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INTONATION IN 'EUROPEAN GREEK'

Abstract

This study investigates the intonation of a group of Dutch near-native speakers of (Modern) Greek. Specifically, it investigates the timing of peaks in non-final or prenuclear accents in declarative intonation. Production data for the Dutch near-native speakers of Greek were obtained for both Dutch and Greek statements. These data were compared to those produced by a native Dutch and a native Greek control group. Evidence was found for bi-directional interference in four out of the five speakers: they produced peak alignment incorrectly in *both* languages. The fifth speaker produced peak alignment correctly in both the first (L1) and the second (L2) language, suggesting that she was able to keep the L1 and L2 peak alignment categories separate. It was found that this speaker had been exposed to the L2 at an earlier age, and it was hypothesized that age may be a determining factor in the ability to establish new L2 categories. The results are interpreted in terms of the Speech Learning Model (e.g. Flege, 1995) and the appropriateness of this model for prosodic aspects of L2 learning is evaluated.

1. Introduction

During the First International Conference of Modern Greek Dialects and Linguistic Theory quite a few conference participants were able to speak Greek (some even managed to present their paper in Greek!), even though Greek is not their native language. In some cases their speech may have sounded somehow *different* from that of native speakers. This difference is often referred to as 'accented speech' or 'foreign accent', and we can often perceive it even when the non-native speaker is reasonably proficient in that language. When listening to such accents it is usually possible to infer the language background of the speaker. That is, we can recognise from their accent in Greek whether they are for instance Italian or Dutch. This is because speakers of a second language (L2) often experience transfer or interference from their first language (L1), most notably at the level of the sound system (Beebe, 1987; Broselow, 1988; Scovel, 1969).

The fact that we can recognise the language background of L2 speakers implies that their speech differs in a systematic way from that of native speakers. In other words, the foreign accent of Dutch speakers is different from that spoken by, for example, Italian speakers. Therefore, one could say that people from different L1 backgrounds speak different 'dialects' of the L2. This paper investigates a European dialect of Greek, i.e. that spoken by Dutch native speakers. More specifically, it investigates whether and in which way Dutch near-native speakers of Greek differ from native speakers, in terms of their intonation.

1.1. Speech Learning Model

Adults who learn a second language often have difficulties producing segments that do not appear in or are slightly different from those in the native language. Such production difficulties have been amply documented in the literature, and have led to the development of several theoretical models which try to account for segmental aspects of L2 learning (Best, 1994; Best, McRoberts, & Sithole, 1988; Best, 1995; Flege, 1986, 1991, 1995; Iverson & Kuhl, 1995, 1996; Kuhl, 1991; Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992). The Speech Learning Model (SLM) developed by Flege (Flege, 1991, 1995) generates predictions concerning the accuracy with which highly experienced learners of various L1 backgrounds will produce L2 speech. The predictions the model makes are restricted to L2 consonants and vowels. The model is based on the assumption that many L2 production errors have a perceptual origin. It is well established that sometime during the L1 acquisition process sensitivity to non-native speech sounds decreases and perception becomes attuned to the L1. As a result of this process L2 learners will fail to recognize phonetic differences between L1 and L2 sounds and identify L2 sounds in terms of similar L1 sounds. This concept, called 'equivalence classification', was introduced by Flege (Flege, 1981, 1987a; Flege & Hillenbrand, 1984). The difficulty certain L2 sounds will pose for learners can be predicted on the basis of the perceived relation of these two sounds to L1 categories.

According to the model, the greater the perceived relation between the L1 and L2 sound – i.e. the more similar the sounds are – the more likely it is that equivalence classification will take place. As a result, the formation of a new phonetic category for the L2 sound will initially be blocked. Over time (as learners receive more L2 input) learners may gradually become able to discern phonetic differences between certain L2 sounds and their L1 counterparts. If an L2 sound is successfully recognized as different from L1 sounds, a new L2 phonetic category should develop. If, on the other hand, an L2 sound fails to be discerned from its L1 counterpart, category formation may continue to be blocked even after many years of experience with the L2. In such cases, it is hypothesized that listeners classify the L2 sound and its L1 counterpart into a single phonetic category.

Since the SLM assumes that many L2 production errors are perceptually motivated, determining the perceived relation between L1 and L2 sounds will lead to predictions about the production of L2 sounds. The SLM predicts that when a category cannot be established for an L2 sound, production of this sound will be phonetically inaccurate, resulting in accented production. Furthermore, the production of the L1 counterpart will gradually shift away from the monolingual norm, and the L1 and L2 sound will eventually come to resemble one another in production. In other words, the L2 sound and its L1 counterpart will gradually 'merge' (Flege, 1981, 1984, 1987b; Flege & Hillenbrand, 1984). If, on the other hand, the learner is able to develop a new category for an L2 sound, the learner should (in principle) be able to produce it in an accent-free manner. However, this is not always the case (as will be explained shortly).

According to the SLM, the likelihood of the learner being able to discern phonetic differences between L1 and L2 sounds – which would result in more accurate production – is related to the age when L2 learning starts. Thus, the earlier learning starts the more likely it is that differences can be discerned, and the less likely it is that L2 production is accented. However, even when a new phonetic category can be established for an L2 sound, there is no guarantee that this category is identical to a monolingual's. In order to account for this phenomenon, the model posits that both L1 and L2 categories exist in a 'common phonological space'. In order to maintain contrast within that common space, that is contrast within and across languages, it is argued that categories might be 'deflected away' from each other (Flege, 1995: p. 242). As a result, the L2 sound might not be produced in the same way as it is produced by native speakers, even though a new category for the L2 sound has been established. Incidentally, by positing a common phonological space the SLM can also provide an elegant explanation for the finding that experienced L2 learners may merge the properties of similar L1 and L2 sounds. The assumption that the L1 and L2 phonetic systems of adult bilinguals are not (fully) isolated implies that they can mutually influence each other. So, not only can the L1 have an influence on the production of an L2, the L2 can just as well have an effect on the production of the L1 (Flege, Frieda, & Nozawa, 1997).

However, the evidence for bi-directional interference is rather limited. Most evidence for bi-directional interference comes from studies on adult bilinguals' voice onset time (Caramazza, Yeni-Komshian, Zurif, & Carbone, 1973; Flege, 1987b; Williams, 1980) or from non-instrumental foreign accent judgements (Flege et al., 1997; Piske & MacKay, 1999). Furthermore, in a recent replication of Flege *et al's* study, evidence was only found for influence of the L1 on the L2, but not vice versa (Guion, Flege, & Loftin, 2000). All in all, the evidence is far from being established. Further instrumental studies into the nature of interference are needed as little is known about cross-language interference in segmental - let alone nonsegmental - dimensions. This study offers a first step towards filling this gap, by investigating bi-directional interference in the intonation of Dutch near-native speakers of (Modern) Greek.

1.2. Cross-linguistic differences in Dutch and Greek intonation

One intonation pattern which shows similarities between Greek and Dutch is the non-final or prenuclear accent in declarative intonation (Mennen, 1999). In both languages this intonation pattern is characterized by a rise that begins at the onset of the accented syllable and rises steeply until somewhere near the end of the accented syllable during which F0 starts falling again. However, the patterns are not identical and there are two crucial cross-linguistic differences between the two. Firstly, there is a difference in the exact timing (alignment) of the peak. In Greek prenuclear accents the peak is consistently aligned after the onset of the first postaccentual vowel (Arvaniti, Ladd, & Mennen, 1998). Typically, in words with antepenultimate stress, the peak occurs around 10 to 20 ms after the beginning of the postaccentual vowel. The rise in Dutch prenuclear accents, by comparison, has already reached its peak somewhere within the accented syllable, i.e. the peak is earlier in Dutch than in Greek prenuclear accents (Mennen, 1999).

A second difference is related to the phonological structure of the two languages. Greek has a simple five vowel system consisting of /i, e, a, o, u/, all of which are of equal phonological weight (Joseph & Philippaki-Warburton, 1987; Mirambel, 1959). Dutch, on the other hand, has series of long (tense) and short (lax) vowels. Crucially, this difference in phonological vowel length of accented syllables has an effect on the timing of the peak in prenuclear accents (Ladd, Mennen, & Schepman, 2000; Mennen, 1999). Specifically, it appears that in syllables with phonologically long vowels the peaks are aligned earlier than in phonologically short ones. Typically, the peak occurs during the *accented vowel* in the

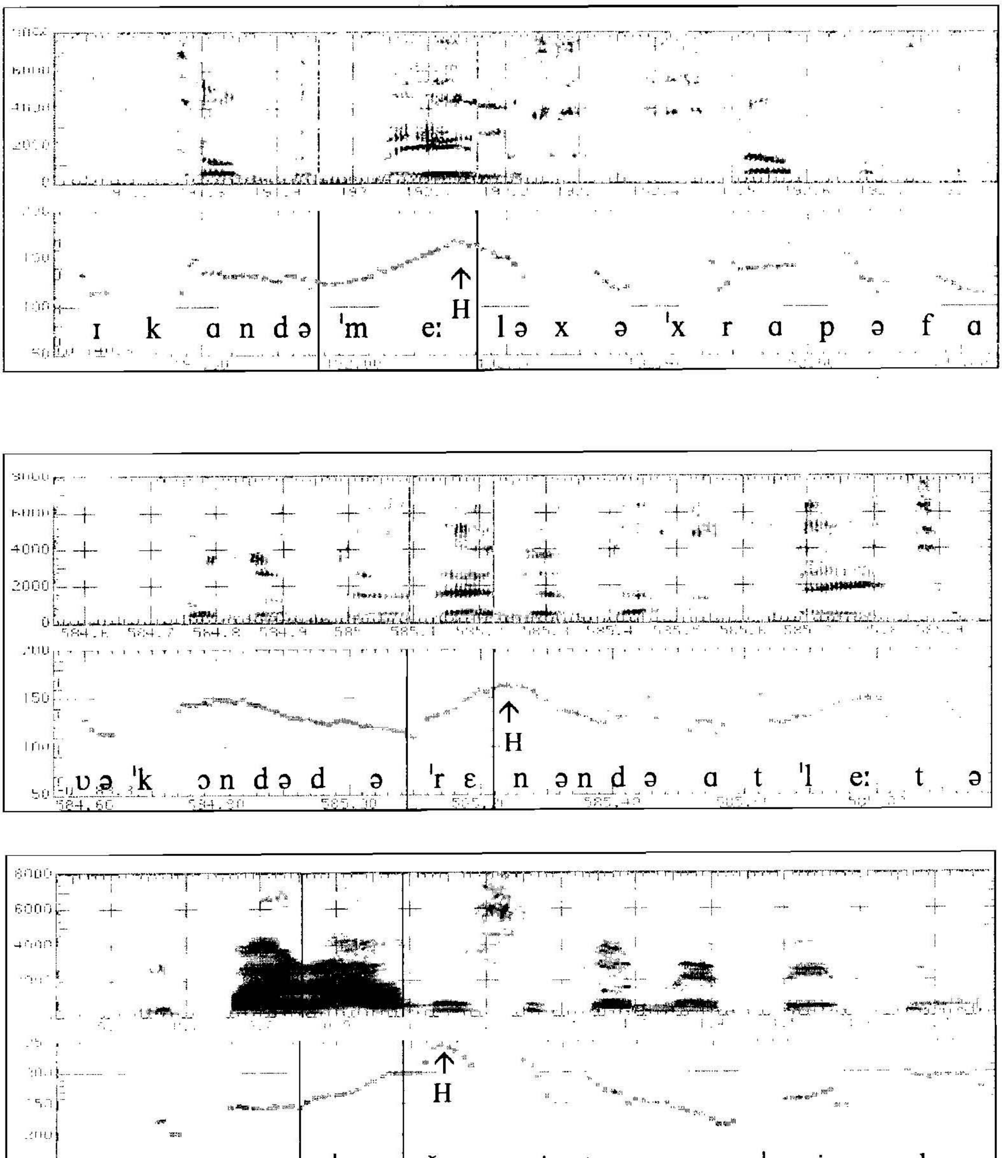

Figure 1. Differences in peak alignment between a Dutch sentence with a phonologically long vowel in the accented syllable of the test word (top panel); a Dutch sentence with a phonologically short vowel (middle panel); and a Greek sentence (bottom panel). Note that the peak (H) is aligned earlier in the top panel, later in the middle panel, and latest in the bottom panel. Vertical lines demarcate the beginning and end of the accented syllable of the test word.

former but during the *following consonant* in the latter. The similarities and differences between Greek and Dutch prenuclear accents are exemplified in Figure 1.

1.3. Predictions

As the SLM is concerned with segmental L2 acquisition it doesn't as such allow us to make specific predictions about prosodic acquisition. But if we assume that the SLM can account for prosodic data, the degree of similarity between the L1 and L2 intonation patterns would lead to some general expectations. Dutch and Greek prenuclear accents have a similar intonation pattern, characterised by a rise which starts at the beginning of the accented syllable and reaches its peak near the end of the accented syllable. However, as discussed before, they differ in the timing of the peak. As a result, category formation for the L2 pattern should be blocked, and Dutch learners of Greek should classify the L2 pattern according to their L1 category. This would lead to inaccurate production of the L2 pattern, specifically with respect to the timing of the peak. The SLM holds that inaccurate production would persist even after long exposure to the L2. It is further predicted that, over time, the L2 learners will merge the properties of the L1 and L2 patterns. That is, Dutch learners of Greek would develop a 'merged' system, intermediate between the L1 and the L2 norm. Dutch learners would therefore align the peak in Greek accents somewhere between the Dutch and the Greek norm, i.e. later than in Dutch and earlier than in Greek.

As the SLM holds that interference is bi-directional, it is expected that not only will Dutch learners of Greek experience an influence from Dutch in their production of Greek peak alignment, at the same time their Dutch peak alignment should be affected as well.

2. Experiment 1

This experiment tested whether Dutch speakers of Greek were able to produce peak timing in their L2 (Greek) accurately.

2.1. Materials

The materials for Greek were a subset of those used by Arvaniti et al. (1998; Experiment 2): 20 declarative sentences with one of the vowels /i/, /e/, /a/, /o/, and /u/ in the accented syllable of the test word in roughly equal distribution. The materials for Dutch were 20 Dutch declarative sentences with one of the short vowels /ɪ/, /ɛ/, /ɑ/, /ɔ/, and /ʏ/ and 20 with one of the long vowels /i/, /e/, /a/, /o/, and /y/ in the accented syllable of the test word. Each test word had lexical stress on the antepenultimate syllable and the stressed syllable was followed by two to five unaccented syllables. This was done in order to avoid effects of prosodic context on the alignment of the peak, such as those reported in the literature (Arvaniti et al., 1998; Prieto, Van Santen, & Hirschberg, 1995; Silverman & Pierrehumbert, 1990). For ease of measurement only sonorants, or in a few cases voiced obstruents, were used in the relevant syllables of the test words. In the majority of cases the accented vowel was preceded and followed by a singleton consonant. All materials were designed with the aim to elicit a prenuclear accent on the test word, followed by either another prenuclear accent or a nuclear accent on the following word. Examples of the test word are given in Table I.

Table I. *Sample test items for (a) Dutch materials with one of the long vowels, (b) one of the short vowels in the accented syllable of the test word, and (c) Greek materials. The test words are underlined.*

(a) Dutch - Long	[ɪk kɑn də 'meːləxə 'xrɑpə fɑn sɛt 'xɑikəmaː 'nit 'lɑŋər 'aːnhorə] I can no longer stand Seth Gaaikema's corny jokes.
(b) Dutch - Short	[ʋə 'kɔndə də 'rɛnəndə ɑt'leːtə mɛt xeːm 'moːxələkhɛit 'bɛihɔudə] There was no way we could keep up with the running athletes.
(c) Greek	[i pa'raðosi ton e'piplon θa 'jini ti 'driti to pro'i] The delivery of the furniture will take place on Tuesday morning.

2.2. Subjects

Three groups of five speakers participated in this experiment: a native Dutch control group (D), a native Greek control group (G), and a group of non-native (Dutch) speakers of Greek (BG). Group D consisted of three females (D1, D4, and D5) and two males (D2, and D3). Group G also consisted of three females (G3, G4, and G5) and two males (G1 and G2). The speakers of Group BG were two females (BG2 and BG4) and three males (BG1, BG3, and BG5). It was originally intended to select only monolingual speakers for the native Dutch and Greek control groups. However, this proved to be an unrealistic criterion for speaker selection, especially among educated speakers. Therefore, speakers were selected who were not highly proficient in any other language than their L1 and English, in which they were all reasonably competent. For the non-native group (BG) the same criterion was applied with the exception that all speakers were also highly proficient in Greek. All non-native speakers had learned Greek as an L2 in adulthood, and had extensive experience with the L2 (between 12 and 35 years). They all hold a university degree in Greek language and literature, and currently teach Greek at university level. As it was not easy to find speakers with such a high level of proficiency in L2 Greek, we did not have the opportunity to have equal numbers of males and females (or to have a single sex group). In any case, this was not thought to be problematic for the study, as previous studies suggested that there were no significant differences in alignment between females and males (Ladd et al., 2000; Mennen, 1999). The bilinguals all reported that they used both languages on a daily basis. The amount of L1 use was similar for all bilinguals.

2.3. Procedure

Speakers of each group read two repetitions of test sentences which were presented in random order. The speakers of Group D read the two sets of Dutch sentences (one set with one of the long vowels and one with the short vowels), whereas speakers of Group G and Group BG read the set of Greek sentences. Recordings of the materials were made on Digital Audio Tape (DAT) in the studios of the universities of Groningen, Amsterdam, or Edinburgh, or in a quiet room in the speaker's home. Materials were digitized at a 16kHz sampling rate with appropriate low-pass prefiltering. The author selected the first acceptable repetition for further measurement, on the basis of carefully defined selection criteria. Selected sentences were analyzed in the ESPS Waves+ (Entropic Inc.) signal processing package. F0 was extracted using a 49-ms cos4 window moving in 10-ms steps. The alignment of the peak was expressed as the distance of the peak from the end of the accented vowel of the test word.

2.4. Results

First it was established whether bilinguals were able to produce accurate peak timing in their L2 Greek. Therefore, peak alignment data for the bilinguals were compared to the means of the Greek control group in individual one-way ANOVAs (with ITEMS as the random factor and GROUP as a single between-items fixed factor). The results reveal a main effect of the factor GROUP for speakers BG1 [$F(1, 37) = 39.80$; $p < 0.0001$], BG2 [$F(1, 36) = 75.749$; $p < 0.0001$], BG3 [$F(1, 38) = 151.214$; $p < 0.0001$], and BG5 [$F(1, 33) = 40.430$; $p < 0.0001$], but not for speaker BG4 [$F < 1$]. The peak alignment values for speaker BG4 lie within the norms for the native Greek control group (58.3 ms versus 67.1 ms *after* the offset of the vowel, respectively). The peak for the other bilinguals, however, is significantly earlier (mean peak alignment is 11.8 ms *before* the offset of the vowel). Individual speakers' means for peak alignment, together with group means for the native Greek control group are graphed in Figure 2.

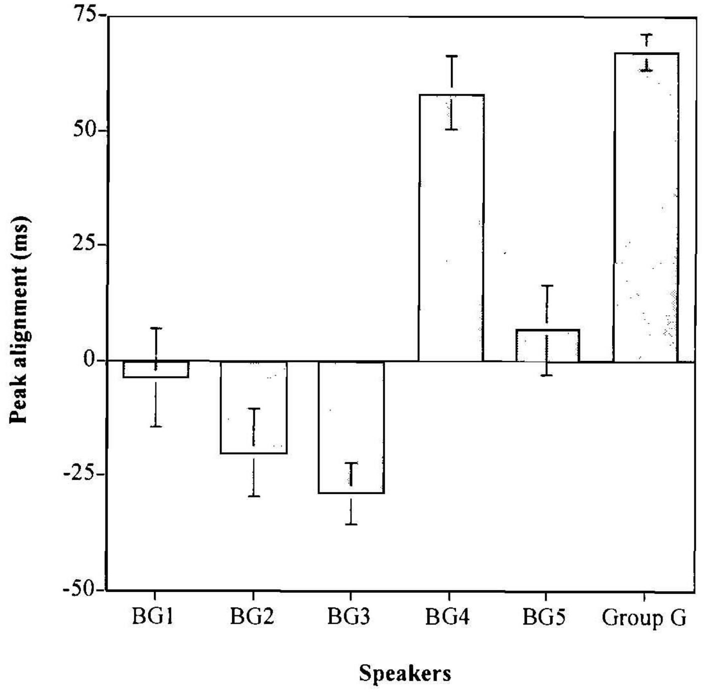

Figure 2. *L2 peak alignment. Means (ms) and standard errors for peak alignment in the Greek materials for each of the bilingual speakers (BG), together with the group means for the native Greek control group (Group G).*

The next step was to investigate whether bilinguals who did not fully acquire Greek peak alignment had developed some kind of merged system, intermediate between the native Dutch and Greek control groups. In order to assess this, the means for those bilingual speakers who did not reach native peak alignment values in their L2 (all speakers apart from BG4) were calcualted for each item and entered into three overall one-way ANOVAs: one comparing them to the means for the set of items with the long vowels produced by the Dutch control group; a second comparing them to the means for the short vowels produced by the Dutch control group; and a third comparing them to the means for the set of Greek sentences produced by the Greek control group. The overall one-way ANOVAs confirmed that there was an effect of GROUP when the bilinguals were compared to the native Greek control group [F (1, 38) = 121.07; $p < 0.0001$], with peak alignment earlier for the bilinguals than for the native Greek control group. There was also a main effect of GROUP when the bilinguals were compared to the means for the short vowel syllables produced by the native Dutch control group [F (1, 38) = 29.69; $p < 0.0001$] (with earlier peak alignment for the bilinguals than that for the Dutch control group in short vowel syllables), but there was no significant effect of GROUP when compared to the long vowel syllables produced by the Dutch control group [$F < 1$] (see Figure 3).

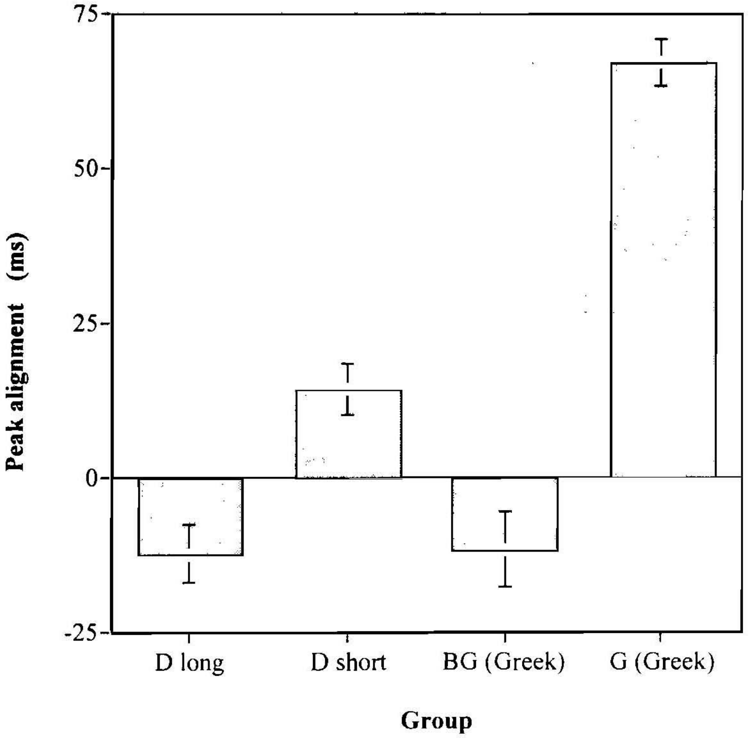

Figure 3. *Means (ms) and standard errors for peak alignment in the long and short vowel materials for the Dutch control group, and in the Greek materials for the group of bilinguals (BG) and the Greek control group (G).*

2.5. Summary of results

Production of L2 (Greek) peak alignment proved to be rather difficult for four out of the five bilingual speakers, even after many years of experience with the Greek language. Peak timing for these four speakers was closer to the means for the native Dutch control group in the long vowel syllables, than to that of the native Greek control group. The results provide evidence that interference from the L1 is indeed an important factor in the production of L2 intonation. The earlier peak aligment in the bilinguals' production of Greek sentences can be attributed to an influence from the native language.

However, one of the bilingual speakers (BG4) did not show any evidence of interference from the L1. She produced peak alignment values which were within the norm for the L2 (native Greek) control group. Discussion about the possible reason for her success is postponed until the discussion of experiment 2.

On the basis of the SLM it was predicted that if bilinguals did not acquire Greek peak alignment, they would develop a 'merged' system. That is, they would produce peak alignment values in the L2 which would be later than those for the native Dutch control group and earlier than those for the native Greek control group. There was no evidence in the data supporting that this was the case. The speakers either reached native L2 peak alignment values (speaker BG4), or they produced values which were similar to the values for the native Dutch control group in the long vowel syllables (speakers BG1, BG2, BG3, and BG5). No evidence was found for values which were intermediate between the L1 and the L2.

3. Experiment 2

The second experiment tested whether experience with the L2 can have an effect on the L1, specifically on its peak alignment. It was tested whether the group of Dutch/Greek bilinguals differed from a Dutch control group in their peak alignment in a set of Dutch sentences.

3.1. Method

For this experiment only the Dutch sentences were used, i.e. 20 sentences with long vowels, and 20 with short vowels in the accented syllables of the test word. The same speakers of the Dutch control group (Group D) and the bilingual group (Group BG) which participated in Experiment 1 also took part in this experiment. The general recording procedure was the same as for Experiment 1, except that this time the speakers only read the Dutch sentences. Just as in Experiment 1, the first acceptable repetition of each test sentence was selected for further measurement (see also Experiment 1).

3.2. Results and discussion

All data were analyzed in two-way (2x2) mixed design ANOVAs, with ITEM as the random factor, PHONOLOGICAL LENGTH as the between-items factor, and GROUP as a within-items factor. The general analyses were followed by individual speaker analyses. The latter were done by means of one-way ANOVAs, with ITEM as the random factor and PHONOLOGICAL LENGTH as a between-items factor. For the bilingual speakers the peak was aligned 5.7 ms before the offset of the vowel when the vowel was long, and 13.5 ms after the vowel offset when the vowel was short. The native Dutch control group aligned the peak 12.5 ms before the vowel offset in long vowels and 24.8 ms after the vowel offset in short vowels. The overall analysis revealed no significant main effect of GROUP [F (1, 38) < 1]. There was, however, a significant effect of PHONOLOGICAL LENGTH [F (1, 38) = 36.02; p < 0.0001], together with a significant interaction between the two factors [F (1, 38) = 10.52; p = 0.002]. As can be seen in Figure 4, this interaction is due to the fact that there is a larger difference between the peak alignment in the short and long vowels for the Dutch control group than for the group of bilinguals. The bilinguals align the peak earlier in short vowels and later in long vowels than the Dutch control group does.

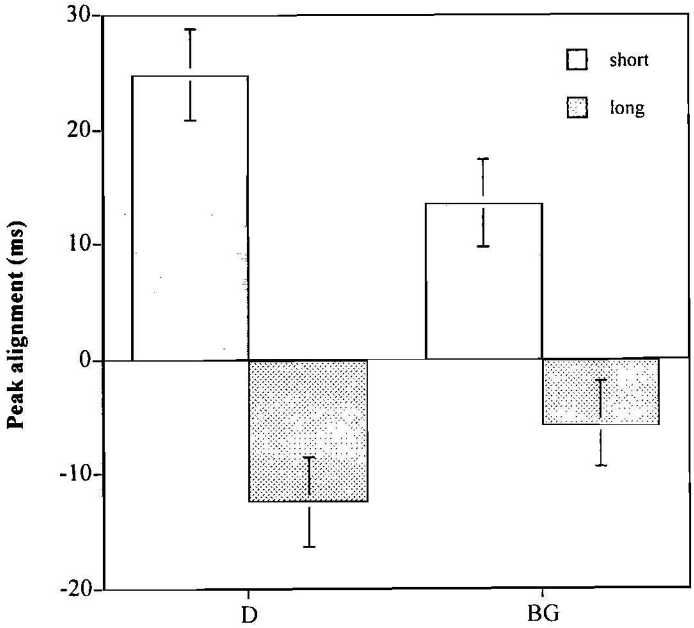

Figure 4. *Means (ms) and standard erros for peak alignment produced in the Dutch materials by the group of bilingual speakers (BG) and the Dutch control group (D).*

All individual analyses for the speakers of the Dutch control group were also significant for the factor PHONOLOGICAL LENGTH. However, for the bilingual speakers this was not always the case. The individual analyses show that only speakers BG1 and BG4 show a similar effect of PHONOLOGICAL LENGTH (for BG1 [F (1, 38) = 5.621; p = 0.023], and for BG4 [F (1, 37) = 16.292; p < 0.0001]). For the other bilinguals there is no significant effect of PHONOLOGICAL LENGTH (for BG2 [F (1, 36) = 4.033; p = 0.052 ns], for BG3 [F (1, 38) = 2.963; p = 0.093 ns], and for BG5 [F (1, 36) = 0.717; p = 0.040 ns].

Thus, the results of this experiment reveal that even though both groups of speakers show a difference in peak alignment between long and short syllables in Dutch, this difference is significantly smaller for the group of bilinguals. In fact, the difference in peak alignment of the bilingual group could be attributed to only two of its speakers, BG1 and BG4. Incidentally, as reported in Experiment 1, speaker BG4 was also the only speaker who had managed to produce native levels of peak alignment in the L2. It can be concluded that speaker BG4 does not show evidence of interference, neither from the L1 in the L2, nor vice versa. On the other hand, the findings for the four other Dutch/Greek bilinguals show an L1 influence on the L2, as well as an L2 influence on the L1.

4. General discussion

The main aim of this study was to establish whether there is evidence of bi-directional interference in the intonation of Dutch/Greek bilinguals. It was found that the majority of bilinguals in this study showed an L1 influence in the production of peak alignment in their L2.

The majority of bilinguals (four out of five) were found to have an L1 influence in their production of L2 sentences. Peak alignment in these sentences was earlier (i.e. within the accented vowel) than that of the native Greek control group (for whom the peak occurred in the following unaccented vowel). More specifically, it was as early as that found in the production of Dutch sentences with long vowels of the Dutch control group. Furthermore, even though these four bilinguals did not produce accurate peak alignment in the L2, their L1 was affected nevertheless. Only one of them showed similar peak alignment to the Dutch control group, with an earlier peak in phonologically long vowels than in phonologically short ones. The results show that bi-directional interference - which has previously only been attested for segmental aspects of speech production - is also apparent in prosodic aspects.

One speaker (BG4), however, shows a completely different pattern. Her peak alignment values lie within the native norms in *both* languages. In other words, her data provided no evidence for interference in either of her languages. This result suggests that - unlike the other four speakers - speaker DG4 is able to keep the L1 and L2 types of peak alignment apart.

The question arises of how it is possible that this speaker does not show any signs of interference in either language, whereas the other speakers show evidence of interference in both languages. Factors reported to have an influence on the occurrence and degree of interference are age of learning (Flege, Munro, & Mackay, 1995; Long, 1990), relation between L1 and L2 systems (Best, 1994; Best, 1995; Flege, 1992, 1995), and amount of L1 use (Flege, 1995; Flege et al., 1997; Guion et al., 2000; Piske & MacKay, 1999). The only difference found between speaker BG4 and the other bilinguals was a slight difference in age of learning. Even though all the bilinguals in this study had started learning the L2 in adulthood, speaker DG4 was slightly younger than the other speakers (18 as opposed to 20-25 years of age) when she started learning Greek. Furthermore, when questioned afterwards, it appeared that she had failed to mention that she had been exposed to Greek on a fairly regular basis from the age of 15. It is well possible that this is what made her so successful. In order to investigate whether age of learning could be a factor in preventing the two systems to interact, the same experiments were replicated with a simultaneous bilingual. This speaker (BG6) acquired both Dutch and Greek in childhood. The results for speaker BG6 confirmed the earlier findings, e.g. no evidence for interference was found in his data. This result, combined with the results for speaker BG4 suggest that age of learning may indeed be a factor contributing to the development of differentiated systems. However, more research is necessary in order to confirm this finding.

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