel differs from the pre-geminate vowel only in duration. The pre-geminate and short vowels are differentiated by B1, B2 and length. Thus, the three Japanese vowels seem to have their own spaces. Moving to English high-front vowels, the Fig. 26 indicates that the tense and lax vowels are differentiated from one another only by length. This suggests that these English vowels are held separate from each other. In comparison, the English tense vowel is likely to be merged into the Japanese long vowel, because no significant differences can be found between these two vowels. By contrast, the Japanese vowel and the English lax are separate from each other, as they are significantly different in B3 and duration. Neither English vowel is substituted by the Japanese short vowel, since the English tense vowel is differentiated from the Japanese vowel by B1, B2 and length, and the English lax vowel differs from the Japanese short vowel in B1 and length.

The Japanese pre-geminate vowel and the English tense vowel are statistically different only in duration, while the Japanese vowel is distinguished from the English lax vowel by B3 and length. Hence, both English vowels seem to be independent from the Japanese pre-geminate vowel. Given the results above, it is likely that these advanced learners have four independent high-front vowels: the Japanese long/English tense, the Japanese short, the Japanese pre-geminate and the English lax vowels.

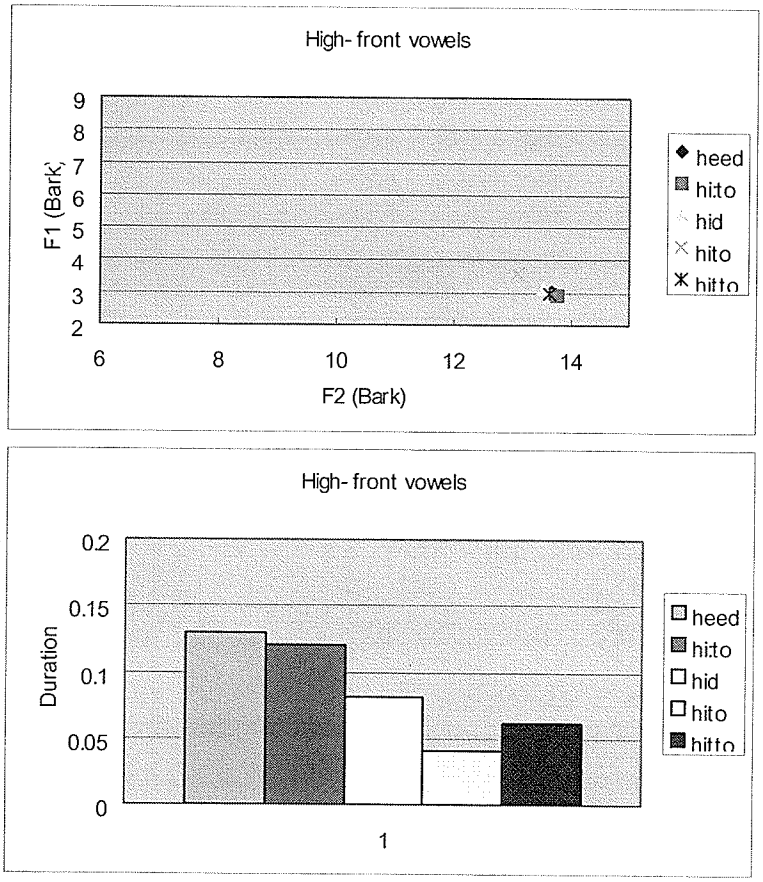
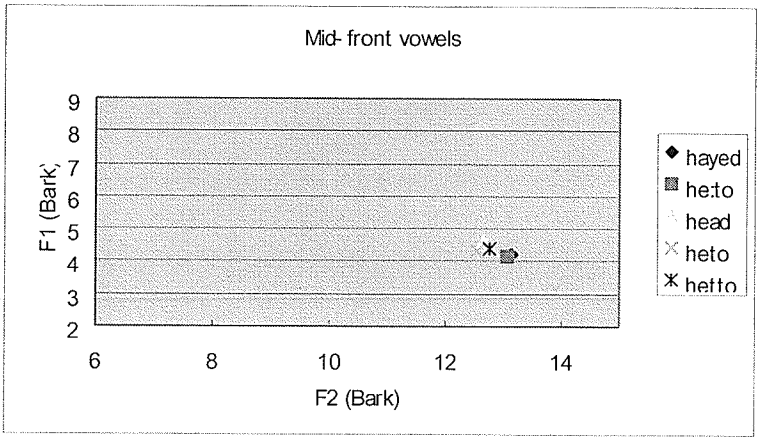


Fig. 26. The male advanced group's production of high-front vowels

Because differences between the Japanese mid-front short and the pre-geminate are not statistically significant, it is likely that these two Japanese vowels are merged into one category, as indicated in Fig. 27. The long vowel, however, is differentiated from the other two by duration. Therefore, the long vowel is kept independent. The English mid-

front vowels are held separate from each other, because they are different in B1, B2 and length, as summarized in Fig. 27. As for the Japanese and English pairs, the Japanese long and the English tense vowels are differentiated from each other only by duration, while the Japanese vowel is significantly different from the English lax vowel in B1, B2 and duration (see Fig. 27). It is likely that neither of the English vowels is merged into the Japanese long vowel. There are significant differences between the Japanese short and the English tense vowels in B2 and duration, and between the Japanese and the English lax vowels in duration, as displayed in Fig. 27. This suggests that both of the English vowels are separate from the Japanese short vowel. The Japanese pre-geminate vowel also has statistical differences from the English tense and lax vowels; the difference between the Japanese vowel and the English tense lies in B2 and length; the difference between the Japanese vowel and the English lax lies in length. Thus, both of the English vowels are independent from the Japanese vowel.

From the results above, it can be inferred that these bilinguals have four independent mid-front vowel categories: the Japanese long, short/pre-geminate, English tense and lax vowels.



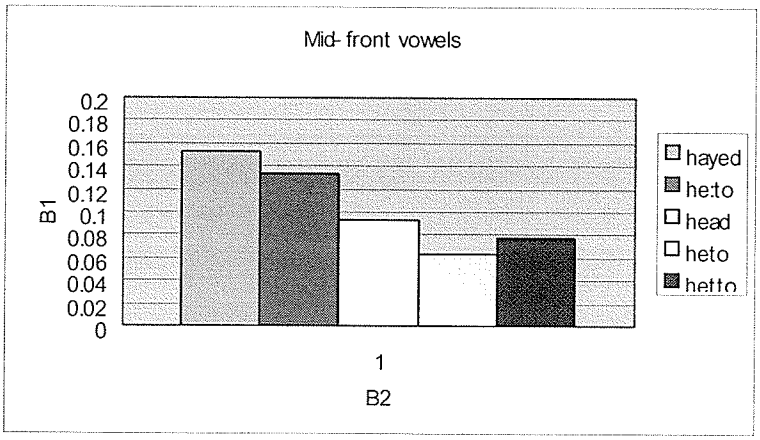
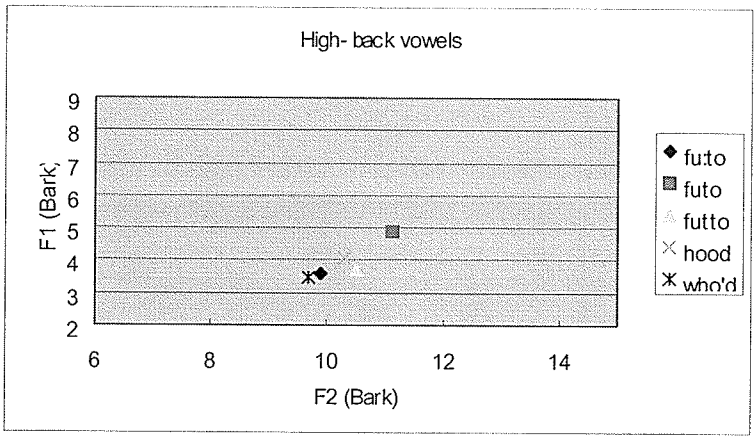


Fig. 27. The male advanced group's production of mid-front vowels

The three Japanese high-back vowels are independent from one another, because there are statistical differences among them, as displayed in Fig. 28. The long vowel and short vowel are differentiated by B1, B2 and length, while the long and pre-geminate vowels are different only in duration. The difference between the short and pre-geminate vowels lies in B1. Moving to English vowels, as summarized in Fig. 28, the high-back tense and lax vowels are distinct from each other only in duration, but this suggests that they are not mixed together in a category, but that they exist in different categories. Because the English tense vowel is not significantly different from the Japanese long vowel, the English vowel seems to be replaced by the Japanese vowel category (see Fig. 28). Contrastively, the Japanese long vowel is distinct from the English lax vowel, which implies that the English vowel category has been established. The Japanese short vowel is differentiated from the English tense vowel by B1, B2 and length, and from the lax vowel by length. This implies that the male learners at the advanced level do not replace the English high-back vowels with the Japanese high-back vowel, but that these English vowels are kept independent. Because both of the English vowels are statistically

different from the Japanese pre-geminate vowel in length, these English vowels are held separate from the Japanese vowel.

In summary, there exist four distinct high-back vowel categories in the participants' minds, the Japanese long/the English tense vowel, the Japanese short vowel, the Japanese pre-geminate and the English lax vowel.



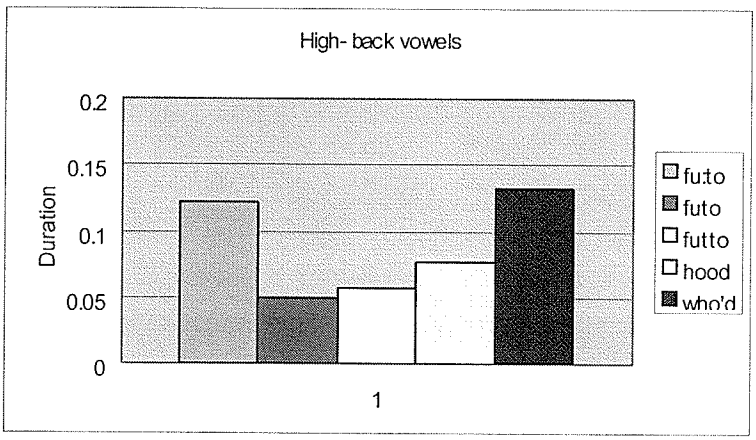
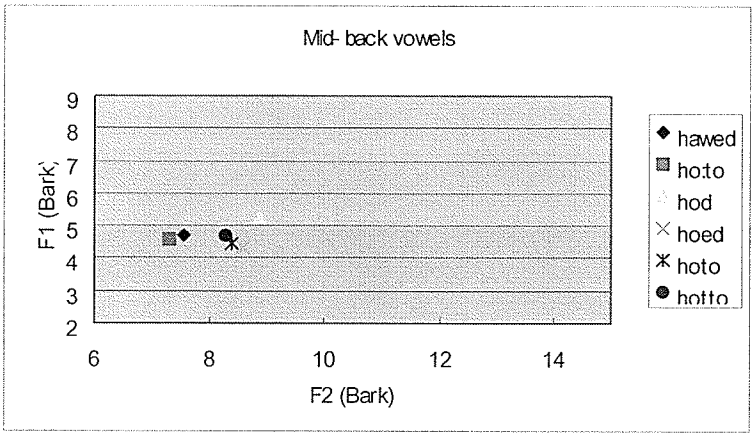


Fig. 28. The male advanced group's production of high-back vowels

As seen in Fig. 29, all of the Japanese mid-back vowels are significantly different from each other in duration, which implies that the long, short, and pre-geminate vowels are held independent. It is likely that /ɔ/ and /o/ are not separate from each other, because no statistical differences can be found between these vowels. However, /ɑ/ has significant

differences from /ɔ/ and /o/ in B1 and length, which suggests that /ɑ/ has a separate category from the others. The Japanese long vowel is distinguished from /ɔ/ by B1 and duration, and the English vowel /o/ is differentiated from the Japanese vowel by length (see Fig. 29). There are differences between the Japanese vowel and /ɑ/ in B1, B2 and duration. Thus, these subjects are likely to have independent spaces for all the English vowels from the Japanese long vowel. All the English mid-back vowels are distinguished from the Japanese short vowel by duration as shown in Fig. 29. In addition, /o/ and the Japanese vowel are also significantly different in B2. It seems that none of the English vowels is merged into the Japanese short vowel. The English vowels /ɔ/ and /o/ are distinguished from the Japanese pre-geminate vowel by length, while /ɑ/ and the Japanese vowel are different in B1 and length. The results suggest that five distinct mid-back vowel categories exist in the male advanced learners' minds, the Japanese long, short, pre-geminate vowels, /ɔ///o/ and /ɑ/.



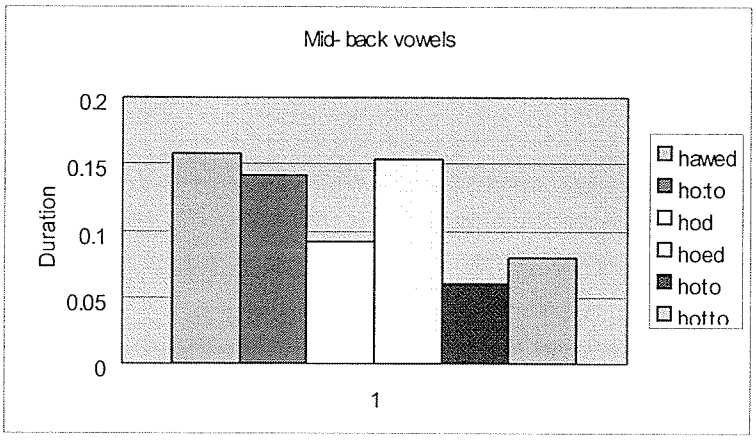
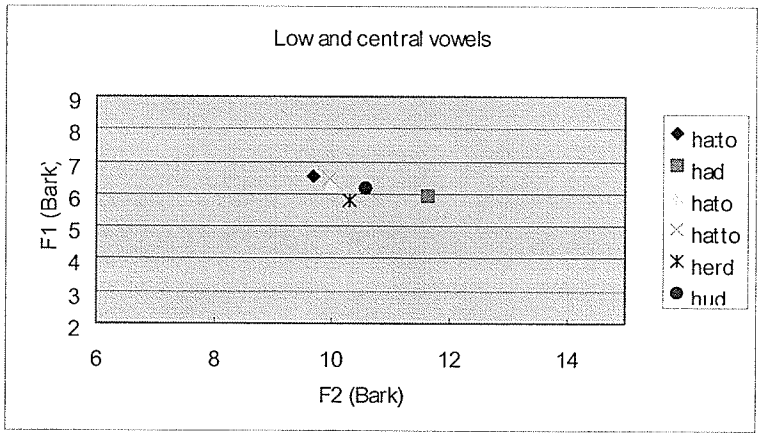


Fig. 29. The male advanced group's production of mid-back vowels

The Japanese low long vowel is significantly different from the other two Japanese vowels in length, while the differences between the short and pre-geminate vowels are not statistically significant, as summarized in Fig. 30. Hence, only the long vowel is kept separate and the others exist in a single category. Moving to the English low and central vowels, as displayed in Fig. 30, /æ/ is distinguished from /ə/ by B2, B3 and duration, and from and /ʌ/ by B2, B3 and duration by B2 and duration. There is also a durational difference between /ə/ and /ʌ/. It is likely that /æ/, /ə/ and /ʌ/ are held independent from one another. The Japanese long vowel has statistical differences from the English vowel, /æ/, in B1, B2 and length, while the Japanese vowel and /ʌ/ are distinct from each other in B2 and length (see Fig. 30). There are also significant differences between the Japanese long vowel and /ə/ in B2, B3 and length. Therefore, all the English vowels seem to be independent from the Japanese long vowel. The Japanese short vowel and /æ/ have significant differences in B2 and duration. The short vowel is also different from /ə/ in B1 and duration and from /ʌ/ in B2 and duration. These results suggest that all the three English vowels are separate from the Japanese short vowel.

Figure 30 also displays that the Japanese pre-geminate vowel is distinguished from /ʌ/ only by B2, while the Japanese vowel is different from /æ/ in B2 and duration, and from /ə/ in B2, B3 and duration. This implies that none of the English vowels is mixed together in the Japanese category.

In summary, it is likely that there exist five low and central categories in these subjects' vowel space: the Japanese long, short/pre-geminate vowels and /æ/, /ə/ and /ʌ/.



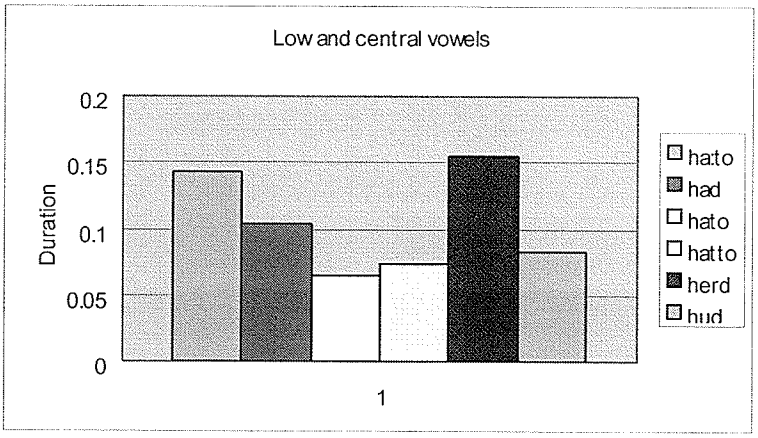


Fig. 30. The male advanced group's production of low and central vowels

As with the female advanced learners, my results sometimes follow the hypotheses and sometimes do not. Against the hypothesis, these learners put Japanese /e/ and /eQ/, and Japanese /a/ and /aQ/ into the same categories, although the other Japanese

vowels were differentiated from each other. As expected, these male participants utilize spectral cues to distinguish Japanese vowels as well as English vowels. However, only one category has been established for both English /ɔ/ and /o/. English /i/ and /u/ are merged into Japanese vowel categories /i:/ and /u:/ respectively, which the SLM predicted for the elementary group, not for the advanced group. Despite some deviations from the hypotheses, /ɪ/, /ɛ/, /ʊ/, /ɑ/, /æ/, /ə/ and /ʌ/ have obtained their own spaces, and the male advanced learners have more distinct vowels than the other male participants, as predicted.

As for the advanced group, both of the female and male subjects tend to differentiate Japanese short and pre-geminate vowels, and they frequently rely on spectral cues to distinguish Japanese and English vowels and to distinguish English vowels. However, the females do not utilize spectral cues in order to differentiate Japanese vowels while the males do. The result also suggests that advance female and male participants are different from each other in the degree of vowel independence. The advanced female bilinguals have fewer independent vowel categories than the elementary and intermediate learners, although the advanced male participants have more distinct vowels than the lower-level students.

3.2. Summary

The between-group analyses suggest that the cues that students rely on tend to change from durational cues to spectral cues, and that the degree of independence of Japanese and English vowels is different from one level to another, although sometimes lower-level learners have more distinct vowels.

The results also suggest that lower-level students tend to merge Japanese short and pre-geminate vowels into one category, which may be the English influence because monolingual Japanese speakers separate these two vowels by duration.

4: Discussion

This section addresses the question of whether L2 English vowel production changes as learners' L2 competence changes, and if so, how does it change? To this end, the English vowels produced by bilinguals with three different English levels were examined.

For English vowels, all the bilingual groups will be differentiated from each other because it is expected that the higher L2 proficiency the L2 learners have, the more native-like their English is. As mentioned earlier, the higher-level students are predicted to rely on spectral cues as well as temporal cues, although the elementary learners may pay attention only to durational cues. Therefore, it is hypothesized that the differences among groups will appear not only in duration, but also in formant frequencies.

4.1. L2 competence effects on the production of English vowels: Between-group analyses

4.1.1. Females' changing production of English vowels

Figure 31 shows that the higher competence the learners have, the lower B1 they use for English /i/, although the difference between the lower two levels is not significant. As for B3, the higher the students' L2 level is, the lower value they produce and the elementary and advanced learners are well-distinguished from each other by this domain.

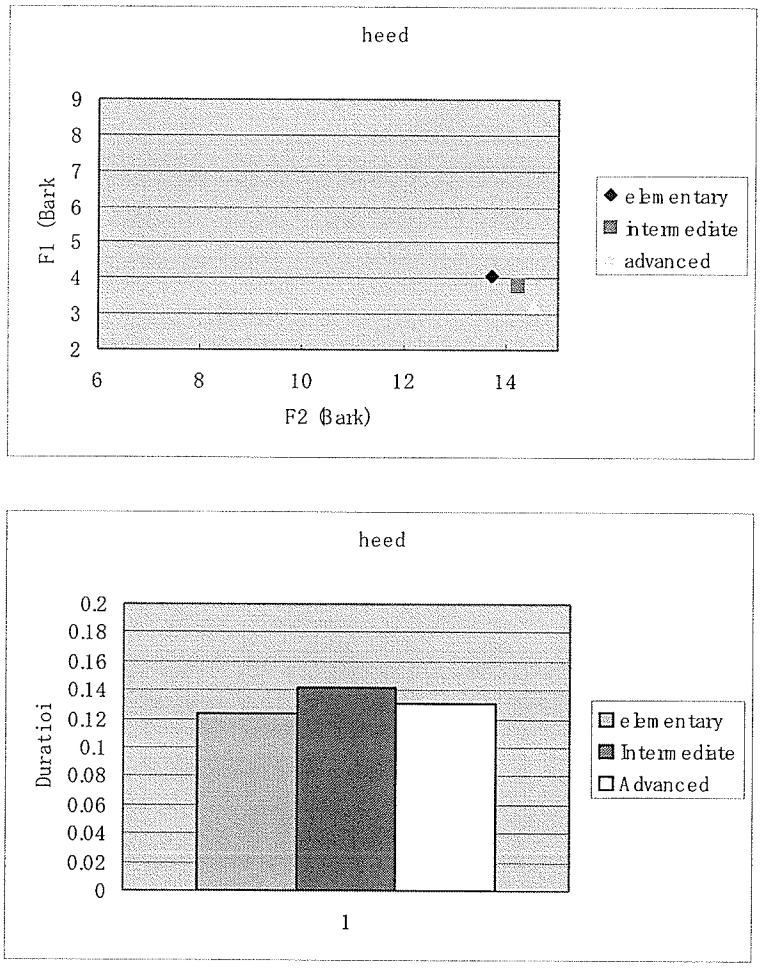
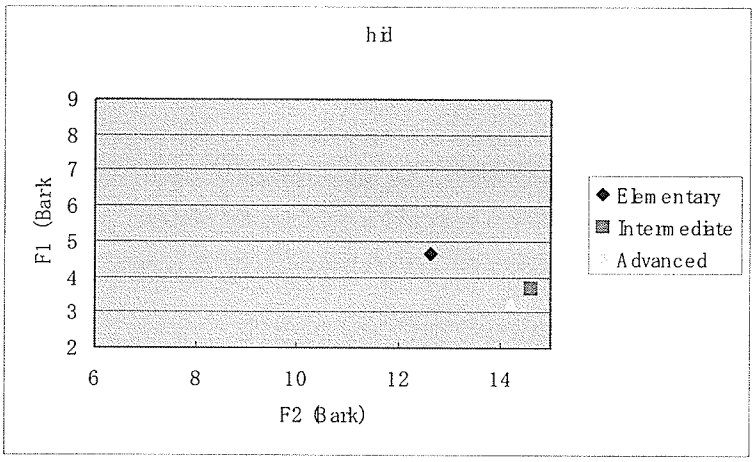


Fig. 31. The female bilingual group's production of English /i/

As with the tense counterpart, the higher the learners' English competence is, the lower B1 they produce, as summarized in Fig. 32. The elementary group is clearly distinguished from the other two groups by B1. The elementary learners are also differentiated from the other groups by B2, producing the lowest B2 of all. The intermediate level has the longest and the advanced has the shortest duration. The advanced learners are significantly different from the other learners in this measure.



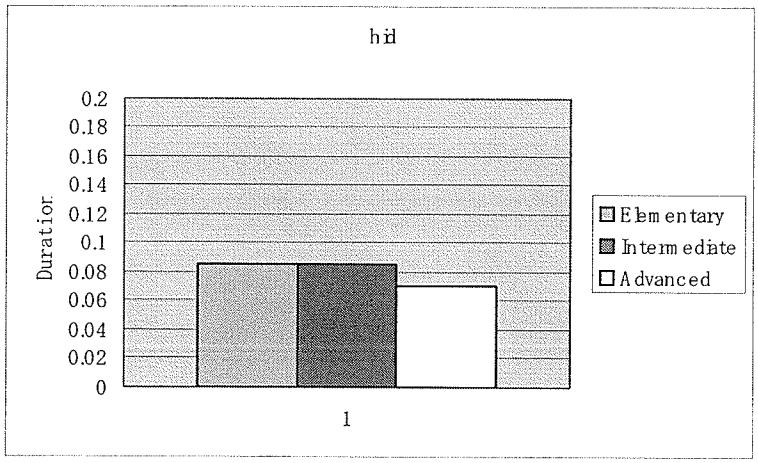
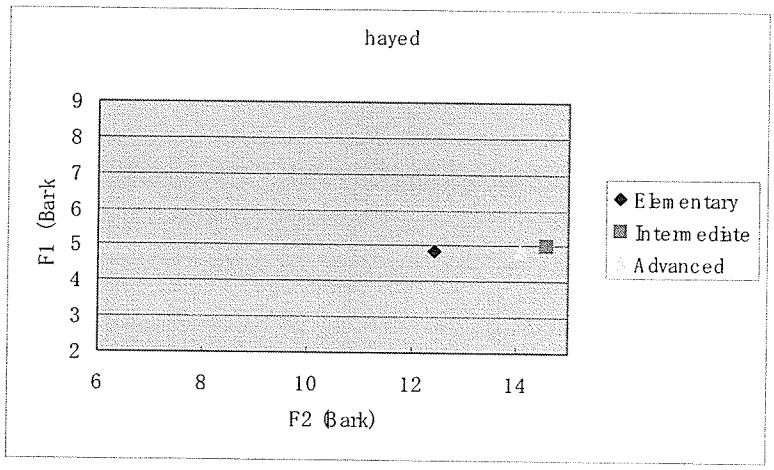


Fig. 32. The female bilingual group's production of English /ɪ/

Turning to mid-front tense /e/, figure 33 displays that the elementary group has the lowest B2 and the intermediate group has the highest. The elementary students are statistically different from the others in this domain. There is also a durational difference; the intermediate-level learners produce the longest and the advanced students produce the shortest length and these two groups are distinguished from one another.



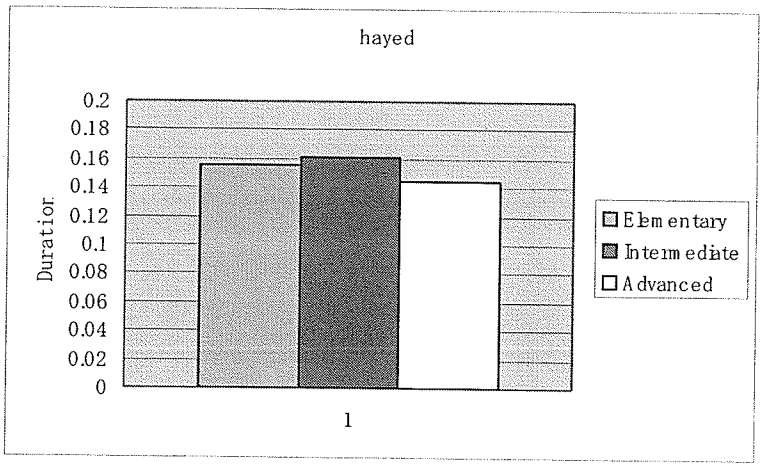
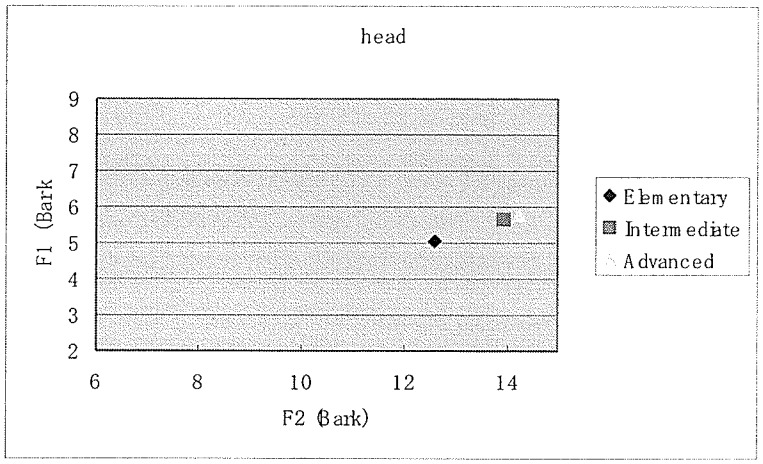


Fig. 33. The female bilingual group's production of English /e/

As summarized in Fig. 34, the higher English competence the bilinguals have, the higher B2 they produce for /ɛ/ and that the elementary students are differentiated from the other students. The elementary and advanced groups have a durational difference as well; the elementary students use the longest and the advanced speakers use the shortest duration.



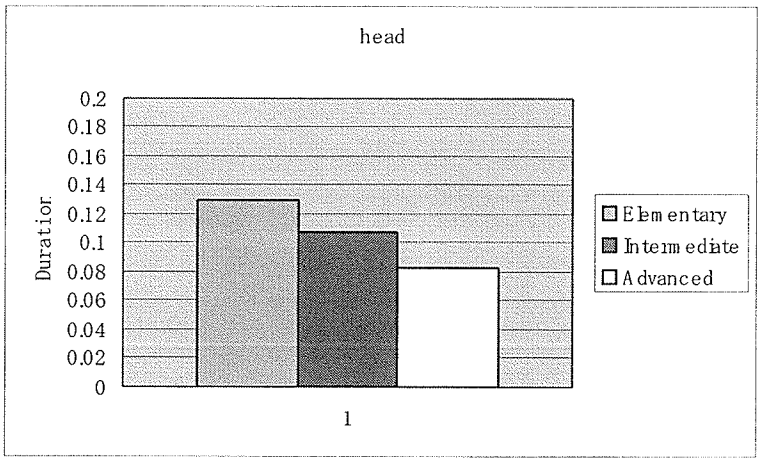
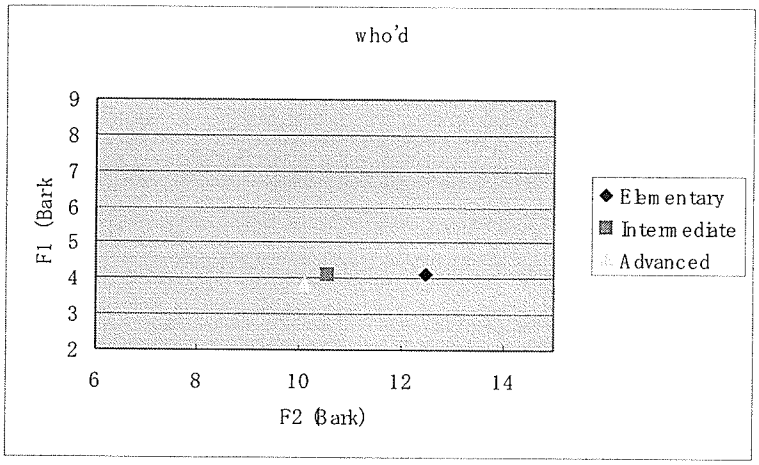


Fig. 34. The female bilingual group's production of English /ɛ/

Moving to high-back tense /u/, as Fig. 35 indicates, the elementary group has the highest B2 and the advanced group has the lowest. The elementary learners are significantly different from the other learners in terms of B2. The elementary group is also differentiated from the advanced group by length; the elementary has the longest and the advanced has the shortest duration.



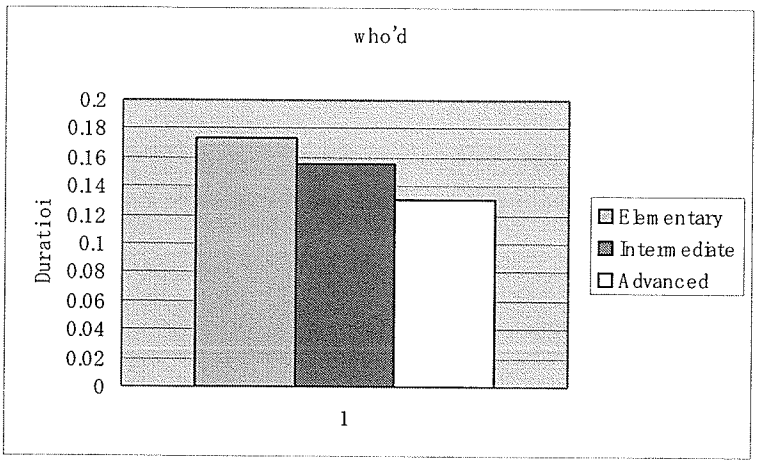
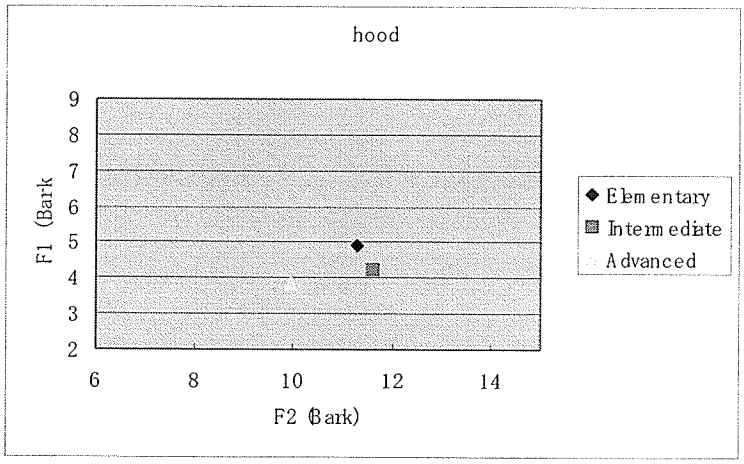


Fig. 35. The female bilingual group's production of English /u/

The higher the students' L2 level is, the lower B2 they use for /ʊ/, although the differences between the intermediate and advance groups is not statistically significant, as seen in Fig. 36. The results also suggest that the higher L2 competence they have, the shorter duration the learners utilize and the elementary and advanced learners are significantly different from one another in this domain.



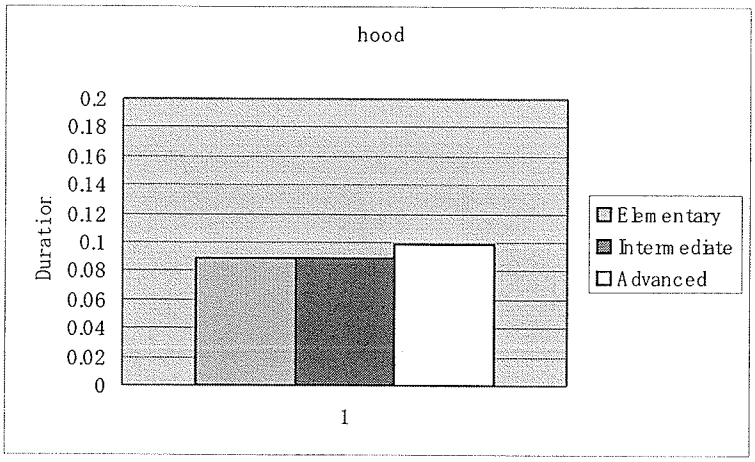
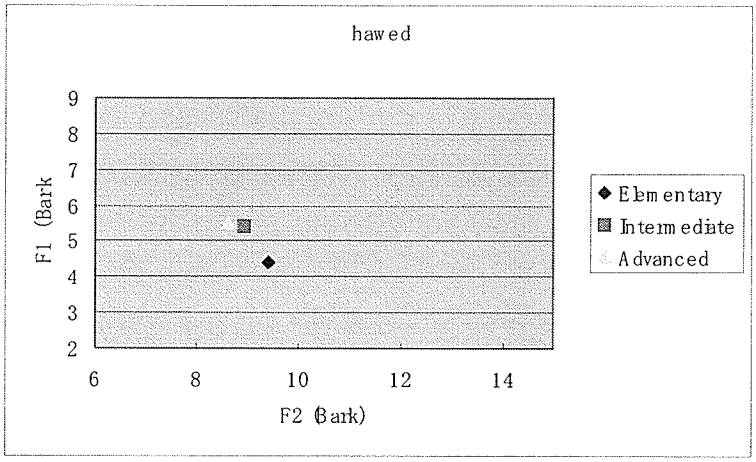


Fig. 36. The female bilingual group's production of English /ʊ/

Turning to /ɔ/, the advanced group has the highest and the elementary group has the lowest B1, as seen in Fig. 37. The latter group is statistically different from the other two groups. There is also a durational difference between the advanced group and the lower two groups. The advanced group has the longest and the intermediate group has the shortest duration.



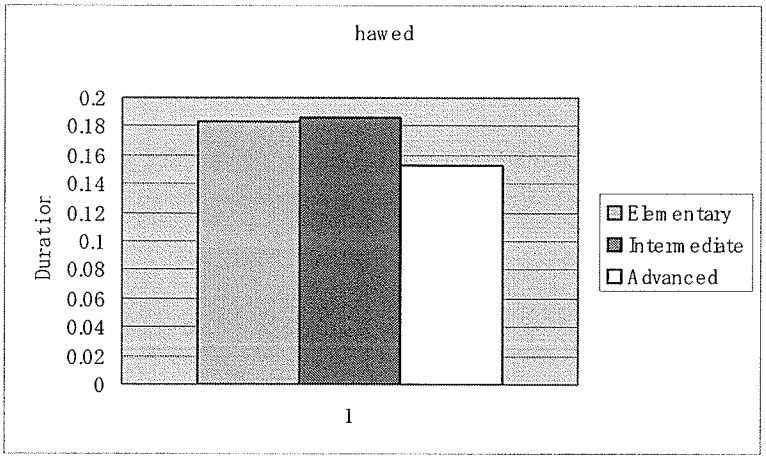
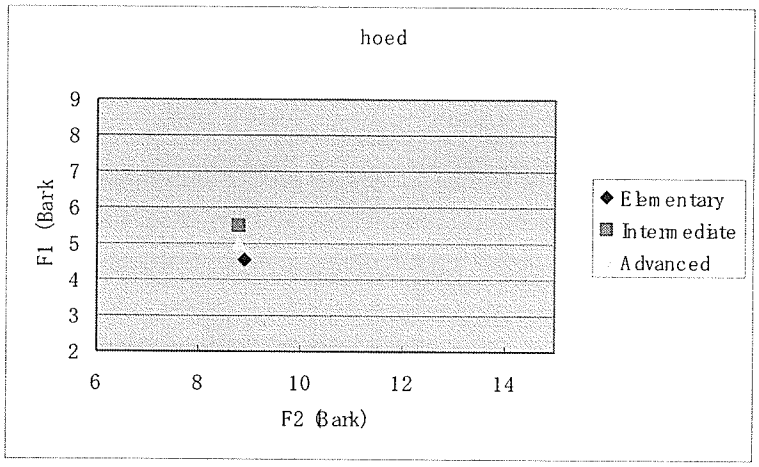


Fig. 37. The female bilingual group's production of English /ɔ/

Figure 38 indicates that the intermediate level has the highest B1 and the elementary level has the lowest for /o/. The difference between these two groups is significant. The advanced learners use the shortest duration and the elementary learners use the longest. The difference between these groups is also significant.



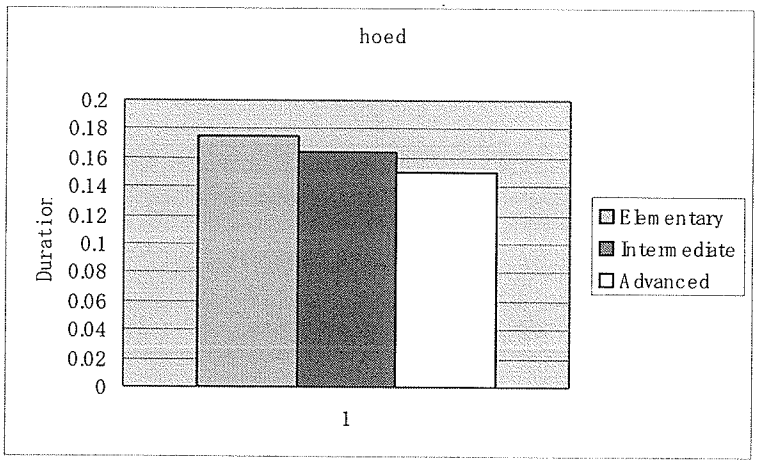
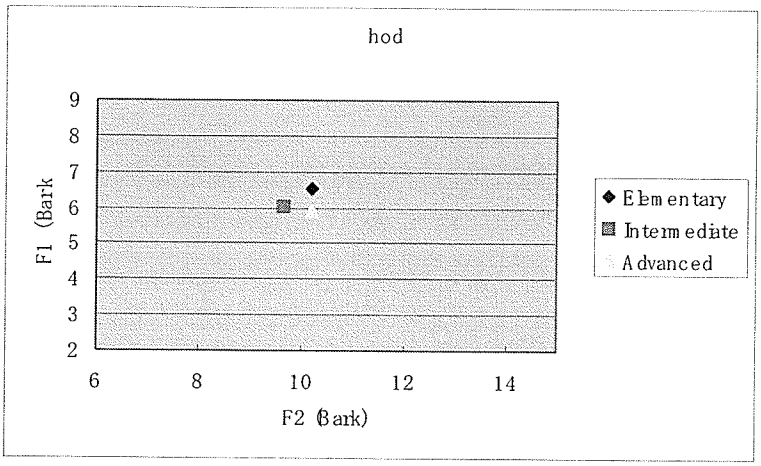


Fig. 38. The female bilingual group's production of English /o/

As for /ɑ/, the intermediate students produce the longest and the advanced students produce the shortest duration, as seen in Fig. 39. These students are distinguished from one another.



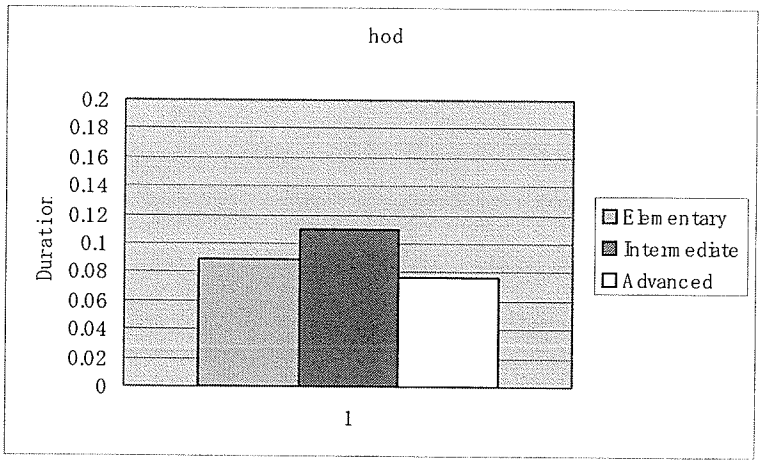
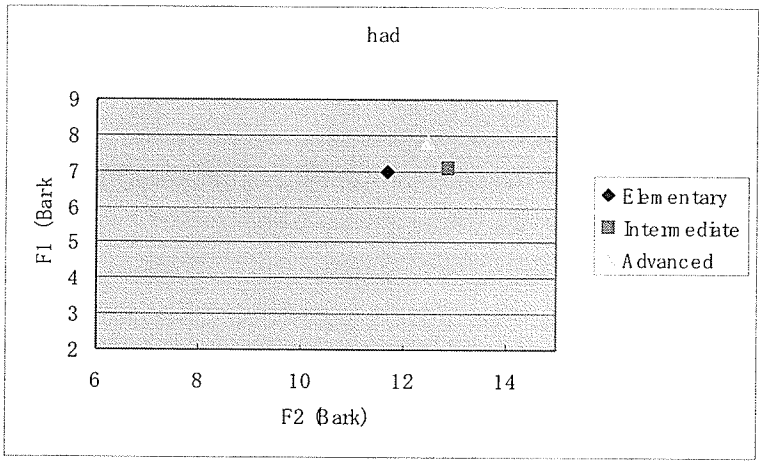


Fig. 39. The female bilingual group's production of English /ɑ/

Turning to /æ/, Figure 40 shows that the higher the bilinguals' L2 competence is, the higher B1 they use. The advanced level is distinguished from the lower two levels by this domain. As for B2, the intermediate group produces the highest and the elementary group produce the lowest value. These two groups are statistically different from each other.



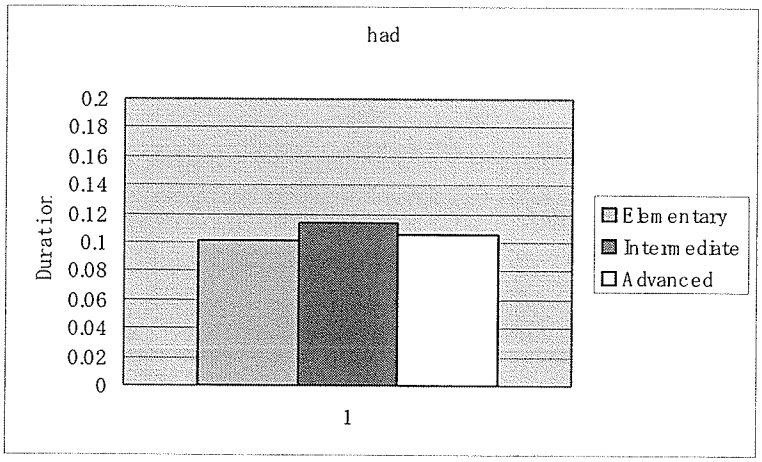
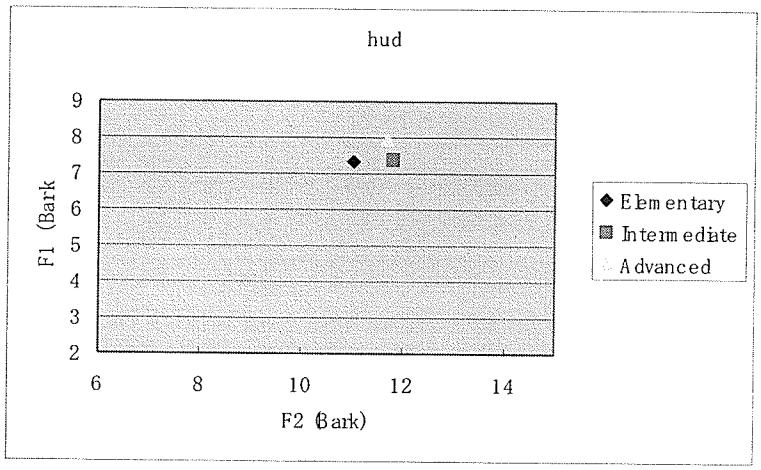


Fig. 40. The female bilingual group's production of English /æ/

As for /ʌ/, the intermediate learners produce the highest B2 and the elementary produce the lowest, and these two groups are significantly different from each other, as shown in Fig. 41. The elementary group produces the longest duration and the advanced group produces the shortest. The difference between these two groups is also significant.



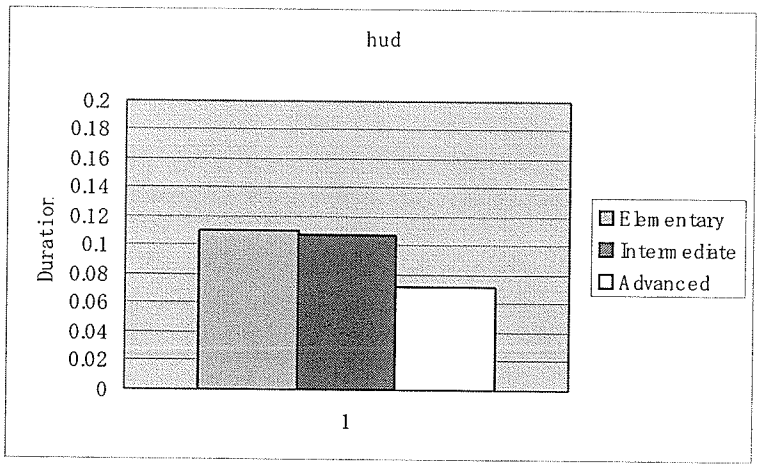
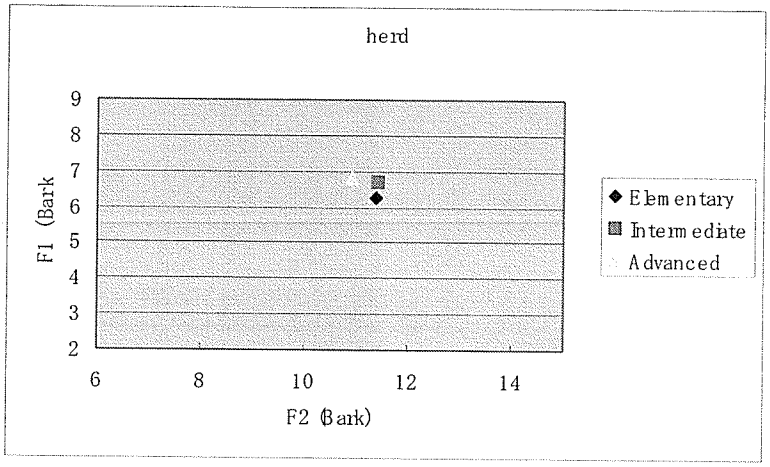


Fig. 41. The female bilingual group's production of English /ʌ/

As indicated in Fig. 42, the higher the learners' L2 level is, the lower B3 they use for /ɚ/. The elementary students are differentiated from the others by this domain.



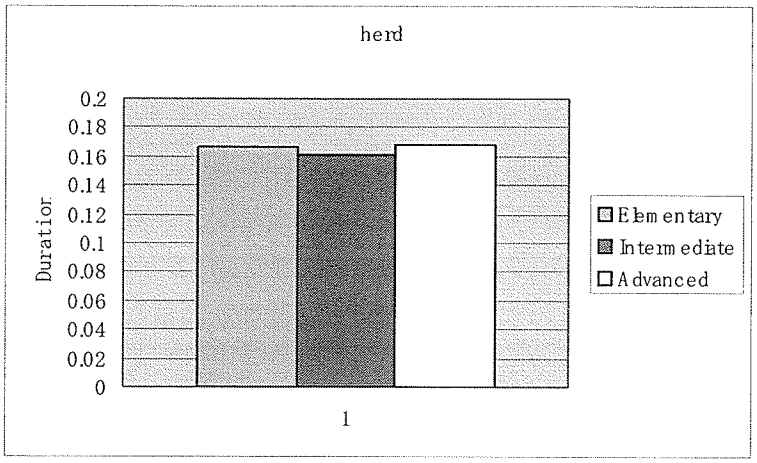


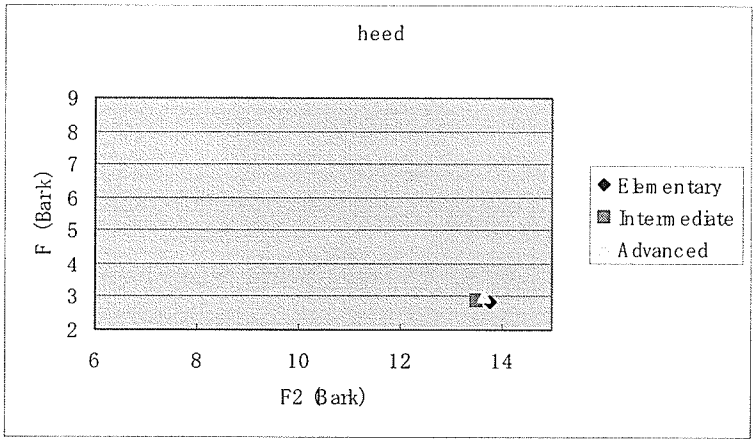
Fig. 42. The female bilingual group's production of English /ɚ/

The results above imply that higher-level bilingual speakers tend to produce the high vowels (/i/, /ɪ/ and /ʊ/) with lower B1 (at a higher position) and that they pronounce the mid and low vowels, /ɛ/, /æ/, with higher B1 (at a lower position). The bilingual subjects with higher English competence also produce the front and central vowel (/ɪ/, /e/, /æ/, and /ʌ/) with higher B2 and the back vowels (/u/ and /ʊ/) with lower B2. There seems to be a pattern related to duration as well; the higher competence the learners have, the shorter duration they utilize.

As predicted, all the English vowels produced by female bilingual participants with different L2 levels are distinguished from one another by B1, B2, B3 and/or duration. This result supports the hypothesis that L2 pronunciation changes through L2 experience. The results also imply that the learners with different English proficiency utilize different cues; the higher-level learners are likely to use spectral cues as well as temporal cues and have become more native-like, as was expected.

4.1.2. Males' changing production of English vowels

Figure 43 displays that there are no significant differences between the groups in /i/ in any domain.



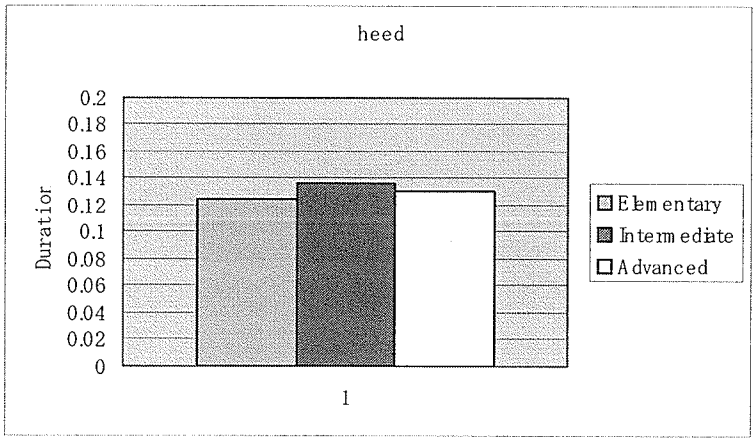


Fig. 43. The male bilingual group's production of English /i/

As summarized in Fig. 44, the higher the learners' English competence, the lower (higher B1) they produce the vowel /ɪ/. The advanced group is statistically different from the other groups in this domain.

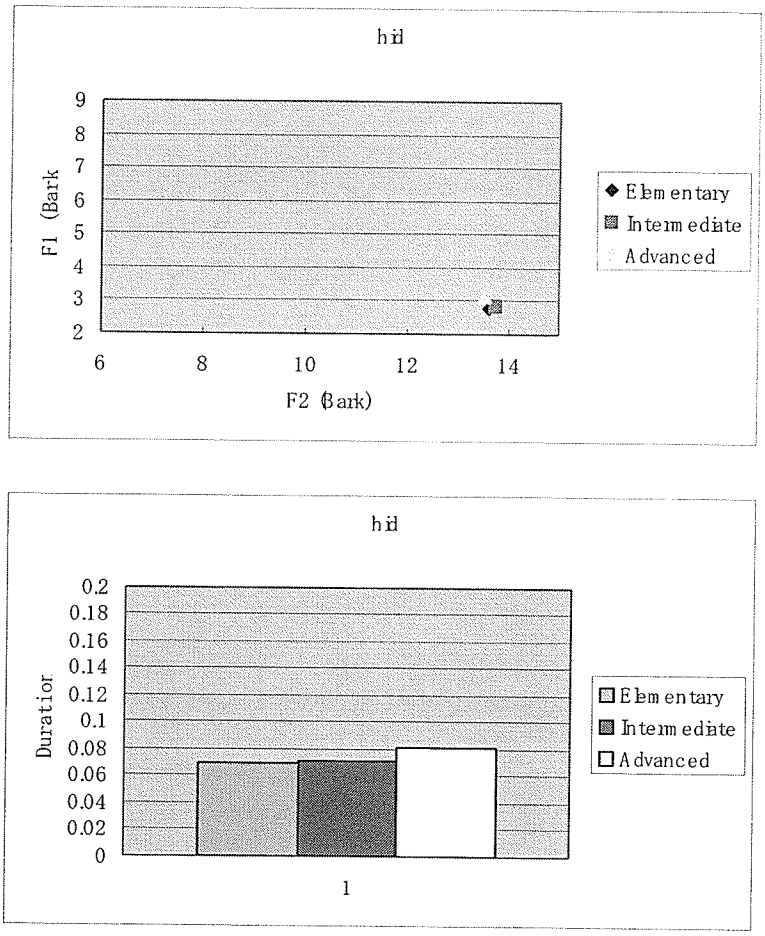


Fig. 44. The male bilingual group's production of English /ɪ/

As shown in Fig. 45, the higher the students' L2 level is, the higher B1 they produce for mid-front tense /e/, and the advanced students are clearly distinguished from the two lower levels. As for B2, the intermediate level has the highest value, and the advanced has the lowest. The difference between these groups is meaningful as well.

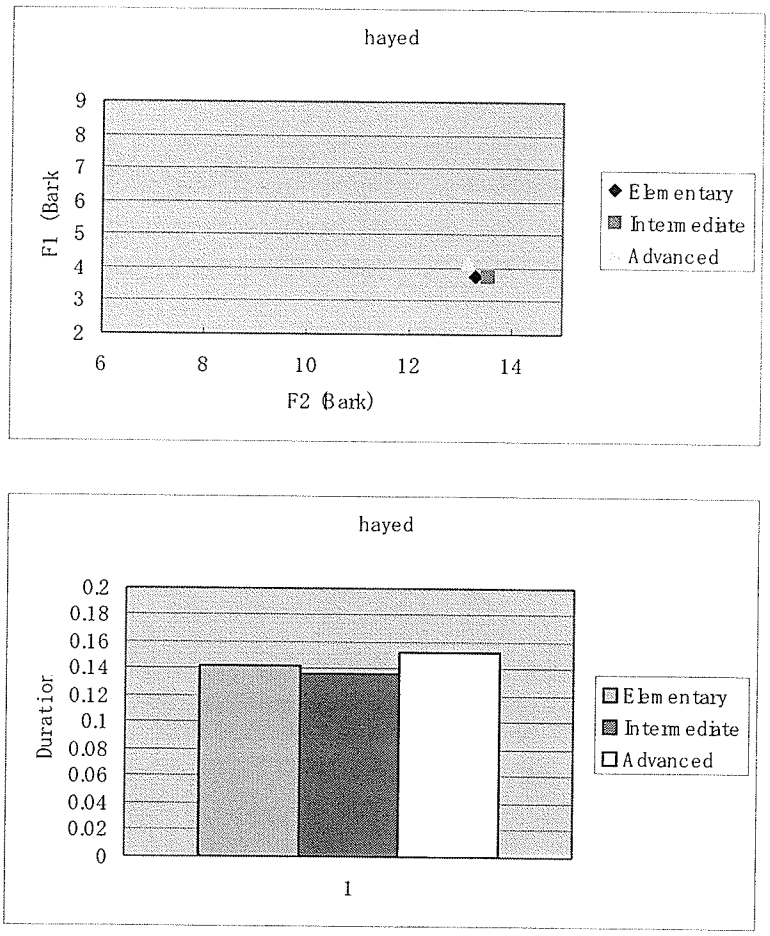
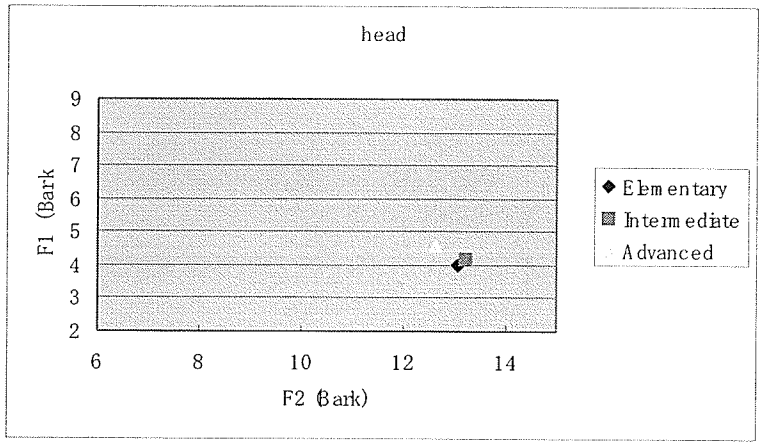


Fig. 45. The male bilingual group's production of English /e/

As with the tense counterpart, the higher the bilinguals' English competence is, the higher B1 they produce for /ɛ/, although the difference between the lower two levels is not significant, as displayed in Fig. 46. Again, similar to /e/, the intermediate learners have the highest B2 and the advanced learners have the lowest. The advanced group is distinguished from the other two groups by this domain.



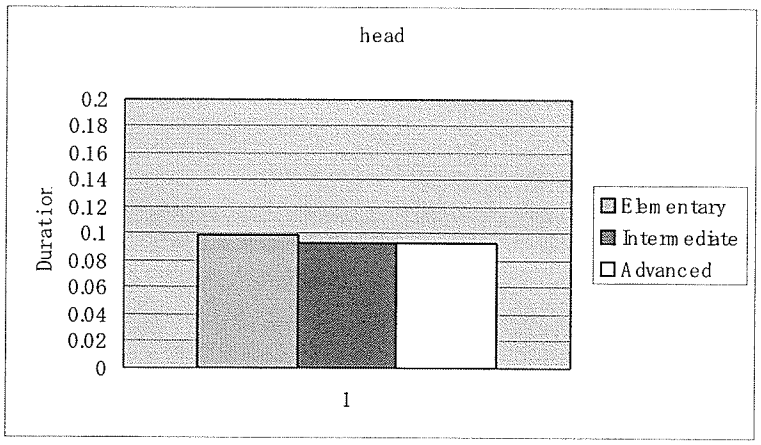
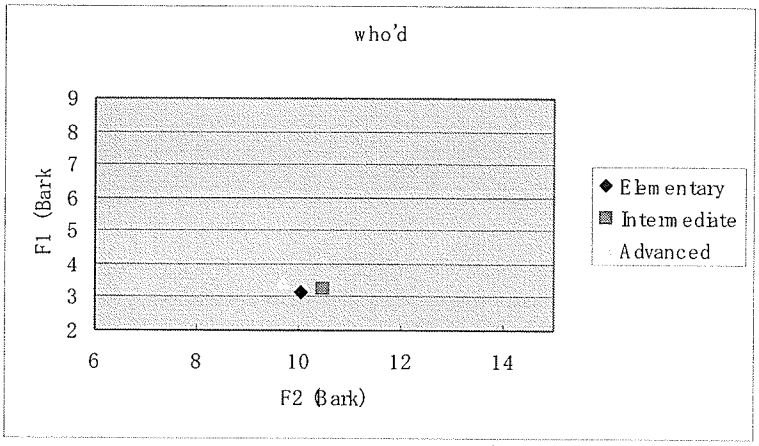


Fig. 46. The male bilingual group's production of English /ɛ/

Turning to high-back tense /u/, as seen in Fig. 47, the intermediate students have the highest and the advanced students have the lowest B2, and these two groups show a significant difference in this domain.



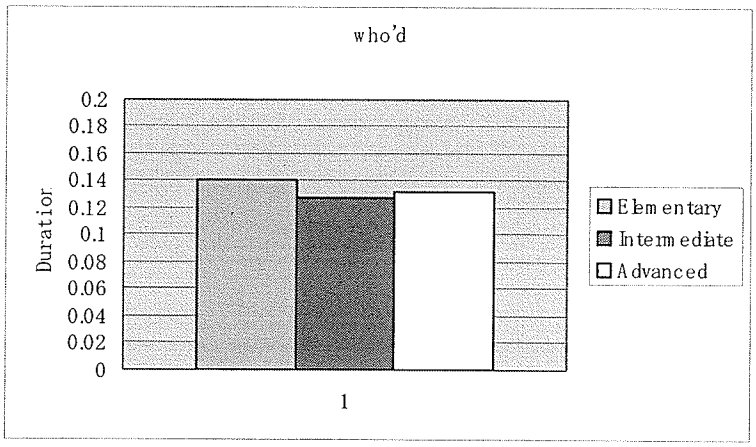
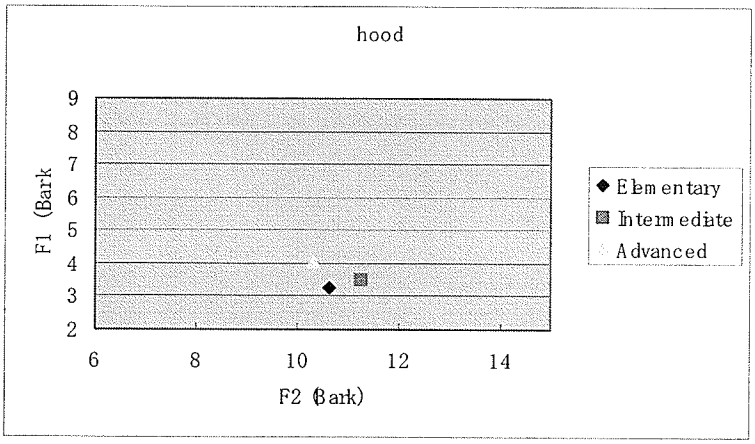


Fig. 47. The male bilingual group's production of English /u/

As indicated in Fig. 48, the higher the learners' L2 competence is, the higher B1 they produce for /ʊ/. The elementary and advanced levels are statistically different in this domain. As for B2, the intermediate group has the highest value and the advanced group has the lowest. The difference between these two groups is significant as well.



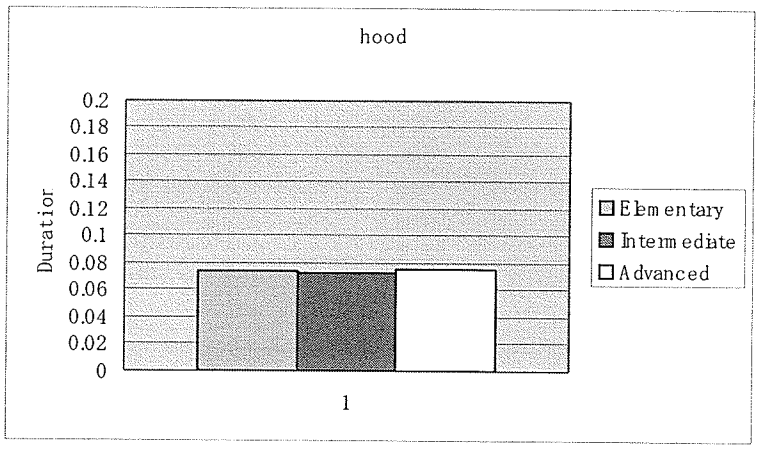
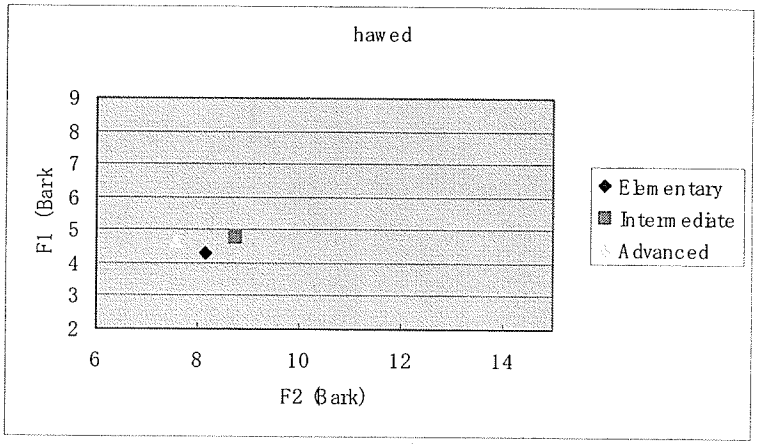


Fig. 48. The male bilingual group's production of English /ʊ/

As for /ɔ/, the elementary group produces the highest B3 and the advanced level produces the lowest, and these two groups show a significant difference in this domain, as summarized in Fig. 49.



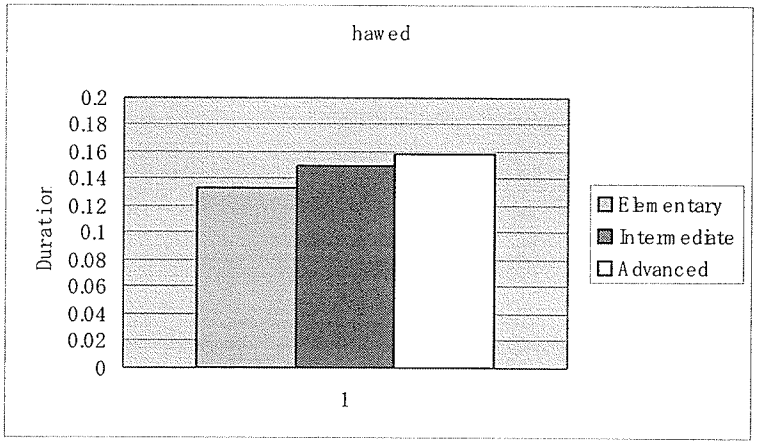
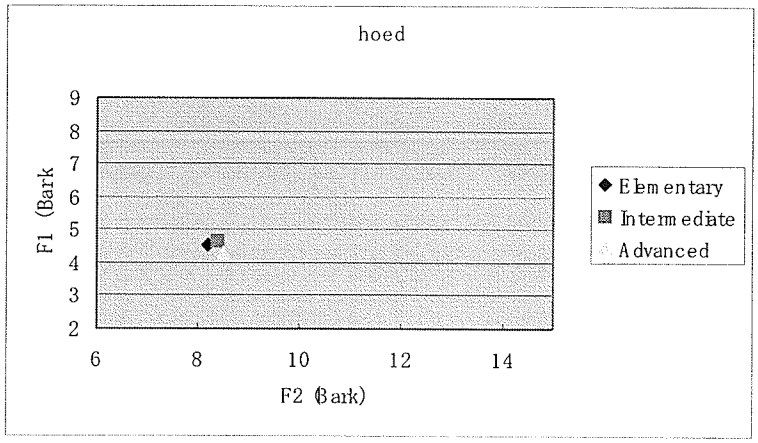


Fig. 49. The male bilingual group's production of English /ɔ/

Moving to /o/, figure 50 displays that there is no significant difference between the groups in any domain.



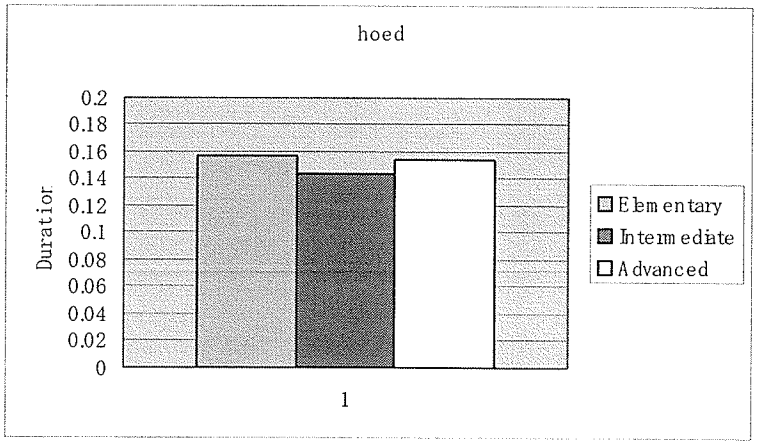


Fig. 50. The male bilingual group's production of English /o/

As seen in Fig. 51, the higher the learners' L2 level, the higher B1 they use for /ɑ/. The elementary students are differentiated from the others by B1.

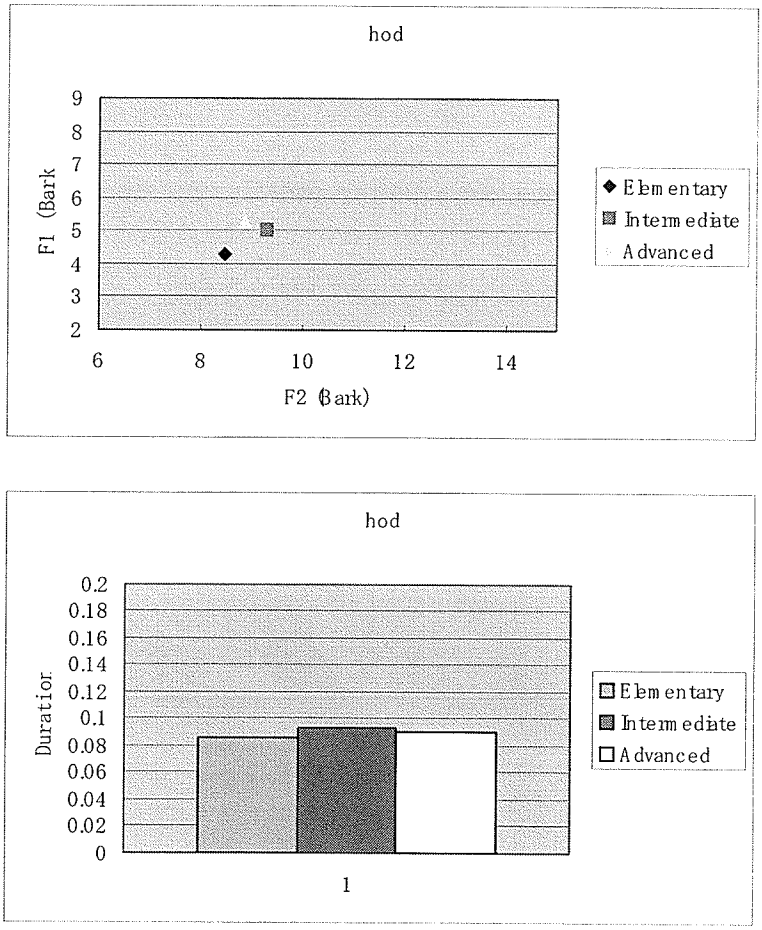


Fig. 51. The male bilingual group's production of English /ɑ/

Figure 52 shows that the intermediate group has the highest B1 and the advanced has the lowest for /æ/. The intermediate learners are significantly different from the other learners in this domain. The higher the bilinguals' L2 competence is, the higher B2 they produce, and the advanced group is well-distinguished from the other groups.

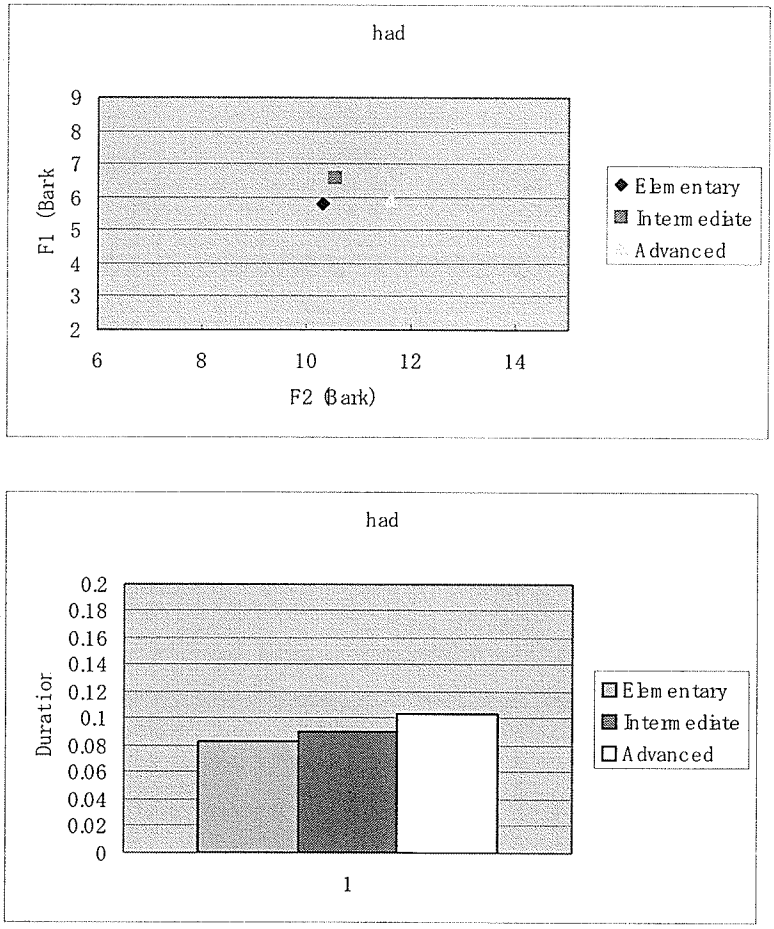
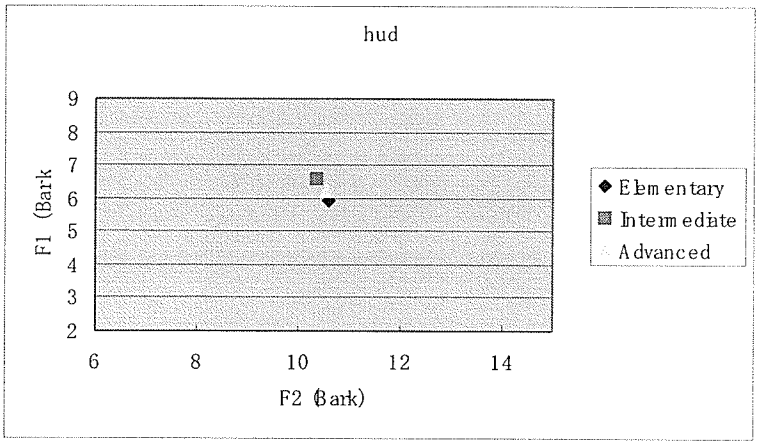


Fig. 52. The male bilingual group's production of English /æ/

As for /ʌ/, the higher the students' English level, the lower B3 they use, and the advanced level is statistically different from the other levels in this measure, as indicated in Fig. 53.



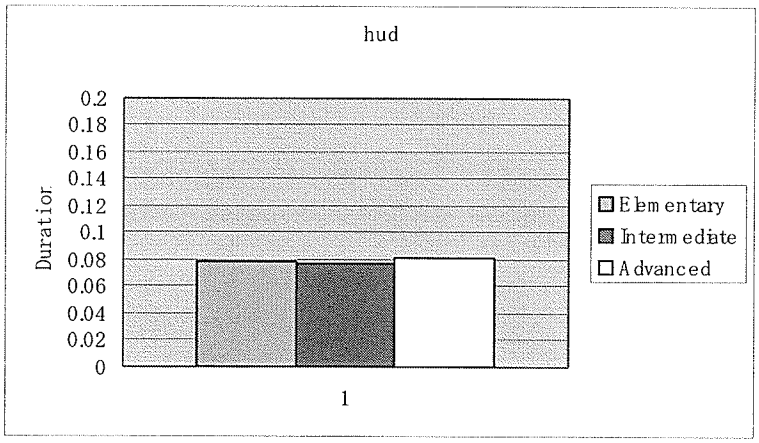


Fig. 53. The male bilingual group's production of English /ʌ/

As seen in Fig. 54, the intermediate group produces the highest B1 and the elementary group produces the lowest for /ə/. The former group is clearly distinguished from the others. The higher the students' English level, the higher B2 they use, although only the elementary and advanced groups show a statistical difference. As for B3, the advanced level produces the lowest and the elementary level produces the highest. The difference between these groups in this domain is also significant.

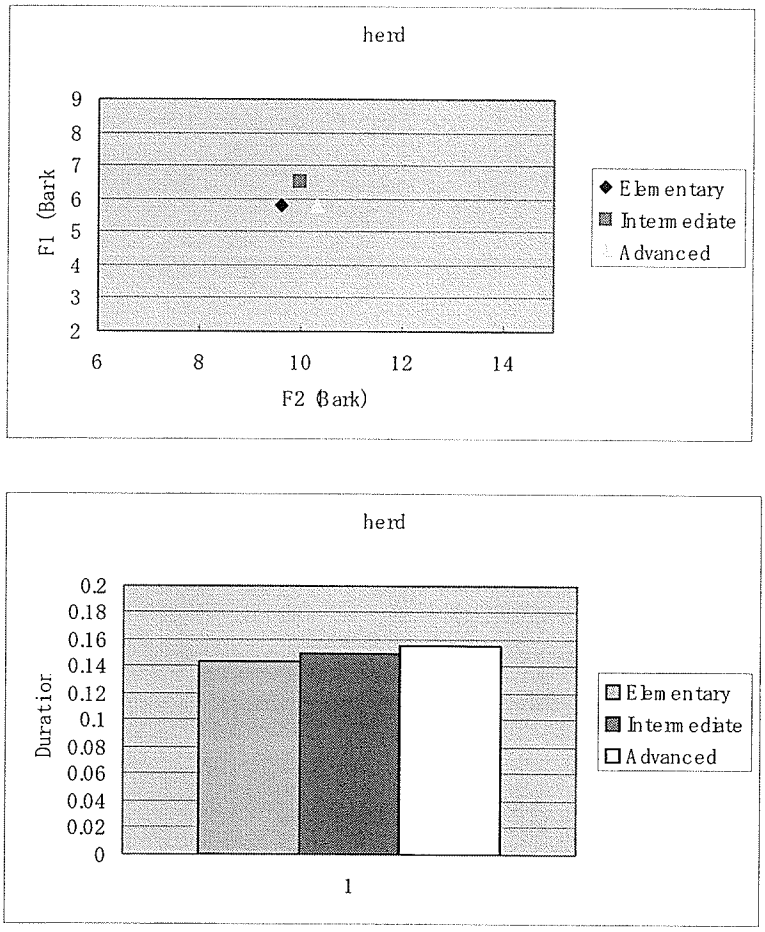


Fig. 54. The male bilingual group's production of English /ə-/

Unlike the female bilingual subjects, the male bilinguals did not show any strong tendencies. However, it appears that the higher L2 level the learners have, the higher B1 they tend to produce, although there are a few exceptions. Additionally, it is also likely that the higher-level students tend to have higher B2, but the advanced learners have the lowest B2 and the intermediate learners have the highest for the mid-front and high-back vowels.

The results for the male subjects do not always support the hypotheses. Unexpectedly, no significant differences among the three groups cannot be found in English /i/ and /o/. This may be because none of the bilingual groups in this study has

created distinct categories for English /i/ and /o/, and they seem to use Japanese vowels for the English vowels, as shown in the within-group analysis section. In contrast, the other English vowels are differentiated by the L2 proficiencies, and the differences often appear in B1 and B3, which follows the hypothesis. However, durational differences can be found only in /ɔ/ and /æ/, although it was expected that there would be more temporal differences, because it was predicted that the bilinguals' cues would change, depending on their L2 competence.

4.2. L2 competence effects on the production of Japanese vowels: Between-group analyses

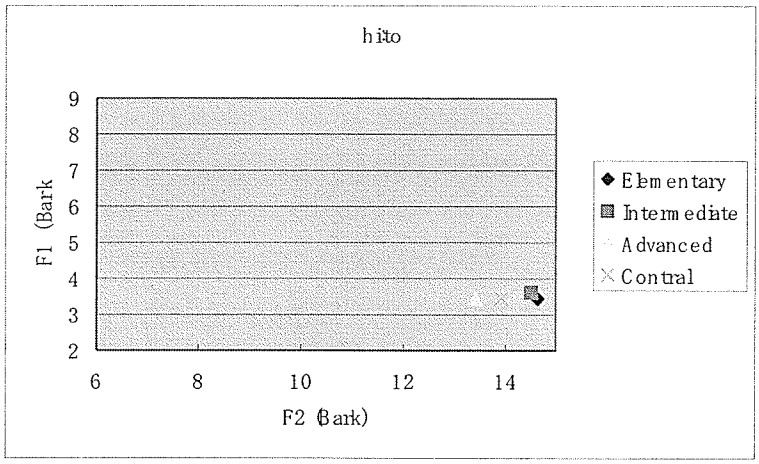
This section addresses the question of whether L2 English acquisition can affect L1 production, and if so, how is the L1 production influenced? To this end, the Japanese vowels produced by bilingual participants at the three different L2 levels are compared. Next, the Japanese vowels produced by all the bilinguals are compared to those produced by Japanese monolinguals. Then, the possible causes for the changes in Japanese vowels are explained, using the results of the within-group analyses above.

The SLM predicts that the realization in productions will be intermediate between the L1 and L2, when category assimilation occurs. In comparison, when category dissimilation takes place, L2 learners will exaggerate the difference between the L1 and L2 sounds. Again, as seen in the within-group analyses, the elementary students in this experiment may categorize English vowels as Japanese vowels. This pattern is category assimilation and will lead the learners to pronounce Japanese vowels differently from the monolingual subjects. However, the changes may appear only in length and the formant frequencies may not be influenced, because the elementary students are predicted to rely

only on durational cues, according to Morrison's research. However, as Flege and Mackay (2004) state, the experience of L2 will help learners to create new categories, and cue shifts are also expected to occur, based on Escudero and Boersma's (2004) research. Thus, the intermediate group is predicted to create new categories for some of the English vowels, which may cause category dissimilation. This dissimilation will result in cue shifts; the intermediate learners should be different from the controls by spectral cues as well as by temporal cues. The advanced learners are expected to be more different from the controls than the intermediate learners, because the advanced-level students should have more distinct vowel categories than the lower-level students, which may cause category dissimilation more frequently. Similar to the intermediate group, the advanced group is predicted to use both durational and spectral cues. Hence, the differences should appear not only in duration, but also in formant frequencies.

4.2.1. Female speakers

As indicated in Fig. 55, the elementary group uses the longest and the intermediate has the shortest duration for the Japanese vowel /i:/, and all the groups are clearly distinguished from each other. The elementary students produce the highest and the advanced learners have the lowest B3. The difference between these two groups is significant.



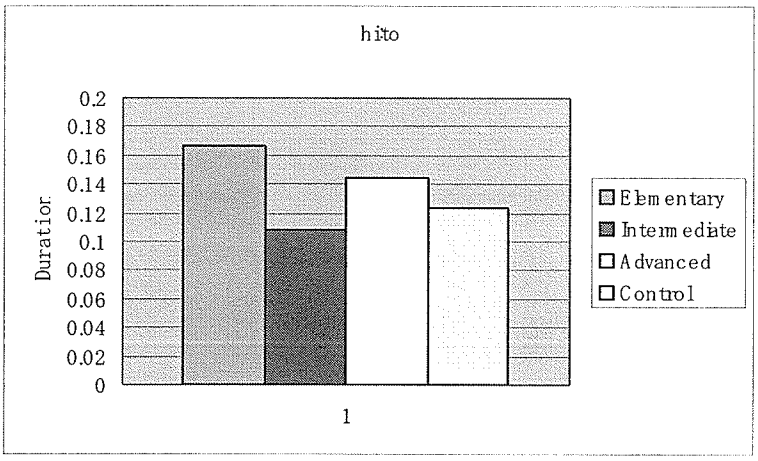
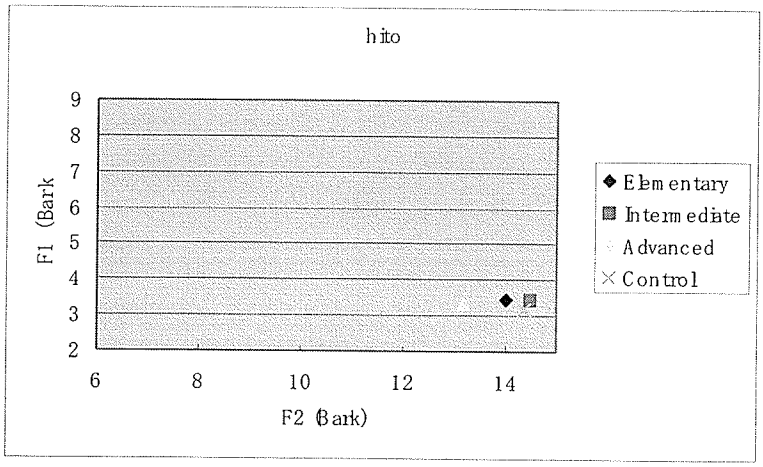


Fig. 55. The female bilingual group's production of Japanese /i:/

As for Japanese /i/, the intermediate level has the highest and the advanced group has the lowest B2 of all, as summarized in Fig. 56. The difference between these two groups is significant, and the advanced and the control groups have a significant difference in this domain as well. For the bilingual speakers, the higher English competence they have, the lower B3 they produce, but the controls have higher B3 than the advanced group. The advanced and elementary learners show a statistical difference in this measure as well as the advanced and intermediate learners. The elementary group produces the longest and the control group produces the shortest duration. The elementary learners are significantly different from the other groups in length.



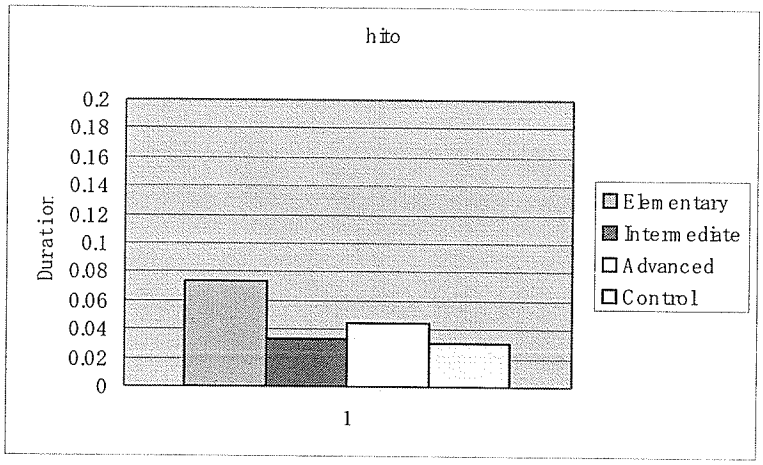
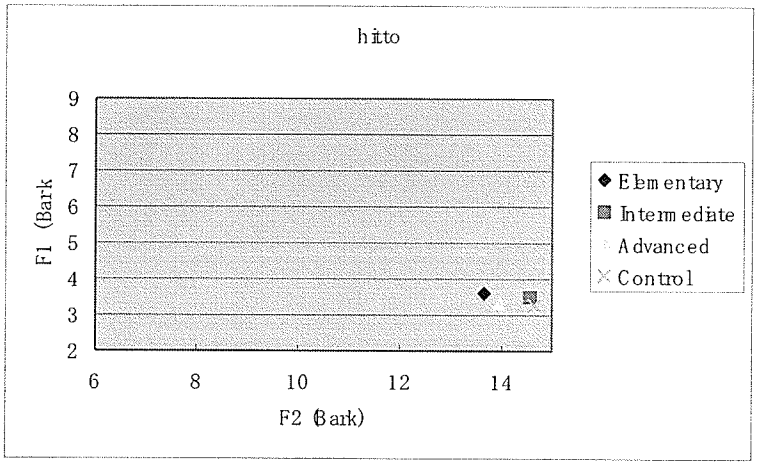


Fig. 56. The female bilingual group's production of Japanese /i/

Moving to /iQ/, as seen in Fig. 57, the results indicate that there are durational differences between the elementary and the intermediate groups and between the intermediate learners and the controls; the elementary group has the longest and the intermediate group has the shortest duration.



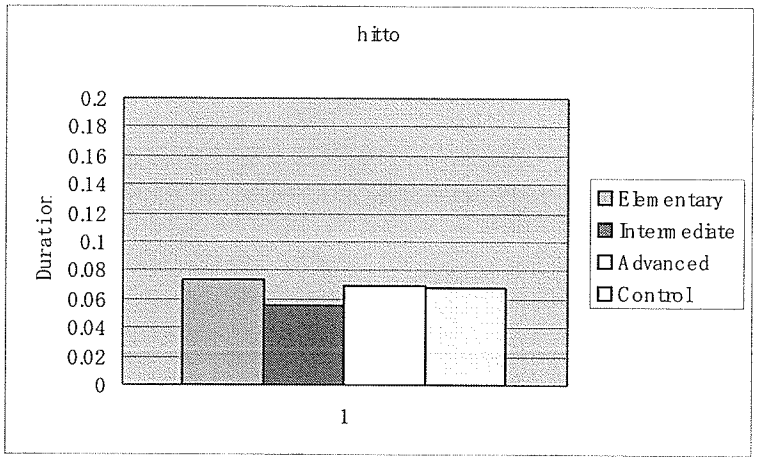
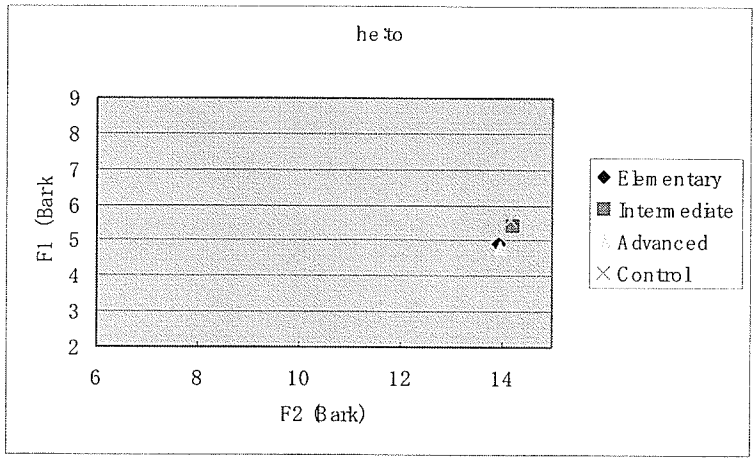


Fig. 57. The female bilingual group's production of Japanese /iQ/

The cause for Japanese vowel changes may be explained by the results of the within-group analyses. The elementary and intermediate students have more distinct vowels than the controls and these bilinguals frequently depend on durational cues to distinguish one vowel from another. This may be why some of the high-front vowels produced by the lower two level learners are different from those produced by the monolinguals in terms of duration. In addition to the durational difference, the elementary-level learners produce the Japanese short vowel with higher B3 than the control group, while there is no difference between the intermediate group and the control group. The elementary learners seem to rely on B3 to distinguish the Japanese long vowel

from the English vowels, while the intermediate learners utilize no Barks. The advanced students have only three vowels, the same number as the monolinguals. These bilinguals, however, pay attention to B2 and B3 as well as length, and this may lead them to produce the Japanese long vowel longer and the short vowel further back than the controls.

The advanced group has the lowest B1 and the controls have the highest for the Japanese long vowel /e:/, as shown in Fig. 58. The difference between these two groups is great and the advanced learners are also significantly different from the intermediate students. The durational order of the levels is intermediate, control, advanced and elementary. The elementary group is distinguished from the intermediate and the control groups. The advanced bilinguals also have significant differences from the intermediate students and the controls.



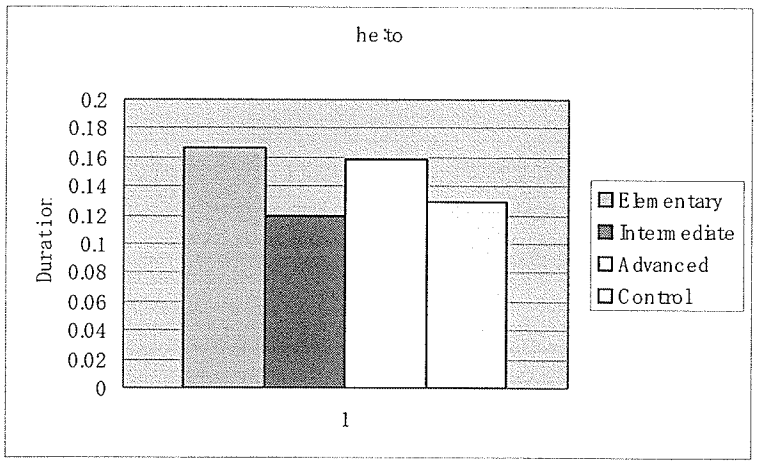
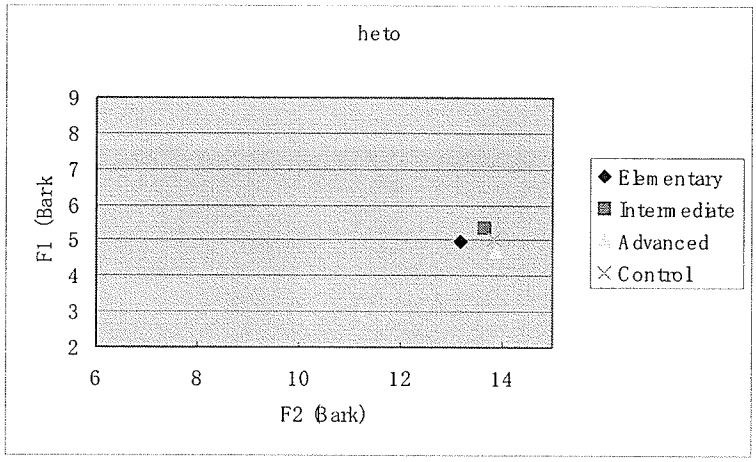


Fig. 58. The female bilingual group's production of Japanese /e:/

Figure 59 indicates that the intermediate level has the highest and the advanced level has the lowest B1 for /e/. These two groups are distinguished from each other by this domain. The advanced group is also significantly different from the elementary group in B3; the former has the highest and the latter has the lowest B3. The order of duration within the levels is as follows: the intermediate, control, advanced and elementary. The elementary group is differentiated from all the groups, and the intermediate and advanced are distinguished from each other as well.



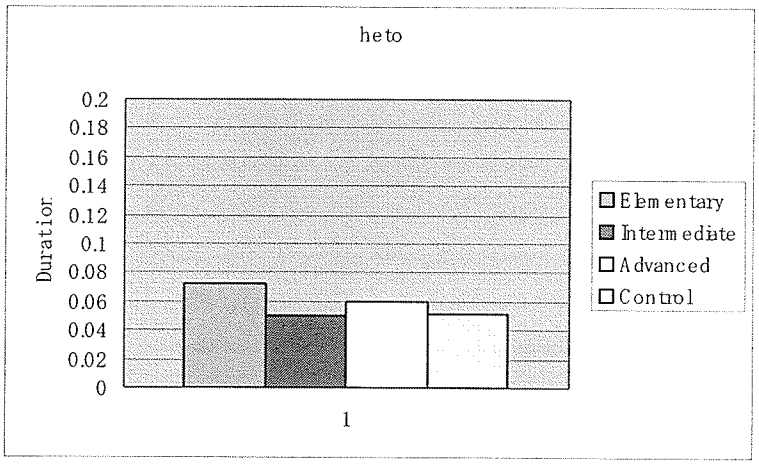
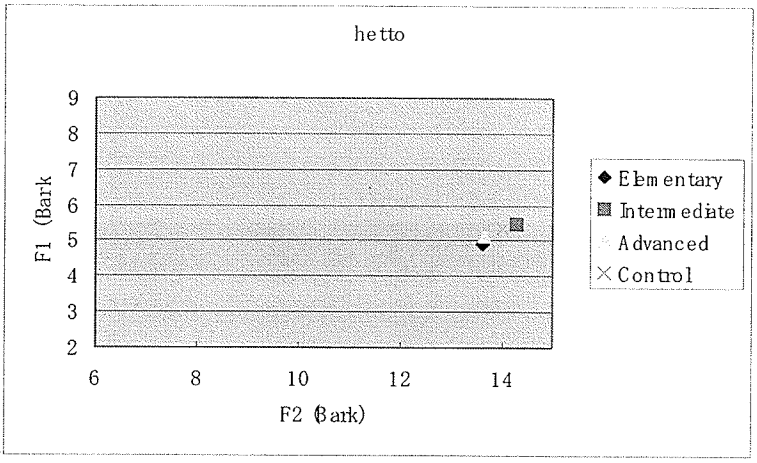


Fig. 59. The female bilingual group's production of Japanese /e/

The elementary learners have the lowest and the intermediate have the highest B2 for the Japanese vowel /eQ/, as seen in Fig. 60. The advanced bilinguals have lower B2 than the controls. The differences between the elementary and advanced groups and between the intermediate and advanced learners are significant. The elementary group produces the longest duration and is differentiated from the intermediate subjects and the controls.



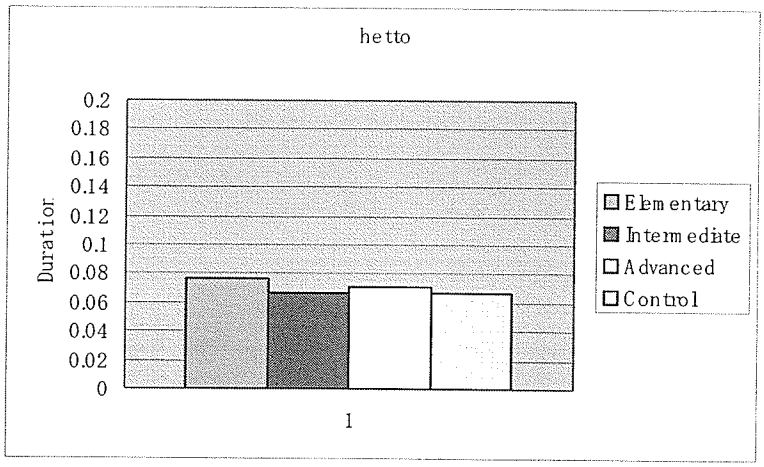
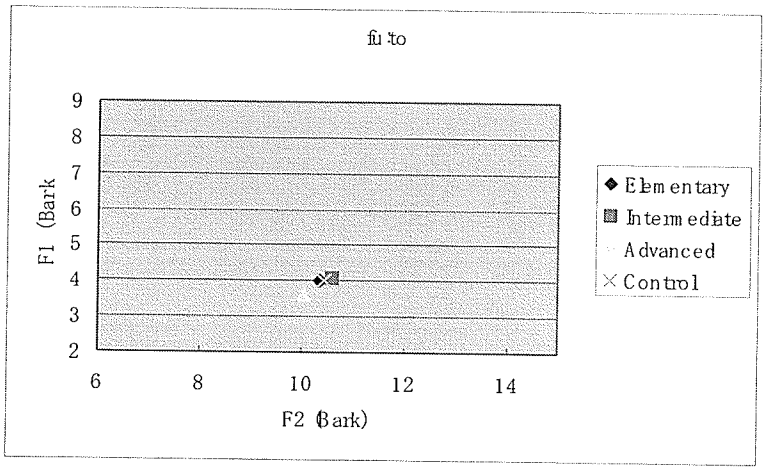


Fig. 60. The female bilingual group's production of Japanese /eQ/

The results of the Japanese mid-front vowel analyses suggest that there is no position change among the elementary students, although they produce all the Japanese vowels longer than the monolinguals. Considering the results of the within-group analyses, the elementary bilinguals appear to have added a new category for the English vowels to their vowel system, and mostly they utilize durational cues to tell vowels apart. (As for the intermediate level, the bilinguals seem to have established a new category for the English tense vowel, but this does not affect the Japanese vowels at all.) It appears that the advanced students have not established separate categories for the English vowels. These learners, however, rely on B2 to distinguish the English lax vowel from the Japanese long and short vowels as well as on length. This reliance on B2 may be the reason that the advanced group pronounces the Japanese long vowel higher and longer, and pronounces the Japanese short vowel higher than the controls, although the advanced learners have no separate categories for English.

For the Japanese long vowel /u:/, as indicated in Fig. 61, the order of duration is as follows: intermediate, control, advanced and elementary. All the subjects but the advanced learners and the controls are statistically different.



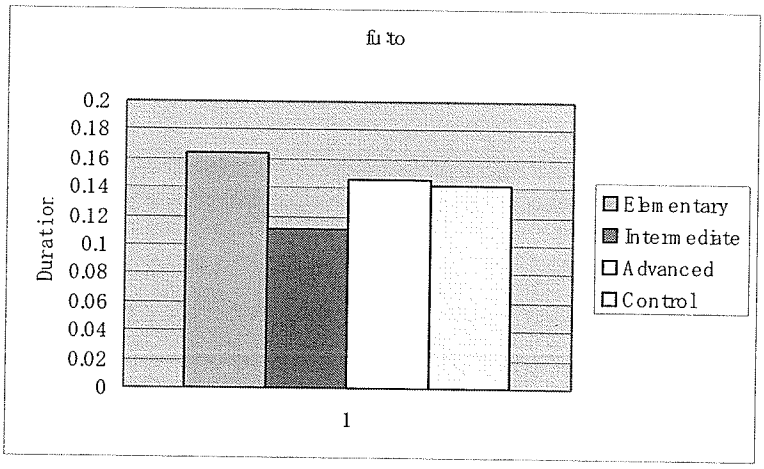


Fig. 61. The female bilingual group's production of Japanese /u:/

Moving to the short vowel /u/, for the bilingual participants, the higher English competence they have, the lower B1 they produce although the controls use lower B1 than the lower two level learners, as summarized in Fig. 62. The elementary and the intermediate groups are significantly different from the advanced subjects and the controls in this domain. The advanced students have the lowest B2 and are distinguished from the other groups. The elementary level has the longest and the intermediate level has the shortest duration. The elementary students are significantly different from the other three groups, and the intermediate group is also different from the controls.

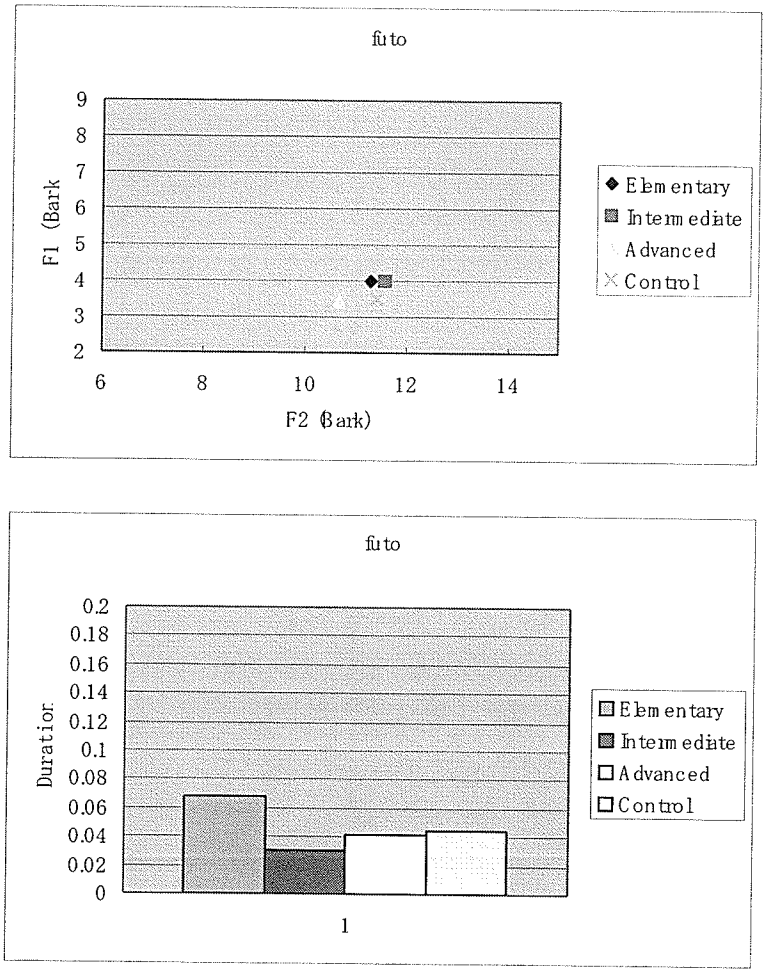
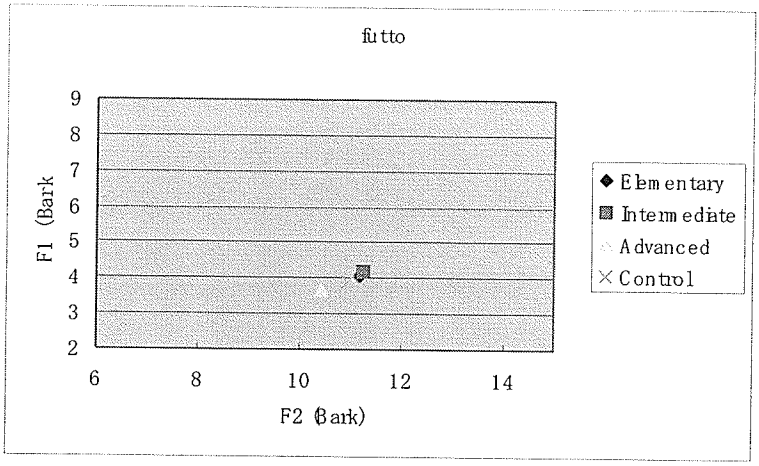


Fig. 62. The female bilingual group's production of Japanese /u/

As seen in Fig. 63, the intermediate learners have the highest and the advanced learners have the lowest B1 for /uQ/. The differences between the advanced and the other bilingual groups are significant, although the advanced group is not distinguished from the control group. The intermediate level and the control group are significantly different from each other in B1. As with B1, the advanced group has the lowest B2 and the intermediate group has the highest. The former is distinguished from the other bilingual participants. Moving to B3, the order from lowest to highest is as follows: the control, intermediate, elementary and advanced groups. Only the differences between the control and the elementary groups, and between the control and advanced groups are statistically

significant. The elementary-level learners produce the longest and the intermediate learners produce the shortest duration. The difference between these two groups is significant, and the intermediate group is also statistically different from the advanced students and the controls.



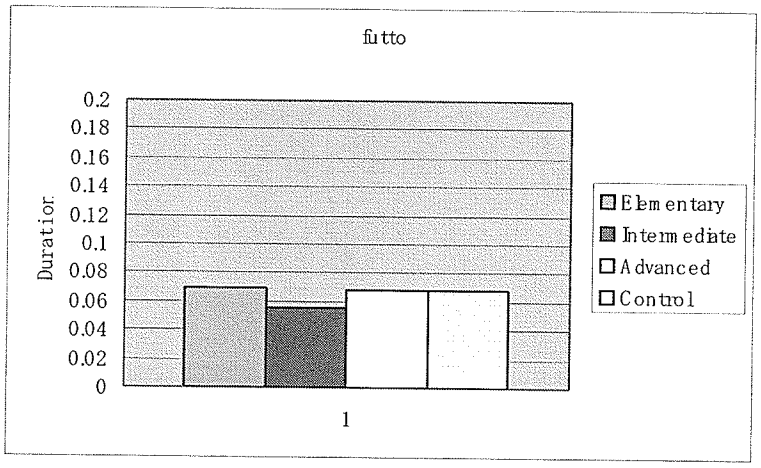
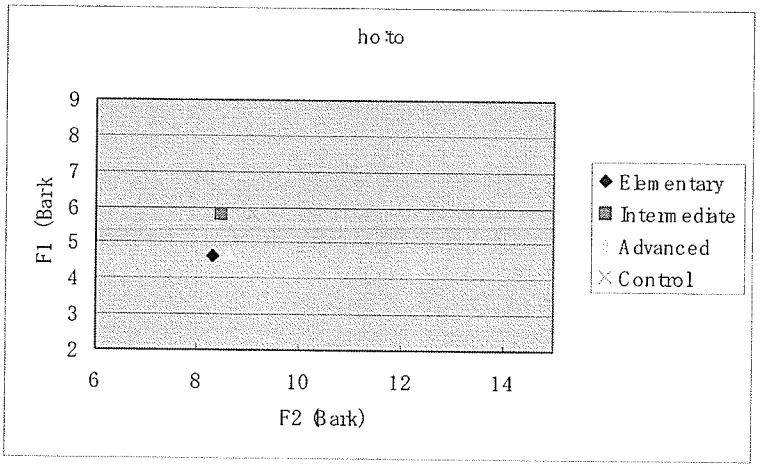


Fig. 63. The female bilingual group's production of Japanese /uQ/

According to the results of the within-group analyses, the elementary group has formed new categories for the English high-back vowels, relying on duration, B1 and B2. This seems to cause the Japanese long vowel to be produced with longer duration, and to cause the Japanese short vowel to be pronounced lower and longer. However, there is no obvious cause for the pre-geminate vowel being produced with higher B3, because the

elementary students never use the domain. The within-group analyses also imply that the intermediate group maintains six distinct vowels in this space, utilizing B2 as well as length. This causes the durational changes in all the Japanese vowels (the long vowel is longer and the others are shorter), and leads the short and pre-geminate vowels to move lower. The advanced learners have five separate vowels. However, the changes among these bilinguals are different from those among the intermediate learners. The Japanese short vowel moves back, although the advanced students do not rely on B2. In contrast, the advanced learners rely on B3 to distinguish the English lax vowel from the Japanese pre-geminate vowel, and this method of discrimination seems to be reflected in the Japanese pre-geminate vowel production, which is produced with higher B3.

As seen in Fig. 64, all the bilingual groups have a lower B1 than the controls for /o:/. The intermediate learners have the highest and the elementary learners have the lowest B1 of all the bilingual subjects. The control group is significantly different from the elementary and advanced students, and the intermediate bilinguals are different from the other bilingual participants in B1. The durational order is as follows: the intermediate, control, advanced, and elementary groups. All the groups are distinguished from one another, except the advanced and controls groups.



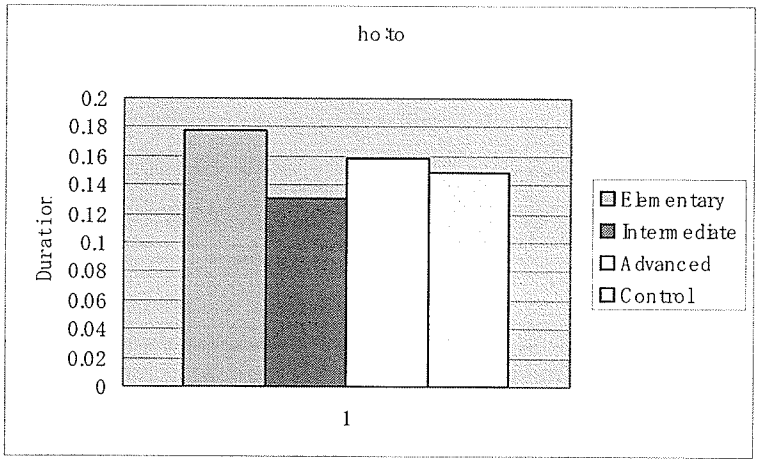
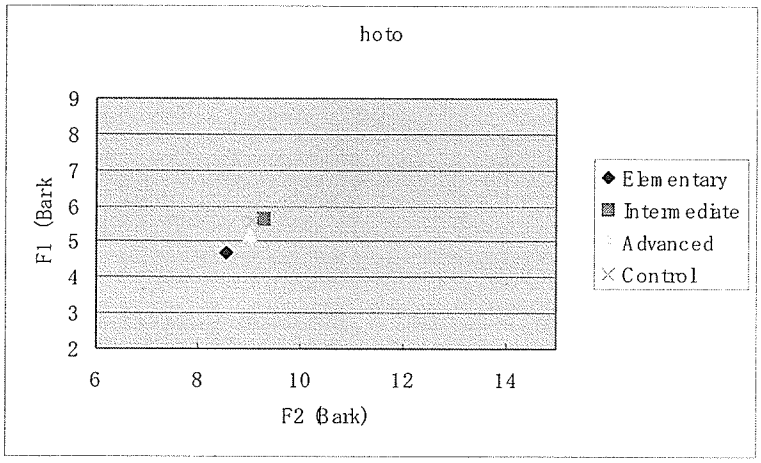


Fig. 64. The female bilingual group's production of Japanese /o:/

Turning to the short vowel /o/, figure 65 shows that the elementary group has the lowest B1 and the intermediate group has the highest of all. These two levels are statistically different from each other. The elementary learners are also distinguished from the controls by this domain. The elementary learners have the lowest and the intermediate learners have the highest B2, and they are distinguished from each other. As for B3, the controls have the lowest value and for bilingual participants, the higher their English level, the higher B3 they produce. The differences between the controls and the two higher-level learners are significant. There are also durational differences. The elementary learners use the longest and the intermediate learners produce the shortest duration, and all the groups except the advanced and control groups are significantly different.



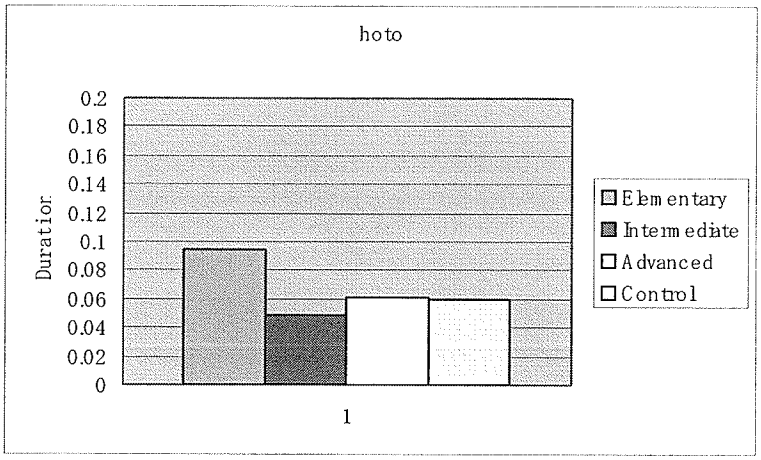


Fig. 65. The female bilingual group's production of Japanese /o/

As for the short vowel /o/, the order of B1 from lowest to highest is elementary, advanced, control and intermediate, as summarized in Fig. 66. The elementary learners are distinguished from the intermediate and control groups, and the controls are statistically different from the advanced students. Additionally, the advanced and intermediate groups are differentiated from one another as well. The advanced group has the highest and the control group has the lowest B3, and the difference between these two groups is significant. The elementary group produces the longest duration, while the intermediate level uses the shortest. These two groups are statistically different from each

other. The intermediate learners are also distinguished from the advanced students and the controls.

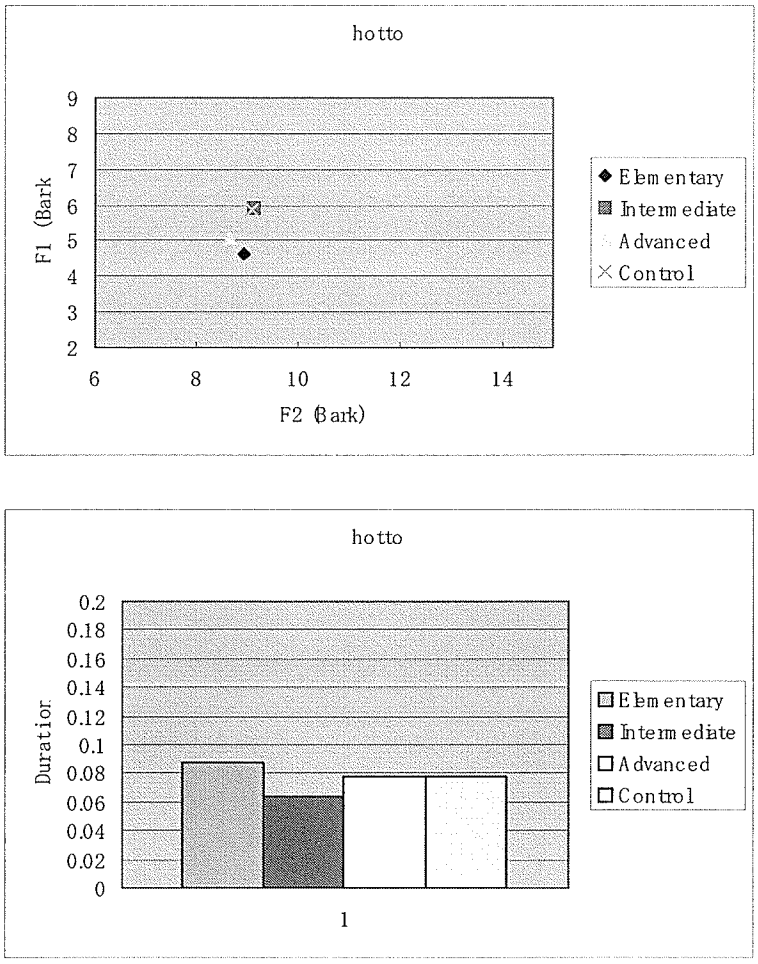
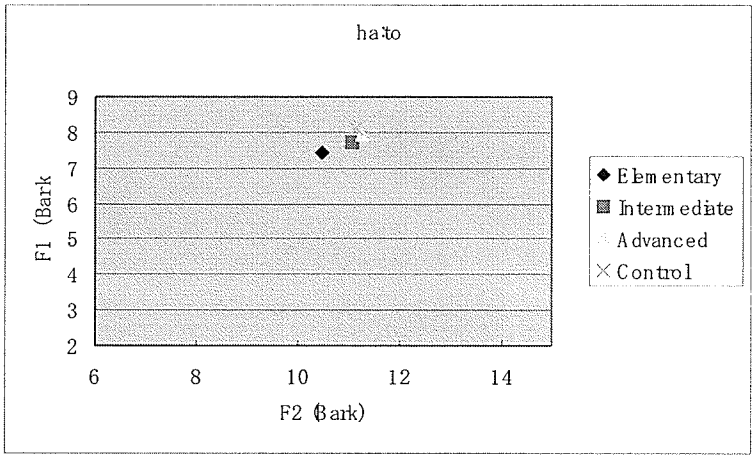


Fig. 66. The female bilingual group's production of Japanese /oQ/

According to the within-group analysis results for mid-back vowels, the elementary level has more separate vowels than the controls do. These learners frequently depend on B1 and B2 as well as length, which may explain the positional and durational changes in the Japanese vowels. The intermediate group has established new categories for all the English vowels in this space. However, the learners at this level use only duration to distinguish one vowel from another. Therefore, none of the Japanese vowels changes its position, although all the vowels are pronounced shorter. On the contrary, the

English and Japanese vowels produced by the advanced group share some space, but the bilingual speakers rely on all the spectral cues as well as length. This may lead the Japanese long and pre-geminate vowels to move higher, and the short and pre-geminate vowels to be produced with higher B3.

The controls have the highest B1, and for the bilingual subjects, the higher L2 competence they have, the higher B1 they use for the long vowel /a:/, as seen in Fig. 67. Only the elementary and control groups show a statistical difference. As for B2, the elementary group has the lowest and the advanced level has the highest value. The elementary students are statistically different from the other groups in this measure. The durational order is as follows: the intermediate, control, advanced and elementary. All the groups are distinguished from each other by length.



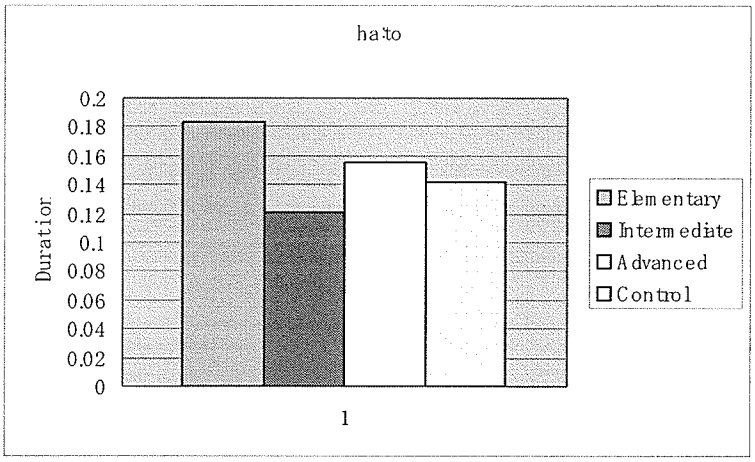
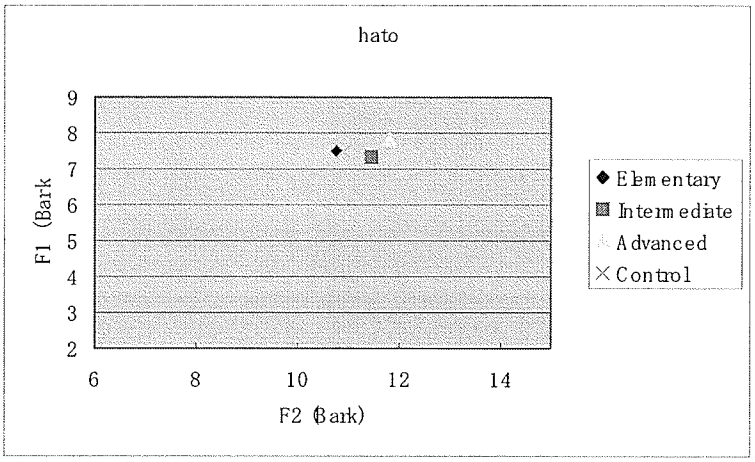


Fig. 67. The female bilingual group's production of Japanese /a:/

Moving to /a/, as displayed in Fig. 68, the elementary group produces the lowest B2 and the advanced learners use the highest of all. The elementary learners are distinguished from the other bilinguals, and the controls are statistically different from the higher two level learners in this domain. The elementary students use the longest duration and are significantly different from the other three groups.



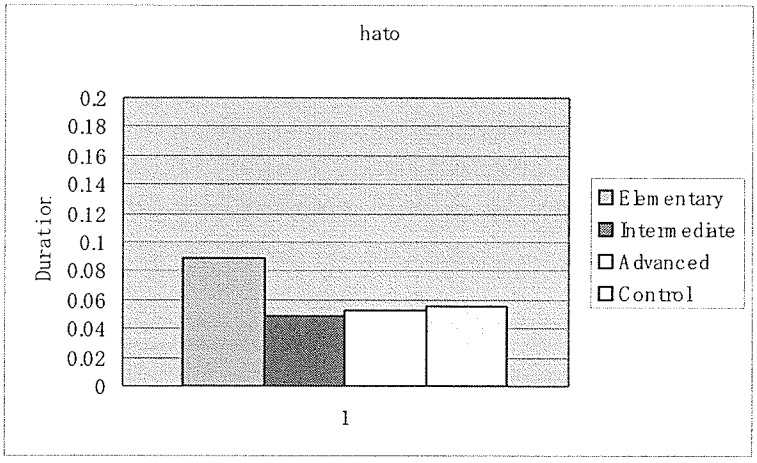
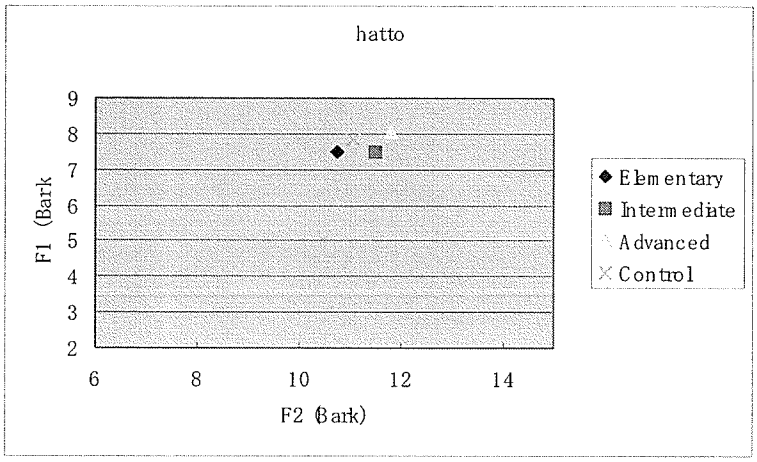


Fig. 68. The female bilingual group's production of Japanese /a/

The elementary group uses the lowest B2, while the advanced group has the highest for /aQ/, as seen in Fig. 69. The former is statistically different from the other bilingual groups and the latter is different from the controls. The control group has the lowest B3 and bilingual subjects with higher English competence produce higher B3. The difference between the elementary and advanced levels is significant. The control group is differentiated from the higher two levels as well. The elementary learners produce the longest and the intermediate students have the shortest duration. The difference between these groups is statistically significant.



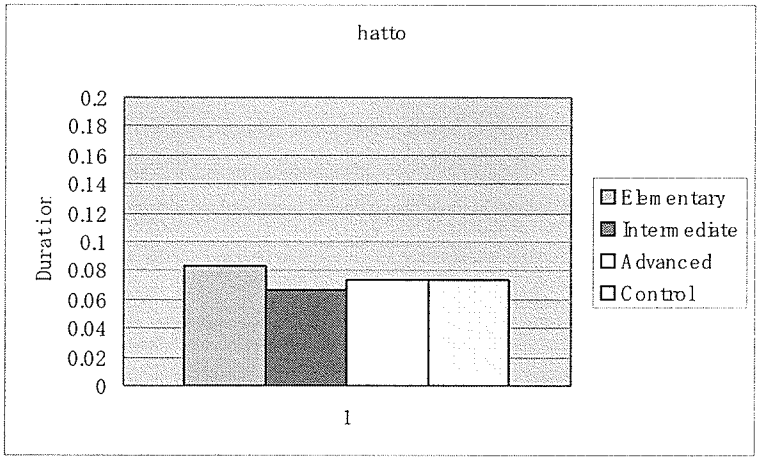


Fig. 69. The female bilingual group's production of Japanese /aQ/

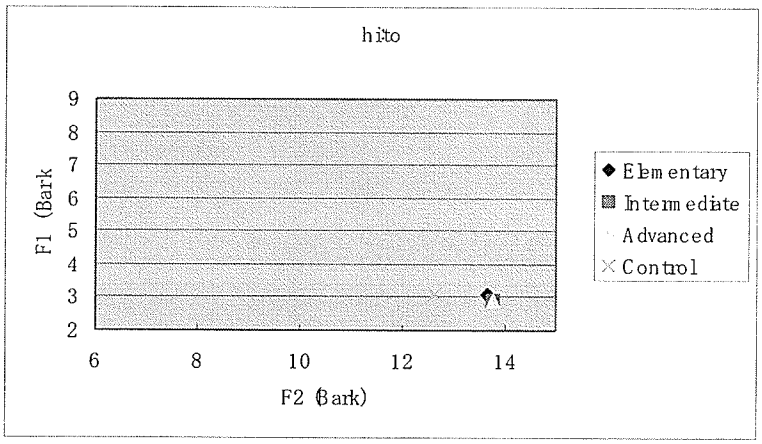
The changes in Japanese low vowels may be accounted for terms of the results of the within-groups analyses. The elementary level relies on B1 and B2 as well as duration. This seems to be the reason that the Japanese long vowel produced by these bilinguals is higher, more rear and longer, and that the short vowel is longer. The intermediate level maintains six distinct vowels in this vowel space, using all the domains. This appears to affect the Japanese vowels; the Japanese long vowel is shortened and the short vowel is shifted forward. As for the advanced group, one English vowel seems to be merged into a Japanese category, but the advanced students rely on all the domains to distinguish one vowel from another. This makes the Japanese long vowel longer, the short vowel more fronted. This also leads the pre-geminate vowel to be produced more fronted and with higher B3.

The results do not always follow the hypotheses. As predicted, the female elementary students are differentiated from the controls by length; the bilinguals tend to pronounce Japanese vowels longer. However, these bilingual participants are significantly different from the monolinguals in formant frequencies of some vowels as well. These changes were not expected to occur at the elementary level. The intermediate

group tends to differ from the control group in duration, which follows the hypothesis, but unlike the other bilinguals, the intermediate students shorten the duration, instead of lengthening it. The female intermediate learners also show English influences on formant frequencies of Japanese vowels. However, it seems that these subjects are less affected in formant frequencies than the elementary students, which fails to support the expectations. On the contrary, the advanced students are distinguished from the control speakers by formant frequencies more frequently than the other bilinguals, as was expected.

4.2.2. Male speakers

As shown in Fig. 70, the order of B2 from lowest to highest is control, elementary, advanced and intermediate, and the control group is clearly differentiated from all the bilingual groups for the long vowel /i:/. The results show that the productions of all the bilingual groups are more fronted.



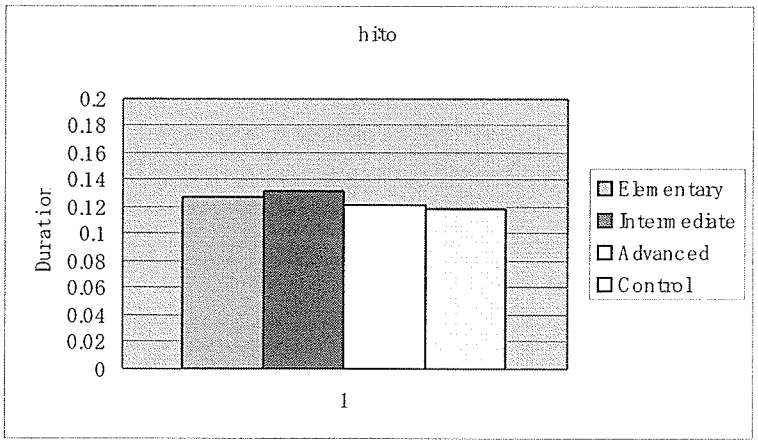
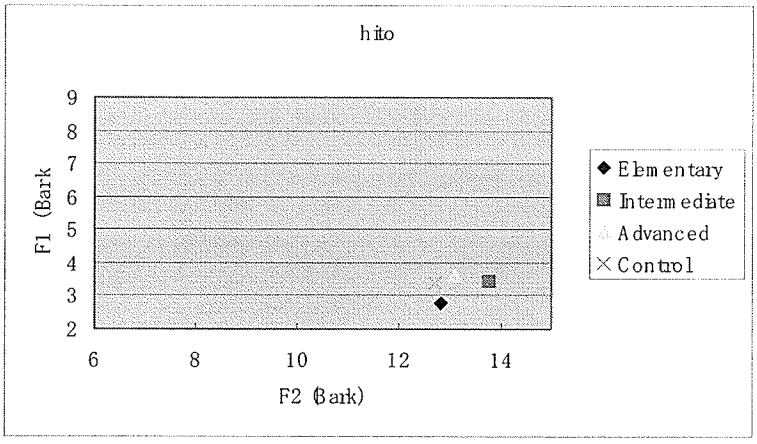


Fig. 70. The male bilingual group's production of Japanese /i:/

Turning to the short vowel /i/, figure 71 indicates that the intermediate-level students have the highest B3 and that the control speakers have the lowest. These two groups show a statistical difference in this domain. Moving to length, the control and elementary groups have the same value, which is the shortest, and the intermediate students have the longest. The control and elementary groups are differentiated from both the intermediate and advanced groups.



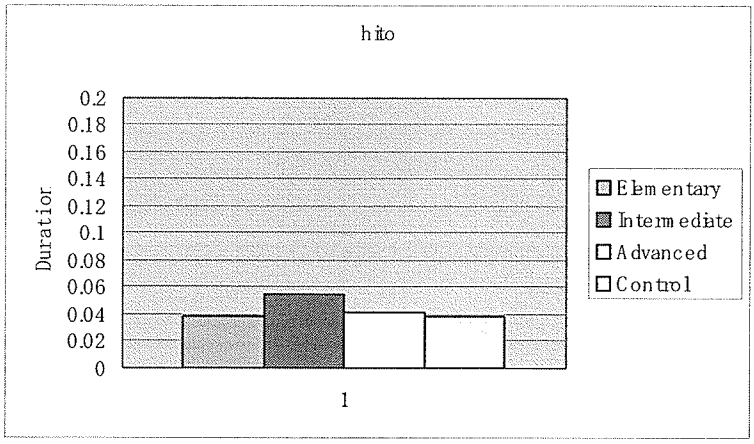
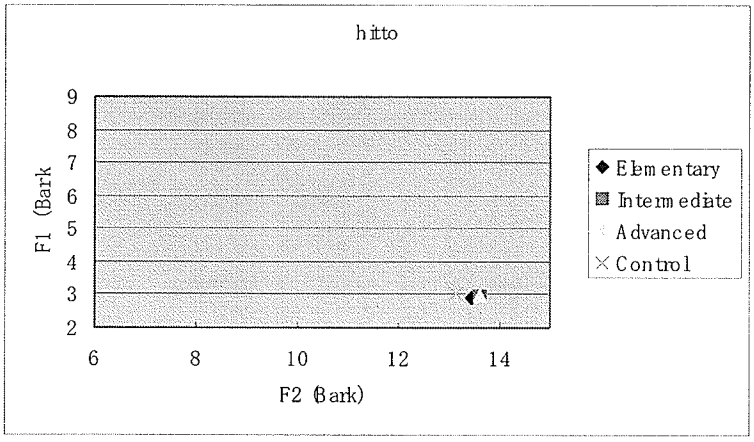


Fig. 71. The male bilingual group's production of Japanese /i/

Turning to /iQ/, as indicated in Fig. 72, the durational order is as follows: control, elementary, advanced and intermediate. The intermediate learners are distinguished from the other subjects by length.



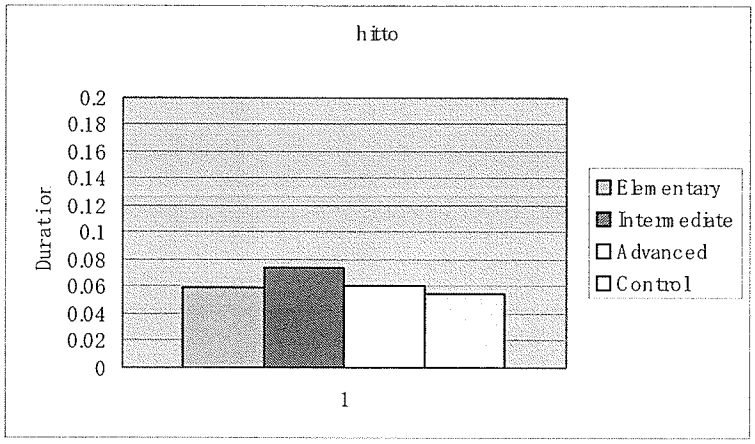
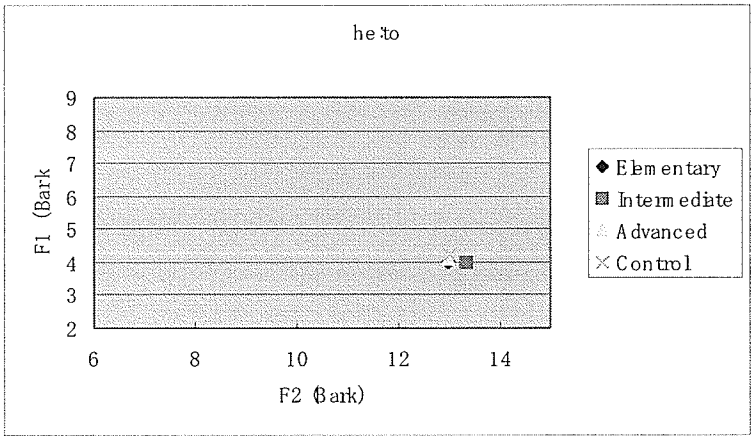


Fig. 72. The male bilingual group's production of Japanese /iQ/

The cause for these changes in the Japanese high-front vowels may be explained by the within-group analyses; all the bilingual participants sometimes rely on B2 in order to distinguish two vowels.

The controls have the highest B3 for the long vowel /e:/, and for the bilingual participants, the higher English competence they have, the higher B3 they produce, as seen in Fig. 73. The elementary group is statistically different from the advanced and control groups.



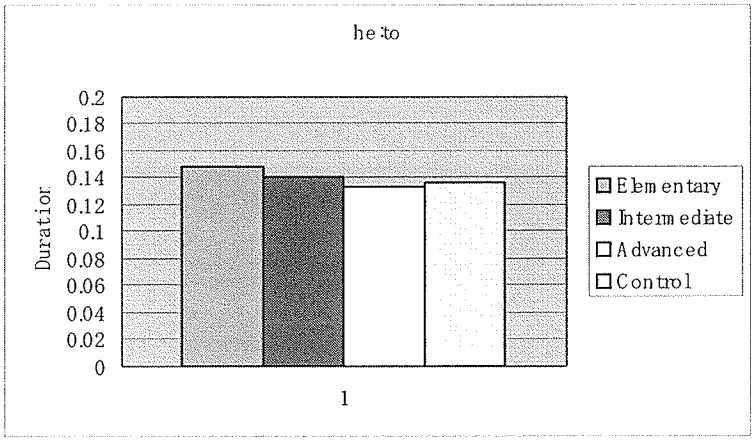
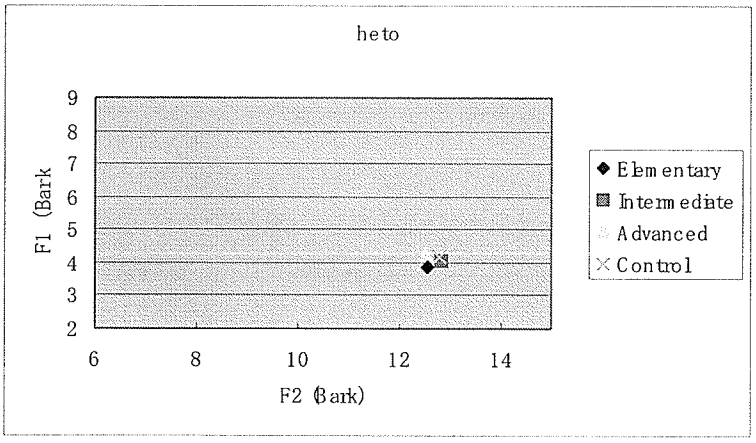


Fig. 73. The male bilingual group's production of Japanese /e:/

For /e/, as Fig. 74 shows, the advanced level has the highest B1 and the elementary level has the lowest. The difference between these two levels is significant. As for B2, the intermediate group has the highest value and the advanced group has the lowest, and these two groups are statistically different from each other. The B3 order from lowest to highest is advanced, elementary, intermediate and control. The controls are distinguished from all the bilinguals by this domain. The durational order is as follows: control, advanced, elementary and intermediate. The control group is significantly different from the intermediate and advanced groups in length.



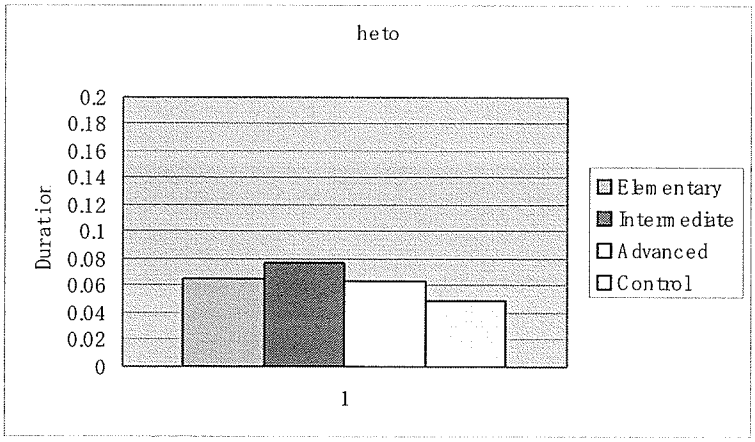


Fig. 74. The male bilingual group's production of Japanese /e/

Moving to the short vowel /eQ/, the elementary students have the lowest, and the advanced learners have the highest B1. The advanced group is statistically different from the two lower-level bilinguals, as indicated in Fig. 75. The B3 order from lowest to highest is intermediate, elementary, advanced and control. The controls are well-distinguished from the two lower-level groups by this domain. The control group is also differentiated from the intermediate and advanced students by length; these bilinguals have longer duration than the controls.

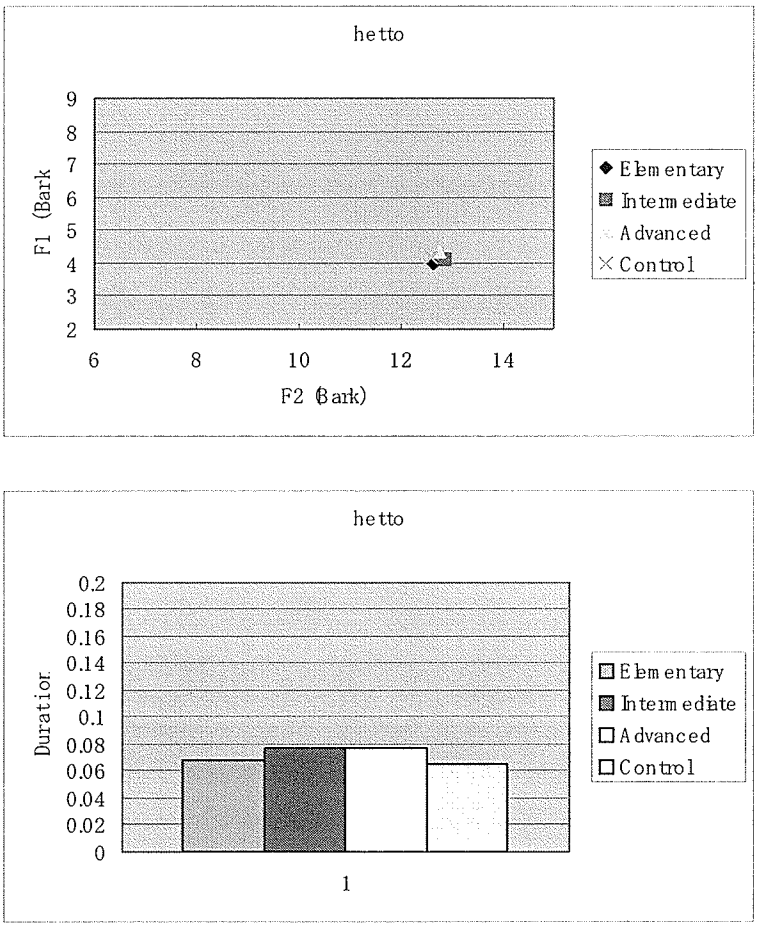


Fig. 75. The male bilingual group's production of Japanese /eQ/

According to the results of the within-group analyses, all the bilinguals frequently rely on B2 and length, and sometimes on B1 to differentiate mid-front vowels. Thus, it

seems natural that some of the Japanese vowels produced by the bilingual subjects are pronounced longer. However, the cause for the B3 changes in all the Japanese vowels produced by the elementary students, the short vowels by the intermediate and advanced learners, is not evident.

For the high-back long vowel /u:/, the elementary students have the highest B3 and the advanced students have the lowest, as seen in Fig. 76. The difference between these learners is significant. The intermediate and advanced groups are significantly different from each other in duration. However, only the intermediate group is distinguished from the monolingual group by this domain.

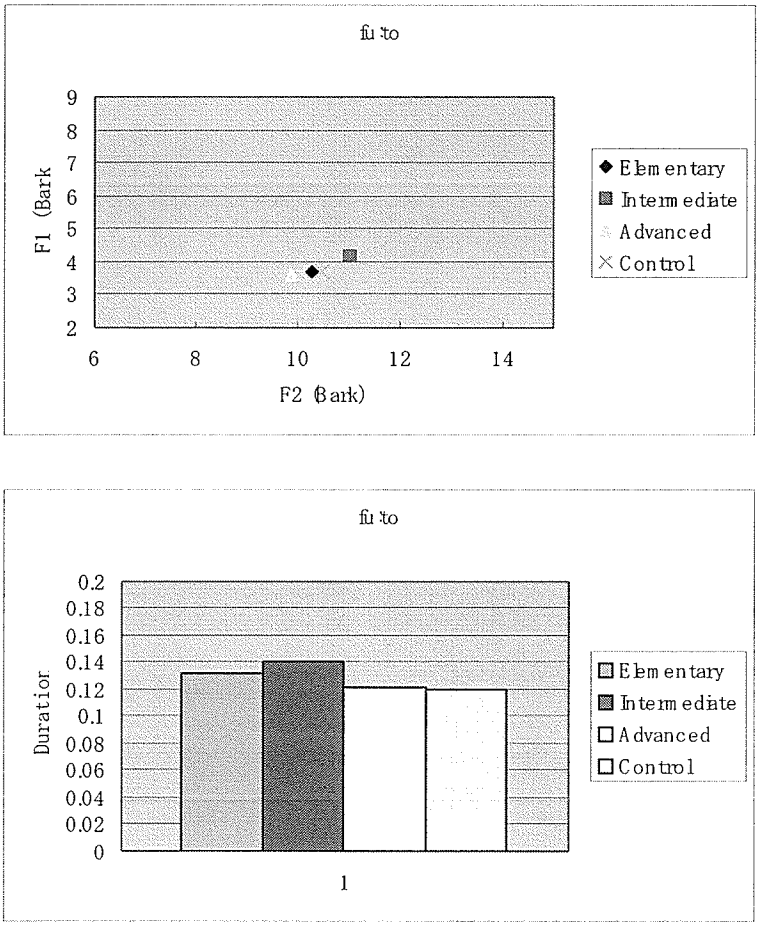


Fig. 76. The male bilingual group's production of Japanese /u:/

Turning to the short vowel /u/, as with the long counterpart, only the intermediate bilinguals have a significant difference in length from the monolinguals, although the advanced students are also distinguished from the intermediate bilinguals, as summarized in Fig. 77.

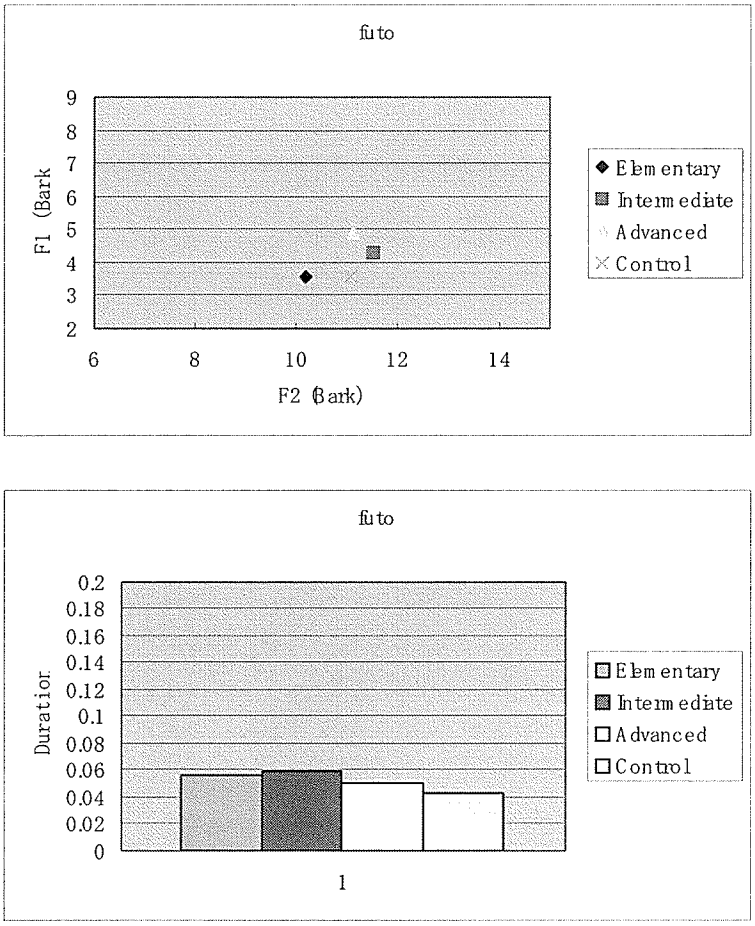


Fig. 77. The male bilingual group's production of Japanese /u/

Figure 78 indicates that the intermediate group has the lowest B1 for /uQ/, and differ from the advanced and control groups in this measure. As for B3, the elementary group has the highest value and the intermediate group has the lowest. The elementary learners show statistical differences from the intermediate and advanced learners in B3.

There is also a durational difference between the intermediate and control groups; the intermediate learners have the longest and the controls have the shortest.

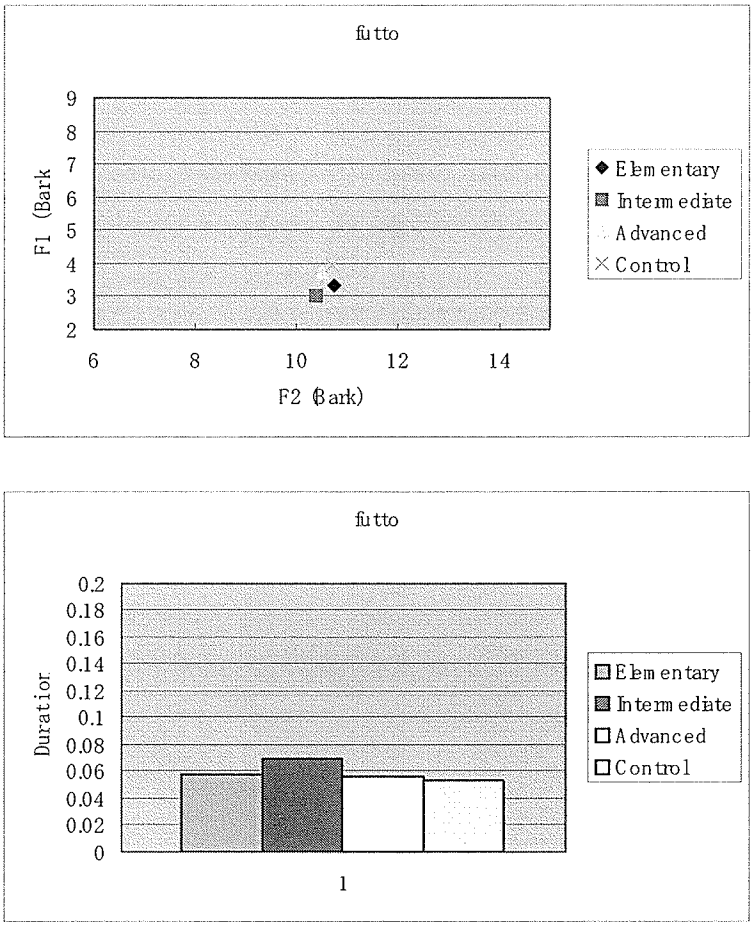
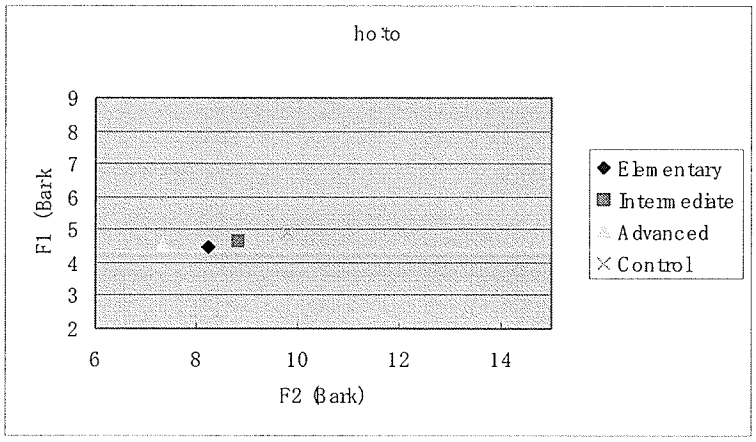


Fig. 78. The male bilingual group's production of Japanese /uQ/

Comparing the results of the two types of analyses allows for an interesting observation; the elementary and advanced learners have established a new category for an English high-back vowel, but the differences between these bilinguals and the controls in this vowel is not statistically significant. In comparison, the intermediate learners produce all the vowels longer and the pre-geminate vowel higher than the controls, although they do not rely on Barks at all and merge English vowels into Japanese categories.

Figure 79 shows that the elementary group has the lowest and the control group has the highest B1 for the long vowel /o:/. The difference between these two groups is significant. The monolinguals produce the highest B2 and the advanced bilinguals produce the lowest, and these two groups show a statistical difference in this measure. As for B3, the intermediate students have the highest value, and the controls have lowest. These two groups are significantly different from each other as well. The durational order from lowest to highest is control, intermediate, advanced and elementary. All the bilinguals are differentiated from the monolinguals.



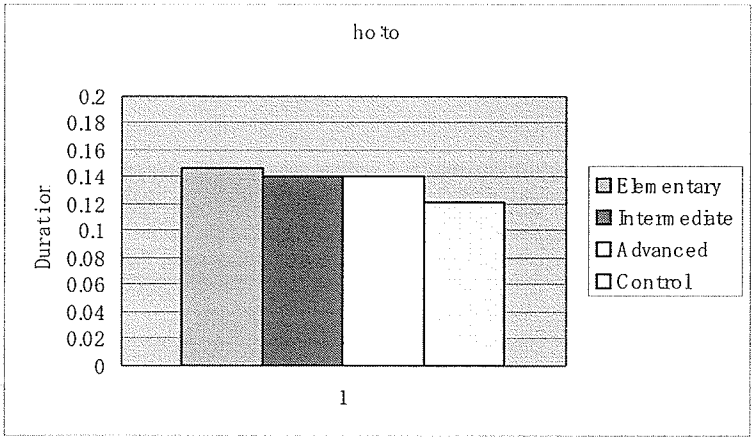


Fig. 79. The male bilingual group's production of Japanese /o:/

Moving to the short vowel /o/, the monolingual speakers have the highest B1 and the elementary learners have the lowest, as seen in Fig. 80. The difference between these subjects is significant. As for B2, all the bilinguals are distinguished from the monolinguals. The advanced learners are also differentiated from the controls by B3; the advanced bilinguals have the highest and the monolinguals have the lowest. As with the long counterpart, all the bilinguals are statistically different from the controls.

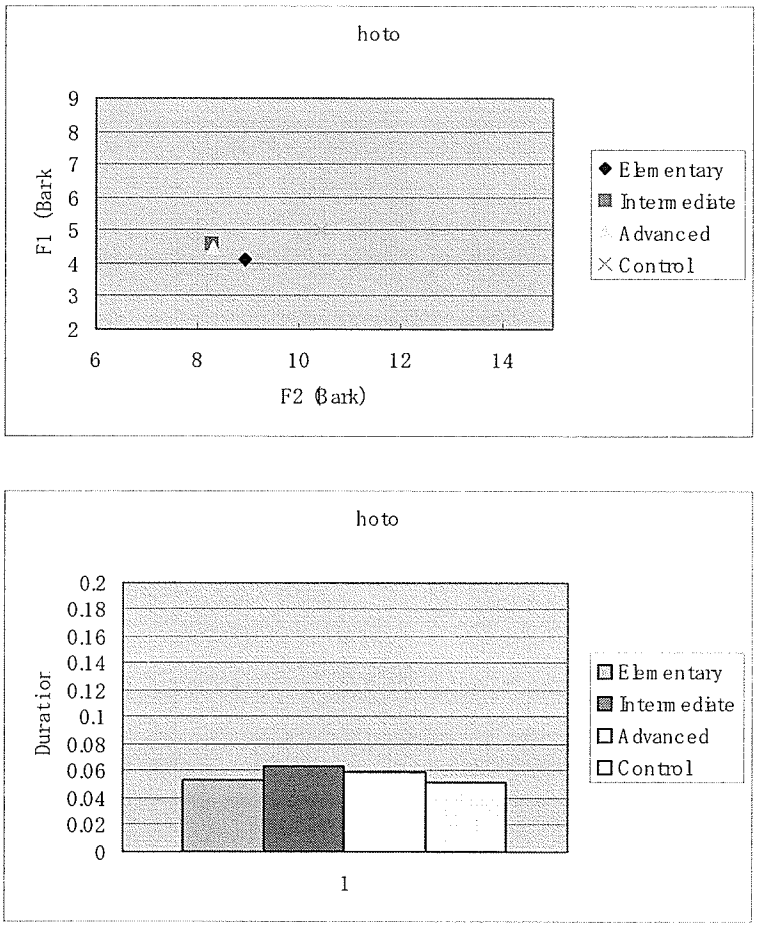
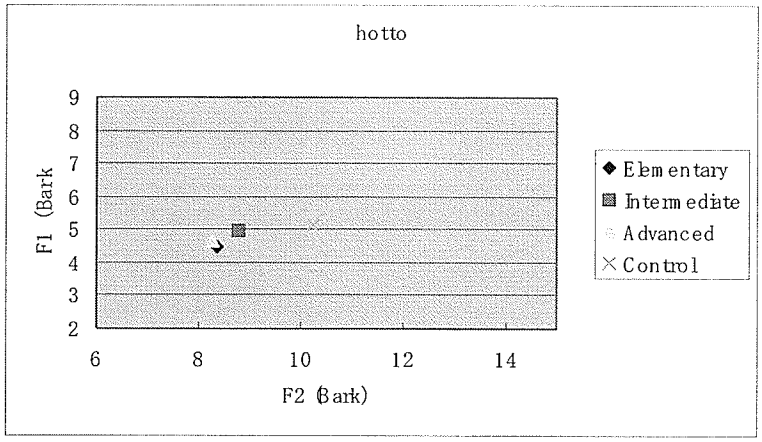


Fig. 80. The male bilingual group's production of Japanese /o/

As in the case with the short counterpart, the monolinguals produce the highest B2 and the elementary students produce the lowest for /oQ/, as shown in Fig. 81. These two groups show a statistical difference in this measure. As for B2 and B3, all the

bilinguals differ from the monolinguals; the B2 order from lowest to highest is advanced, elementary, intermediate and control; the B3 order is control, intermediate, advanced and elementary. The durational order is as follows; elementary, control, intermediate and advance. The elementary learners are distinguished from the other bilinguals by this domain.



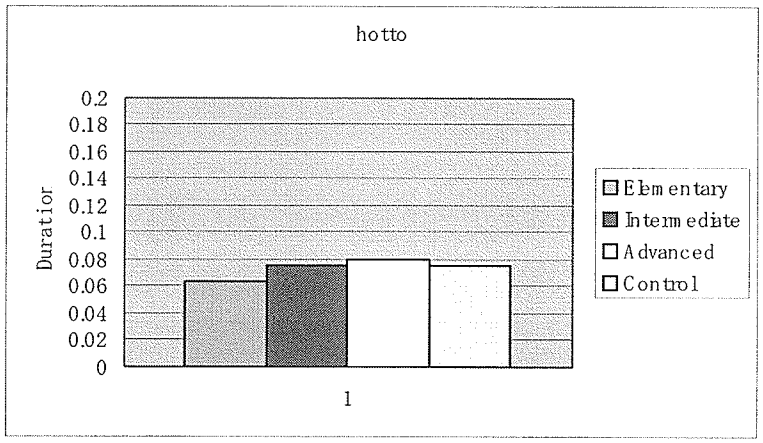
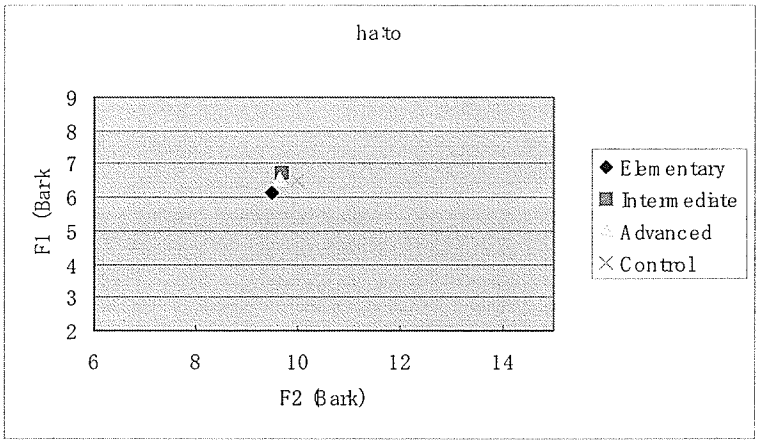


Fig. 81. The male bilingual group's production of Japanese /oQ/

Considering the results of the other analyses for mid-back vowels, it seems natural that most of the vowels are pronounced longer and may be shifted both horizontally and vertically. All bilinguals seem to have established/be establishing new vowel categories and frequently rely on durational cues, which may be the cause for

durational changes. Additionally, the elementary students appear to start using the spectral cues, although there are no statistical differences in Barks. This tendency occurs among the intermediate students as well, and may explain why there are some changes in their Japanese vowels. In comparison, the advance-level students do show statistical differences in some pairs in B1 and B2, which is a likely cause for positional changes in all the vowels.

As shown in Fig. 82, the elementary learners have the lowest B1 for the long vowel /a:/. They are differentiated from the other bilingual groups, while there is no statistical difference between the controls and intermediate students nor between the control and advanced groups in B1. The elementary group has the lowest B2 and the control group has the highest. The difference between these two groups is statistically significant. As for B3, the intermediate bilinguals produce the highest value and the monolinguals produce the lowest, and these groups are distinguished from each other by this measure.



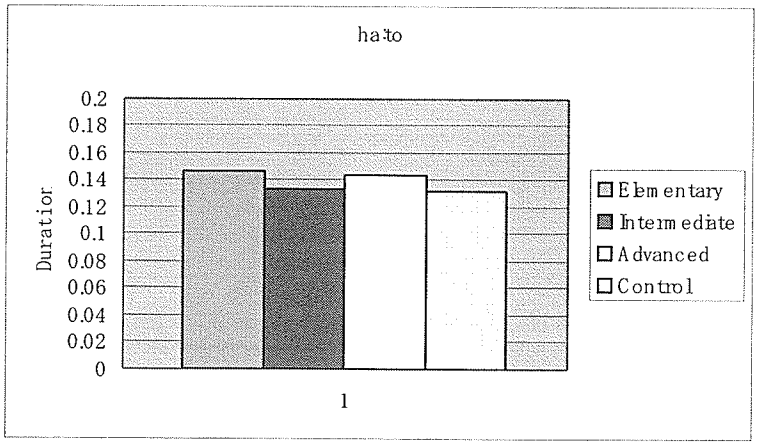
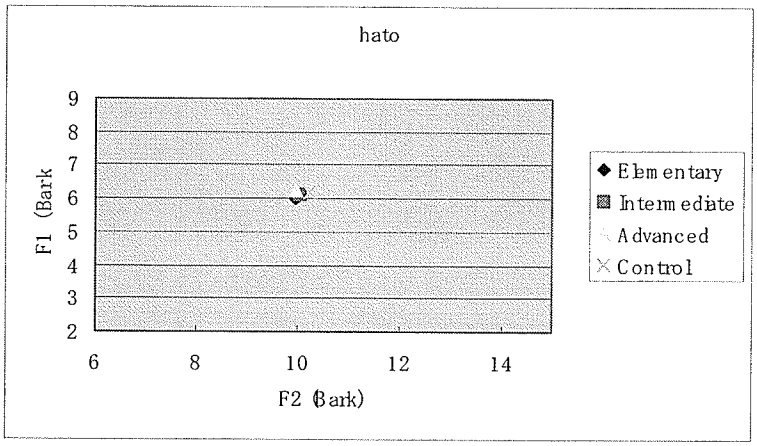


Fig. 82. The male bilingual group's production of Japanese /a:/

For /a/, as seen in Fig. 83, there is no significant difference between the four groups in B1 and B2. The difference between the advanced learners and the control speakers in B3 is statistically significant. The advanced group is also different from the intermediate level in this measure.



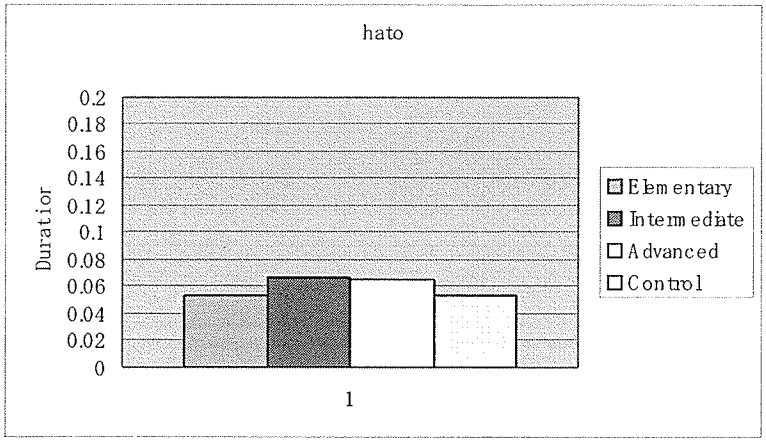
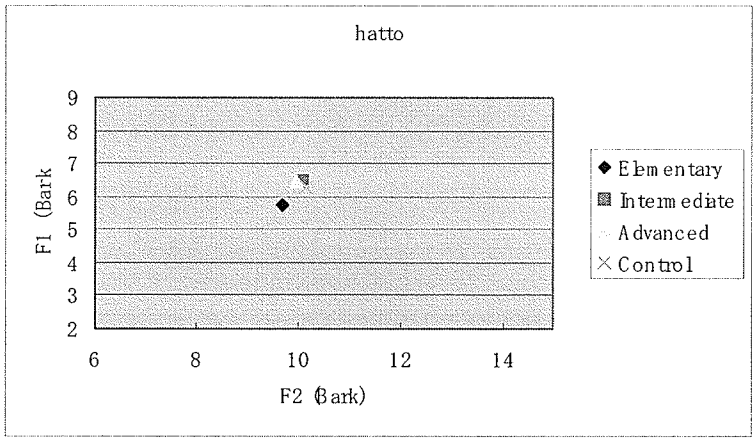


Fig. 83. The male bilingual group's production of Japanese /a/

Moving to /aQ/, the elementary students have the lowest B1 and the intermediate learners have the highest, as summarized in Fig. 84. The elementary group is statistically different from the other groups in this domain. The elementary bilinguals are different from the controls in B2 as well; the controls produce the highest value and the elementary learners produce the lowest.



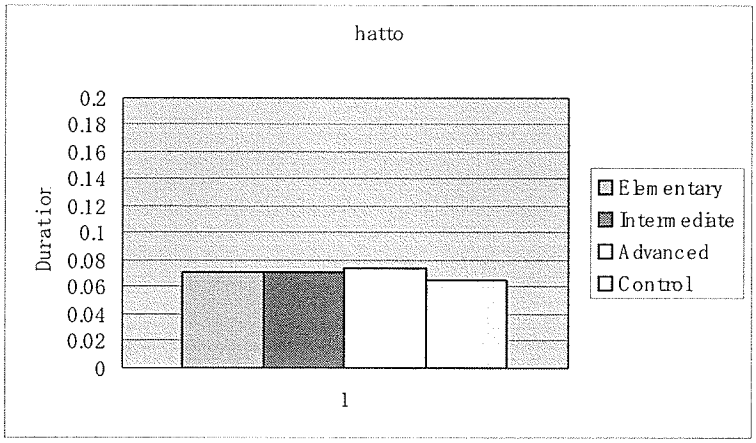


Fig. 84. The male bilingual group's production of Japanese /aQ/

The within-group analyses for low and central vowels suggest that the elementary group sometimes uses B2 to pronounce a vowel. This is a likely cause for the long and pre-geminate vowels being moved more rear, while the reason for the pre-geminate vowel's vertical move cannot be found. The intermediate students rely on B3 as well as the other domains. This seems to lead the bilinguals to produce the Japanese long vowel with higher B3. Similarly, the advanced learners rely on B3 as well as the other measures, which is likely to be the cause for B3 change in the Japanese short vowel.

The results generally fail to support the expectations. The male elementary group was predicted to be frequently different from the control group in duration, because it is the only cues that these bilinguals should rely on. However, the elementary learners do not show as many changes in this domain as predicted, and they show some shifts in formant frequencies, which is not expected to occur at this level. The male intermediate students are different in both length and formant frequencies, as was expected. These bilingual subjects, however, seem to be less influenced in this domain than the lower-level students, which is against the hypothesis that the higher-level learners will have more influence on formant frequencies. As with the female advanced learners, the male

advanced students do not show many differences in duration from the monolinguals. In addition, it is likely that the male advanced group is less affected in terms of formant frequencies than the lower-level students. These results also fail to follow the predictions.

4.3. Interaction between Japanese and English vowels: Merger of the results from the within-group and between-group analyses

This section addresses the question of whether L1 Japanese and L2 English influence one another, and if so, how? To this end, the results from the within-group analyses and those from the between-group analyses were compared.

The SLM predicts that the realization of productions will be intermediate between the L1 and L2, when category assimilation occurs. The SLM also predicts that when category dissimilation takes place, L2 learners will exaggerate the difference between the L1 and L2 sounds. Therefore, if learners have established a new category for an English vowel, it is expected that category dissimilation will occur and that its Japanese counterpart will be pronounced differently. Conversely, when an English vowel is merged into a Japanese vowel, the Japanese vowel will be intermediate between English and Japanese, which will also cause changes in the Japanese vowel. When category assimilation or dissimilation occurs, the changes may appear in the cues that the learners rely on in discriminating vowels in the same vowel space.

As the within-group analyses suggest, the female elementary learners have established completely independent categories for English /i/, /ɪ/, /u/, /ʊ/, /ɑ/ and /ɚ/, and merged categories for English /e/ and /ɛ/, /o/ and /ɔ/, and /æ/ and /ʌ/. The first category is separate from the Japanese vowels, but English /o/ shares some space with Japanese /o:/ and English /ʌ/ with Japanese /aQ/. The new categories for English /i/ and /ɪ/ seems to

condition changes in Japanese vowels /i:/ and /i/. These bilinguals relied on length, B1, B2 and/or B3 to distinguish one category from another in this vowel space, which may have caused longer pronunciation of Japanese /i:/ as well as the longer and higher B3 pronunciation of Japanese /i/. For the high-back vowels, the female elementary students have formed distinct categories for English /u/ and /ʊ/, relying on duration and position in the vowel space (B1 and B2). These new categories are a likely reason that the Japanese /u:/ is pronounced longer, and /u/ is longer and lower, although there is no plausible explanation for /uQ/ produced with higher B3. English /ə/ also has its own space, and this vowel is differentiated from Japanese /a:/, /a/ and /aQ/ by B1, B2, B3 and/or duration. This reliance on B1, B2 and duration may have caused the Japanese /a:/ to be produced higher and more back in the vowel space, and longer, and Japanese vowel /a/ longer as well. The elementary learners mostly depended on durational cues to differentiate a Japanese mid-front vowel from an English mid-front vowel, which is likely the cause for the lengthening of Japanese /e:/, /e/ and /eQ/. English vowel /ɑ/ is differentiated from the Japanese /o/ and /oQ/ by duration, B1 and/or B2. The establishment of the English vowel and the reliance on these cues are the likely reason why the Japanese short vowel is shifted upward and backward and produced longer, and the pre-geminate vowel was moved upward. In comparison, it appears that the merger of English /o/ into Japanese /o:/ may explain the upward movement of the Japanese vowel.

For the elementary male subjects, English /i/ was merged into Japanese vowel /i:/. These learners utilized duration, B2 and/or B3 to distinguish one high-front vowel from another. Therefore, it can be inferred that this combined vowel system and the reliance on these cues, especially on B2, moved /i:/ forward. These male participants, on

the contrary, have formed new categories for English /e/ and /ɛ/, relying on length and B2, which appears to be the explanation for lengthening of Japanese vowel /e/. However, no plausible reason that Japanese vowel /e:/, /e/ and /eQ/ were produced with lower B3 was found, because these bilinguals never used B3. The movement of Japanese vowel /o:/ may also have been caused by the merger of English /o/ and /ɔ/ into the Japanese vowel. It was not statistically significant, but it appears that these learners started relying on all the spectral cues, which may have shifted the Japanese vowel upward. In comparison, /ɑ/ has established its own space. This new category may have caused Japanese /o/ to be shifted upward and backward, and Japanese /oQ/ to be produced upward, backward and with higher B3. These changes in Japanese may be explained by the reliance on spectral cues in discriminating vowels, although the differences in these cues are not significant. The results also show that English /ʊ/ has not been formed and is not distinguished from Japanese /u/ and /uQ/. In addition, there is no shift in Japanese high-back vowels. Thus, it can be inferred that the male elementary students did not notice the differences between Japanese and English and, therefore, use the Japanese mixed category /u/ and /uQ/ for the English vowel. Contrarily, English /ɚ/ was merged into Japanese /a:/, and this combined vowel system may have caused the Japanese vowel to move backward. The establishment of a new category for /æ/ and /ʌ/ seems to have caused /aQ/ to shift as well; the vowel shifted upward and backward.

Moving to the female intermediate learners, the participants have established new categories for all the English vowels but /ɛ/. These female learners relied only on durational cues to distinguish one high-front vowel from another, which may explain the durational changes in /i:/ and /iQ/. Similarly, all the Japanese high-back vowels showed

changes in length, which may be the result of the reliance on temporal cues. Japanese /u/ and /uQ/ were moved lower as well. However, the cause for these position changes cannot be found, because these bilingual participants did not utilize B2 in order to differentiate one vowel from another in this vowel space. All the Japanese mid-back vowels, /o:/, /o/ and /oQ/, were shortened. This seems to be caused by the establishment of English /o/ and /ɔ/ and /ɑ/ and frequent reliance on duration. It also appears that the establishment of English /æ/, /ʌ/ and /ɚ/ caused changes in Japanese /a:/ and /a/; /a:/ was shortened and /a/ was more fronted. These shifts may have resulted from the use of duration and B2 respectively.

The intermediate male students merged English /i/ into Japanese /i:/, and English /ɪ/ into Japanese /i/ and /iQ/. These learners utilized length and B2 to distinguish one category from another in this vowels space. This reliance on these cues and the merger appeared to condition /i:/ to be more fronted, /i/ more fronted and longer, and /iQ/ longer. These bilingual participants have formed categories for English /e/ and /ɛ/, and relied on duration, B1, B2 and/or B3 in order to differentiate one mid-front vowel from another, which is a likely reason that Japanese /e/ and /eQ/ changed; they are produced longer and with higher B3. On the contrary, the male intermediate bilinguals merged English /u/ into Japanese /u:/, and English /ʊ/ into /u/ and /uQ/, and utilized only temporal cues. This reliance and mergers may explain why all the Japanese high-back vowels were longer, but do not explain the reason that /uQ/ was shifted upward. Similarly, English /o/ and /ɔ/ were merged into Japanese /o:/ and English /ɑ/ into Japanese /oQ/. The bilingual speakers relied mainly on temporal cues, but they also used all the spectral cues, although the differences in these spectral cues between the vowels were not statistically significant.

These mergers and reliance may explain why Japanese /o:/ was produced longer and with higher B3, /o/ more rear, and /oQ/ more rear and with higher B3. In contrast, /ɚ/ has been established in these learners' mind, and these bilinguals used duration, B2 and/or B3 in distinguishing one vowel from another in this vowel space. The change in /a:/ may be attributed to the establishment of the new vowel category and the reliance on these cues; the vowel is produced with higher B3.

Moving to the female advanced students, any new category for English high-front vowels has not been established, and English /i/ was mixed together with Japanese /i:/, and English /ɪ/ with Japanese /iQ/. These mergers are a likely cause for changes in Japanese /i:/ and /i/ and the reliance on length and B2 (and/or B3) may cause the long vowel to be longer and the short vowel further back. Similarly, these bilingual speakers merged English /e/ into Japanese /e:/, and English /ɛ/ into Japanese /eQ/, and relied on length and B1 to differentiate one category from another in this vowel space. It appears that the changes in Japanese /e:/ and /e/ were caused by the mergers and the reliance on these cues; /e:/ was produced higher and longer and /e/ was produced higher. In comparison, the female advanced learners have formed new categories for English /u/ and /ʊ/, utilizing duration and/or B3. This may have caused /uQ/ to be pronounced with higher B3, although any plausible cause for the backward movement of Japanese /u/ cannot be found. English /o/ and /ɔ/ were mixed together with Japanese /o:/, while /ɑ/ was merged into Japanese /o/, which may have caused /o:/ to be pronounced higher, /o/ with higher B3 and /oQ/ higher and with higher B3. These learners used length as well as B1, B2 and/or B3, which may be the reason why the changes appeared in duration and B3. English /ɚ/ has obtained its own space, and the female learners relied on duration and B2

in discriminating the English vowel from Japanese /a:/. This reliance on length and B2 and the establishment of the new category may be the explanation for the forward movement of the Japanese vowel. On the contrary, /ʌ/ was merged into Japanese /a/, which may explain the forward shift of the Japanese vowel. (The apparent reason that Japanese /aQ/ was moved forward and pronounced with higher B3 was not found. It might be caused by the merger of the English vowel into the Japanese vowel, or by the establishment of a new category, but further research is needed to find the explanation.)

The male advanced students merged English /i/ into Japanese /i:/. This merger seems to cause the Japanese vowel to mover forward. When distinguishing one category in this vowel space from another, these learners utilized length, B1, B2 and/or B3, which may be the reason that /i:/ moved forward. In comparison, the male advanced bilinguals have formed new categories for English /e/ and /ɛ/, and used duration, B1 and/or B2, which may explain why Japanese /eQ/ was lengthened, but does not explain the reason that /e/ was pronounced with lower B3. Two categories for English mid-back vowels have been formed: one is for /o/ and /ɔ/ and the other is /ɑ/. For the mid-back vowels, the bilingual participants relied mainly on duration, but they sometimes used B1 and B2 as well, which is a likely reason why all the Japanese vowels in this vowel space were moved backward and /o:/ was pronounced longer. However, the reliance on these cues does not explain why /o/ and /oQ/ were produced with higher B3. Similarly, new categories for all the English low and central vowels have been formed based on length and/or spectral cues, which may cause Japanese /a/ to be pronounced with lower B3.

The results of the two types of analyses mostly follow the expectations and suggest that there tends to be a correlation between the establishment of a new category

for L2 and changes in L1, between the merger of L2 into L1 and changes in L1, and between cue shifts and changes in L1.

4.4. What does it all mean?

The results reported here suggest that there are L2 competence effects among the elementary, intermediate and advanced students in the production of Japanese and English vowels. Although there are some disparities between the expectations and the actual results, there is also evidence of correlations between L1 Japanese and L2 English.

The within-group analyses indicate that students at different English levels categorized Japanese and English vowels differently, and that the higher-level groups tended to utilize more formant frequencies than temporal cues, although the male elementary group was an exception. These results generally followed the expectations, but there was a disparity; it was not always the case that higher-level students have more distinct vowels than lower-level students. The possible explanations for the disaccord with the expectations will be provided later.

The between-group analyses suggest that all the English vowels produced by female bilingual participants with different L2 levels were distinguished from one another by B1, B2, B3 and/or duration. The results also imply that higher-level bilingual speakers tend to produce the high vowels (/i/, /ɪ/ and /ʊ/) with lower B1 (as a higher vowel than lower-level learners) and that they pronounce the mid and low vowels /ɛ/ and /æ/ with higher B1 (at a lower position). The bilingual subjects with higher English competence also produce the front and central vowels (/ɪ/, /e/, /æ/, and /ʌ/) with higher B2 and the back vowels (/u/ and /ʊ/) with lower B2. There seems to be a pattern related to duration as well; the higher competence the learners have, the shorter duration they

utilize. Unlike the female participants, the male bilinguals were not differentiated from each other in English /i/ and /o/ by any measure. The other English vowels produced by the bilinguals with different English levels, however, were different from one another in B1, B2, B3 and/or duration.

The results also suggest that the higher the L2 level, the higher B1 and B2 the learners tend to produce in English. Therefore, as expected, L2 pronunciation changed through experience, although the female and male participants behaved differently. This difference between genders may have been caused by culture and/or gender difference in adaptability to language as well as physical differences. Johnson (2006) compared L1 sounds produced by male and female speakers of different L1. The difference between the Australian men and women was much larger than Johnson anticipated if the difference was caused only by the difference in vocal tract length, while the gap between Danish male and female speakers was as not large as expected. The author concluded that the differences between genders were caused not only by the physical difference but also by culture-based gender differences. Tahta, Wood and Loewenthal (1981) investigated the foreign accents of bilingual speakers and concluded that the female subjects were less foreign accented than the male participants. However, gender difference in this field is controversial and more research is needed to find a concrete answer.

The results also imply that the higher L2 proficiency bilinguals have, the more native-like they become in their production of English. Although no monolingual English speaking controls are used in this research, this assumption is supported by previous research. Flege, Bohn and Jang (1997) examined the English vowels produced by experienced non-native speakers and those produced by inexperienced non-native

speakers whose L1s are German, Spanish, Mandarin and Korean. Their results revealed that the productions by the experienced subjects were identified as intended more frequently than those produced by inexperienced participants, by native English listeners.

The results of the between-group analyses for Japanese suggest that all the Japanese vowels but /iQ/ and /aQ/ produced by the female elementary bilinguals were differentiated from those produced by the controls. The changes appeared in length in 11 vowels, in B1 in 5 vowels, in B2 and B3 in 2 vowels. The male elementary learners pronounced all the Japanese mid vowels, /i:/, /a:/ and /aQ/ differently from the monolingual speakers. The bilingual participants had 2 changes in duration, 3 in B1, 5 in B2 and 4 in B3. For the female intermediate students, no changes occurred in mid-front vowel, /i/ and /aQ/, but appeared everywhere else. These speakers utilized durational cues frequently as with the elementary female learners; 9 vowels changed in duration. There were some shifts in formant frequencies as well: 2 vowels shifted in B1 and 1 vowel in B2 and B3. All the Japanese vowels but /e:/, /a/ and /aQ/ produced by the male intermediate learners were distinguished from those produced by the control speakers. The differences occurred in length of 7 vowels, in B1 of 1 vowel and B2 and B3 of 4 vowels. The female advanced students produced every vowel except /iQ/, /eQ/ and /u:/ differently from the control-group speakers. Three vowels changed in duration, 4 vowels in B1, B2 and B3. For the male advanced group, the bilinguals produced all the mid-back vowels, /a/, /i:/, /e/ and /eQ/ differently from the monolinguals. The shifts appeared in three measures: length of 2 vowels and B2 and B3 of 4 vowels.

These results reported here suggest that L2 English acquisition does affect L1 Japanese production, which is consistent with the predictions based on the SLM. The

model postulates that if category assimilation or category dissimilation occurs, L1 production will change (More details will be discussed later.). However, the results did not always follow the expectations. The elementary learners were not expected to show any influence on formant frequencies by English learning, but these learners showed some changes. These shifts among the elementary students may indicate that the L2 effects on L1 start occurring even at a very early stage of L2 learning.

The results also indicate that changes through L2 experimence appeared not only in duration but also in formant frequencies, and that the cues preferred were different from one level to another. The Japanese vowels produced by the lower-level groups generally had more changes in duration than in formant frequencies, while the advanced students showed more shifts in formant frequencies than in length. The behaviour of the two lower-level groups may be explained by Morrison's (2002) research. In his experiment, Japanese speakers tended to rely on temporal cues, instead of spectral cues in distinguishing English vowels. According to Morrison, the reason for the strong preference for durational cues over spectral cues is that the temporal cues are the only cues utilized in Japanese and easier for Japanese speakers to detect. The elementary and intermediate subjects in the present research may have paid more attention to temporal cues than spectral cues as with the subjects in Morrison's experiment, while the advanced learners had shifted the cues and relied more on formant frequencies.

The cue shifts may be supported by previous research as well. Guion and Pederson (2007) found that advanced Mandarin learners whose L1 is English judged synthesized tones based on both average F0 and F0 slope, similarly to native Mandarin

speakers, while English monolingual and Japanese-English bilingual speakers did not rely on F0 slope.

Against the expectations, it was not always the case that the Japanese vowels produced by higher-level students were more influenced by L2 acquisition in terms of formant frequencies. As for the female bilingual participants, the advanced learners were most influenced, but the least influenced was the intermediate group, not the elementary group. For the male subjects, the degree of the influence on the two higher-level groups was almost the same, but the elementary learners were much more affected. The possible causes for this discrepancy will be argued later in this chapter.

Merging the results from the within-group and between-group analyses suggest that there was interaction between L1 Japanese and L2 English. This interaction between the two languages seems to be caused by the blending of English into Japanese or the establishment of a new English category. It can be inferred that the Japanese-English bilinguals in this study produced an intermediate sound between L1 and L2 when they merged an English vowel into a Japanese vowel. This merger is a likely cause for the changes in the Japanese vowel in duration and/or formant frequencies, depending on which cues the learners utilize.

In comparison, when these learners established a new category for an English vowel, the difference between the English vowel and its Japanese counterpart may be exaggerated, and the Japanese vowel was produced differently from the one produced by the monolingual Japanese speakers. These behaviours of the L2 learners are consistent with Flege's SLM (1992). The SLM predicts that if an L2 learner perceives an L2 speech sound as "similar" to an L1 speech sound, the L2 category will merge into the L1

category. The realization of the merged category will be intermediate between the L1 and L2, which is called category assimilation. In contrast, if the L2 sound is perceived as "new", a new category for the L2 will be established. If the L1 and L2 categories are phonetically similar, the speaker may exaggerate the differences between the L1 and L2 in order to keep these two sounds distinct. This exaggeration is called category dissimilation.

As mentioned earlier, there are some discrepancies between the predictions and the actual results, which may be caused by a number of factors, including, for example, age of learning. The participants in this experiment were selected based on their English proficiency, and their age of learning is not taken into account. Some previous research, however, demonstrated the influence of age of learning on L1 and L2 production, although the degree of the L2 effect on the L1 is not clear. Guion's (2003) study found that the earlier they start learning L2, the more likely it is that the bilinguals learn the L2 vowels accurately. However, the lower the age of learning, the more likely it is that their L1 sounds change, although the simultaneous bilinguals were exceptional and they showed no interaction between the two languages. Kang and Guion (2006) examined early and late Korean-English bilinguals stop production. These researchers found that the early bilinguals produced L2 English native-like and pronounced their L1 stops in the same manner as the monolingual Korean speakers. In other words, L1 and L2 do not affect each other in these bilinguals' minds. In contrast, the late bilingual participants were different from both the English and the Korean monolinguals, which means that there is interrelated influence between L1 Korean and L2 English in the late bilinguals'

production. Hence, if participants' age ranges had been more similar, the results might have been closer to the anticipated ones.

Flege, Yeni-komshian and Liu (1999) pointed out that the amount of L1 and L2 use may influence learners' L2 pronunciation as well. The authors divided native Korean-speaking immigrants to the United States who shared the age of learning into two groups. One was those who spoke English relatively seldom and Korean often and the other was those who used English relatively often and Korean seldom. The group with more English use was found to have a significantly better pronunciation than the other group. Flege et al. concluded that the amount of L1 and L2 use was a predictor of L2 foreign accent. The questionnaire for the present study showed that the amount of L2 learning was different from one participant to another (range 0.5-7 hour a week). This difference may have been one of the causes for the discrepancies.

It appears that learning method also influences L2 production. Hazan, Sennema, Iba and Faulkner (2005) trained speakers learning English. The researchers reported that the learners who received audiovisual training pronounced English sounds better than those who received only audio training. Therefore, if the participants in the present study used different learning methods outside of the classroom, their English production may have been affected.

Some researchers argue that motivation plays a role in L2 accent. Bongaerts, Summeren, Planken and Schils (1997) recruited 11 native Dutch speakers who were late learners of English. All of these participants but two were teaching English at a university or a teacher-training institute in Holland when they were tested and considered it very important to speak English without a Dutch accent. The results revealed that five of the

subjects had no foreign accent (as judged by native English speakers). Hence, the authors concluded that learners' motivation could predict the degree of their L2 accent. The motivation level was not asked in the questionnaire in the present study. However, it appeared that the subjects were learning English for various reasons, which may have influenced their motivation level and affected their English production.

Another possible factor affecting an L2 accent is formal instruction. Moyer (1999) recruited 24 English speakers whose L2 was German and who had experience teaching German to undergraduate students. After these participants received both suprasegmental and segmental training, native German speakers rated the German sounds produced by the English-German bilinguals. The results suggested that these bilingual speakers had obtained ratings close to those for native German controls. The English school where the participants for the present study were recruited offers courses focusing on different aspects of language, such as grammar, reading, conversation skills and pronunciation. Thus, there is a possibility that some of the subjects had taken the pronunciation lessons before the experiment and some had not, which may have caused the discrepancies between the predictions and the results.

When the participants were recorded may be one of the causes of the discrepancies. The behaviour of bilinguals may be influenced by the exposure to their L1 or L2 in the months before research, and this effect may occur after the bilinguals have been exposed to the L1 or L2 in hours or even minutes (Flege, Mackay and Piske, 2001). In the present study, some of the bilinguals were recorded right after their English lesson, while others were recorded earlier, which may have affected their L2 production.

The Japanese test words were written in *katakana*, which is a syllabic writing system often used for loan words. Some of the tested words are words borrowed from English, which may have caused the bilingual subjects, especially the advanced subjects, to consider the tested words English, instead of Japanese, and to pronounce the words more English-like. Thus, *hiragana*, which is normally used for non-borrowed words, should have been used in order to avoid this risk.

Because all the participants in this study live in Japan and their exposure to English is relatively limited, even the advanced learners' English competence was not very high. The differences in English levels among the three categories may not have been signifcant enough to obtain the anticipated results.

The numbers of the participants in this study might have been too small, which may have caused the discrepancies between the predictions and results. If there is a subject who behaves totally differently from the other subjects in a study with a small number of participants, it would impact the results severly. Therefore, a larger number of subjects should be used if further research is conducted.

Finally, it is important to mention again that no methods for correcting for Type I errors were utilized here. Therefore, 5% of significant differences found in this research occurred by chance.

5: Conclusion

This study investigated whether L1 Japanese and L2 English affect each other, and if so, whether the amount of interaction between these two languages changes depending on the learners' L2 competence. Do the students rely on different cues as their L2 English improves? The within-group analyses confirmed that the degree of independence of L1 Japanese and L2 English vowels is different from one level to another and that the cues relied on tend to change from durational cues to spectral cues through L2 experience. However, the degree of independence and the number of distinct vowel categories are not always as predicted; lower-level students sometimes have more separate categories than higher-level learners. The between-group analyses for English vowels seem to support the hypothesis that the higher the L2 level, the more native-like the learners' English becomes. Therefore, it can be inferred that as learners improve the L2, the influence of L1 on L2 decreases. The between-group analyses for Japanese vowels showed that the bilingual speakers behave differently from the monolingual speakers most of the time. This result indicates that L2 English does affect L1 Japanese, although the L2 English effect on L1 Japanese formant frequencies started occurring at an earlier stage of learning than expected. The amount of influence was not always larger on higher-level bilinguals, which was also contrary to expectations. The merger of the two types of analyses supports the predictions based on SLM and indicates that there is a correlation between the changes in L1 Japanese and L2 English learning. When a new category for English was established, its Japanese counterpart was usually changed. When an English category merged into a Japanese category, the Japanese vowel was often pronounced differently as well. In addition, changes in L1 Japanese frequently

appeared in the cues that the bilingual speakers relied on. Thus, it can be also inferred that there is correlation between the cue re-weightings and changes in L1.

As mentioned earlier, there are some discrepancies between the predictions and the actual results. Hence, in order to obtain more concrete conclusions on how bilinguals categorize L1 and L2 sounds and how much L2 competence influences L1 and L2 production, further research is needed, selecting subjects whose other conditions, including age of learning, learning methods, motivation and so on, are similar.

For future studies, particular care should be taken to address some of the issues that were not addressed or controlled here. For instance, expansion of differences between learners' L2 competence might be useful. In this study, years-of study at an English language school was one criterion for dividing the learners into the three groups although a replacement test that the students took before they started taking lessons was also taken into account. This categorization of subjects may or not reflect their actual L2 competence and does not control for other factors that may affect the results, such as out-of-classroom language involvement or experience, learning motivation and so on. Examining unscripted speech or using test words written in *hiragana* (as opposed to *katakana* used in this study which is frequently used for foreign and loan words in Japanese writing) might reveal a more natural speech style than that studied here.

Nonetheless, it is found that L2 competence level does seem to influence L1 pronunciation and this study provides further support for the SLM.

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Appendix A

Scripts

Japanese

1. もう一度「ホート」と言ってください。
2. もう一度「フット」と言ってください。
3. もう一度「ヘト」と言ってください。
4. もう一度「ハット」と言ってください。
5. もう一度「ヘート」と言ってください。
6. もう一度「ヒト」と言ってください。
7. もう一度「ハート」と言ってください
8. もう一度「ホト」と言ってください。
9. もう一度「ホット」と言ってください。
10. もう一度「ヘット」と言ってください。
11. もう一度「ヒート」と言ってください。
12. もう一度「フト」と言ってください。
13. もう一度「ハト」と言ってください。
14. もう一度「フート」と言ってください。
15. もう一度「ヒット」と言ってください。
16. もう一度「フト」と言ってください。
17. もう一度「ホット」と言ってください。
18. もう一度「ヒト」と言ってください。
19. もう一度「フート」と言ってください。
20. もう一度「ホット」と言ってください。
21. もう一度「ヘト」と言ってください。
22. もう一度「ホート」と言ってください。
23. もう一度「ヘット」と言ってください。
24. もう一度「ハト」と言ってください。
25. もう一度「フト」と言ってください。
26. もう一度「ヒット」と言ってください。
27. もう一度「ヒート」と言ってください。
28. もう一度「フット」と言ってください。
29. もう一度「ハット」と言ってください。
30. もう一度「ハート」と言ってください
31. もう一度「ヘート」と言ってください。

32. もう一度「ホト」と言ってください。
33. もう一度「ヒト」と言ってください。
34. もう一度「フット」と言ってください。
35. もう一度「ハート」と言ってください
36. もう一度「ヒット」と言ってください。
37. もう一度「ヘット」と言ってください。
38. もう一度「ヒット」と言ってください。
39. もう一度「ハット」と言ってください。
40. もう一度「ホート」と言ってください。
41. もう一度「ハート」と言ってください
42. もう一度「フト」と言ってください。
43. もう一度「フート」と言ってください。
44. もう一度「ヒト」と言ってください。
45. もう一度「フット」と言ってください。
46. もう一度「ホット」と言ってください。
47. もう一度「ヘト」と言ってください。
48. もう一度「ヘート」と言ってください。
49. もう一度「ホト」と言ってください。
50. もう一度「ヒート」と言ってください。
51. もう一度「ハト」と言ってください。
52. もう一度「フート」と言ってください。
53. もう一度「ヘト」と言ってください。
54. もう一度「ハット」と言ってください。

English

1. Say “head” again.
2. Say, “herd” again.
3. Say, “hud” again.
4. Say “hod” again.
5. Say, “who’d” again.
6. Say “hawed” again.
7. Say, “hood” again.
8. Say “had” again.
9. Say, “heed” again.
10. Say “hoed” again.
11. Say, “hid” again.
12. Say, “hayed” again.
13. Say “hawed” again.
14. Say, “heed” again.
15. Say “head” again.
16. Say, “hid” again.
17. Say, “who’d” again.
18. Say, “hood” again.
19. Say, “hayed” again.
20. Say, “hud” again.
21. Say “had” again.
22. Say “hod” again.
23. Say, “herd” again.
24. Say “hoed” again.
25. Say “hoed” again.
26. Say “hod” again.
27. Say “head” again.
28. Say “hawed” again.
29. Say, “hud” again.
30. Say “hoed” again.
31. Say “hod” again.
32. Say “had” again.
33. Say, “hood” again.
34. Say, “herd” again.
35. Say, “who’d” again.
36. Say “head” again.
37. Say, “heed” again.
38. Say, “hayed” again.

39. Say, “hid” again.
40. Say, “hud” again.
41. Say, “herd” again.
42. Say, “who’d” again.

Appendix B

Tables for analyses

Within-group analyses

Elementary

High-front

Descriptive Statistics

Female				Male		
Word	Mean	Std. Dev.	Count	Mean	Std. Dev.	Count
B1, Total	3.854	0.846	129	2.898	0.646	108
B1, heed	4.048	0.412	24	2.859	0.319	27
B1, hi:to	3.448	0.351	24	3.093	1.091	27
B1, hid	4.67	1.311	27	2.777	0.529	27
B1, hito	3.457	0.455	29	2.801	0.38	6
B1, hitto	3.604	0.495	27	2.881	0.281	21
B2, Total	13.752	1.705	129	13.597	0.463	108
B2, heed	13.693	1.379	24	13.776	0.33	27
B2, hi:to	14.66	1.284	24	13.649	0.522	27
B2, hid	12.64	1.353	27	13.638	0.32	27
B2, hito	14.089	1.718	29	12.831	0.351	6
B2, hitto	13.658	2.022	27	13.468	0.496	21
B3, Total	15.974	0.435	129	15.642	0.348	108
B3, heed	15.73	0.462	24	15.595	0.186	27
B3, hi:to	16.32	0.395	24	15.767	0.255	27
B3, hid	15.76	0.306	27	15.434	0.493	27
B3, hito	16	0.293	29	15.482	0.127	6
B3, hitto	16.068	0.442	27	15.853	0.248	21

Scheffe for B1

Female				Male		
Word	Mean Diff.	Crit. Diff.	P-Value	Mean Diff.	Crit. Diff.	P-Value
heed, hi:to	0.6	0.645	0.082	-0.235	0.553	0.777
heed, hid	-0.621	0.626	0.053	0.082	0.553	0.995
heed, hito	0.591	0.663	0.114	0.057	0.917	1
heed, hitto	0.444	0.626	0.301	-0.022	0.591	>.9999
hi:to, hid	-1.222	0.626	<.0001	0.316	0.553	0.524
hi:to, hito	-0.09	0.663	>.9999	0.292	0.917	0.909
hi:to, hitto	-0.156	0.626	0.962	0.213	0.591	0.865
hid, hito	1.212	0.642	<.0001	-0.024	0.917	>.9999
hid, hitto	1.066	0.608	<.0001	-0.104	0.591	0.989
hito, hitto	-0.147	0.642	0.988	-0.08	0.94	0.999

Scheffe for B2

Female				Male		
Word	Mean Diff.	Crit. Diff.	P-Value	Mean Diff.	Crit. Diff.	P-Value
heed, hi:to	-0.967	1.435	0.355	0.126	0.358	0.874
heed, hid	1.053	1.394	0.239	0.138	0.358	0.835
heed, hito	-0.395	1.483	0.976	0.944	0.594	2E-04
heed, hitto	0.035	1.394	>.9999	0.308	0.383	0.183
hi:to, hid	2.02	1.394	7E-04	0.011	0.358	>.9999
hi:to, hito	0.571	1.483	0.888	0.818	0.594	0.002
hi:to, hitto	1.002	1.394	0.288	0.182	0.383	0.697
hid, hito	-1.449	1.437	0.467	0.807	0.594	0.002
hid, hitto	-1.018	1.352	0.243	0.17	0.383	0.746
hito, hitto	0.431	1.437	0.96	-0.637	0.609	0.035

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	-0.59	0.348	<.0001	-0.172	0.269	0.406
heed, hid	-0.03	0.338	0.999	0.161	0.269	0.477
heed, hito	-0.271	0.357	0.261	0.113	0.446	0.959
heed, hitto	-0.338	0.363	0.084	-0.258	0.288	0.102
hi:to, hid	0.56	0.338	<.0001	0.334	0.269	0.007
hi:to, hito	0.32	0.357	0.11	0.286	0.446	0.406
hi:to, hitto	0.252	0.338	0.252	-0.086	0.288	0.927
hid, hito	-0.24	0.346	0.362	-0.048	0.446	0.998
hid, hitto	-0.308	0.328	0.078	-0.42	0.288	7E-04
hito, hitto	-0.068	0.346	0.994	-0.372	0.458	0.174

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.101	0.047	129	0.094	0.036	108
Duration, heed	0.124	0.045	24	0.124	0.015	27
Duration, hi:to	0.167	0.032	24	0.128	0.016	27
Duration, hid	0.085	0.017	27	0.069	0.018	27
Duration, hito	0.068	0.03	27	0.038	0.016	6
Duration, hitto	0.074	0.01	27	0.059	0.013	21

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	-0.043	0.026	<.0001	-0.004	0.013	0.925
heed, hid	0.039	0.025	2E-04	0.054	0.013	<.0001
heed, hito	0.051	0.025	<.0001	0.086	0.022	<.0001
heed, hitto	0.05	0.025	<.0001	0.065	0.014	<.0001
hi:to, hid	0.082	0.025	<.0001	0.058	0.013	<.0001
hi:to, hito	0.094	0.025	<.0001	0.09	0.022	<.0001
hi:to, hitto	0.094	0.025	<.0001	0.069	0.014	<.0001
hid, hito	0.012	0.024	0.312	0.032	0.022	0.001
hid, hitto	0.011	0.024	0.685	0.01	0.014	0.274
hito, hitto	-0.001	0.024	>.9999	-0.021	0.023	0.086

Mid-front

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.933	0.986	123	3.924	0.461	132
B1, hayed	4.823	1.44	24	3.734	0.276	24
B1, he:to	4.917	0.851	27	3.996	0.478	27
B1, head	5.045	0.965	21	4.016	0.453	27
B1, heto	4.97	0.838	27	3.885	0.573	27
B1, hetto	4.924	0.8	24	3.965	0.435	27
B2, Total	13.174	1.673	123	12.918	0.426	132
B2, hayed	12.35	2.156	24	13.329	0.326	24
B2, he:to	13.935	0.771	27	13.004	0.265	27
B2, head	12.589	2.425	21	13.069	0.445	27
B2, heto	13.191	1.301	27	12.575	0.307	27
B2, hetto	13.634	0.764	24	12.656	0.278	27
B3, Total	15.598	0.603	123	14.785	0.315	132
B3, hayed	15.766	0.403	24	14.884	0.349	24
B3, he:to	15.57	0.547	27	14.708	0.279	27
B3, head	15.641	0.717	21	14.779	0.414	27
B3, heto	15.459	0.627	27	14.762	0.287	27
B3, hetto	15.582	0.695	24	14.803	0.211	27

Scheffe for B1						
Female				**Male**		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	-0.094	0.878	0.999	-0.262	0.4	0.386
hayed, head	-0.222	0.936	0.968	-0.282	0.4	0.309
hayed, heto	-0.147	0.878	0.991	-0.151	0.4	0.846
hayed, hetto	-0.101	0.904	0.998	-0.23	0.4	0.522
he:to, head	-0.129	0.911	0.996	-0.02	0.388	>.9999
he:to, heto	-0.053	0.852	1	0.111	0.388	0.938
he:to, hetto	-0.007	0.878	>.9999	0.032	0.388	1
head, heto	0.075	0.911	0.999	0.131	0.388	0.891
head, hetto	0.121	0.936	0.997	0.052	0.388	0.996
heto, hetto	0.046	0.878	>.9999	-0.08	0.388	0.982

Scheffe for B2						
Female				**Male**		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	-1.585	1.394	0.016	0.325	0.29	0.019
hayed, head	-0.24	1.485	0.992	0.259	0.29	0.105
hayed, heto	-0.841	1.394	0.471	0.754	0.29	<.0001
hayed, hetto	-1.285	1.434	0.104	0.673	0.29	<.0001
he:to, head	1.345	1.446	0.082	-0.066	0.281	0.97
he:to, heto	0.744	1.352	0.566	0.429	0.281	3E-04
he:to, hetto	0.3	1.394	0.978	0.347	0.281	0.007
head, heto	-0.601	1.446	0.791	0.494	0.281	<.0001
head, hetto	-1.045	1.485	0.309	0.413	0.281	6E-04
heto, hetto	-0.444	1.394	0.91	-0.081	0.281	0.936

Scheffe for B3						
Female				**Male**		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	0.195	0.531	0.856	0.176	0.276	0.413
hayed, head	0.125	0.565	0.975	0.105	0.276	0.839
hayed, heto	0.306	0.531	0.517	0.122	0.276	0.751
hayed, hetto	0.184	0.546	0.892	0.081	0.276	0.933
he:to, head	-0.071	0.55	0.997	-0.071	0.268	0.953
he:to, heto	0.111	0.515	0.978	-0.054	0.268	0.983
he:to, hetto	-0.012	0.531	>.9999	-0.095	0.268	0.872
head, heto	0.182	0.55	0.899	0.017	0.268	1
head, hetto	0.059	0.565	0.999	-0.024	0.268	0.999
heto, hetto	-0.123	0.531	0.971	-0.041	0.268	0.994

Descriptive Statistics						
Female				**Male**		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.12	0.052	123	0.104	0.045	132
Duration, hayed	0.156	0.032	24	0.142	0.042	24
Duration, he:to	0.166	0.017	27	0.148	0.028	27
Duration, head	0.13	0.068	21	0.1	0.025	27
Duration, heto	0.072	0.012	27	0.065	0.03	27
Duration, hetto	0.076	0.013	24	0.068	0.016	27

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	-0.01	0.029	0.903	-0.006	0.026	0.967
hayed, head	0.026	0.031	0.149	0.043	0.026	<.0001
hayed, heto	0.084	0.029	<.0001	0.077	0.026	<.0001
hayed, hetto	0.081	0.03	<.0001	0.074	0.026	<.0001
he:to, head	0.036	0.031	0.012	0.049	0.025	<.0001
he:to, heto	0.093	0.029	<.0001	0.083	0.025	<.0001
he:to, hetto	0.09	0.029	<.0001	0.08	0.025	<.0001
head, heto	0.058	0.031	<.0001	0.034	0.025	0.002
head, hetto	0.054	0.031	<.0001	0.031	0.025	0.005
heto, hetto	-0.003	0.029	0.998	-0.003	0.025	0.998

High-back

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.203	0.796	120	3.368	1.008	111
B1, fu:to	3.994	0.402	21	3.679	1.32	24
B1, futo	3.991	0.293	27	3.556	1.438	9
B1, futto	4.099	0.314	27	3.352	1.018	27
B1, hood	4.755	1.495	18	3.262	0.64	24
B1, who'd	4.145	0.429	27	3.139	0.742	27
B2, Total	11.381	1.213	123	10.407	1.503	111
B2, fu:to	10.381	0.473	21	10.272	1.973	24
B2, futo	11.301	0.437	27	10.19	1.157	9
B2, futto	11.186	0.446	27	10.766	1.717	27
B2, hood	11.433	0.425	18	10.632	1.06	24
B2, who'd	12.495	1.99	27	10.039	1.186	27
B3, Total	15.61	0.334	123	15.011	0.486	111
B3, fu:to	15.589	0.362	21	15.273	0.504	24
B3, futo	15.587	0.346	27	15.218	0.536	9
B3, futto	15.697	0.265	27	15.15	0.451	27
B3, hood	15.609	0.194	18	14.872	0.333	24
B3, who'd	15.559	0.428	27	14.693	0.406	27

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.003	0.675	>.9999	0.122	1.233	0.999
fu:to, futto	-0.105	0.675	0.993	0.327	0.885	0.854
fu:to, hood	-0.764	0.668	0.016	0.416	0.911	0.726
fu:to, who'd	-0.151	0.675	0.974	0.54	0.885	0.459
futo, futto	-0.109	0.632	0.99	0.204	1.214	0.991
futo, hood	-0.902	0.675	0.003	0.294	1.233	0.967
futo, who'd	-0.154	0.632	0.964	0.417	1.214	0.884
futto, hood	-0.793	0.675	0.012	0.089	0.885	0.999
futto, who'd	-0.046	0.632	1	0.213	0.859	0.962
hood, who'd	0.61	0.633	0.066	0.124	0.885	0.996

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	-0.92	0.932	0.055	0.082	1.841	>.9999
fu:to, futto	-0.805	0.932	0.129	-0.494	1.322	0.848
fu:to, hood	-1.052	1.03	0.042	-0.36	1.36	0.952
fu:to, who'd	-2.114	0.932	<.0001	0.233	1.322	0.989
futo, futto	0.115	0.872	0.997	-0.576	1.813	0.91
futo, hood	-0.132	0.976	0.996	-0.442	1.841	0.966
futo, who'd	-1.193	0.872	0.002	0.151	1.813	0.999
futto, hood	-0.247	0.976	0.96	0.134	1.322	0.999
futto, who'd	-1.309	0.872	4E-04	0.727	1.282	0.534
hood, who'd	-1.19	0.932	0.005	0.593	1.322	0.74

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.003	0.306	>.9999	0.055	0.536	0.999
fu:to, futto	-0.108	0.306	0.873	0.123	0.385	0.908
fu:to, hood	-0.024	0.325	1	0.401	0.396	0.045
fu:to, who'd	0.031	0.306	0.999	0.58	0.385	4E-04
futo, futto	-0.111	0.286	0.832	0.068	0.528	0.997
futo, hood	-0.026	0.306	0.999	0.346	0.536	0.399
futo, who'd	0.028	0.286	0.999	0.525	0.528	0.052
futto, hood	0.085	0.306	0.944	0.278	0.385	0.282
futto, who'd	0.139	0.286	0.681	0.457	0.373	0.008
hood, who'd	0.054	0.306	0.989	0.179	0.385	0.711

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.111	0.06	123	0.097	0.042	111
Duration, fu:to	0.164	0.025	21	0.132	0.018	24
Duration, futo	0.068	0.027	27	0.056	0.008	9
Duration, futto	0.069	0.018	27	0.058	0.018	27
Duration, hood	0.089	0.03	21	0.074	0.031	24
Duration, who'd	0.174	0.067	27	0.14	0.019	27

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.095	0.035	<.0001	0.076	0.026	<.0001
fu:to, futto	0.095	0.035	<.0001	0.074	0.019	<.0001
fu:to, hood	0.075	0.037	<.0001	0.058	0.019	<.0001
fu:to, who'd	-0.01	0.035	0.927	-0.007	0.019	0.815
futo, futto	-3.38E-04	0.033	>.9999	-0.002	0.026	1
futo, hood	-0.021	0.035	0.494	-0.018	0.026	0.356
futo, who'd	-0.106	0.033	<.0001	-0.083	0.026	<.0001
futto, hood	-0.02	0.035	0.511	-0.016	0.019	0.142
futto, who'd	-0.105	0.033	<.0001	-0.081	0.018	<.0001
hood, who'd	-0.085	0.035	<.0001	-0.065	0.019	<.0001

Mid-back

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.748	0.834	143	4.367	0.746	159
B1, hawed	4.42	0.54	27	4.296	0.941	27
B1, ho:to	4.643	0.512	27	4.451	0.78	27
B1, hod	6.536	1.539	11	4.321	0.469	27
B1, hoed	4.547	0.331	27	4.564	0.401	24
B1, hoto	4.695	0.601	23	4.104	0.976	27
B1, hotto	4.64	0.477	27	4.485	0.659	27
B2, Total	8.96	1.205	143	8.492	1.767	159
B2, hawed	9.423	1.353	27	8.712	2.603	27
B2, ho:to	8.337	1.334	27	8.246	2.4	27
B2, hod	10.25	0.797	11	8.493	0.663	27
B2, hoed	8.909	1.061	27	8.185	1.287	24
B2, hoto	8.536	0.764	23	8.928	1.617	27
B2, hotto	8.953	0.941	27	8.357	1.224	27
B3, Total	15.608	0.41	143	15.289	0.353	159
B3, hawed	15.485	0.653	27	15.343	0.455	27
B3, ho:to	15.705	0.261	27	15.394	0.381	27
B3, hod	15.396	0.278	11	15.173	0.298	27
B3, hoed	15.514	0.409	27	15.221	0.299	24
B3, hoto	15.683	0.28	23	15.233	0.335	27
B3, hotto	15.752	0.281	27	15.364	0.286	27

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	-0.223	0.588	0.896	-0.154	0.681	0.989
hawed, hod	-2.116	0.75	<.0001	-0.024	0.681	>.9999
hawed, hoed	-0.126	0.588	0.991	-0.268	0.702	0.893
hawed, hoto	-0.269	0.606	0.813	0.192	0.681	0.969
hawed, hotto	-0.22	0.588	0.901	-0.189	0.681	0.972
ho:to, hod	-1.893	0.75	<.0001	0.13	0.681	0.995
ho:to, hoed	0.097	0.588	0.997	-0.114	0.702	0.998
ho:to, hoto	-0.046	0.606	>.9999	0.346	0.681	0.709
ho:to, hotto	0.003	0.588	>.9999	-0.035	0.681	>.9999
hod, hoed	1.989	0.75	<.0001	-0.244	0.702	0.927
hod, hoto	1.847	0.764	<.0001	0.216	0.681	0.949
hod, hotto	1.896	0.75	<.0001	-0.165	0.681	0.985
hoed, hoto	-0.143	0.606	0.986	0.46	0.702	0.434
hoed, hotto	-0.094	0.588	0.998	0.079	0.702	1
hoto, hotto	0.049	0.606	>.9999	-0.381	0.681	0.615

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	1.086	1.008	0.026	0.466	1.629	0.967
hawed, hod	-0.795	1.284	0.5	0.219	1.629	0.999
hawed, hoed	0.514	1.008	0.705	0.528	1.679	0.952
hawed, hoto	0.86	1.039	0.174	-0.216	1.629	0.999
hawed, hotto	0.47	1.008	0.78	0.355	1.629	0.99
ho:to, hod	-1.881	1.284	4E-04	-0.247	1.629	0.998
ho:to, hoed	-0.572	1.008	0.599	0.061	1.679	>.9999
ho:to, hoto	-0.226	1.039	0.99	-0.682	1.629	0.849
ho:to, hotto	-0.617	1.008	0.514	-0.111	1.629	>.9999
hod, hoed	1.39	4.152	>.9999	0.308	1.679	0.996
hod, hoto	1.655	1.309	0.004	-0.435	1.629	0.976
hod, hotto	1.265	1.284	0.057	0.136	1.629	>.9999
hoed, hoto	0.346	1.039	0.938	-0.743	1.679	0.816
hoed, hotto	-0.045	1.008	>.9999	-0.172	1.679	1
hoto, hotto	-0.391	1.039	0.899	0.571	1.629	0.924

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	-0.22	0.365	0.533	-0.051	0.32	0.998
hawed, hod	0.065	0.466	0.999	0.17	0.32	0.667
hawed, hoed	-0.029	0.365	>.9999	0.122	0.329	0.905
hawed, hoto	-0.198	0.377	0.679	0.11	0.32	0.929
hawed, hotto	-0.267	0.365	0.304	-0.02	0.32	>.9999
ho:to, hod	0.285	0.466	0.513	0.221	0.32	0.372
ho:to, hoed	0.191	0.365	0.683	0.173	0.329	0.682
ho:to, hoto	0.022	0.377	>.9999	0.161	0.32	0.72
ho:to, hotto	-0.047	0.365	0.999	0.03	0.32	1
hod, hoed	-0.094	0.466	0.993	-0.048	0.329	0.999
hod, hoto	-0.263	0.475	0.625	-0.06	0.32	0.995
hod, hotto	-0.332	0.466	0.332	-0.19	0.32	0.546
hoed, hoto	-0.169	0.377	0.808	-0.012	0.329	>.9999
hoed, hotto	-0.238	0.365	0.44	-0.142	0.329	0.831
hoto, hotto	-0.069	0.377	0.996	-0.13	0.32	0.863

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.14	0.053	143	0.106	0.046	159
Duration, hawed	0.183	0.031	27	0.133	0.02	27
Duration, ho:to	0.178	0.031	27	0.147	0.018	27
Duration, hod	0.089	0.013	12	0.086	0.023	27
Duration, hoed	0.175	0.046	27	0.157	0.034	24
Duration, hoto	0.094	0.021	24	0.053	0.023	27
Duration, hotto	0.088	0.018	27	0.063	0.011	27

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	0.005	0.028	0.996	-0.013	0.02	0.436
hawed, hod	0.094	0.035	<.0001	0.047	0.02	<.0001
hawed, hoed	0.008	0.028	0.965	-0.024	0.021	0.015
hawed, hoto	0.089	0.029	<.0001	0.08	0.02	<.0001
hawed, hotto	0.095	0.028	<.0001	0.07	0.02	<.0001
ho:to, hod	0.089	0.035	<.0001	0.061	0.02	<.0001
ho:to, hoed	0.003	0.028	1	-0.011	0.021	0.725
ho:to, hoto	0.084	0.029	<.0001	0.094	0.02	<.0001
ho:to, hotto	0.09	0.028	<.0001	0.083	0.02	<.0001
hod, hoed	-0.086	0.035	<.0001	-0.071	0.021	<.0001
hod, hoto	-0.006	0.036	0.998	0.033	0.02	<.0001
hod, hotto	0.001	0.035	>.9999	0.023	0.02	0.019
hoed, hoto	0.081	0.029	<.0001	0.104	0.021	<.0001
hoed, hotto	0.087	0.028	<.0001	0.094	0.021	<.0001
hoto, hotto	0.006	0.029	0.989	-0.01	0.02	0.725

Low and central

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.156	1.277	153	5.905	0.837	162
B1, ha:to	7.423	0.778	27	6.133	0.36	27
B1, had	6.986	1.591	27	5.781	0.65	27
B1, hato	7.5	0.852	27	5.992	0.624	27
B1, hatto	7.498	0.812	27	5.757	0.766	27
B1, herd	6.243	1.746	27	5.823	0.472	27
B1, hud	7.354	1.051	18	5.941	1.575	27
B2, Total	11.028	0.913	153	9.952	0.827	162
B2, ha:to	10.484	0.319	27	9.493	0.397	27
B2, had	11.717	1.148	27	10.296	0.42	27
B2, hato	10.794	0.27	27	9.983	0.615	27
B2, hatto	10.748	0.352	27	9.701	0.43	27
B2, herd	11.402	1.418	27	9.629	0.755	27
B2, hud	11.017	0.501	18	10.609	1.343	27
B3, Total	15.25	0.679	153	14.768	0.454	162
B3, ha:to	15.474	0.399	27	14.791	0.46	27
B3, had	15.25	0.809	27	14.669	0.351	27
B3, hato	15.388	0.579	27	14.665	0.391	27
B3, hatto	15.338	0.361	27	14.758	0.371	27
B3, herd	15.181	0.783	27	14.75	0.267	27
B3, hud	14.675	0.867	18	14.972	0.718	27

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.437	1.112	0.88	0.352	0.771	0.796
ha:to, hato	-0.077	1.112	>.9999	0.142	0.771	0.996
ha:to, hatto	-0.075	1.112	>.9999	0.376	0.771	0.745
ha:to, herd	1.18	1.112	0.03	0.31	0.771	0.869
ha:to, hud	0.069	1.243	>.9999	0.192	0.771	0.983
had, hato	-0.514	1.112	0.786	-0.21	0.771	0.974
had, hatto	-0.513	1.112	0.788	0.024	0.771	>.9999
had, herd	0.742	1.112	0.411	-0.041	0.771	>.9999
had, hud	-0.369	1.243	0.962	-0.16	0.771	0.992
hato, hatto	0.001	1.112	>.9999	0.234	0.771	0.958
hato, herd	1.256	1.112	0.016	0.169	0.771	0.99
hato, hud	0.145	1.243	1	0.05	0.771	>.9999
hatto, herd	1.255	1.112	0.016	-0.065	0.771	1
hatto, hud	0.144	1.243	1	-0.184	0.771	0.985
herd, hud	-1.111	1.243	0.113	-0.119	0.771	0.998

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	-1.233	0.752	<.0001	-0.803	0.677	0.009
ha:to, hato	-0.31	0.752	0.857	-0.49	0.677	0.317
ha:to, hatto	-0.264	0.752	0.923	-0.208	0.677	0.956
ha:to, herd	-0.918	0.752	0.006	-0.137	0.677	0.993
ha:to, hud	-0.533	0.84	0.472	-1.117	0.677	<.0001
had, hato	0.923	0.752	0.006	0.313	0.677	0.787
had, hatto	0.969	0.752	0.003	0.595	0.677	0.126
had, herd	0.315	0.752	0.849	0.666	0.677	0.057
had, hud	0.699	0.84	0.17	-0.314	0.677	0.786
hato, hatto	0.046	0.752	>.9999	0.282	0.677	0.853
hato, herd	-0.608	0.752	0.197	0.353	0.677	0.687
hato, hud	-0.223	0.84	0.977	-0.627	0.677	0.09
hatto, herd	-0.654	0.752	0.133	0.071	0.677	1
hatto, hud	-0.269	0.84	0.947	-0.908	0.677	0.002
herd, hud	0.384	0.84	0.793	-0.98	0.677	5E-04

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.224	0.596	0.9	0.122	0.412	0.962
ha:to, hato	0.087	0.596	0.999	0.126	0.412	0.956
ha:to, hatto	0.136	0.596	0.988	0.033	0.412	>.9999
ha:to, herd	0.293	0.596	0.738	0.041	0.412	1
ha:to, hud	0.8	0.667	0.008	-0.181	0.412	0.822
had, hato	-0.137	0.596	0.988	0.004	0.412	>.9999
had, hatto	-0.088	0.596	0.999	-0.089	0.412	0.991
had, herd	0.069	0.596	1	-0.081	0.412	0.994
had, hud	0.576	0.667	0.139	-0.303	0.412	0.298
hato, hatto	0.049	0.596	>.9999	-0.093	0.412	0.989
hato, herd	0.207	0.596	0.927	-0.085	0.412	0.993
hato, hud	0.713	0.667	0.028	-0.307	0.412	0.283
hatto, herd	0.157	0.596	0.977	0.008	0.412	>.9999
hatto, hud	0.664	0.667	0.052	-0.214	0.412	0.69
herd, hud	0.506	0.667	0.262	-0.222	0.412	0.655

Descriptive Statistics

Female				Male		
Word	Mean	Std. Dev.	Count	Mean	Std. Dev.	Count
Duration, Total	0.123	0.05	153	0.096	0.041	162
Duration, ha:to	0.183	0.024	27	0.146	0.022	27
Duration, had	0.102	0.03	27	0.083	0.02	27
Duration, hato	0.089	0.021	27	0.054	0.016	27
Duration, hatto	0.083	0.018	27	0.071	0.019	27
Duration, herd	0.167	0.055	27	0.143	0.013	27
Duration, hud	0.111	0.025	18	0.079	0.029	27

Scheffe for Duration

Female				Male		
Word	Mean Diff.	Crit. Diff.	P-Value	Mean Diff.	Crit. Diff.	P-Value
ha:to, had	0.081	0.029	<.0001	0.063	0.019	<.0001
ha:to, hato	0.095	0.029	<.0001	0.092	0.019	<.0001
ha:to, hatto	0.1	0.029	<.0001	0.075	0.019	<.0001
ha:to, herd	0.016	0.029	0.621	0.003	0.019	0.997
ha:to, hud	0.072	0.032	<.0001	0.067	0.019	<.0001
had, hato	0.014	0.029	0.774	0.028	0.019	2E-04
had, hatto	0.019	0.029	0.417	0.011	0.019	0.537
had, herd	-0.065	0.029	<.0001	-0.06	0.019	<.0001
had, hud	-0.009	0.032	0.971	0.003	0.019	0.997
hato, hatto	0.006	0.029	0.994	-0.017	0.019	0.095
hato, herd	-0.078	0.029	<.0001	-0.089	0.019	<.0001
hato, hud	-0.023	0.032	0.357	-0.025	0.019	0.002
hatto, herd	-0.084	0.029	<.0001	-0.071	0.019	<.0001
hatto, hud	-0.028	0.032	0.13	-0.008	0.019	0.832
herd, hud	0.056	0.032	<.0001	0.063	0.019	<.0001

Intermediate

High-front

Descriptive Statistics

Female				Male		
Word	Mean	Std. Dev.	Count	Mean	Std. Dev.	Count
B1, Total	3.608	0.577	171	2.958	0.665	117
B1, heed	3.784	0.698	36	2.895	0.295	27
B1, hi:to	3.586	0.411	36	2.921	0.26	27
B1, hid	3.713	0.743	36	2.872	0.276	30
B1, hito	3.441	0.443	27	3.453	2.237	9
B1, hitto	3.475	0.429	36	2.993	0.327	24
B2, Total	14.477	1.345	171	13.779	0.331	117
B2, heed	14.203	1.606	36	13.945	0.312	27
B2, hi:to	14.521	1.772	36	13.791	0.264	27
B2, hid	14.621	0.996	36	13.742	0.279	30
B2, hito	14.478	1.135	27	13.77	0.571	9
B2, hitto	14.56	1.003	36	13.629	0.308	24
B3, Total	16.003	0.516	171	15.761	0.485	117
B3, heed	15.848	0.406	36	15.714	0.413	27
B3, hi:to	16.157	0.517	36	15.854	0.512	27
B3, hid	15.989	0.522	36	15.596	0.446	30
B3, hito	15.99	0.567	27	16.059	0.669	9
B3, hitto	16.026	0.548	36	15.805	0.454	24

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	0.198	0.418	0.703	-0.027	0.562	>.9999
heed, hid	0.071	0.418	0.991	0.022	0.548	>.9999
heed, hito	0.343	0.451	0.236	-0.559	0.795	0.31
heed, hitto	0.309	0.418	0.262	-0.098	0.58	0.991
hi:to, hid	-0.127	0.418	0.925	0.049	0.548	0.999
hi:to, hito	0.145	0.451	0.91	-0.532	0.795	0.361
hi:to, hitto	0.111	0.418	0.953	-0.072	0.58	0.997
hid, hito	0.272	0.451	0.477	-0.581	0.785	0.258
hid, hitto	0.238	0.418	0.535	-0.121	0.566	0.978
hito, hitto	-0.034	0.451	1	0.46	0.808	0.529

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	-0.318	0.993	0.91	0.153	0.272	0.541
heed, hid	-0.418	0.993	0.786	0.203	0.265	0.227
heed, hito	-0.275	1.073	0.959	0.175	0.385	0.732
heed, hitto	-0.358	0.993	0.868	0.315	0.28	0.018
hi:to, hid	-0.1	0.993	0.999	0.05	0.265	0.987
hi:to, hito	0.043	1.073	>.9999	0.021	0.385	1
hi:to, hitto	-0.039	0.993	>.9999	0.162	0.28	0.515
hid, hito	0.143	1.073	0.996	-0.028	0.38	1
hid, hitto	0.061	0.993	1	0.113	0.274	0.798
hito, hitto	-0.083	1.073	1	0.141	0.391	0.865

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	-0.309	0.376	0.168	-0.14	0.405	0.882
heed, hid	-0.141	0.376	0.849	0.118	0.395	0.928
heed, hito	-0.142	0.406	0.879	-0.345	0.573	0.473
heed, hitto	-0.178	0.376	0.703	-0.091	0.418	0.976
hi:to, hid	0.167	0.376	0.75	0.258	0.395	0.386
hi:to, hito	0.166	0.406	0.803	-0.205	0.573	0.868
hi:to, hitto	0.13	0.376	0.883	0.049	0.418	0.998
hid, hito	-0.001	0.406	>.9999	-0.463	0.566	0.169
hid, hitto	-0.037	0.376	0.999	-0.209	0.408	0.631
hito, hitto	-0.036	0.406	0.999	0.254	0.582	0.76

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.088	0.04	171	0.1	0.041	117
Duration, heed	0.141	0.023	36	0.137	0.037	27
Duration, hi:to	0.108	0.01	36	0.132	0.023	27
Duration, hid	0.086	0.019	36	0.071	0.019	30
Duration, hito	0.034	0.006	27	0.055	0.018	9
Duration, hitto	0.055	0.015	36	0.074	0.016	24

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	0.033	0.012	<.0001	0.005	0.021	0.97
heed, hid	0.055	0.012	<.0001	0.066	0.02	<.0001
heed, hito	0.107	0.013	<.0001	0.082	0.03	<.0001
heed, hitto	0.086	0.012	<.0001	0.063	0.022	<.0001
hi:to, hid	0.022	0.012	<.0001	0.061	0.02	<.0001
hi:to, hito	0.074	0.013	<.0001	0.077	0.03	<.0001
hi:to, hitto	0.053	0.012	<.0001	0.058	0.022	<.0001
hid, hito	0.052	0.013	<.0001	0.017	0.029	0.54
hid, hitto	0.031	0.012	<.0001	-0.003	0.021	0.996
hito, hitto	-0.021	0.013	<.0001	-0.019	0.03	0.397

Mid-front

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.401	0.715	177	4.014	0.36	123
B1, hayed	5.027	0.965	36	3.74	0.482	18
B1, he:to	5.434	0.566	36	3.964	0.286	27
B1, head	5.681	0.829	36	4.161	0.315	24
B1, heto	5.384	0.547	33	4.043	0.341	30
B1, hetto	5.477	0.356	36	4.091	0.293	24
B2, Total	14.147	0.966	177	13.14	0.334	123
B2, hayed	14.585	0.591	36	13.562	0.187	18
B2, he:to	14.219	1.014	36	13.349	0.228	27
B2, head	13.945	1.096	36	13.23	0.205	24
B2, heto	13.666	1.317	33	12.847	0.167	30
B2, hetto	14.281	0.214	36	12.866	0.199	24
B3, Total	15.755	0.517	177	14.908	0.31	123
B3, hayed	15.809	0.491	36	15.194	0.446	18
B3, he:to	15.815	0.42	36	14.921	0.249	27
B3, head	15.649	0.643	36	14.938	0.241	24
B3, heto	15.63	0.563	33	14.824	0.254	30
B3, hetto	15.864	0.424	36	14.754	0.229	24

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	-0.407	0.506	0.185	-0.224	0.325	0.328
hayed, head	-0.654	0.506	0.004	-0.421	0.333	0.005
hayed, heto	-0.357	0.518	0.333	-0.303	0.318	0.07
hayed, hetto	-0.45	0.506	0.111	-0.351	0.333	0.033
he:to, head	-0.246	0.506	0.682	-0.196	0.299	0.383
he:to, heto	0.05	0.518	0.999	-0.079	0.283	0.943
he:to, hetto	-0.042	0.506	0.999	-0.126	0.299	0.782
head, heto	0.297	0.518	0.53	0.117	0.292	0.811
head, hetto	0.204	0.506	0.813	0.07	0.308	0.973
heto, hetto	-0.092	0.518	0.989	-0.048	0.292	0.992

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	0.366	0.679	0.592	0.214	0.189	0.017
hayed, head	0.64	0.679	0.076	0.333	0.193	<.0001
hayed, heto	0.919	0.695	0.003	0.716	0.185	<.0001
hayed, hetto	0.304	0.679	0.747	0.696	0.193	<.0001
he:to, head	0.274	0.679	0.811	0.119	0.174	0.338
he:to, heto	0.553	0.695	0.193	0.502	0.164	<.0001
he:to, hetto	-0.062	0.679	0.999	0.483	0.174	<.0001
head, heto	0.279	0.695	0.815	0.383	0.17	<.0001
head, hetto	-0.336	0.679	0.668	0.364	0.179	<.0001
heto, hetto	-0.615	0.695	0.113	-0.019	0.17	0.998

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, head	0.16	0.377	0.783	0.256	0.276	0.083
hayed, heto	0.179	0.386	0.72	0.371	0.264	0.001
hayed, hetto	-0.055	0.377	0.995	0.44	0.276	1E-04
he:to, head	0.166	0.377	0.758	-0.017	0.248	1
he:to, heto	0.185	0.386	0.694	0.097	0.235	0.795
he:to, hetto	-0.049	0.377	0.997	0.167	0.248	0.357
head, heto	0.019	0.386	>.9999	0.114	0.242	0.702
head, hetto	-0.215	0.377	0.535	0.184	0.255	0.285
heto, hetto	-0.234	0.386	0.469	0.07	0.242	0.937

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.102	0.043	177	0.102	0.035	123
Duration, hayed	0.161	0.024	36	0.137	0.036	18
Duration, he:to	0.119	0.008	36	0.14	0.022	27
Duration, head	0.107	0.025	36	0.093	0.017	24
Duration, heto	0.05	0.007	33	0.077	0.02	30
Duration, hetto	0.067	0.006	36	0.077	0.012	24

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	0.043	0.012	<.0001	-0.003	0.021	0.992
hayed, head	0.054	0.012	<.0001	0.044	0.021	<.0001
hayed, heto	0.111	0.013	<.0001	0.06	0.02	<.0001
hayed, hetto	0.095	0.012	<.0001	0.06	0.021	<.0001
he:to, head	0.012	0.012	0.076	0.047	0.019	<.0001
he:to, heto	0.069	0.013	<.0001	0.063	0.018	<.0001
he:to, hetto	0.052	0.012	<.0001	0.063	0.019	<.0001
head, heto	0.057	0.013	<.0001	0.016	0.019	0.131
head, hetto	0.041	0.012	<.0001	0.016	0.02	0.183
heto, hetto	-0.016	0.013	0.003	-2.39E-04	0.019	>.9999

High-back

Descriptive Statistics

	Female			Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.126	0.53	180	3.698	1.535	120
B1, fu:to	4.085	0.513	36	4.153	2.101	27
B1, futo	3.988	0.512	36	4.312	2.12	27
B1, futto	4.192	0.481	36	3.053	0.414	24
B1, hood	4.24	0.457	36	3.51	0.849	18
B1, who'd	4.123	0.656	36	3.281	24	24
B2, Total	11.127	0.961	180	10.946	1.473	120
B2, fu:to	10.615	0.897	36	11.032	1.908	27
B2, futo	11.562	0.571	36	11.528	1.591	27
B2, futto	11.285	0.682	36	10.409	1.377	24
B2, hood	11.618	0.726	36	11.262	1.112	18
B2, who'd	10.555	1.235	36	10.495	0.663	24
B3, Total	15.475	0.374	180	14.841	0.677	120
B3, fu:to	15.47	0.427	36	15.055	0.838	27
B3, futo	15.576	0.323	36	14.976	0.781	27
B3, futto	15.565	0.277	36	14.706	0.409	24
B3, hood	15.383	0.387	36	14.762	0.748	18
B3, who'd	15.384	0.408	36	14.641	0.404	24

Scheffe for B1

	Female			Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.097	0.388	0.963	-0.159	1.256	0.997
fu:to, futto	-0.107	0.388	0.946	1.1	1.294	0.139
fu:to, hood	-0.155	0.388	0.819	0.643	1.404	0.725
fu:to, who'd	-0.038	0.388	0.999	0.872	1.294	0.354
futo, futto	-0.204	0.388	0.614	1.259	1.294	0.061
futo, hood	-0.251	0.388	0.399	0.802	1.404	0.527
futo, who'd	-0.135	0.388	0.882	1.032	1.294	0.191
futto, hood	-0.047	0.388	0.998	-0.457	1.438	0.911
futto, who'd	0.069	0.388	0.989	-0.228	1.332	0.991
hood, who'd	0.117	0.388	0.928	0.229	1.438	0.993

Scheffe for B2

	Female			Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	-0.946	0.627	3E-04	-0.496	1.219	0.804
fu:to, futto	-0.67	0.627	0.029	0.623	1.256	0.661
fu:to, hood	-1.002	0.627	1E-04	-0.23	1.363	0.991
fu:to, who'd	0.06	0.627	0.999	0.537	1.256	0.774
futo, futto	0.277	0.627	0.756	1.12	1.256	0.108
futo, hood	-0.056	0.627	0.999	0.267	1.363	0.984
futo, who'd	1.007	0.627	1E-04	1.033	1.256	0.165
futto, hood	-0.333	0.627	0.604	-0.853	1.396	0.458
futto, who'd	0.73	0.627	0.013	-0.086	1.293	1
hood, who'd	1.063	0.627	<.0001	0.767	1.396	0.567

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	-0.105	0.271	0.831	0.079	0.569	0.996
fu:to, futto	-0.095	0.271	0.88	0.349	0.586	0.485
fu:to, hood	0.088	0.271	0.907	0.293	0.636	0.721
fu:to, who'd	0.086	0.271	0.911	0.414	0.586	0.304
futo, futto	0.011	0.271	>.9999	0.27	0.586	0.721
futo, hood	0.193	0.271	0.298	0.214	0.636	0.892
futo, who'd	0.192	0.271	0.305	0.336	0.586	0.526
futto, hood	0.182	0.271	0.358	-0.056	0.651	0.999
futto, who'd	0.181	0.271	0.365	0.065	0.603	0.998
hood, who'd	-0.001	0.271	>.9999	0.121	0.651	0.987

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.088	0.047	180	0.096	0.041	120
Duration, fu:to	0.111	0.01	36	0.141	0.017	27
Duration, futo	0.031	0.01	36	0.06	0.014	27
Duration, futto	0.055	0.007	36	0.07	0.015	24
Duration, hood	0.089	0.02	36	0.072	0.018	18
Duration, who'd	0.156	0.034	36	0.128	0.037	24

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.08	0.014	<.0001	0.081	0.019	<.0001
fu:to, futto	0.056	0.014	<.0001	0.071	0.019	<.0001
fu:to, hood	0.021	0.014	3E-04	0.069	0.021	<.0001
fu:to, who'd	-0.045	0.014	<.0001	0.013	0.019	0.386
futo, futto	-0.024	0.014	<.0001	-0.01	0.019	0.61
futo, hood	-0.059	0.014	<.0001	-0.012	0.021	0.482
futo, who'd	-0.125	0.014	<.0001	-0.068	0.019	<.0001
futto, hood	-0.035	0.014	<.0001	-0.002	0.021	0.998
futto, who'd	-0.101	0.014	<.0001	-0.058	0.02	<.0001
hood, who'd	-0.066	0.014	<.0001	-0.056	0.021	<.0001

Mid-back

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.71	0.876	213	4.779	0.855	168
B1, hawed	5.392	1.011	36	4.8	0.861	24
B1, ho:to	5.788	0.841	36	4.643	0.572	30
B1, hod	6.058	1.116	33	5.011	1.233	33
B1, hoed	5.482	0.937	36	4.651	0.698	30
B1, hoto	5.638	0.522	36	4.605	0.761	24
B1, hotto	5.933	0.543	36	4.927	0.77	27
B2, Total	9.039	1.042	213	8.747	2.319	168
B2, hawed	8.929	1.388	36	8.743	2.262	24
B2, ho:to	8.466	0.715	36	8.836	3.247	30
B2, hod	9.665	1.338	33	9.301	2.207	33
B2, hoed	8.797	0.859	36	8.379	2.001	30
B2, hoto	9.298	0.635	36	8.291	1.638	24
B2, hotto	9.133	0.711	36	8.786	2.158	27
B3, Total	15.758	0.539	213	15.161	0.673	168
B3, hawed	15.54	0.469	36	15.044	0.675	24
B3, ho:to	15.936	0.503	36	15.493	0.73	30
B3, hod	15.693	0.579	33	15.034	0.751	33
B3, hoed	15.648	0.505	36	14.988	0.563	30
B3, hoto	15.878	0.535	36	15.139	0.419	24
B3, hotto	15.848	0.567	36	15.264	0.711	27

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	-0.397	0.676	0.567	0.156	0.788	0.994
hawed, hod	-0.667	0.691	0.067	-0.211	0.772	0.974
hawed, hoed	-0.09	0.676	0.999	0.148	0.788	0.995
hawed, hoto	-0.247	0.676	0.912	0.195	0.83	0.987
hawed, hotto	-0.541	0.676	0.21	-0.127	0.807	0.998
ho:to, hod	-0.27	0.691	0.886	-0.367	0.726	0.714
ho:to, hoed	0.306	0.676	0.803	-0.008	0.743	>.9999
ho:to, hoto	0.15	0.676	0.99	0.039	0.788	>.9999
ho:to, hotto	-0.144	0.676	0.992	-0.283	0.763	0.905
hod, hoed	0.576	0.691	0.17	0.359	0.726	0.733
hod, hoto	0.42	0.691	0.527	0.406	0.772	0.678
hod, hotto	0.126	0.691	0.996	0.084	0.746	1
hoed, hoto	-0.156	0.676	0.988	0.047	0.788	>.9999
hoed, hotto	-0.451	0.676	0.418	-0.275	0.763	0.915
hoto, hotto	-0.294	0.676	0.829	-0.322	0.807	0.874

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	0.464	0.779	0.55	-0.093	2.148	>.9999
hawed, hod	-0.736	0.796	0.091	-0.558	2.104	0.977
hawed, hoed	0.133	0.779	0.997	0.364	2.148	0.997
hawed, hoto	-0.368	0.779	0.772	0.452	2.264	0.994
hawed, hotto	-0.204	0.779	0.978	-0.043	2.201	>.9999
ho:to, hod	-1.199	0.796	2E-04	-0.465	1.979	0.987
ho:to, hoed	-0.331	0.779	0.843	0.457	2.025	0.989
ho:to, hoto	-0.832	0.779	0.028	0.544	2.148	0.981
ho:to, hotto	-0.668	0.779	0.146	0.05	2.081	>.9999
hod, hoed	0.868	0.796	0.023	0.922	1.979	0.781
hod, hoto	0.367	0.796	0.791	1.01	2.104	0.759
hod, hotto	0.532	0.796	0.415	0.515	2.036	0.981
hoed, hoto	-0.501	0.779	0.46	0.087	2.148	>.9999
hoed, hotto	-0.337	0.779	0.834	-0.407	2.081	0.994
hoto, hotto	0.164	0.779	0.992	-0.495	2.201	0.989

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	-0.397	0.417	0.074	-0.448	0.608	0.296
hawed, hod	-0.154	0.427	0.917	0.01	0.596	>.9999
hawed, hoed	-0.108	0.417	0.979	0.056	0.608	1
hawed, hoto	-0.338	0.417	0.197	-0.095	0.641	0.999
hawed, hotto	-0.308	0.417	0.296	-0.22	0.623	0.922
ho:to, hod	0.243	0.427	0.599	0.459	0.56	0.186
ho:to, hoed	0.288	0.417	0.374	0.505	0.573	0.124
ho:to, hoto	0.059	0.417	0.999	0.353	0.608	0.576
ho:to, hotto	0.089	0.417	0.992	0.228	0.589	0.887
hod, hoed	0.045	0.427	1	0.046	0.56	>.9999
hod, hoto	-0.184	0.427	0.833	-0.105	0.596	0.996
hod, hotto	-0.154	0.427	0.915	-0.23	0.576	0.874
hoed, hoto	-0.23	0.417	0.636	-0.151	0.608	0.983
hoed, hotto	-0.2	0.417	0.764	-0.276	0.589	0.777
hoto, hotto	0.03	0.417	>.9999	-0.125	0.623	0.994

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.117	0.054	213	0.112	0.04	168
Duration, hawed	0.186	0.032	36	0.15	0.024	24
Duration, ho:to	0.131	0.012	36	0.14	0.02	30
Duration, hod	0.11	0.021	33	0.093	0.025	33
Duration, hoed	0.164	0.029	36	0.143	0.026	30
Duration, hoto	0.049	0.007	36	0.064	0.017	24
Duration, hotto	0.064	0.009	36	0.076	0.019	27

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	0.055	0.016	<.0001	0.01	0.021	0.77
hawed, hod	0.075	0.017	<.0001	0.058	0.02	<.0001
hawed, hoed	0.022	0.016	0.002	0.007	0.021	0.918
hawed, hoto	0.137	0.016	<.0001	0.086	0.022	<.0001
hawed, hotto	0.121	0.016	<.0001	0.074	0.021	<.0001
ho:to, hod	0.021	0.017	0.006	0.048	0.019	<.0001
ho:to, hoed	-0.033	0.016	<.0001	-0.002	0.019	0.999
ho:to, hoto	0.082	0.016	<.0001	0.076	0.021	<.0001
ho:to, hotto	0.066	0.016	<.0001	0.065	0.02	<.0001
hod, hoed	-0.054	0.017	<.0001	-0.05	0.019	<.0001
hod, hoto	0.062	0.017	<.0001	0.028	0.02	7E-04
hod, hotto	0.046	0.017	<.0001	0.017	0.019	0.141
hoed, hoto	0.115	0.016	<.0001	0.079	0.021	<.0001
hoed, hotto	0.099	0.016	<.0001	0.067	0.02	<.0001
hoto, hotto	-0.016	0.016	0.063	-0.012	0.021	0.634

Low and central

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.286	0.691	216	6.522	0.659	162
B1, ha:to	7.739	0.458	36	6.748	0.48	30
B1, had	7.083	0.83	36	6.611	0.888	27
B1, hato	7.325	0.652	36	6.11	0.495	24
B1, hatto	7.495	0.468	36	6.476	0.455	27
B1, herd	6.677	0.493	36	6.525	0.827	27
B1, hud	7.397	0.675	36	6.592	0.551	27
B2, Total	11.69	0.897	216	10.109	0.662	162
B2, ha:to	11.073	0.519	36	9.687	0.488	30
B2, had	12.879	0.922	36	10.546	0.692	27
B2, hato	11.471	0.476	36	10.053	0.326	24
B2, hatto	11.507	0.474	36	10.078	0.439	27
B2, herd	11.407	1.012	36	9.969	0.915	27
B2, hud	11.805	0.569	36	10.363	0.592	27
B3, Total	15.17	1.049	216	14.787	0.41	162
B3, ha:to	15.408	1.057	36	14.982	0.291	30
B3, had	15.314	0.86	36	14.748	0.313	27
B3, hato	15.11	1.221	36	14.856	0.29	24
B3, hatto	15.683	0.737	36	14.956	0.242	27
B3, herd	14.203	1.084	36	14.42	0.658	27
B3, hud	15.303	0.6	36	14.748	0.25	27

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.656	0.484	0.001	0.137	0.572	0.986
ha:to, hato	0.414	0.484	0.147	0.638	0.591	0.025
ha:to, hatto	0.244	0.484	0.72	0.272	0.572	0.765
ha:to, herd	1.062	0.484	<.0001	0.223	0.572	0.885
ha:to, hud	0.343	0.484	0.344	0.156	0.572	0.974
had, hato	-0.242	0.484	0.728	0.501	0.605	0.175
had, hatto	-0.412	0.484	0.152	0.136	0.587	0.987
had, herd	0.406	0.484	0.165	0.086	0.587	0.999
had, hud	-0.313	0.484	0.452	0.02	0.587	>.9999
hato, hatto	-0.17	0.484	0.924	-0.366	0.605	0.53
hato, herd	0.648	0.484	0.002	-0.415	0.605	0.38
hato, hud	-0.072	0.484	0.999	-0.482	0.605	0.213
hatto, herd	0.818	0.484	<.0001	-0.049	0.587	>.9999
hatto, hud	0.099	0.484	0.993	-0.116	0.587	0.994
herd, hud	-0.72	0.484	2E-04	-0.067	0.587	1

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	-1.806	0.552	<.0001	-0.859	0.544	<.0001
ha:to, hato	-0.398	0.552	0.323	-0.366	0.561	0.44
ha:to, hatto	-0.435	0.552	0.226	-0.391	0.544	0.324
ha:to, herd	-0.334	0.552	0.531	-0.282	0.544	0.692
ha:to, hud	-0.732	0.552	0.002	-0.676	0.544	0.005
had, hato	1.408	0.552	<.0001	0.492	0.575	0.146
had, hatto	1.372	0.552	<.0001	0.468	0.558	0.164
had, herd	1.472	0.552	<.0001	0.577	0.558	0.038
had, hud	1.074	0.552	<.0001	0.183	0.558	0.943
hato, hatto	-0.036	0.552	>.9999	-0.025	0.575	>.9999
hato, herd	0.064	0.552	1	0.084	0.575	0.999
hato, hud	-0.334	0.552	0.532	-0.31	0.575	0.655
hatto, herd	0.1	0.552	0.996	0.109	0.558	0.994
hatto, hud	-0.298	0.552	0.657	-0.285	0.558	0.706
herd, hud	-0.398	0.552	0.324	-0.394	0.558	0.345

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.094	0.753	0.999	0.234	0.331	0.342
ha:to, hato	0.298	0.753	0.88	0.126	0.342	0.907
ha:to, hatto	-0.275	0.753	0.912	0.026	0.331	>.9999
ha:to, herd	1.204	0.753	<.0001	0.562	0.331	<.0001
ha:to, hud	0.105	0.753	0.999	0.234	0.331	0.345
had, hato	0.203	0.753	0.975	-0.108	0.35	0.955
had, hatto	-0.369	0.753	0.744	-0.208	0.339	0.513
had, herd	1.11	0.753	3E-04	0.328	0.339	0.066
had, hud	0.01	0.753	>.9999	-4.52E-04	0.339	>.9999
hato, hatto	-0.573	0.753	0.263	-0.1	0.35	0.968
hato, herd	0.907	0.753	0.007	0.436	0.35	0.005
hato, hud	-0.193	0.753	0.98	0.108	0.35	0.956
hatto, herd	1.48	0.753	<.0001	0.536	0.339	<.0001
hatto, hud	0.38	0.753	0.72	0.208	0.339	0.516
herd, hud	-1.1	0.753	3E-04	-0.328	0.339	0.065

Descriptive Statistics						
Female				**Male**		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.103	0.041	216	0.099	0.038	162
Duration, ha:to	0.121	0.012	36	0.134	0.019	30
Duration, had	0.114	0.021	36	0.091	0.025	27
Duration, hato	0.048	0.011	36	0.067	0.012	24
Duration, hatto	0.067	0.013	36	0.071	0.012	27
Duration, herd	0.161	0.025	36	0.149	0.029	27
Duration, hud	0.108	0.017	36	0.077	0.016	27

Scheffe for Duration						
Female				**Male**		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.007	0.014	0.717	0.043	0.018	<.0001
ha:to, hato	0.073	0.014	<.0001	0.067	0.018	<.0001
ha:to, hatto	0.054	0.014	<.0001	0.064	0.018	<.0001
ha:to, herd	-0.04	0.014	<.0001	-0.015	0.018	0.157
ha:to, hud	0.013	0.014	0.092	0.058	0.018	<.0001
had, hato	0.066	0.014	<.0001	0.024	0.019	0.004
had, hatto	0.047	0.014	<.0001	0.02	0.018	0.019
had, herd	-0.047	0.014	<.0001	-0.058	0.018	<.0001
had, hud	0.006	0.014	0.855	0.014	0.018	0.223
hato, hatto	-0.019	0.014	5E-04	-0.003	0.019	0.996
hato, herd	-0.113	0.014	<.0001	-0.082	0.019	<.0001
hato, hud	-0.061	0.014	<.0001	-0.009	0.019	0.732
hatto, herd	-0.094	0.014	<.0001	-0.079	0.018	<.0001
hatto, hud	-0.041	0.014	<.0001	-0.006	0.018	0.947
herd, hud	0.052	0.014	<.0001	0.073	0.018	<.0001

Advanced

Descriptive Statistics						
Female				**Male**		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.316	0.494	131	3.124	0.532	165
B1, heed	3.257	0.658	27	3.026	0.267	36
B1, hi:to	3.448	0.541	27	2.895	0.218	30
B1, hid	3.241	0.48	27	3.175	0.232	36
B1, hito	3.318	0.303	27	3.617	1.059	27
B1, hitto	3.317	0.411	23	2.99	0.253	36
B2, Total	13.86	1.44	131	13.563	0.66	165
B2, heed	14.518	1.292	27	13.664	0.687	36
B2, hi:to	13.428	1.714	27	13.784	0.602	30
B2, hid	14.228	1.411	27	13.555	0.727	36
B2, hito	13.202	1.237	27	13.102	0.449	27
B2, hitto	13.936	1.083	23	13.63	0.607	36
B3, Total	15.892	0.442	131	15.658	0.352	165
B3, heed	16.124	0.48	27	15.651	0.295	36
B3, hi:to	15.939	0.347	27	15.745	0.384	30
B3, hid	15.972	0.373	27	15.422	0.279	36
B3, hito	15.666	0.349	27	15.664	0.368	27
B3, hitto	15.738	0.517	23	15.825	0.317	36

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	-0.192	0.422	0.732	0.13	0.371	0.878
heed, hid	0.016	0.422	>.9999	-0.149	0.354	0.785
heed, hito	-0.062	0.422	0.995	-0.591	0.382	2E-04
heed, hitto	-0.06	0.44	0.996	0.036	0.354	0.999
hi:to, hid	0.208	0.422	0.669	-0.28	0.371	0.243
hi:to, hito	0.13	0.422	0.92	-0.722	0.398	<.0001
hi:to, hitto	0.132	0.44	0.927	-0.095	0.371	0.959
hid, hito	-0.078	0.422	0.988	-0.442	0.382	0.014
hid, hitto	-0.076	0.44	0.99	0.185	0.354	0.618
hito, hitto	0.002	0.44	>.9999	0.627	0.382	<.0001

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	1.09	1.167	0.081	-0.12	0.486	0.964
heed, hid	0.289	1.167	0.963	0.109	0.463	0.97
heed, hito	1.315	1.167	0.018	0.562	0.5	0.018
heed, hitto	0.582	1.217	0.693	0.034	0.463	1
hi:to, hid	-0.8	1.167	0.337	0.228	0.486	0.709
hi:to, hito	0.226	1.167	0.985	0.682	0.521	0.003
hi:to, hitto	-0.508	1.217	0.79	0.153	0.486	0.914
hid, hito	1.026	1.167	0.117	0.453	0.5	0.098
hid, hitto	0.292	1.217	0.967	-0.075	0.463	0.992
hito, hitto	-0.734	1.217	0.474	-0.529	0.5	0.032

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	0.186	0.354	0.613	-0.094	0.252	0.851
heed, hid	0.152	0.354	0.771	0.229	0.24	0.071
heed, hito	0.459	0.354	0.004	-0.013	0.259	>.9999
heed, hitto	0.386	0.369	0.035	-0.174	0.24	0.283
hi:to, hid	-0.034	0.354	0.999	0.323	0.252	0.004
hi:to, hito	0.273	0.354	0.22	0.082	0.27	0.926
hi:to, hitto	0.201	0.369	0.578	-0.08	0.252	0.914
hid, hito	0.307	0.354	0.126	-0.241	0.259	0.082
hid, hitto	0.234	0.369	0.419	-0.403	0.24	<.0001
hito, hitto	-0.072	0.369	0.984	-0.161	0.259	0.443

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.092	0.043	131	0.088	0.037	165
Duration, heed	0.131	0.013	27	0.13	0.015	36
Duration, hi:to	0.145	0.021	27	0.121	0.016	30
Duration, hid	0.07	0.014	27	0.081	0.021	36
Duration, hito	0.044	0.018	27	0.041	0.008	27
Duration, hitto	0.067	0.017	23	0.061	0.01	36

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
heed, hi:to	-0.014	0.014	0.059	0.009	0.012	0.213
heed, hid	0.06	0.014	<.0001	0.049	0.011	<.0001
heed, hito	0.087	0.014	<.0001	0.089	0.012	<.0001
heed, hitto	0.063	0.015	<.0001	0.069	0.011	<.0001
hi:to, hid	0.074	0.014	<.0001	0.04	0.012	<.0001
hi:to, hito	0.101	0.014	<.0001	0.08	0.012	<.0001
hi:to, hitto	0.077	0.015	<.0001	0.06	0.012	<.0001
hid, hito	0.026	0.014	<.0001	0.04	0.012	<.0001
hid, hitto	0.003	0.015	0.98	0.019	0.011	<.0001
hito, hitto	-0.023	0.015	2E-04	-0.02	0.012	<.0001

Mid-front

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.051	1.145	135	4.324	0.46	174
B1, hayed	4.877	0.815	27	4.191	0.446	36
B1, he:to	4.777	1.112	27	4.131	0.503	36
B1, head	5.763	1.266	27	4.614	0.567	36
B1, heto	4.712	0.869	27	4.318	0.271	33
B1, hetto	5.124	1.32	27	4.37	0.256	33
B2, Total	13.976	1.234	135	12.839	0.438	174
B2, hayed	14.059	1.574	27	13.135	0.443	36
B2, he:to	13.996	1.163	27	13.077	0.404	36
B2, head	14.264	0.523	27	12.66	0.42	36
B2, heto	13.913	1.255	27	12.536	0.286	33
B2, hetto	13.65	1.402	27	12.757	0.26	33
B3, Total	15.843	0.52	135	14.906	0.404	174
B3, hayed	15.852	0.449	27	15.022	0.364	36
B3, he:to	15.851	0.528	27	15.018	0.454	36
B3, head	15.812	0.431	27	14.781	0.261	36
B3, heto	15.909	0.53	27	14.757	0.507	33
B3, hetto	15.792	0.663	27	14.941	0.33	33

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	0.1	0.932	0.999	0.06	0.317	0.987
hayed, head	-0.886	0.932	0.072	-0.423	0.317	0.002
hayed, heto	0.165	0.932	0.989	-0.128	0.324	0.825
hayed, hetto	-0.247	0.932	0.953	-0.179	0.324	0.566
he:to, head	-0.986	0.932	0.032	-0.483	0.317	3E-04
he:to, heto	0.065	0.932	1	-0.188	0.324	0.519
he:to, hetto	-0.347	0.932	0.852	-0.239	0.324	0.265
head, heto	1.051	0.932	0.018	0.295	0.324	0.095
head, hetto	0.639	0.932	0.337	0.244	0.324	0.246
heto, hetto	-0.412	0.932	0.753	-0.051	0.331	0.994

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	0.063	1.051	1	0.058	0.274	0.98
hayed, head	-0.205	1.051	0.985	0.475	0.274	<.0001
hayed, heto	0.146	1.051	0.996	0.599	0.28	<.0001
hayed, hetto	0.409	1.051	0.83	0.378	0.28	0.002
he:to, head	-0.268	1.051	0.959	0.417	0.274	3E-04
he:to, heto	0.083	1.051	1	0.541	0.28	<.0001
he:to, hetto	0.346	1.051	0.901	0.321	0.28	0.015
head, heto	0.351	1.051	0.896	0.124	0.28	0.754
head, hetto	0.614	1.051	0.507	-0.097	0.28	0.885
heto, hetto	0.263	1.051	0.961	-0.221	0.286	0.222

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	0.001	0.448	>.9999	0.004	0.288	>.9999
hayed, head	0.04	0.448	0.999	0.241	0.288	0.153
hayed, heto	-0.058	0.448	0.997	0.265	0.294	0.101
hayed, hetto	0.06	0.448	0.996	0.081	0.294	0.948
he:to, head	0.039	0.448	0.999	0.237	0.288	0.165
he:to, heto	-0.058	0.448	0.997	0.262	0.294	0.11
he:to, hetto	0.059	0.448	0.997	0.077	0.294	0.955
head, heto	-0.097	0.448	0.977	0.025	0.294	0.999
head, hetto	0.02	0.448	>.9999	-0.16	0.294	0.581
heto, hetto	0.118	0.448	0.954	-0.185	0.3	0.456

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.103	0.044	135	0.105	0.038	174
Duration, hayed	0.145	0.017	27	0.152	0.015	36
Duration, he:to	0.158	0.022	27	0.134	0.017	36
Duration, head	0.083	0.027	27	0.093	0.015	36
Duration, heto	0.06	0.014	27	0.064	0.019	33
Duration, hetto	0.071	0.01	27	0.077	0.019	33

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hayed, he:to	-0.013	0.016	0.198	0.019	0.012	4E-04
hayed, head	0.062	0.016	<.0001	0.06	0.012	<.0001
hayed, heto	0.085	0.016	<.0001	0.088	0.013	<.0001
hayed, hetto	0.073	0.016	<.0001	0.075	0.013	<.0001
he:to, head	0.075	0.016	<.0001	0.041	0.012	<.0001
he:to, heto	0.098	0.016	<.0001	0.07	0.013	<.0001
he:to, hetto	0.086	0.016	<.0001	0.056	0.013	<.0001
head, heto	0.023	0.016	9E-04	0.029	0.013	<.0001
head, hetto	0.011	0.016	0.312	0.015	0.013	0.01
heto, hetto	-0.012	0.016	0.271	-0.013	0.013	0.039

High-back

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.68	0.799	129	3.948	1.509	165
B1, fu:to	3.624	0.702	27	3.613	0.298	33
B1, futo	3.472	0.411	27	4.875	2.571	33
B1, futto	3.658	0.412	27	3.73	0.855	33
B1, hood	3.827	1.087	24	4.065	1.585	33
B1, who'd	3.855	1.151	24	3.459	0.652	33
B2, Total	10.253	1.371	129	10.302	1.366	165
B2, fu:to	10.038	1.107	27	9.881	1.372	33
B2, futo	10.676	0.84	27	11.129	1.597	33
B2, futto	10.428	0.864	27	10.507	1.098	33
B2, hood	9.964	1.752	24	10.31	1.292	33
B2, who'd	10.111	1.988	24	9.683	0.962	33
B3, Total	15.389	0.606	129	14.739	0.7	165
B3, fu:to	15.418	0.609	27	14.721	0.643	33
B3, futo	15.344	0.557	27	14.91	0.989	33
B3, futto	15.704	0.526	27	14.757	0.612	33
B3, hood	15.127	0.637	24	14.744	0.709	33
B3, who'd	15.313	0.597	24	14.562	0.427	33

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.152	0.68	0.974	-1.262	1.105	0.016
fu:to, futto	-0.034	0.68	>.9999	-0.117	1.105	0.999
fu:to, hood	-0.203	0.701	0.935	-0.452	1.105	0.804
fu:to, who'd	-0.232	0.701	0.899	0.154	1.105	0.996
futo, futto	-0.186	0.68	0.947	1.144	1.105	0.038
futo, hood	-0.355	0.701	0.644	0.81	1.105	0.271
futo, who'd	-0.384	0.701	0.572	1.415	1.105	0.004
futto, hood	-0.169	0.701	0.966	-0.334	1.105	0.926
futto, who'd	-0.198	0.701	0.941	0.271	1.105	0.964
hood, who'd	-0.029	0.722	>.9999	0.606	1.105	0.572

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	-0.638	1.162	0.568	-1.248	0.985	0.005
fu:to, futto	-0.39	1.162	0.893	-0.626	0.985	0.42
fu:to, hood	0.074	1.198	1	-0.429	0.985	0.764
fu:to, who'd	-0.073	1.198	1	0.198	0.985	0.983
futo, futto	0.248	1.162	0.978	0.623	0.985	0.425
futo, hood	0.713	1.198	0.487	0.819	0.985	0.157
futo, who'd	0.566	1.198	0.703	1.446	0.985	5E-04
futto, hood	0.464	1.198	0.831	0.196	0.985	0.984
futto, who'd	0.317	1.198	0.953	0.823	0.985	0.153
hood, who'd	-0.147	1.233	0.998	0.627	0.985	0.417

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.074	0.498	0.995	-0.189	0.537	0.876
fu:to, futto	-0.286	0.498	0.523	-0.036	0.537	1
fu:to, hood	0.291	0.513	0.536	-0.023	0.537	>.9999
fu:to, who'd	0.105	0.513	0.982	0.159	0.537	0.931
futo, futto	-0.36	0.498	0.283	0.153	0.537	0.939
futo, hood	0.217	0.513	0.78	0.167	0.537	0.919
futo, who'd	0.031	0.513	1	0.348	0.537	0.398
futto, hood	0.577	0.513	0.018	0.013	0.537	>.9999
futto, who'd	0.391	0.513	0.232	0.195	0.537	0.865
hood, who'd	-0.186	0.528	0.875	0.182	0.537	0.892

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.096	0.043	129	0.087	0.037	165
Duration, fu:to	0.146	0.019	27	0.122	0.017	33
Duration, futo	0.041	0.012	27	0.05	0.015	33
Duration, futto	0.068	0.011	27	0.057	0.021	33
Duration, hood	0.099	0.018	24	0.076	0.008	33
Duration, who'd	0.13	0.02	24	0.132	0.018	33

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
fu:to, futo	0.105	0.014	<.0001	0.073	0.012	<.0001
fu:to, futto	0.078	0.014	<.0001	0.065	0.012	<.0001
fu:to, hood	0.047	0.014	<.0001	0.046	0.012	<.0001
fu:to, who'd	0.015	0.014	0.03	-0.009	0.012	0.248
futo, futto	-0.027	0.014	<.0001	-0.007	0.012	0.504
futo, hood	-0.058	0.014	<.0001	-0.027	0.012	<.0001
futo, who'd	-0.09	0.014	<.0001	-0.082	0.012	<.0001
futto, hood	-0.031	0.014	<.0001	-0.019	0.012	2E-04
futto, who'd	-0.063	0.014	<.0001	-0.075	0.012	<.0001
hood, who'd	-0.032	0.015	<.0001	-0.055	0.012	<.0001

Mid-back

Descriptive Statistics

	Female			Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.229	1.312	162	4.664	0.72	204
B1, hawed	5.51	1.534	27	4.681	0.658	33
B1, ho:to	4.673	1.162	27	4.561	0.448	36
B1, hod	5.938	1.596	27	5.27	0.959	36
B1, hoed	4.981	0.982	27	4.31	0.815	36
B1, hoto	5.204	0.879	27	4.449	0.324	30
B1, hotto	5.07	1.286	27	4.681	0.442	33
B2, Total	8.99	1.568	162	8.163	1.684	204
B2, hawed	8.64	1.659	27	7.579	1.608	33
B2, ho:to	8.619	1.432	27	7.33	1.473	36
B2, hod	10.188	1.61	27	8.88	0.952	36
B2, hoed	8.792	1.992	27	8.507	2.515	36
B2, hoto	9.029	1.165	27	8.381	0.703	30
B2, hotto	8.672	0.776	27	8.298	1.665	33
B3, Total	15.749	0.604	162	15.158	0.571	204
B3, hawed	15.4	0.533	27	14.909	0.417	33
B3, ho:to	15.801	0.624	27	15.197	0.578	36
B3, hod	15.737	0.56	27	14.987	0.422	36
B3, hoed	15.428	0.519	27	15.213	0.711	36
B3, hoto	16.037	0.507	27	15.312	0.483	30
B3, hotto	16.092	0.551	27	15.348	0.641	33

Scheffe for B1

	Female			Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	0.837	1.163	0.323	0.121	0.533	0.989
hawed, hod	-0.427	1.163	0.908	-0.589	0.533	0.02
hawed, hoed	0.529	1.163	0.798	0.371	0.533	0.363
hawed, hoto	0.307	1.163	0.977	0.232	0.557	0.854
hawed, hotto	0.44	1.163	0.897	0.001	0.544	>.9999
ho:to, hod	-1.265	1.163	0.023	-0.709	0.521	0.001
ho:to, hoed	-0.308	1.163	0.977	0.251	0.521	0.759
ho:to, hoto	-0.531	1.163	0.796	0.111	0.546	0.993
ho:to, hotto	-0.397	1.163	0.932	-0.12	0.533	0.989
hod, hoed	0.957	1.163	0.181	0.96	0.521	<.0001
hod, hoto	0.734	1.163	0.479	0.821	0.546	2E-04
hod, hotto	0.868	1.163	0.282	0.589	0.533	0.019
hoed, hoto	-0.223	1.163	0.995	-0.139	0.546	0.981
hoed, hotto	-0.089	1.163	>.9999	-0.37	0.533	0.365
hoto, hotto	0.134	1.163	1	-0.231	0.557	0.856

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	0.021	1.367	>.9999	0.25	1.306	0.995
hawed, hod	-1.547	1.367	0.015	-1.301	1.306	0.052
hawed, hoed	-0.151	1.367	1	-0.928	1.306	0.34
hawed, hoto	-0.389	1.367	0.968	-0.801	1.367	0.568
hawed, hotto	-0.032	1.367	>.9999	-0.718	1.334	0.658
ho:to, hod	-1.568	1.367	0.013	-1.55	1.277	0.007
ho:to, hoed	-0.172	1.367	0.999	-1.177	1.277	0.093
ho:to, hoto	-0.41	1.367	0.96	-1.051	1.34	0.229
ho:to, hotto	-0.052	1.367	>.9999	-0.968	1.306	0.291
hod, hoed	1.396	1.367	0.042	0.373	1.277	0.965
hod, hoto	1.158	1.367	0.155	0.499	1.34	0.904
hod, hotto	1.516	1.367	0.019	0.582	1.306	0.814
hoed, hoto	-0.237	1.367	0.997	0.126	1.34	1
hoed, hotto	0.12	1.367	1	0.209	1.306	0.998
hoto, hotto	0.357	1.367	0.978	0.083	1.367	>.9999

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	-0.401	0.505	0.215	-0.289	0.45	0.463
hawed, hod	-0.337	0.505	0.412	-0.079	0.45	0.997
hawed, hoed	-0.029	0.505	>.9999	-0.304	0.45	0.399
hawed, hoto	-0.638	0.505	0.004	-0.403	0.471	0.147
hawed, hotto	-0.693	0.505	0.001	-0.439	0.46	0.072
ho:to, hod	0.064	0.505	0.999	0.21	0.44	0.765
ho:to, hoed	0.372	0.505	0.295	-0.016	0.44	>.9999
ho:to, hoto	-0.237	0.505	0.776	-0.114	0.462	0.983
ho:to, hotto	-0.292	0.505	0.582	-0.15	0.45	0.938
hod, hoed	0.308	0.505	0.518	-0.226	0.44	0.704
hod, hoto	-0.301	0.505	0.547	-0.324	0.462	0.353
hod, hotto	-0.356	0.505	0.349	-0.36	0.45	0.208
hoed, hoto	-0.609	0.505	0.007	-0.099	0.462	0.991
hoed, hotto	-0.664	0.505	0.002	-0.135	0.45	0.961
hoto, hotto	-0.055	0.505	1	-0.036	0.471	>.9999

Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.113	0.046	162	0.115	0.04	204
Duration, hawed	0.153	0.021	27	0.158	0.015	33
Duration, ho:to	0.159	0.022	27	0.141	0.013	36
Duration, hod	0.076	0.019	27	0.091	0.015	36
Duration, hoed	0.15	0.023	27	0.154	0.013	36
Duration, hoto	0.061	0.013	27	0.06	0.015	30
Duration, hotto	0.078	0.015	27	0.08	0.012	33

Scheffe for Duration

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
hawed, ho:to	-0.005	0.018	0.966	0.016	0.011	3E-04
hawed, hod	0.078	0.018	<.0001	0.067	0.011	<.0001
hawed, hoed	0.003	0.018	0.994	0.004	0.011	0.943
hawed, hoto	0.092	0.018	<.0001	0.097	0.012	<.0001
hawed, hotto	0.075	0.018	<.0001	0.077	0.011	<.0001
ho:to, hod	0.083	0.018	<.0001	0.05	0.011	<.0001
ho:to, hoed	0.009	0.018	0.746	-0.013	0.011	0.011
ho:to, hoto	0.097	0.018	<.0001	0.081	0.012	<.0001
ho:to, hotto	0.08	0.018	<.0001	0.061	0.011	<.0001
hod, hoed	-0.074	0.018	<.0001	-0.063	0.011	<.0001
hod, hoto	0.015	0.018	0.174	0.03	0.012	<.0001
hod, hotto	-0.002	0.018	0.999	0.011	0.011	0.082
hoed, hoto	0.089	0.018	<.0001	0.094	0.012	<.0001
hoed, hotto	0.072	0.018	<.0001	0.074	0.011	<.0001
hoto, hotto	-0.017	0.018	0.066	-0.02	0.012	<.0001

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Descriptive Statistics

Female				Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.734	1.029	156	6.196	0.627	210
B1, ha:to	7.955	0.924	27	6.523	0.354	33
B1, had	7.837	1.105	27	5.95	0.691	36
B1, hato	7.832	0.995	27	6.276	0.397	33
B1, hatto	8.075	0.903	27	6.457	0.369	36
B1, herd	6.804	0.9	27	5.805	0.79	36
B1, hud	7.951	0.795	21	6.199	0.672	36
B2, Total	11.661	1.106	156	10.364	0.937	210
B2, ha:to	11.257	0.76	27	9.671	0.403	33
B2, had	12.477	1.527	27	11.613	1.093	36
B2, hato	11.801	0.528	27	9.98	0.345	33
B2, hatto	11.807	0.741	27	9.967	0.32	36
B2, herd	10.932	1.303	27	10.304	0.93	36
B2, hud	11.701	0.72	21	10.556	0.653	36
B3, Total	15.273	1.045	156	14.525	0.57	210
B3, ha:to	15.741	0.837	27	14.813	0.448	33
B3, had	15.343	0.76	27	14.667	0.424	36
B3, hato	15.559	0.944	27	14.445	0.593	33
B3, hatto	15.929	0.301	27	14.718	0.311	36
B3, herd	13.903	1.049	27	14.147	0.84	36
B3, hud	15.134	0.734	21	14.377	0.378	36

Scheffe for B1

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.118	0.869	0.999	0.573	0.468	0.006
ha:to, hato	0.123	0.869	0.999	0.247	0.478	0.699
ha:to, hatto	-0.12	0.869	0.999	0.066	0.468	0.999
ha:to, herd	1.151	0.869	0.002	0.718	0.468	1E-04
ha:to, hud	0.004	0.929	>.9999	0.324	0.468	0.372
had, hato	0.005	0.869	>.9999	-0.326	0.468	0.363
had, hatto	-0.238	0.869	0.973	-0.507	0.458	0.019
had, herd	1.033	0.869	0.009	0.145	0.458	0.951
had, hud	-0.114	0.929	0.999	-0.249	0.458	0.647
hato, hatto	-0.243	0.869	0.971	-0.181	0.468	0.89
hato, herd	1.029	0.869	0.009	0.471	0.468	0.047
hato, hud	-0.118	0.929	0.999	0.077	0.468	0.998
hatto, herd	1.272	0.869	4E-04	0.652	0.458	6E-04
hatto, hud	0.125	0.929	0.999	0.258	0.458	0.611
herd, hud	-1.147	0.929	0.005	-0.394	0.458	0.143

Scheffe for B2

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	-1.22	0.923	0.002	-1.943	0.566	<.0001
ha:to, hato	-0.545	0.923	0.558	-0.309	0.578	0.665
ha:to, hatto	-0.55	0.923	0.546	-0.296	0.566	0.687
ha:to, herd	0.325	0.923	0.922	-0.633	0.566	0.017
ha:to, hud	-0.444	0.987	0.805	-0.885	0.566	<.0001
had, hato	0.675	0.923	0.304	1.633	0.566	<.0001
had, hatto	0.67	0.923	0.313	1.647	0.553	<.0001
had, herd	1.545	0.923	<.0001	1.309	0.553	<.0001
had, hud	0.776	0.987	0.226	1.058	0.553	<.0001
hato, hatto	-0.005	0.923	>.9999	0.013	0.566	>.9999
hato, herd	0.87	0.923	0.079	-0.324	0.566	0.593
hato, hud	0.1	0.987	1	-0.576	0.566	0.043
hatto, herd	0.875	0.923	0.076	-0.338	0.553	0.522
hatto, hud	0.106	0.987	1	-0.589	0.553	0.029
herd, hud	-0.77	0.987	0.234	-0.251	0.553	0.801

Scheffe for B3

Female				Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.398	0.743	0.659	0.146	0.428	0.933
ha:to, hato	0.183	0.743	0.983	0.367	0.438	0.164
ha:to, hatto	-0.188	0.743	0.981	0.095	0.428	0.99
ha:to, herd	1.838	0.743	<.0001	0.666	0.428	<.0001
ha:to, hud	0.607	0.794	0.255	0.436	0.428	0.043
had, hato	-0.215	0.743	0.966	0.221	0.428	0.698
had, hatto	-0.586	0.743	0.221	-0.051	0.419	0.999
had, herd	1.44	0.743	<.0001	0.52	0.419	0.005
had, hud	0.209	0.794	0.978	0.29	0.419	0.371
hato, hatto	-0.371	0.743	0.725	-0.272	0.428	0.473
hato, herd	1.656	0.743	<.0001	0.298	0.428	0.364
hato, hud	0.424	0.794	0.662	0.069	0.428	0.998
hatto, herd	2.026	0.743	<.0001	0.571	0.419	0.001
hatto, hud	0.795	0.794	0.049	0.341	0.419	0.192
herd, hud	-1.231	0.794	1E-04	-0.23	0.419	0.64

Descriptive Statistics

	Female			Male		
Word	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.106	0.049	156	0.104	0.04	210
Duration, ha:to	0.156	0.021	27	0.143	0.022	33
Duration, had	0.105	0.032	27	0.104	0.024	36
Duration, hato	0.053	0.013	27	0.065	0.022	
Duration, hatto	0.074	0.016	27	0.074	0.019	36
Duration, herd	0.168	0.022	27	0.155	0.017	36
Duration, hud	0.072	0.017	21	0.082	0.019	36

Scheffe for Duration

	Female			Male		
Word	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
ha:to, had	0.05	0.019	<.0001	0.039	0.017	<.0001
ha:to, hato	0.103	0.019	<.0001	0.078	0.017	<.0001
ha:to, hatto	0.082	0.019	<.0001	0.069	0.017	<.0001
ha:to, herd	-0.013	0.019	0.447	-0.012	0.017	0.293
ha:to, hud	0.084	0.021	<.0001	0.06	0.017	<.0001
had, hato	0.053	0.019	<.0001	0.039	0.017	<.0001
had, hatto	0.031	0.019	<.0001	0.03	0.016	<.0001
had, herd	-0.063	0.019	<.0001	-0.051	0.016	<.0001
had, hud	0.034	0.021	<.0001	0.022	0.016	0.002
hato, hatto	-0.021	0.019	0.019	-0.009	0.017	0.695
hato, herd	-0.116	0.019	<.0001	-0.09	0.017	<.0001
hato, hud	-0.019	0.021	0.093	-0.017	0.017	0.031
hatto, herd	-0.094	0.019	<.0001	-0.081	0.016	<.0001
hatto, hud	0.002	0.021	1	-0.009	0.016	0.638
herd, hud	0.097	0.021	<.0001	0.073	0.016	<.0001

Between-group analyses (A: elementary level, B: intermediate level, C: advanced level, D: control group)

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.693	0.688	87	2.936	0.298	90
B1, A	4.048	0.412	24	2.859	0.319	27
B1, B	3.784	0.698	36	2.895	0.295	27
B1, C	3.257	0.658	27	3.026	0.267	36
B2, Total	14.16	1.471	87	13.782	0.51	90
B2, A	13.693	1.379	24	13.776	0.33	27
B2, B	14.203	1.606	36	13.945	0.312	27
B2, C	14.518	1.292	27	13.664	0.687	36
B3, Total	15.901	0.468	87	15.653	0.31	90
B3, A	15.73	0.462	24	15.595	0.186	27
B3, B	15.848	0.406	36	15.714	0.413	27
B3, C	16.124	0.48	27	15.651	0.295	36

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.265	0.407	0.274	-0.036	0.198	0.903
A, C	0.792	0.433	<.0001	-0.167	0.185	0.086
B, C	0.527	0.393	0.005	-0.131	0.185	0.217

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.509	0.954	0.417	-0.169	0.34	0.467
A, C	-0.824	1.016	0.136	0.112	0.318	0.684
B, C	-0.315	0.922	0.697	0.281	0.318	0.095

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.119	0.293	0.602	-0.119	0.21	0.376
A, C	-0.395	0.311	0.009	-0.056	0.197	0.778
B, C	-0.276	0.283	0.057	0.063	0.197	0.73

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.133	0.029	87	0.13	0.024	90
Duration, A	0.124	0.045	24	0.124	0.015	27
Duration, B	0.141	0.023	36	0.137	0.037	27
Duration, C	0.131	0.013	27	0.13	0.015	36

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.017	0.019	0.078	-0.013	0.016	0.123
A, C	-0.007	0.02	0.701	-0.006	0.015	0.568
B, C	0.011	0.018	0.357	0.007	0.015	0.519

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.858	1.054	90	2.962	0.393	93
B1, A	4.67	1.311	27	2.777	0.529	27
B1, B	3.713	0.743	36	2.872	0.276	30
B1, C	3.241	0.48	27	3.175	0.232	36
B2, Total	13.909	1.494	90	13.639	0.511	93
B2, A	12.64	1.353	27	13.638	0.32	27
B2, B	14.621	0.996	36	13.742	0.279	30
B2, C	14.228	1.411	27	13.555	0.727	36
B3, Total	15.915	0.431	90	15.482	0.409	93
B3, A	15.76	0.306	27	15.434	0.493	27
B3, B	15.989	0.522	36	15.596	0.446	30
B3, C	15.972	0.373	27	15.422	0.279	36

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.957	0.569	3E-04	-0.095	0.235	0.604
A, C	1.429	0.608	<.0001	-0.398	0.225	2E-04
B, C	0.472	0.569	0.124	-0.303	0.219	0.004

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-1.981	0.787	<.0001	-0.104	0.337	0.746
A, C	-1.588	0.841	<.0001	0.083	0.323	0.816
B, C	0.393	0.787	0.465	0.187	0.314	0.339

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.229	0.269	0.11	-0.162	0.268	0.326
A, C	-0.212	0.287	0.19	0.012	0.257	0.994
B, C	0.017	0.269	0.988	0.174	0.25	0.229

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.81	0.18	90	0.074	0.02	93
Duration, A	0.85	0.17	27	0.069	0.018	27
Duration, B	0.86	0.19	36	0.071	0.019	30
Duration, C	0.7	0.14	27	0.081	0.021	36

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.001	0.011	0.944	-0.002	0.013	0.939
A, C	0.014	0.011	0.009	-0.011	0.012	0.08
B, C	0.016	0.011	0.002	-0.009	0.012	0.151

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Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.954	1.064	90	3.946	0.465	78
B1, A	4.935	1.394	27	3.734	0.276	24
B1, B	5.027	0.965	36	3.74	0.482	18
B1, C	4.877	0.815	27	4.191	0.446	36
B2, Total	13.815	1.703	90	13.293	0.397	78
B2, A	12.543	2.103	27	13.329	0.326	24
B2, B	14.585	0.591	36	13.562	0.187	18
B2, C	14.059	1.574	27	13.135	0.443	36
B3, Total	15.808	0.444	90	15.019	0.391	78
B3, A	15.765	0.379	27	14.884	0.349	24
B3, B	15.809	0.491	36	15.194	0.446	18
B3, C	15.852	0.449	27	15.022	0.364	36

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.092	0.681	0.945	-0.006	0.32	0.999
A, C	0.058	0.728	0.981	-0.456	0.271	3E-04
B, C	0.15	0.681	0.861	-0.451	0.296	0.001

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-2.041	0.941	<.0001	-0.233	0.283	0.127
A, C	-1.516	1.006	0.002	0.194	0.239	0.135
B, C	0.526	0.941	0.384	0.427	0.262	6E-04

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.044	0.284	0.928	-0.31	0.296	0.037
A, C	-0.087	0.303	0.776	-0.138	0.25	0.392
B, C	-0.043	0.284	0.932	0.172	0.274	0.296

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.154	0.026	90	0.146	0.031	78
Duration, A	0.154	0.031	27	0.142	0.042	24
Duration, B	0.161	0.024	36	0.137	0.036	18
Duration, C	0.145	0.017	27	0.152	0.015	36

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.008	0.016	0.476	0.006	0.024	0.843
A, C	0.009	0.017	0.427	-0.01	0.02	0.453
B, C	0.017	0.016	0.036	-0.016	0.022	0.209

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Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.548	1.05	84	4.303	0.54	87
B1, A	5.045	0.965	21	4.016	0.453	27
B1, B	5.681	0.829	36	4.161	0.315	24
B1, C	5.763	1.266	27	4.614	0.567	36
B2, Total	13.709	1.565	84	12.944	0.452	87
B2, A	12.589	2.425	21	13.069	0.445	27
B2, B	13.945	1.096	36	13.23	0.205	24
B2, C	14.264	0.523	27	12.66	0.42	36
B3, Total	15.699	0.602	84	14.824	0.317	87
B3, A	15.641	0.717	21	14.779	0.414	27
B3, B	15.649	0.643	36	14.938	0.241	24
B3, C	15.812	0.431	27	14.781	0.261	36

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.635	0.699	0.083	-0.144	0.331	0.558
A, C	-0.718	0.74	0.06	-0.597	0.301	<.0001
B, C	-0.082	0.648	0.951	-0.453	0.311	0.002

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-1.355	0.982	0.004	-0.16	0.267	0.333
A, C	-1.675	1.041	6E-04	0.409	0.243	3E-04
B, C	-0.319	0.911	0.684	0.57	0.251	<.0001

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.008	0.414	0.999	-0.159	0.218	0.197
A, C	-0.171	0.438	0.623	-0.003	0.198	0.999
B, C	-0.163	0.384	0.572	1.57E-01	0.205	0.169

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.105	0.044	84	0.095	0.019	87
Duration, A	0.13	0.068	21	0.1	0.025	27
Duration, B	0.107	0.025	36	0.093	0.017	24
Duration, C	0.083	0.027	27	0.093	0.015	36

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.023	0.028	0.13	0.007	0.013	0.432
A, C	0.047	0.03	7E-04	0.007	0.012	0.357
B, C	0.024	0.026	0.07	4.49E-05	0.012	>.9999

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Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.056	0.775	87	3.305	0.614	84
B1, A	4.145	0.429	27	3.139	0.742	27
B1, B	4.123	0.656	36	3.281	0.285	24
B1, C	3.855	1.151	24	3.459	0.652	33
B2, Total	11.034	1.97	87	10.029	1.015	84
B2, A	12.495	1.99	27	10.039	1.186	27
B2, B	10.555	1.235	36	10.495	0.663	24
B2, C	10.111	1.988	24	9.683	0.962	33
B3, Total	15.418	0.478	87	14.626	0.413	84
B3, A	15.559	0.428	27	14.693	0.406	27
B3, B	15.384	0.408	36	14.641	0.404	24
B3, C	15.313	0.597	24	14.562	0.427	33

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.022	0.491	0.994	-0.142	0.424	0.707
A, C	0.289	0.541	0.415	-0.32	0.392	0.133
B, C	0.268	0.508	0.426	-0.178	0.406	0.55

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	1.94	1.089	1E-04	-0.456	0.679	0.252
A, C	2.384	1.2	<.0001	0.356	0.628	0.372
B, C	0.444	1.127	0.619	0.812	0.649	0.01

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.175	0.3	0.353	0.052	0.29	0.903
A, C	0.246	0.331	0.186	0.131	0.268	0.477
B, C	0.071	0.311	0.851	0.079	0.277	0.778

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.154	0.047	87	0.133	0.025	84
Duration, A	0.174	0.067	27	0.14	0.019	27
Duration, B	0.156	0.034	36	0.128	0.037	24
Duration, C	0.13	0.02	24	0.132	0.018	33

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.018	0.028	0.271	0.011	0.018	0.295
A, C	0.044	0.031	0.003	0.008	0.016	0.492
B, C	0.025	0.029	0.099	-0.003	0.017	0.888

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	4.287	1.115	81	3.675	1.228	75
B1, A	4.893	1.613	21	3.262	0.64	24
B1, B	4.24	0.457	36	3.51	0.849	18
B1, C	3.827	1.087	24	4.065	1.585	33
B2, Total	11.046	1.306	81	10.642	1.224	75
B2, A	11.305	0.553	21	10.632	1.06	24
B2, B	11.618	0.726	36	11.262	1.112	18
B2, C	9.964	1.752	24	10.31	1.292	33
B3, Total	15.366	0.478	81	14.789	0.619	75
B3, A	15.613	0.227	21	14.872	0.333	24
B3, B	15.383	0.387	36	14.762	0.748	18
B3, C	15.127	0.637	24	14.744	0.709	33

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.653	0.722	0.085	-0.247	0.928	0.802
A, C	1.066	0.785	0.005	-0.803	0.798	0.049
B, C	0.413	0.693	0.336	-0.555	0.872	0.288

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.313	0.757	0.59	-0.629	0.92	0.238
A, C	1.341	0.824	6E-04	0.322	0.791	0.599
B, C	1.654	0.726	<.0001	0.951	0.864	0.027

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.23	0.306	0.18	0.11	0.487	0.852
A, C	0.486	0.334	0.002	0.129	0.419	0.746
B, C	0.256	0.294	0.101	0.018	0.458	0.995

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.092	0.023	81	0.075	0.02	75
Duration, A	0.089	0.03	21	0.074	0.031	24
Duration, B	0.089	0.02	36	0.072	0.018	18
Duration, C	0.099	0.018	24	0.076	0.008	33

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-4.09E-04	0.015	0.998	0.002	0.016	0.97
A, C	-0.01	0.017	0.361	-0.002	0.014	0.918
B, C	-0.009	0.015	0.301	-0.004	0.015	0.816

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Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.051	0.902	90	4.492	0.696	90
B1, A	4.547	0.331	27	4.564	0.401	24
B1, B	5.482	0.937	36	4.651	0.698	30
B1, C	4.981	0.982	27	4.31	0.815	36
B2, Total	8.829	1.335	90	8.378	2.058	90
B2, A	8.909	1.061	27	8.185	1.287	24
B2, B	8.797	0.859	36	8.379	2.001	30
B2, C	8.792	1.992	27	8.507	2.515	36
B3, Total	15.542	0.486	90	15.14	0.58	90
B3, A	15.514	0.409	27	15.221	0.299	24
B3, B	15.648	0.505	36	14.988	0.563	30
B3, C	15.428	0.519	27	15.213	0.711	36

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.935	0.521	1E-04	-0.087	0.469	0.899
A, C	-0.435	0.557	0.157	0.254	0.451	0.377
B, C	0.501	0.521	0.062	0.341	0.423	0.139

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.112	0.855	0.948	-0.194	1.417	0.943
A, C	0.117	0.914	0.951	-0.323	1.364	0.841
B, C	0.005	0.855	1	-0.128	1.279	0.969

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.134	0.306	0.553	0.233	0.393	0.341
A, C	0.086	0.327	0.81	0.008	0.378	0.999
B, C	0.22	0.306	0.208	-0.225	0.355	0.293

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.163	0.035	90	0.151	0.025	90
Duration, A	0.175	0.046	27	0.157	0.034	24
Duration, B	0.164	0.029	36	0.143	0.026	30
Duration, C	0.15	0.023	27	0.154	0.013	36

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.012	0.021	0.403	0.014	0.017	0.108
A, C	0.025	0.023	0.025	0.003	0.016	0.883
B, C	0.014	0.021	0.279	-0.011	0.015	0.193

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Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.136	1.183	90	4.591	0.838	83
B1, A	4.42	0.54	27	4.296	0.941	27
B1, B	5.392	1.011	36	4.8	0.861	24
B1, C	5.51	1.534	27	4.684	0.668	32
B2, Total	8.991	1.48	90	8.287	2.214	83
B2, A	9.423	1.353	27	8.712	2.603	27
B2, B	8.929	1.388	36	8.743	2.262	24
B2, C	8.64	1.659	27	7.587	1.633	32
B3, Total	15.481	0.546	90	15.086	0.544	83
B3, A	15.485	0.653	27	15.343	0.455	27
B3, B	15.54	0.469	36	15.044	0.675	24
B3, C	15.4	0.533	27	14.9	0.42	32

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.971	0.695	0.003	-0.503	0.574	0.098
A, C	-1.09	0.743	0.002	-0.387	0.535	0.203
B, C	-0.119	0.695	0.913	0.116	0.553	0.872

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.493	0.928	0.42	-0.031	1.518	0.999
A, C	0.783	0.992	0.151	1.125	1.414	0.146
B, C	0.289	0.928	0.741	1.156	1.461	0.149

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.055	0.348	0.926	0.299	0.361	0.126
A, C	0.085	0.372	0.85	0.443	0.337	0.006
B, C	0.14	0.348	0.607	0.145	0.348	0.586

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.175	0.032	90	0.148	0.022	83
Duration, A	0.183	0.031	27	0.133	0.02	27
Duration, B	0.186	0.032	36	0.15	0.024	24
Duration, C	0.153	0.021	27	0.158	0.015	32

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.002	0.018	0.95	-0.017	0.014	0.012
A, C	0.03	0.02	0.001	-0.025	0.013	<.0001
B, C	0.032	0.018	2E-04	-0.008	0.013	0.355

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	6.093	1.377	72	4.914	1.031	96
B1, A	6.536	1.519	12	4.321	0.469	27
B1, B	6.058	1.116	33	5.011	1.233	33
B1, C	5.938	1.596	27	5.27	0.959	36
B2, Total	9.953	1.385	72	8.916	1.482	96
B2, A	10.218	0.768	12	8.493	0.663	27
B2, B	9.665	1.338	33	9.301	2.207	33
B2, C	10.188	1.61	27	8.88	0.952	36
B3, Total	15.664	0.539	72	15.056	0.535	96
B3, A	15.42	0.277	12	15.173	0.298	27
B3, B	15.693	0.579	33	15.034	0.751	33
B3, C	15.737	0.56	27	14.987	0.422	36

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.478	1.164	0.593	-0.69	0.623	0.026
A, C	0.598	1.198	0.463	-0.95	0.611	0.001
B, C	0.121	0.896	0.945	-0.259	0.578	0.539

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.553	1.163	0.496	-0.808	0.944	0.109
A, C	0.031	1.197	0.998	-0.387	0.926	0.584
B, C	-0.523	0.895	0.35	0.421	0.877	0.493

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.274	0.451	0.322	0.139	0.345	0.607
A, C	-0.317	0.464	0.239	0.186	0.339	0.398
B, C	-0.043	0.347	0.953	0.047	0.321	0.936

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.094	0.024	72	0.09	0.021	96
Duration, A	0.089	0.013	12	0.086	0.023	27
Duration, B	0.11	0.021	33	0.093	0.025	33
Duration, C	0.076	0.019	27	0.091	0.015	36

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.021	0.016	0.006	-0.007	0.014	0.487
A, C	0.013	0.016	0.15	-0.005	0.013	0.684
B, C	0.034	0.012	<.0001	0.002	0.013	0.933

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Descriptive Statistics						
Female				**Male**		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.28	1.226	90	6.098	0.813	90
B1, A	6.986	1.591	27	5.781	0.65	27
B1, B	7.083	0.83	36	6.611	0.888	27
B1, C	7.837	1.105	27	5.95	0.691	36
B2, Total	12.41	1.279	90	10.898	1.008	90
B2, A	11.717	1.148	27	10.296	0.42	27
B2, B	12.879	0.922	36	10.546	0.692	27
B2, C	12.477	1.527	27	11.613	1.093	36
B3, Total	15.303	0.808	90	14.692	0.37	90
B3, A	15.25	0.809	27	14.669	0.351	27
B3, B	15.314	0.86	36	14.748	0.313	27
B3, C	15.343	0.76	27	14.667	0.424	36

Scheffe for B1						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.097	0.75	0.949	-0.83	0.505	5E-04
A, C	-0.851	0.801	0.035	-0.168	0.472	0.675
B, C	-0.754	0.75	0.048	0.662	0.472	0.003

Scheffe for B2						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-1.162	0.759	0.001	-0.25	0.558	0.538
A, C	-0.76	0.811	0.071	-1.318	0.522	<.0001
B, C	0.402	0.759	0.422	-1.068	0.522	<.0001

Scheffe for B3						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.063	0.517	0.955	-0.078	0.252	0.742
A, C	-0.093	0.553	0.916	0.002	0.236	1
B, C	-0.03	0.517	0.99	0.081	0.236	0.697

Descriptive Statistics						
Female				**Male**		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.108	0.028	90	0.094	0.025	90
Duration, A	0.102	0.03	27	0.083	0.02	27
Duration, B	0.114	0.021	36	0.091	0.025	27
Duration, C	0.105	0.032	27	0.104	0.024	36

Scheffe for Duration						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.012	0.017	0.248	-0.008	0.016	0.414
A, C	-0.003	0.019	0.918	-0.021	0.015	0.002
B, C	0.009	0.017	0.467	-0.013	0.015	0.091

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.542	0.84	75	6.24	1.028	90
B1, A	7.354	1.051	18	5.941	1.575	27
B1, B	7.397	0.675	36	6.592	0.551	27
B1, C	7.951	0.795	21	6.199	0.672	36
B2, Total	11.587	0.676	75	10.514	0.898	90
B2, A	11.017	0.501	18	10.609	1.343	27
B2, B	11.805	0.569	36	10.363	0.592	27
B2, C	11.701	0.72	21	10.556	0.653	36
B3, Total	15.105	0.744	75	14.667	0.538	90
B3, A	14.675	0.867	18	14.972	0.718	27
B3, B	15.303	0.6	36	14.748	0.25	27
B3, C	15.134	0.734	21	14.377	0.378	36

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.042	0.585	0.984	-0.65	0.683	0.065
A, C	-0.596	0.651	0.08	-0.258	0.638	0.605
B, C	-0.554	0.557	0.051	0.393	0.638	0.314

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.788	0.433	1E-04	0.246	0.612	0.607
A, C	-0.684	0.482	0.003	0.053	0.572	0.974
B, C	0.104	0.412	0.821	-0.193	0.572	0.704

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.628	0.511	0.012	0.224	0.325	0.235
A, C	-0.46	0.569	0.138	0.596	0.304	<.0001
B, C	0.169	0.486	0.688	0.371	0.304	0.012

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.099	0.025	75	0.08	0.022	90
Duration, A	0.111	0.025	18	0.079	0.029	27
Duration, B	0.108	0.017	36	0.077	0.016	27
Duration, C	0.072	0.017	21	0.082	0.019	36

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.003	0.014	0.859	0.003	0.015	0.893
A, C	0.04	0.015	<.0001	-0.003	0.014	0.859
B, C	0.037	0.013	<.0001	-0.006	0.014	0.572

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	6.585	1.13	90	6.026	0.786	90
B1, A	6.243	1.746	27	5.823	0.472	27
B1, B	6.677	0.493	36	6.525	0.827	27
B1, C	6.804	0.9	27	5.805	0.79	36
B2, Total	11.263	1.238	90	10.001	0.911	90
B2, A	11.402	1.418	27	9.629	0.755	27
B2, B	11.407	1.012	36	9.969	0.915	27
B2, C	10.932	1.303	27	10.304	0.93	36
B3, Total	14.407	1.113	90	14.41	0.698	90
B3, A	15.181	0.783	27	14.75	0.267	27
B3, B	14.203	1.084	36	14.42	0.658	27
B3, C	13.903	1.049	27	14.147	0.84	36

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.434	0.709	0.318	-0.702	0.49	0.003
A, C	-0.56	0.758	0.19	0.018	0.458	0.995
B, C	-0.127	0.709	0.906	0.72	0.458	9E-04

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.005	0.782	1	-0.339	0.594	0.368
A, C	0.47	0.836	0.379	-0.675	0.556	0.013
B, C	0.476	0.782	0.322	-0.336	0.556	0.328

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.978	0.629	0.001	0.331	0.447	0.189
A, C	1.278	0.673	<.0001	0.603	0.418	0.002
B, C	0.3	0.629	0.496	0.272	0.418	0.273

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.165	0.036	90	0.15	0.021	90
Duration, A	0.167	0.055	27	0.143	0.013	27
Duration, B	0.161	0.025	36	0.149	0.029	27
Duration, C	0.168	0.022	27	0.155	0.017	36

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.006	0.023	0.794	-0.007	0.014	0.493
A, C	-0.001	0.024	0.994	-0.012	0.013	0.066
B, C	-0.007	0.023	0.726	-0.006	0.013	0.553

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Descriptive Statistics

Femle				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.489	0.433	114	3.003	0.604	111
B1, A	3.448	0.351	24	3.093	1.091	27
B1, B	3.586	0.411	36	2.921	0.26	27
B1, C	3.448	0.541	27	2.895	0.218	30
B1, D	3.435	0.409	27	3.114	0.437	27
B2, Total	14.157	1.851	114	13.477	1.341	111
B2, A	14.66	1.284	24	13.649	0.522	27
B2, B	14.521	1.772	36	13.791	0.264	27
B2, C	13.428	1.714	27	13.784	0.602	30
B2, D	13.952	2.293	27	12.648	2.431	27
B3, Total	16.102	0.458	114	15.728	0.534	111
B3, A	16.32	0.395	24	15.767	0.255	27
B3, B	16.157	0.517	36	15.854	0.512	27
B3, C	15.939	0.347	27	15.745	0.384	30
B3, D	15.998	0.452	27	15.545	0.812	27

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.137	0.325	0.696	0.172	0.467	0.7779
A, C	-1.78E-04	0.346	>.9999	0.198	0.455	0.6762
A, D	0.013	0.346	1	-0.02	0.467	0.9995
B, C	0.137	0.314	0.673	0.026	0.455	0.9989
B, D	0.151	0.314	0.603	-0.192	0.467	0.7137
C, D	0.013	0.335	1	-0.218	0.455	0.6045

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.139	1.355	0.994	-0.142	0.983	0.9824
A, C	1.232	1.443	0.124	-0.134	0.958	0.9839
A, D	0.708	1.443	0.586	1.001	0.983	0.0442
B, C	1.093	1.309	0.138	0.008	0.958	>.9999
B, D	0.569	1.309	0.678	1.143	0.983	0.0152
C, D	-0.524	1.4	0.77	1.135	0.958	1.28E-02

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.163	0.33	0.581	-0.087	0.409	0.9476
A, C	0.381	0.351	0.028	0.022	0.399	0.999
A, D	0.322	0.351	0.086	0.223	0.409	0.4984
B, C	0.218	0.319	0.293	0.109	0.399	0.8958
B, D	0.159	0.319	0.574	0.309	0.409	0.2088
C, D	-0.059	0.341	0.97	0.2	0.399	0.5661

Descriptive Statistics						
Female				**Male**		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.133	0.029	114	0.125	0.019	111
Duration, A	0.167	0.032	24	0.128	0.016	27
Duration, B	0.108	0.01	36	0.132	0.023	27
Duration, C	0.145	0.021	27	0.121	0.016	30
Duration, D	0.123	0.011	27	0.118	0.018	27

Scheffe for Duration						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.059	0.014	<.0001	-0.004	0.014	0.8573
A, C	0.022	0.015	0.001	0.007	0.014	0.6041
A, D	0.045	0.015	<.0001	0.01	0.014	0.2984
B, C	-0.036	0.014	<.0001	0.011	0.014	0.1706
B, D	-0.014	0.014	0.043	0.014	0.014	0.0543
C, D	0.022	0.015	9E-04	0.003	0.014	0.944

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Descriptive Statistics						
Female				**Male**		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.36	0.392	105	3.435	1.259	69
B1, A	3.434	0.465	30	2.801	0.38	6
B1, B	3.441	0.443	27	3.453	2.237	9
B1, C	3.318	0.303	27	3.617	1.059	27
B1, D	3.201	0.254	21	3.388	1.152	27
B2, Total	13.999	1.402	105	13.021	0.975	69
B2, A	14.037	1.712	30	12.831	0.351	6
B2, B	14.478	1.135	27	13.77	0.571	9
B2, C	13.202	1.237	27	13.102	0.449	27
B2, D	14.355	1	21	12.732	1.366	27
B3, Total	15.892	0.433	105	15.722	0.488	69
B3, A	16.002	0.288	30	15.482	0.127	6
B3, B	15.99	0.567	27	16.059	0.669	9
B3, C	15.666	0.349	27	15.664	0.368	27
B3, D	15.898	0.422	21	15.72	0.538	27

Scheffe for B1						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.007	0.291	>.9999	-0.652	1.917	0.8127
A, C	0.116	0.291	0.735	-0.815	1.642	0.569
A, D	0.233	0.312	0.219	-0.587	1.642	0.7885
B, C	0.122	0.299	0.716	-0.164	1.4	0.9902
B, D	0.24	0.319	0.215	0.065	1.4	0.9994
C, D	0.117	0.319	0.78	0.228	0.99	0.9318

Scheffe for B2						
Female				**Male**		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.441	1.002	0.668	-0.939	1.416	0.314
A, C	0.834	1.002	0.14	-0.27	1.212	0.9378
A, D	-0.318	1.075	0.871	0.099	1.212	0.9966
B, C	1.276	1.028	0.008	0.668	1.034	0.3366
B, D	0.123	1.099	0.992	1.038	1.034	0.0488
C, D	-1.152	1.099	0.036	0.369	0.731	0.5549

Scheffe for B3

Female				Male		
Group	Mean Diff.	Crit. Diff.	P-Value	Mean Diff.	Crit. Diff.	P-Value
A, B	0.012	0.314	1	-0.577	0.72	0.1624
A, C	0.336	0.314	0.03	-0.182	0.617	0.8685
A, D	0.104	0.337	0.857	-0.238	0.617	0.7458
B, C	0.325	0.322	0.047	0.395	0.526	0.2094
B, D	0.092	0.344	0.901	0.339	0.526	0.3391
C, D	-0.233	0.344	0.303	-0.056	0.372	0.9791

Descriptive Statistics

Female				Male		
Group	Mean	Std. Dev.	Count	Mean	Std. Dev.	Count
Duration, Total	0.047	0.026	105	0.041	0.012	69
Duration, A	0.073	0.032	30	0.038	0.016	6
Duration, B	0.034	0.006	27	0.055	0.018	9
Duration, C	0.044	0.018	27	0.041	0.08	27
Duration, D	0.03	0.011	21	0.038	0.01	21

Scheffe for Duration

Female				Male		
Group	Mean Diff.	Crit. Diff.	P-Value	Mean Diff.	Crit. Diff.	P-Value
A, B	0.039	0.015	<.0001	-0.017	0.017	0.0546
A, C	0.029	0.015	<.0001	-0.003	0.015	0.9491
A, D	0.043	0.016	<.0001	-0.001	0.015	0.9988
B, C	-0.01	0.016	0.343	0.014	0.013	0.0237
B, D	0.004	0.017	0.934	0.016	0.013	0.006
C, D	0.014	0.017	0.138	0.002	0.009	0.9153

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Descriptive Statistics

Female				Male		
Group	Mean	Std. Dev.	Count	Mean	Std. Dev.	Count
B1, Total	3.43	0.443	114	2.977	0.319	108
B1, A	3.604	0.495	27	2.881	0.281	21
B1, B	3.475	0.429	36	2.993	0.327	24
B1, C	3.308	0.404	24	2.99	0.253	36
B1, D	3.305	0.39	27	3.021	0.408	27
B2, Total	14.246	1.37	114	13.48	0.955	108
B2, A	13.658	2.022	27	13.468	0.496	21
B2, B	14.56	1.003	36	13.629	0.308	24
B2, C	13.983	1.084	24	13.63	0.607	36
B2, D	14.649	0.975	27	13.155	1.68	27
B3, Total	15.922	0.528	114	15.799	0.417	108
B3, A	16.068	0.442	27	15.853	0.248	21
B3, B	16.026	0.548	36	15.805	0.454	24
B3, C	15.756	0.513	24	15.825	0.317	36
B3, D	15.783	0.545	27	15.718	0.585	27

Scheffe for B1

Female				Male		
Group	Mean Diff.	Crit. Diff.	P-Value	Mean Diff.	Crit. Diff.	P-Value
A, B	0.129	0.312	0.71	-0.112	0.271	0.7123
A, C	0.296	0.344	0.119	-0.109	0.249	0.6728
A, D	0.299	0.334	0.098	-0.14	0.264	0.5223
B, C	0.167	0.323	0.544	0.003	0.239	>.9999
B, D	0.169	0.312	0.502	-0.028	0.255	0.9921
C, D	0.002	0.344	>.9999	-0.031	0.231	0.9861

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.902	0.958	0.073	-0.162	0.805	0.955
A, C	-0.325	1.056	0.858	-0.162	0.74	0.9421
A, D	-0.991	1.024	0.062	0.313	0.784	0.7331
B, C	0.578	0.992	0.438	-0.001	0.71	>.9999
B, D	-0.089	0.958	0.995	0.474	0.756	0.3696
C, D	-0.666	1.056	0.365	0.475	0.686	0.2811

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.042	0.373	0.992	0.048	0.357	0.9854
A, C	0.312	0.411	0.207	0.029	0.328	0.996
A, D	0.285	0.399	0.255	0.135	0.347	0.7468
B, C	0.27	0.387	0.273	-0.02	0.315	0.9985
B, D	0.244	0.373	0.335	0.087	0.335	0.9083
C, D	-0.027	0.411	0.998	0.107	0.304	0.8015

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.065	0.014	114	0.062	0.014	108
Duration, A	0.074	0.01	27	0.059	0.13	21
Duration, B	0.055	0.015	36	0.074	0.016	24
Duration, C	0.069	0.018	24	0.061	0.01	36
Duration, D	0.068	0.004	27	0.055	0.01	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.018	0.009	<.0001	-0.015	0.01	0.0011
A, C	0.005	0.01	0.597	-0.002	0.01	0.9199
A, D	0.006	0.01	0.415	0.004	0.01	0.7796
B, C	-0.013	0.009	0.002	0.013	0.009	0.0019
B, D	-0.012	0.009	0.003	0.019	0.01	<.0001
C, D	0.001	0.01	0.995	0.006	0.009	0.2888

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.192	0.893	117	4.079	0.434	117
B1, A	4.917	0.851	27	3.996	0.478	27
B1, B	5.434	0.566	36	3.964	0.286	27
B1, C	4.777	1.112	27	4.131	0.503	36
B1, D	5.561	0.831	27	4.209	0.384	27
B2, Total	14.095	0.887	117	13.115	0.531	117
B2, A	13.935	0.771	27	13.004	0.265	27
B2, B	14.219	1.014	36	13.349	0.228	27
B2, C	13.996	1.163	27	13.077	0.404	36
B2, D	14.189	0.331	27	13.045	0.916	27
B3, Total	15.725	0.49	117	14.948	0.389	117
B3, A	15.57	0.547	27	14.708	0.279	27
B3, B	15.815	0.42	36	14.921	0.249	27
B3, C	15.851	0.528	27	15.018	0.454	36
B3, D	15.636	0.439	27	15.123	0.395	27

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.518	0.608	0.127	0.032	0.331	0.9946
A, C	0.139	0.65	0.946	-0.134	0.31	0.679
A, D	-0.644	0.65	0.053	-0.213	0.331	0.3474
B, C	0.657	0.608	0.029	-0.166	0.31	0.5099
B, D	-0.126	0.608	0.951	-0.245	0.331	0.2262
C, D	-0.783	0.65	0.011	-0.079	0.31	0.9144

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.284	0.643	0.666	-0.345	0.403	0.1225
A, C	-0.061	0.687	0.996	-0.073	0.377	0.9586
A, D	-0.254	0.687	0.777	-0.041	0.403	0.9937
B, C	0.224	0.643	0.808	0.271	0.377	0.2483
B, D	0.03	0.643	0.999	0.304	0.403	0.2108
C, D	-0.193	0.687	0.888	0.032	0.377	0.9962

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.245	0.348	0.269	-0.213	0.281	0.2076
A, C	-0.281	0.372	0.211	-0.31	0.263	0.013
A, D	-0.066	0.372	0.969	-0.416	0.281	0.0009
B, C	-0.036	0.348	0.993	-0.098	0.263	0.7738
B, D	0.179	0.348	0.549	-0.203	0.281	0.2466
C, D	0.215	0.372	0.446	-0.105	0.263	0.7322

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.141	0.027	117	0.139	0.022	117
Duration, A	0.166	0.017	27	0.148	0.028	27
Duration, B	0.119	0.008	36	0.14	0.022	27
Duration, C	0.158	0.022	27	0.134	0.017	36
Duration, D	0.129	0.025	27	0.136	0.021	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.047	0.013	<.0001	0.008	0.017	0.592
A, C	0.008	0.014	0.442	0.014	0.016	0.0906
A, D	0.037	0.014	<.0001	0.012	0.017	0.2621
B, C	-0.039	0.013	<.0001	0.006	0.016	0.7525
B, D	-0.011	0.013	0.175	0.004	0.017	0.9411
C, D	0.028	0.014	<.0001	-0.002	0.016	0.9805

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.043	0.884	114	4.114	0.435	117
B1, A	4.97	0.838	27	3.885	0.573	27
B1, B	5.384	0.547	33	4.043	0.341	30
B1, C	4.712	0.869	27	4.318	0.271	33
B1, D	5.03	1.143	27	4.171	0.422	27
B2, Total	13.654	1.191	114	12.681	0.442	117
B2, A	13.191	1.301	27	12.575	0.307	27
B2, B	13.666	1.317	33	12.847	0.167	30
B2, C	13.913	1.255	27	12.536	0.286	33
B2, D	13.844	0.66	27	12.781	0.751	27
B3, Total	15.671	0.556	114	14.906	0.452	117
B3, A	15.459	0.627	27	14.762	0.287	27
B3, B	15.63	0.563	33	14.824	0.254	30
B3, C	15.909	0.53	27	14.757	0.507	33
B3, D	15.697	0.418	27	15.325	0.448	27

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.414	0.634	0.333	-0.158	0.308	0.5497
A, C	0.258	0.665	0.751	-0.433	0.301	0.0014
A, D	-0.06	0.665	0.996	-0.286	0.316	0.0922
B, C	0.672	0.634	0.033	-0.275	0.293	0.074
B, D	0.354	0.634	0.475	-0.128	0.308	0.7091
C, D	-0.318	0.665	0.608	0.148	0.301	0.5884

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.475	0.865	0.491	-0.271	0.321	0.1309
A, C	-0.723	0.908	0.171	0.039	0.314	0.9886
A, D	-0.653	0.908	0.25	-0.206	0.329	0.3724
B, C	-0.247	0.865	0.883	0.31	0.305	0.0446
B, D	-0.178	0.865	0.952	0.065	0.321	0.954
C, D	0.07	0.908	0.997	-0.245	0.314	0.1844

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.171	0.398	0.688	-0.062	0.296	0.95
A, C	-0.45	0.418	0.029	0.005	0.29	>.9999
A, D	-0.237	0.418	0.46	-0.563	0.304	<.0001
B, C	-0.279	0.398	0.271	0.067	0.282	0.9285
B, D	-0.067	0.398	0.973	-0.501	0.296	0.0001
C, D	0.213	0.418	0.557	-0.568	0.29	<.0001

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.058	0.013	114	0.139	0.022	117
Duration, A	0.072	0.012	27	0.149	0.028	27
Duration, B	0.05	0.007	33	0.14	0.022	27
Duration, C	0.06	0.014	27	0.134	0.017	36
Duration, D	0.052	0.006	27	0.136	0.021	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.022	0.007	<.0001	-0.011	0.015	0.2372
A, C	0.013	0.008	2E-04	0.001	0.015	0.9955
A, D	0.02	0.008	<.0001	0.016	0.016	0.0446
B, C	-0.01	0.007	0.005	0.013	0.015	0.1192
B, D	-0.002	0.007	0.841	0.027	0.015	<.0001
C, D	0.007	0.008	0.082	0.015	0.015	0.059

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.241	0.88	111	4.166	0.36	111
B1, A	4.924	0.8	24	3.965	0.435	27
B1, B	5.477	0.356	36	4.091	0.293	24
B1, C	5.124	1.32	27	4.37	0.256	33
B1, D	5.337	0.828	24	4.184	0.319	27
B2, Total	13.928	0.848	111	12.722	0.436	111
B2, A	13.634	0.764	24	12.656	0.278	27
B2, B	14.281	0.214	36	12.866	0.199	24
B2, C	13.65	1.402	27	12.757	0.26	33
B2, D	14.007	0.423	24	12.616	0.757	27
B3, Total	15.704	0.579	111	14.914	0.326	111
B3, A	15.582	0.695	24	14.803	0.211	27
B3, B	15.864	0.424	36	14.754	0.229	24
B3, C	15.792	0.663	27	14.941	0.33	33
B3, D	15.486	0.484	24	15.132	0.37	27

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.553	0.648	0.125	-0.126	0.263	0.6046
A, C	-0.2	0.69	0.878	-0.405	0.243	0.0001
A, D	-0.413	0.71	0.44	-0.219	0.255	0.1198
B, C	0.353	0.626	0.468	-0.279	0.251	0.0226
B, D	0.14	0.648	0.945	-0.093	0.263	0.7971
C, D	-0.213	0.69	0.857	0.186	0.243	0.2001

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.646	0.606	0.032	-0.209	0.344	0.3986
A, C	-0.015	0.646	>.9999	-0.1	0.319	0.8493
A, D	-0.373	0.664	0.472	0.04	0.334	0.9897
B, C	0.631	0.586	0.029	0.109	0.329	0.8289
B, D	0.274	0.606	0.651	0.25	0.344	0.2433
C, D	-0.357	0.646	0.484	0.14	0.319	0.6674

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.282	0.423	0.315	0.049	0.236	0.9502
A, C	-0.21	0.451	0.628	-0.138	0.219	0.3624
A, D	0.095	0.464	0.952	-0.329	0.229	0.0014
B, C	0.072	0.409	0.969	-0.187	0.226	0.1423
B, D	0.378	0.423	0.1	-0.378	0.236	0.0003
C, D	0.305	0.451	0.301	-0.191	0.219	0.1117

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.07	0.01	111	0.072	0.016	111
Duration, A	0.076	0.013	24	0.068	0.016	27
Duration, B	0.067	0.006	36	0.077	0.012	24
Duration, C	0.071	0.01	27	0.077	0.019	33
Duration, D	0.067	0.01	24	0.065	0.009	27

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.009	0.007	0.006	-0.008	0.012	0.2452
A, C	0.004	0.008	0.498	-0.009	0.011	0.1415
A, D	0.009	0.008	0.023	0.003	0.011	0.8671
B, C	-0.005	0.007	0.257	-0.001	0.011	0.9993
B, D	-3.66E-04	0.007	0.999	0.012	0.012	0.0455
C, D	0.005	0.008	0.412	0.012	0.011	0.0174

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Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.942	0.672	111	3.773	1.227	111
B1, A	3.994	0.402	21	3.679	1.32	24
B1, B	4.085	0.513	36	4.153	2.101	27
B1, C	3.624	0.702	27	3.613	0.298	33
B1, D	4.031	0.893	27	3.673	0.32	27
B2, Total	10.386	0.868	111	10.394	1.618	111
B2, A	10.381	0.473	21	10.272	1.973	24
B2, B	10.615	0.897	36	11.032	1.908	27
B2, C	10.038	1.107	27	9.881	1.372	33
B2, D	10.434	0.711	27	10.492	0.948	27
B3, Total	15.448	0.443	111	14.979	0.688	111
B3, A	15.589	0.362	21	15.273	0.504	24
B3, B	15.47	0.427	36	15.055	0.838	27
B3, C	15.418	0.609	27	14.721	0.643	33
B3, D	15.34	0.29	27	14.957	0.631	27

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.091	0.511	0.968	-0.475	0.976	0.5932
A, C	0.37	0.542	0.294	0.066	0.933	0.9979
A, D	-0.037	0.542	0.998	0.005	0.976	>.9999
B, C	0.461	0.474	0.06	0.54	0.902	0.413
B, D	0.054	0.474	0.991	0.48	0.946	0.5597
C, D	-0.407	0.507	0.165	-0.06	0.902	0.9982

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.234	0.665	0.8	-0.76	1.261	0.4064
A, C	0.343	0.704	0.592	0.391	1.205	0.8378
A, D	-0.053	0.704	0.998	-0.22	1.261	0.9696
B, C	0.577	0.616	0.075	1.151	1.166	0.0546
B, D	0.182	0.616	0.873	0.539	1.223	0.6673
C, D	-0.396	0.659	0.409	-0.611	1.166	0.531

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.119	0.344	0.81	0.218	0.532	0.7161
A, C	0.171	0.365	0.62	0.552	0.509	0.0272
A, D	0.25	0.365	0.292	0.316	0.532	0.4194
B, C	0.052	0.319	0.975	0.334	0.492	0.2984
B, D	0.131	0.319	0.717	0.098	0.516	0.9616
C, D	0.078	0.341	0.935	-0.236	0.492	0.6031

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.137	0.026	111	0.128	0.02	111
Duration, A	0.164	0.025	21	0.132	0.04	24
Duration, B	0.111	0.01	36	0.141	0.03	27
Duration, C	0.146	0.019	27	0.122	0.03	27
Duration, D	0.142	0.015	27	0.12	0.04	27

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.053	0.013	<.0001	-0.009	0.015	0.3883
A, C	0.018	0.014	0.006	0.01	0.014	0.2774
A, D	0.021	0.014	6E-04	0.012	0.015	0.1471
B, C	-0.035	0.012	<.0001	0.019	0.013	0.0023
B, D	-0.032	0.012	<.0001	0.021	0.014	0.0009
C, D	0.003	0.013	0.912	0.002	0.013	9.72E-01

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.75	0.467	120	4.223	2.22	96
B1, A	3.991	0.293	27	3.556	1.438	9
B1, B	3.988	0.512	36	4.312	2.12	27
B1, C	3.472	0.411	27	4.875	2.571	33
B1, D	3.499	0.294	30	3.558	1.892	27
B2, Total	11.258	0.771	120	11.151	1.479	96
B2, A	11.301	0.437	27	10.19	1.157	9
B2, B	11.562	0.571	36	11.528	1.591	27
B2, C	10.676	0.84	27	11.129	1.597	33
B2, D	11.377	0.893	30	11.121	1.197	27
B3, Total	15.483	0.4	120	15.073	0.839	96
B3, A	15.587	0.346	27	15.218	0.536	9
B3, B	15.576	0.323	36	14.976	0.781	27
B3, C	15.344	0.557	27	14.91	0.989	33
B3, D	15.403	0.315	30	15.322	0.747	27

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.002	0.287	>.9999	-0.756	2.392	0.8467
A, C	0.519	0.307	1E-04	-1.319	2.337	0.4645
A, D	0.491	0.299	2E-04	-0.002	2.392	>.9999
B, C	0.517	0.287	<.0001	-0.562	1.613	0.8045
B, D	0.489	0.279	<.0001	0.754	1.691	0.6578
C, D	-0.027	0.299	0.995	1.316	1.613	0.1524

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.26	0.51	0.555	-1.338	1.598	0.1358
A, C	0.625	0.545	0.017	-0.939	1.561	0.4065
A, D	-0.075	0.531	0.983	-0.931	1.598	0.4358
B, C	0.885	0.51	<.0001	0.399	1.077	0.7744
B, D	0.185	0.495	0.773	0.407	1.13	0.7883
C, D	-0.701	0.531	0.004	0.008	1.077	>.9999

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.011	0.282	1	0.242	0.914	0.9033
A, C	0.242	0.302	0.164	0.308	0.893	0.8096
A, D	0.183	0.294	0.377	-0.103	0.914	0.9913
B, C	0.231	0.282	0.15	0.066	0.616	0.9926
B, D	0.172	0.274	0.369	-0.345	0.646	0.5123
C, D	-0.059	0.294	0.955	-0.411	0.616	0.312

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.045	0.021	120	0.051	0.015	96
Duration, A	0.068	0.027	27	0.056	0.008	9
Duration, B	0.031	0.01	36	0.06	0.014	27
Duration, C	0.041	0.012	27	0.05	0.015	23
Duration, D	0.044	0.014	30	0.043	0.011	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.038	0.012	<.0001	-0.004	0.015	0.9215
A, C	0.028	0.013	<.0001	0.007	0.014	0.5946
A, D	0.025	0.013	<.0001	0.013	0.015	0.0969
B, C	-0.01	0.012	0.157	0.01	0.01	0.0318
B, D	-0.013	0.012	0.025	0.017	0.01	0.0003
C, D	-0.003	0.013	0.923	0.006	0.01	3.69E-01

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	3.975	0.465	117	4.223	2.22	96
B1, A	4.099	0.314	27	3.556	1.438	9
B1, B	4.192	0.481	36	4.312	2.12	27
B1, C	3.658	0.412	27	4.875	2.571	33
B1, D	3.877	0.436	27	3.558	1.892	27
B2, Total	10.987	0.75	117	11.151	1.479	96
B2, A	11.186	0.446	27	10.19	1.157	9
B2, B	11.285	0.682	36	11.528	1.591	27
B2, C	10.428	0.864	27	11.129	1.597	33
B2, D	10.95	0.671	27	11.121	1.197	27
B3, Total	15.592	0.369	117	15.073	0.839	96
B3, A	15.697	0.265	27	15.218	0.536	9
B3, B	15.565	0.277	36	14.976	0.781	27
B3, C	15.704	0.526	27	14.91	0.989	33
B3, D	15.411	0.311	27	15.322	0.747	27

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.093	0.304	0.86	-0.756	2.392	0.8467
A, C	0.441	0.325	0.003	-1.319	2.337	0.4645
A, D	0.222	0.325	0.293	-0.002	2.392	>.9999
B, C	0.534	0.304	<.0001	-0.562	1.613	0.8045
B, D	0.315	0.304	0.039	0.754	1.691	0.6578
C, D	-0.219	0.325	0.305	1.316	1.613	0.1524

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.099	0.493	0.955	-1.338	1.598	0.1358
A, C	0.758	0.527	0.001	-0.939	1.561	0.4065
A, D	0.236	0.527	0.658	-0.931	1.598	0.4358
B, C	0.857	0.493	<.0001	0.399	1.077	0.7744
B, D	0.335	0.493	0.299	0.407	1.13	0.7883
C, D	-0.522	0.527	0.053	0.008	1.077	>.9999

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.133	0.256	0.542	0.242	0.914	0.9033
A, C	-0.006	0.274	>.9999	0.308	0.893	0.8096
A, D	0.287	0.274	0.036	-0.103	0.914	0.9913
B, C	-0.139	0.256	0.502	0.066	0.616	0.9926
B, D	0.154	0.256	0.408	-0.345	0.646	0.5123
C, D	0.293	0.274	0.03	-0.411	0.616	0.312

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.064	0.014	117	0.051	0.015	96
Duration, A	0.069	0.018	27	0.056	0.008	9
Duration, B	0.055	0.007	36	0.06	0.014	27
Duration, C	0.068	0.011	27	0.05	0.015	33
Duration, D	0.068	0.013	27	0.043	0.011	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.014	0.009	4E-04	-0.004	0.015	0.9215
A, C	0.001	0.01	0.995	0.007	0.014	0.5946
A, D	0.001	0.01	0.991	0.013	0.015	0.0969
B, C	-0.013	0.009	0.001	0.01	0.01	0.0318
B, D	-0.013	0.009	0.001	0.017	0.01	0.0003
C, D	2.01E-04	0.01	>.9999	0.006	0.01	0.3691

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.277	1.058	117	4.637	0.577	119
B1, A	4.643	0.512	27	4.447	0.795	26
B1, B	5.788	0.841	36	4.643	0.572	30
B1, C	4.673	1.162	27	4.561	0.448	36
B1, D	5.832	0.974	27	4.914	0.377	27
B2, Total	8.623	1.315	117	8.483	2.467	119
B2, A	8.337	1.334	27	8.286	2.439	26
B2, B	8.466	0.715	36	8.836	3.247	30
B2, C	8.619	1.432	27	7.33	1.473	36
B2, D	9.122	1.679	27	9.819	1.83	27
B3, Total	15.795	0.474	117	15.243	0.691	119
B3, A	15.705	0.261	27	15.388	0.387	26
B3, B	15.936	0.503	36	15.493	0.73	30
B3, C	15.801	0.624	27	15.197	0.578	36
B3, D	15.69	0.399	27	14.887	0.867	27

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-1.145	0.65	<.0001	-0.196	0.425	0.6359
A, C	-0.03	0.695	1	-0.114	0.409	0.8913
A, D	-1.189	0.695	<.0001	-0.467	0.436	0.0305
B, C	1.115	0.65	<.0001	0.083	0.392	0.9489
B, D	-0.044	0.65	0.998	-0.271	0.421	0.348
C, D	-1.159	0.695	1E-04	-0.353	0.404	0.1105

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.129	0.939	0.985	-0.55	1.762	0.8531
A, C	-0.283	1.004	0.887	0.956	1.692	0.4659
A, D	-0.785	1.004	0.183	-1.533	1.807	0.1281
B, C	-0.154	0.939	0.975	1.506	1.625	0.0807
B, D	-0.657	0.939	0.274	-0.984	1.744	0.4675
C, D	-0.503	1.004	0.57	-2.489	1.674	0.0008

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.232	0.339	0.294	-0.105	0.503	0.9499
A, C	-0.096	0.362	0.905	0.19	0.483	0.7421
A, D	0.015	0.362	1	0.501	0.516	0.061
B, C	0.136	0.339	0.731	0.295	0.464	0.3581
B, D	0.247	0.339	0.24	0.606	0.498	0.0099
C, D	0.111	0.362	0.861	0.31	0.478	0.3397

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.152	0.027	117	0.137	0.02	119
Duration, A	0.178	0.031	27	0.146	0.019	26
Duration, B	0.131	0.012	36	0.14	0.02	30
Duration, C	0.159	0.022	27	0.141	0.013	36
Duration, D	0.149	0.015	27	0.121	0.022	27

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.048	0.015	<.0001	0.006	0.014	0.7129
A, C	0.02	0.016	0.008	0.005	0.013	0.763
A, D	0.029	0.016	<.0001	0.025	0.014	<.0001
B, C	-0.028	0.015	<.0001	-0.001	0.013	0.9991
B, D	-0.019	0.015	0.007	0.02	0.014	0.0015
C, D	0.009	0.016	0.451	0.02	0.013	0.0005

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Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.319	0.82	111	4.531	0.936	105
B1, A	4.689	0.588	24	4.104	0.976	27
B1, B	5.638	0.522	36	4.605	0.761	24
B1, C	5.204	0.879	27	4.449	0.324	30
B1, D	5.599	0.953	24	5.04	1.295	24
B2, Total	9.024	0.874	111	8.971	1.607	105
B2, A	8.563	0.759	24	8.928	1.617	27
B2, B	9.298	0.635	36	8.291	1.638	24
B2, C	9.029	1.165	27	8.381	0.703	30
B2, D	9.07	0.766	24	10.438	1.493	24
B3, Total	15.787	0.487	111	15.147	0.556	105
B3, A	15.682	0.274	24	15.233	0.335	27
B3, B	15.878	0.535	36	15.139	0.419	24
B3, C	16.037	0.507	27	15.312	0.483	30
B3, D	15.475	0.367	24	14.852	0.816	24

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.949	0.553	<.0001	-0.5	0.709	0.2643
A, C	-0.514	0.589	0.111	-0.345	0.67	0.545
A, D	-0.91	0.606	8E-04	-0.936	0.709	0.0041
B, C	0.434	0.535	0.156	0.155	0.692	0.9385
B, D	0.039	0.553	0.998	-0.435	0.729	0.4145
C, D	-0.396	0.589	0.309	-0.591	0.692	0.1241

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.735	0.632	0.015	0.636	1.109	0.4508
A, C	-0.466	0.672	0.28	0.547	1.049	0.535
A, D	-0.507	0.692	0.233	-1.51	1.109	0.0028
B, C	0.269	0.61	0.668	-0.089	1.083	0.9966
B, D	0.228	0.632	0.79	-2.147	1.142	<.0001
C, D	-0.041	0.672	0.999	-2.057	1.083	<.0001

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.195	0.336	0.438	0.094	0.428	0.9424
A, C	-0.355	0.357	0.052	-0.079	0.405	0.9589
A, D	0.207	0.368	0.468	0.381	0.428	0.0999
B, C	-0.16	0.324	0.583	-0.172	0.418	0.7119
B, D	0.402	0.336	0.011	0.288	0.44	0.3331
C, D	0.562	0.357	4E-04	0.46	0.418	0.0245

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.064	0.021	111	0.057	0.019	105
Duration, A	0.094	0.021	24	0.053	0.023	27
Duration, B	0.049	0.007	36	0.064	0.017	24
Duration, C	0.061	0.013	27	0.06	0.015	30
Duration, D	0.06	0.009	24	0.052	0.02	24

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.046	0.01	<.0001	-0.011	0.015	0.2124
A, C	0.033	0.01	<.0001	-0.007	0.014	0.5442
A, D	0.034	0.011	<.0001	0.001	0.015	0.995
B, C	-0.013	0.009	0.003	0.004	0.015	0.8974
B, D	-0.012	0.01	0.012	0.013	0.015	0.1474
C, D	0.001	0.01	0.993	0.009	0.015	0.4158

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Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	5.421	0.977	117	4.768	0.644	105
B1, A	4.64	0.477	27	4.485	0.659	27
B1, B	5.933	0.543	36	4.927	0.77	27
B1, C	5.07	1.286	27	4.681	0.442	33
B1, D	5.871	0.801	27	5.115	0.541	18
B2, Total	8.982	0.792	117	8.77	1.743	105
B2, A	8.953	0.941	27	8.357	1.224	27
B2, B	9.133	0.711	36	8.786	2.158	27
B2, C	8.672	0.776	27	8.298	1.665	33
B2, D	9.121	0.692	27	10.23	0.993	18
B3, Total	15.846	0.513	117	15.159	0.703	105
B3, A	15.752	0.281	27	15.364	0.286	27
B3, B	15.848	0.567	36	15.264	0.711	27
B3, C	16.092	0.551	27	15.348	0.641	33
B3, D	15.692	0.512	27	14.346	0.708	18

Scheffe for B1

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-1.293	0.592	<.0001	-0.441	0.474	0.0785
A, C	-0.43	0.633	0.299	-0.195	0.452	0.6814
A, D	-1.231	0.633	<.0001	-0.63	0.53	0.0125
B, C	0.862	0.592	0.001	0.246	0.452	0.4978
B, D	0.061	0.592	0.993	-0.188	0.53	0.796
C, D	-0.801	0.633	0.007	-0.434	0.51	0.126

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.18	0.564	0.845	-0.429	1.255	0.814
A, C	0.282	0.603	0.626	0.059	1.196	0.9993
A, D	-0.168	0.603	0.891	-1.873	1.403	0.0036
B, C	0.462	0.564	0.152	0.488	1.196	0.7186
B, D	0.012	0.564	>.9999	-1.444	1.403	0.0409
C, D	-0.449	0.603	0.22	-1.932	1.351	0.0015

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.096	0.36	0.903	0.099	0.468	0.9474
A, C	-0.34	0.385	0.104	0.016	0.446	0.9997
A, D	0.059	0.385	0.979	1.017	0.523	<.0001
B, C	-0.244	0.36	0.299	-0.083	0.446	0.9633
B, D	0.155	0.36	0.683	0.918	0.523	<.0001
C, D	0.4	0.385	0.038	1.001	0.504	<.0001

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.076	0.016	117	0.074	0.016	105
Duration, A	0.088	0.018	27	0.063	0.011	27
Duration, B	0.064	0.009	36	0.076	0.019	27
Duration, C	0.078	0.015	27	0.08	0.012	33
Duration, D	0.078	0.012	27	0.075	0.017	18

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.024	0.01	<.0001	-0.013	0.011	0.0213
A, C	0.01	0.011	0.087	-0.017	0.011	0.0004
A, D	0.01	0.011	0.071	-0.012	0.013	0.0755
B, C	-0.014	0.01	0.002	-0.004	0.011	0.732
B, D	-0.013	0.01	0.003	0.001	0.013	0.9984
C, D	3.40E-04	0.011	1	0.005	0.012	0.6989

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Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.806	0.936	117	6.478	0.486	117
B1, A	7.423	0.778	27	6.133	0.36	27
B1, B	7.739	0.458	36	6.748	0.48	30
B1, C	7.955	0.924	27	6.523	0.354	33
B1, D	8.13	1.369	27	6.468	0.551	27
B2, Total	11	0.738	117	9.712	0.548	117
B2, A	10.484	0.319	27	9.493	0.397	27
B2, B	11.073	0.519	36	9.687	0.488	30
B2, C	11.257	0.76	27	9.671	0.403	33
B2, D	11.164	1.003	27	10.011	0.756	27
B3, Total	15.468	0.81	117	14.803	0.412	117
B3, A	15.474	0.399	27	14.791	0.46	27
B3, B	15.408	1.057	36	14.982	0.291	30
B3, C	15.741	0.837	27	14.813	0.448	33
B3, D	15.268	0.661	27	14.604	0.357	27

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.316	0.659	0.605	-0.615	0.332	<.0001
A, C	-0.532	0.705	0.211	-0.39	0.325	0.0111
A, D	-0.706	0.705	0.049	-0.335	0.34	0.0559
B, C	-0.216	0.659	0.835	0.225	0.316	0.2577
B, D	-0.39	0.659	0.423	0.28	0.332	0.1315
C, D	-0.175	0.705	0.92	0.055	0.325	0.972

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.589	0.496	0.013	-0.194	0.395	0.5842
A, C	-0.773	0.53	0.001	-0.178	0.386	0.6338
A, D	-0.68	0.53	0.006	-0.518	0.405	0.0058
B, C	-0.184	0.496	0.775	0.016	0.375	0.9995
B, D	-0.091	0.496	0.965	-0.324	0.395	0.1502
C, D	0.093	0.53	0.969	-0.34	0.386	0.1073

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.066	0.58	0.991	-0.19	0.298	0.3535
A, C	-0.267	0.62	0.684	-0.021	0.291	0.9976
A, D	0.207	0.62	0.827	0.187	0.306	0.3907
B, C	-0.333	0.58	0.45	0.169	0.283	0.4161
B, D	0.14	0.58	0.925	0.378	0.298	0.0063
C, D	0.474	0.62	0.201	0.209	0.291	0.2526

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.148	0.03	117	0.139	0.02	117
Duration, A	0.183	0.024	27	0.146	0.022	27
Duration, B	0.121	0.012	36	0.134	0.019	30
Duration, C	0.156	0.021	27	0.143	0.022	33
Duration, D	0.141	0.02	27	0.132	0.015	27

Scheffe for Duration

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.062	0.014	<.0001	0.012	0.015	0.1838
A, C	0.028	0.015	<.0001	0.003	0.015	0.9412
A, D	0.043	0.015	<.0001	0.014	0.015	0.0909
B, C	-0.035	0.014	<.0001	-0.008	0.014	0.4195
B, D	-0.02	0.014	0.001	0.002	0.015	0.9809
C, D	0.015	0.015	0.045	0.011	0.015	0.2374

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Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.525	0.925	117	6.15	0.51	111
B1, A	7.5	0.852	27	5.992	0.624	27
B1, B	7.325	0.652	36	6.11	0.495	24
B1, C	7.832	0.995	27	6.276	0.397	33
B1, D	7.51	1.172	27	6.188	0.502	27
B2, Total	11.265	0.808	117	10.059	0.56	111
B2, A	10.794	0.27	27	9.983	0.615	27
B2, B	11.471	0.476	36	10.053	0.326	24
B2, C	11.801	0.528	27	9.98	0.345	33
B2, D	10.927	1.245	27	10.239	0.813	27
B3, Total	15.293	0.936	117	14.693	0.479	111
B3, A	15.388	0.579	27	14.665	0.391	27
B3, B	15.11	1.221	36	14.856	0.29	24
B3, C	15.559	0.944	27	14.445	0.593	33
B3, D	15.177	0.729	27	14.88	0.412	27

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.175	0.663	0.905	-0.119	0.403	0.8735
A, C	-0.333	0.709	0.622	-0.285	0.373	0.2015
A, D	-0.01	0.709	>.9999	-0.196	0.391	0.568
B, C	-0.508	0.663	0.2	-0.166	0.385	0.6834
B, D	-0.185	0.663	0.89	-0.078	0.403	0.96
C, D	0.322	0.709	0.646	0.088	0.373	0.9286

Scheffe for B2

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.677	0.515	0.004	-0.071	0.444	0.9769
A, C	-1.007	0.551	<.0001	0.003	0.411	>.9999
A, D	-0.133	0.551	0.926	-0.256	0.431	0.4191
B, C	-0.33	0.515	0.35	0.073	0.425	0.9709
B, D	0.544	0.515	0.034	-0.186	0.444	0.704
C, D	0.875	0.551	3E-04	-0.259	0.411	0.3667

Scheffe for B3

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.277	0.673	0.713	-0.191	0.358	0.5177
A, C	-0.171	0.719	0.929	0.22	0.331	0.3195
A, D	0.21	0.719	0.876	-0.215	0.347	0.3807
B, C	-0.448	0.673	0.316	0.41	0.342	0.0114
B, D	-0.067	0.673	0.994	-0.025	0.358	0.998
C, D	0.381	0.719	0.522	-0.435	0.331	0.0043

Descriptive Statistics

	Female			Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.06	0.021	117	0.06	0.018	111
Duration, A	0.089	0.021	27	0.054	0.016	27
Duration, B	0.048	0.011	36	0.067	0.012	24
Duration, C	0.053	0.013	27	0.065	0.022	33
Duration, D	0.055	0.005	27	0.054	0.014	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.041	0.01	<.0001	-0.013	0.013	0.0589
A, C	0.036	0.01	<.0001	-0.011	0.012	0.1141
A, D	0.033	0.01	<.0001	8.68E-05	0.013	>.9999
B, C	-0.005	0.01	0.555	0.002	0.013	0.9671
B, D	-0.008	0.01	0.169	0.013	0.013	0.0564
C, D	-0.003	0.01	0.9	0.011	0.012	0.1095

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Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
B1, Total	7.702	0.915	114	6.257	0.711	117
B1, A	7.498	0.812	27	5.757	0.766	27
B1, B	7.495	0.468	36	6.476	0.455	27
B1, C	8.075	0.903	27	6.457	0.369	36
B1, D	7.819	1.348	24	6.27	0.956	27
B2, Total	11.305	0.773	114	9.973	0.531	117
B2, A	10.748	0.352	27	9.701	0.43	27
B2, B	11.507	0.474	36	10.078	0.439	27
B2, C	11.807	0.741	27	9.967	0.32	36
B2, D	11.062	1.023	24	10.15	0.79	27
B3, Total	15.515	0.678	114	14.799	0.357	117
B3, A	15.338	0.361	27	14.758	0.371	27
B3, B	15.683	0.737	36	14.956	0.242	27
B3, C	15.929	0.301	27	14.718	0.311	36
B3, D	14.997	0.788	24	14.792	0.452	27

Scheffe for B1

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.003	0.646	>.9999	-0.718	0.509	0.0018
A, C	-0.577	0.691	0.138	-0.7	0.477	0.001
A, D	-0.321	0.712	0.652	-0.512	0.509	0.0481
B, C	-0.58	0.646	0.096	0.018	0.477	0.9996
B, D	-0.324	0.669	0.596	0.206	0.509	0.7255
C, D	0.256	0.712	0.791	0.188	0.477	0.742

Scheffe for B2

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.759	0.484	4E-04	-0.377	0.395	0.068
A, C	-1.059	0.518	<.0001	-0.266	0.37	0.2503
A, D	-0.314	0.534	0.428	-0.449	0.395	0.0188
B, C	-0.299	0.484	0.384	0.111	0.37	0.8668
B, D	0.445	0.501	0.102	-0.072	0.395	0.966
C, D	0.744	0.534	0.002	-0.183	0.37	0.5801

Scheffe for B3

Female				Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	-0.345	0.431	0.167	-0.198	0.27	0.2359
A, C	-0.591	0.46	0.006	0.04	0.253	0.9767
A, D	0.342	0.474	0.249	-0.034	0.27	0.9881
B, C	-0.246	0.431	0.454	0.238	0.253	0.0734
B, D	0.686	0.446	5E-04	0.163	0.27	0.4034
C, D	0.933	0.474	<.0001	-0.074	0.253	0.8732

Descriptive Statistics

Female				Male		
Group	**Mean**	**Std. Dev.**	**Count**	**Mean**	**Std. Dev.**	**Count**
Duration, Total	0.074	0.016	114	0.07	0.016	117
Duration, A	0.083	0.018	27	0.071	0.019	27
Duration, B	0.067	0.013	36	0.071	0.012	27
Duration, C	0.074	0.016	27	0.074	0.019	36
Duration, D	0.073	0.011	24	0.065	0.012	27

Scheffe for Duration

	Female			Male		
Group	**Mean Diff.**	**Crit. Diff.**	**P-Value**	**Mean Diff.**	**Crit. Diff.**	**P-Value**
A, B	0.016	0.011	8E-04	0.001	0.012	0.9994
A, C	0.009	0.011	0.178	-0.002	0.012	0.9596
A, D	0.01	0.012	0.129	0.006	0.012	0.5671
B, C	-0.007	0.011	0.333	-0.003	0.012	0.924
B, D	-0.006	0.011	0.502	0.006	0.012	0.6431
C, D	0.001	0.012	0.996	0.008	0.012	0.2367