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THE PHONOLOGICAL ELEMENTS OF THE SPANISH ACCENT

Michael P. Fuller
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I. INTRODUCTION

We are all aware of the phenomenon of word stress, or accent. Accent gives rhythm to a language. Poets achieve this in their verse by carefully choosing the right combination of words. As Anne Cutler explained, we use accent for the mere identification of words. Accent patterns for each word are stored in our brain and are retrieved to aid in identifying a word when spoken (1984, 89). Indeed, Bond found that in elliptic speech, stressed vowels are altered, rendering the language unintelligible (1981, 89). Accent is necessary simply to communicate.

Accent may be studied under the four areas of linguistics: morphology, semantics, syntax and phonology. In morphology, one studies how word forms affect accent placement. Semantics studies how the meaning of a word changes with regards to accent. Where accents occur according to word order falls under syntax, and the actual production and perception of the accentual sound is studied in phonology.

This paper will analyze the phonological components of the Spanish accent and their relative importance. First a discussion of the Visi-Pitch will be given (a machine that measures the acoustical components of the sound wave). Next, the Spanish accent will be defined phonologically by the acoustical components of the sound wave. This will be followed by a review of the role that these components play in other languages. An analysis of the three studies done on the Spanish accent will ensue, followed by a discussion of this experiment. A conclusion section will close the paper.

II. THE ANALYSIS OF THE SOUND WAVE

The Visi-Pitch

Sound travels in complex waves made up of a fundamental frequency and harmonics. The three main features of the sound wave are its duration, intensity and tone. The development of acoustic measurement devices has greatly enhanced experimental phonology. Linguists can now make
exact measurements of these components. The Visi-pitch makes a graph of these three features on a chart recording. From these graphs, accurate readings can be taken. Figure 1 contains a picture of a chart recording of the utterance Habito en una pequeña casa en Provo.

Figure 1. A chart recording of the utterance Habito en una pequeña casa en Provo.

Analyzing the Elements of Sound with the Visi-pitch

Tone. Tone, or pitch, is determined by the frequency of the sound wave. This is usually measured in cycles per second (Hz). Since sound is a compound wave, it is the sum of multiple single waves. When single waves overlap they form zones of resonance or formants. The formant of most importance in the determination of tone is the first one, which is referred to as the fundamental frequency or $F_0$.

The Visi-pitch plots the fundamental frequency. The $F_0$ for the vowels can be found from the peaks on the graph. The chart for /o/ is shown and the frequency given in Figure 2 on the following page.

Duration. Duration is determined by the length of the sound wave. On the chart recording, duration is measured on the horizontal axis by the length of the frequency band. The machine also makes a separately-clocked mark every second allowing duration to be calculated in milliseconds. In Figure 3, 2.2 seconds were recorded on 220 mm of paper. Therefore, each millimeter represents .01 second, or 10 milliseconds (msec). The duration is calculated for the /o/ and is found in Figure 3 on the following page.
Figure 2. Chart recording showing the frequency of the vowel /o/ = 270 Hz. in the utterance Habito en una pequeña casa en Provo.

Figure 3. Chart recording showing the duration of the vowel /o/ = .12 sec. in the utterance Habito en una pequeña casa en Provo.

Intensity. The Visi-pitch can also produce an intensity line on the lower scale of the chart recording as seen in Figure 4. Intensity can be calculated in decibels from this in the same way by measuring the amplitude of the peak on the chart. In Figure 4 on the following page, intensity for the vowel /o/ is measured by the amplitude of the graph.
Figure 4. Chart recording showing the intensity of the vowel /o/ = 33.4 db. in the utterance *Habito en una pequeña casa en Provo.*

III. A PHONOLOGICAL DEFINITION OF THE SPANISH ACCENT

Acoustically, the Spanish accent is simply the intensification of the acoustical components of the sound wave. Intensity, duration and tone all play a role in its production and perception. The role of duration and intensity have been understood since the 1950's with the studies of Tomás Navarro, who is considered to be the father of Spanish phonetics. Although tone is known to be important in the production and perception of accent, the manner in which it functions is still unclear.

The Role of Intensity

In 1957 Tomás Navarro published *Manual de pronunciación española.* He discusses accent in the chapter entitled "intensity." According to Navarro, intensity is the primary indicator of accent. In his book he wrote that the Spanish ear is evidently more susceptible to the modifications of the accent of intensity than any other phonetic element (183). Navarro is also quoted saying that by defining accent, we should characterize it by greater intensity, and if by pronouncing it with greater intensity a prolongation or elevation of tone is noticed, these are accidental circumstances that in no way modify the nature of the expiratory accent (Bolinger 1961, 31). The results of subsequent studies (Bolinger 1961; Contreras 1963; Quilis 1970), however, show intensity to be the least important element.
The Role of Duration

Navarro notes that accented vowels are longer than unaccented vowels (1957, 206). Later, studies done by Clegg and Fails confirm Navarro's observations. Clegg and Fails recorded six informants and analyzed their speech with a Sona-graph. They found accented syllables to be 50% longer than unaccented syllables in non-final positions, and in final positions, accented syllables were 35% longer (1987, 74-75). Their results are shown in Table 1 and Table 2.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Initial</th>
<th>Pretonic</th>
<th>Tonic</th>
<th>Post-tonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>140 ms</td>
<td>130 ms</td>
<td>219 ms</td>
<td>146 ms</td>
</tr>
<tr>
<td>e</td>
<td>125 ms</td>
<td>114 ms</td>
<td>164 ms</td>
<td>130 ms</td>
</tr>
<tr>
<td>i</td>
<td>123 ms</td>
<td>113 ms</td>
<td>208 ms</td>
<td>122 ms</td>
</tr>
<tr>
<td>o</td>
<td>123 ms</td>
<td>116 ms</td>
<td>181 ms</td>
<td>131 ms</td>
</tr>
<tr>
<td>u</td>
<td>122 ms</td>
<td>106 ms</td>
<td>160 ms</td>
<td>127 ms</td>
</tr>
<tr>
<td>Avg.</td>
<td>127 ms</td>
<td>116 ms</td>
<td>187 ms</td>
<td>131 ms</td>
</tr>
</tbody>
</table>

(Clegg and Fails 1987, 73)

The Role of Tone

Although Navarro states that ascendent intonational movement often coincides with accented syllables and that descendent movement coincides with unaccented ones (1957, 213), he maintains that tone is purely an intonational feature and is divorced from the accentual pattern of the word (1957, 216). Later studies, however, conclude that tone is a feature of both
intonation and accent, and that it is the primary indicator of word stress. The first to propose this idea was Bolinger, in 1961. He hypothesized that tone carries out the principle role of accent, and that what is important is not necessarily an elevation of tone from the average, but rather a departure from it, whether it be an ascendent or a descendent movement (35). Subsequent studies (Contreras 1963; Quilis 1970; Casas 1980) all agree that tone plays the primary role in accent production and perception. A detailed analysis of these studies will be given in a later section.

Although all of the above studies have similar results, they do not adequately challenge the assumption that tone is solely an intonational feature. Bolinger dismisses it simply by saying that one of the lessons of modern acoustics is that any aspect of the sound wave can function in more than one sphere (1961, 41). As an example, he shows that even though two sentences may have the same intonational pattern, one may have two accents and another may have four. See figure 5 below. His argument is good, but he does not consider specific examples (such as sentence final syllables) where tone and intensity vary considerably.

A thesis paper done in 1979 by Relva Whetten has findings that can be applied to the present argument. She was studying the intonational patterns of speakers of Spanish in the state of Jalisco, Mexico. She found that although two different people use the same intonational ending in a given sentence, the $F_0$ on the last accented vowel varied. One informant might raise the $F_0$ while another would lower it. This finding indicates that $F_0$ is not solely an intonational feature, but functions in the production of the accent as well. Because of the incompleteness of the previous studies and the superior accuracy of the Visi-pitch, further work in this area is needed.
IV. THE ROLE OF THE ELEMENTS OF ACCENT IN OTHER LANGUAGES

The Importance of the Study of Other Languages

Although the many languages in the world differ in various ways, all of their accentual systems feature at least one of the acoustical components of the sound wave. Depending on the language, there are many parallels between one accentual system and another. In fact, Lea reports that listeners to a foreign language can successfully identify most stressed syllables in that foreign language. He presumes that they cannot use the wording, syntax or semantics to guess at stress, but instead they successfully use the acoustic data to determine the placement of accent (1977, 69). An understanding of how intensity, duration, and tone function in other languages can shed additional light on how they function in Spanish.

The Role of Intensity

Although intensity is seen to be a cue for stress in the Mohawk and Oneida languages (Chafe 1977) and for English (Fry 1958) and Italian (Bertinetto 1985), overall, it is not recognized as a prominent universal indicator of stress. In 1958, Fry found that in English, intensity is less important than both duration and tone (151). Bertinetto notes that in Italian, a falling intonation occurs in the utterance of isolated words, greatly hindering the use of intensity as a prominent cue for stress (1985, 394). Lea also makes an important observation. He points out, "Stressed vowels have higher intensities. However, each vowel category has its own 'intrinsic intensity' so that a stressed /i/ may be less intense than an unstressed /a/" (1977, 97). This statement is significant because the majority of the studies done comparing intensity to either duration or tone have only taken into account the absolute intensity of the vowels and not the difference between the measured intensity and the intrinsic intensity.

The Role of Duration

Duration has varying roles in different languages. As mentioned above, it is an important cue for stress in English (Fry 1958, 126; Fox 1987, 1). It is also important in the Yuman (Langdon 1977, 246) and Serbo-Croatian languages (Inkelas 1977, 227). (Yuman is an American Indian language and Serbo-Croatian is a Slavic language.) Studies by Bertinetto show that duration is the most important indicator of stress in Italian (1985, 394), and Quilis likewise notes that Delattre finds it to be of equal importance in French (1970, 56).
The Role of Tone

Tone comes close to being a universal cue for stress. Early experiments in Polish (Jassem 1965) and in English (Fry 1958) found it to be the most important element in the perception of stress. A high tone is important in accent perception in Swedish (Bailey 1988, 104), Yuman (Langdon 1977, 250), Mohawk and Oneida (Chafe 1977, 180), Kitandu (a Kikongo African group language)(Goldsmith 1987, 98), and English, where it is an all or none principle (Fry 1958, 151).

The rise and fall of tone is the most common indicator of stress. For English, Lea points out that not only do listeners perceive stress to be associated with vowels having a rising F₀ contour, but they also perceive those vowels to be longer than they really are (1977, 83,95). For certain word endings in Mohawk and Oneida, a falling pitch has developed (Chafe 1977, 180), and in Creek (a Muskogean language of the American Indians that lived in Alabama), successive accents in a multiply accented word are characterized by a downward shift in tone (Haas 1977, 196). Similarly in Hindi, stressed syllables generally have a rising pitch, and the next syllable will have a falling pitch. At times stressed syllables in this language will not have a rising pitch, but the next syllable will still have a falling pitch (Ohala 1977, 332). In Dutch, the primary stress is indicated by a rising tone and secondary stress by a falling tone (Van Heuven 1987, 1). Also in Serbo-Croatian there are four classes of accent, two of which are distinguished by falling and rising tones (Inkelas 1988, 227). Lastly, in Japanese, word accent is signaled by a pitch that is always downward (Kawakami 1977, 41).

There are only a few languages in which tone does not play an important role in accentual perception. One is in Welsh. Williams remarks that pitch prominence alone is no clue to stress but functions only in terms of recognizing intonational patterns (1985, 381). Likewise in Italian, the F₀ is observed to function in the same way.

These exceptions question whether tone is only an intonational feature and not directly related to accentual perception and production. In his study of Hindi, Jones says, "pitch change is related to the sentence intonation of the utterance, since an isolated word is a very short sentence with its own intonation pattern" (1971, 74). Kawakami observes the same in Japanese. He asserts that a pitch rise is not characteristic of the word as such, but of the phrase as an intonational feature (1977, 41). In most cases, the
intonational pattern is superimposed onto the accentual pattern of the word. This reinforces the perception of the accent. In the case of Italian, though, Bertinetto found in his experiment that when changes occurred in the $F_i$, the listeners interpreted them as a manifestation of intonation, not stress (1985, 394-395). It appears that in positions where intonational and accentual patterns do not coincide, tone is a function of intonation only.

V. ANALYSIS OF STUDIES DONE IN SPANISH

Since Bolinger’s study in 1961, only a few studies have been made on the Spanish accent. In this section the experiments of Bolinger, Contreras and Quilis will be discussed.

Bolinger’s Study

As was previously mentioned, Bolinger asserts that a departure from the average tonal line of a phrase indicates word stress. He also proposes to show that tone is a stronger accentual cue than intensity. To test his theories he performs three experiments.

Experiment 1. His first experiment is to show that a downward shift in tone indicates accent. He recorded the sentence "¿sabes el número?" and analyzed it on a Sona-graph. Its intonational curve is given below in Figure 6.

The accent in "número" is on the /ú/. Bolinger maintains that the sharp drop in tone is the cue to the accent. In the word "sabes" the accent falls on the /a/. There is a sharp rise and fall of tone, however, over the /e/. According to his hypothesis, this is where the accent should have been located. Also, he used just one sentence and only one recording of it to justify his claims. Recordings of several different people would have given more weight to his results.
Experiment 2. This experiment was designed to demonstrate the ineffectiveness of intensity as a stress indicator. Bolinger analyzed four sentences and compared the intensity values of similar vowels. For example, in the sentence "¿puede mandarme una taza de café?" (accented vowels are underlined), he finds that the /é/ in "café" is less intense than the /e/ in "de." Except for the fact that he only used one recording and used the sentence final syllables, which diminish in intensity universally, these results are much more justifiable than those of the previous experiment.

Experiment 3. Lastly, Bolinger set up an experiment to compare the strengths of tone and intensity as stress indicators. He used the sentence "Pepe fue al teatro ayer" (Peter went to the theater yesterday) and three other sentences. He placed additional tone and intensity on one of

![Figure 7. Two Possible Combinations of Tone and Intensity in the Sentence "Peter went to the theater yesterday." (Capital letters=increased intensity, raised letters=increased tone.)](adapted from Bolinger 1961, 46)

the words of the sentence and made several recordings, using different combinations. Using the English equivalent, this is shown for two possible combinations in Figure 7. Subjects were asked to indicate which of the following sentences best described the implication of the original sentence.

1. It was Peter who went, not another.
2. Peter went to the theater, not the park.
3. Peter went yesterday, not the day before.

This assumes that someone who marks the first sentence perceives the predominant stress as being on the word "Peter." The results showed that most of the listeners perceived the word with the increased tone as the one that was stressed. This experiment assumes that sentence stress behaves the same as word stress. This may be true, but Bolinger has not demonstrated that assumption. Each of the three words tested has an accent. Unless Bolinger can show equivalence between word stress and sentence stress, the experiment is inappropriate for his purposes.
Summary. Bolinger's conclusions are in accordance with experiments done in other languages such as English (Fry 1958), but because care was not taken in setting up his experiments, the only possible conclusion that can be drawn is that tone is a more important cue for stress than intensity.

Contreras' Study

The next study done on the Spanish accent was by Heles Contreras. This study was a continuation of Bolinger's earlier study. Contreras proposed to verify Bolinger's work and determine the relative importance of duration and intensity as secondary stress indicators. He performed three experiments to obtain his results.

Experiment 1. In the first test, Contreras recorded three items: /papa/, /paro/ and /pego/. Each can represent one of two words depending on the placement of the accent. In each, different combinations of tone, intensity, and duration were used. These combinations were made by ear. He comments that it would have been better to use a speech synthesizer to vary the elements mechanically, but he did not have such equipment (1963, 223). These recordings were then played to three listeners who indicated where they perceived the accent to fall. Each item was recorded four times, so, in total, 12 responses to each combination were obtained.

Four recordings were made where the tone was held constant and the duration and intensity favored the first syllable. This should have been the control set, and all of the listeners should have perceived the accent to fall on the first syllable. However, of these four, two were favored by 67% and another by only 58%. One of the reasons why he was not able to achieve good results is because the items were recorded in isolation. Later in his paper, Contreras quotes Bolinger saying that accent belongs to the sentence, not the word (1963, 232). If this is the case, he should have placed each item within a sentence. Furthermore, he also concludes that a sequence with a strong fall in tone from the first syllable to the second is ambiguous, and that the accented syllable will be the one favored by the other two factors (duration and intensity)(229). He later contradicts this statement by saying that accent is primarily perceived through ascendent and descendent tones. Lastly, Contreras also concludes that duration is a more important stress indicator than intensity.

Experiment 2. In the second experiment, Contreras recorded naturally spoken sentences and isolated words that could change meaning by shifting the accent from one syllable to another. These words were then analyzed
and played to three listeners. In several cases, the listeners did not perceive the accent to fall on the syllable on which initially intended to be. Contreras dismisses these results saying that the words were isolated out of context. This is true for all words, not just those that were the exceptions. If the exceptions should be dismissed on those grounds, then all of the words should be. On top of this, he reports that the recordings were not very clear, making it even harder for the listeners to make correct perceptions.

Experiment 3. Because of the confusing results obtained from experiment two, Contreras performed yet another experiment. In this one, he used the same kinds of words as before, but now he placed them in a sentence. Each sentence was recorded three times. Once, the accent was placed on the first syllable of the given word, and another time it was placed on the second. Lastly, both syllables were accented. He also used 35 listeners instead of just three.

The results from this test are much more conclusive. Tone is determined to be of greatest importance, then duration, followed by intensity. However, there was never a case where duration and intensity opposed each other without the influence of tone, so the relative importance of duration and intensity is still to be determined.

Quilis' Study

Methods. In many ways, the experiment performed by Quilis was similar to the third one performed by Contreras. Quilis was much more careful, however, in setting his up. He used items that could be interpreted in three different ways. For example:

/abito/- custom or habit
/abito/- I inhabit
/abito/- he inhabited

He used these words in three different ways: isolated, in the middle of a sentence, and at the end of a sentence. He recorded five different speakers. Each recording was analyzed to determine the fundamental tone in Hz, the duration of the vowels expressed in tenths of a second, the maximum value of intensity expressed in dB, and the area of intensity expressed in mm². The results of five speakers were averaged for each item.

Results. In the 105 cases that were examined, the fundamental tone was at a maximum on the accented vowel in 85 of them. It was also seen to be the sole
indicator of stress in 5 cases. Of the 24 cases where \( F_0 \) was not at a maximum, it was of equal value to another vowel in 16 cases. Of the remaining eight cases, all of them departed from their tonal configuration in accordance to Bolinger’s hypothesis (1961, 35).

Duration was at a maximum on the accented vowel in 69 cases and was a sole indicator in three of those. Quilis also concludes that the most important stress indicator is the fundamental frequency. The stress can be indicated from a maximum value of tone, from its departure from the tonal configuration of the word, or from a combination of both. Finally, he concludes that duration is the second most important component and that the maximum value of intensity and the area of intensity had little effect on the production of accent.

Comments. Because of the careful design of the experiment, Quilis’ results are much more conclusive than those from the other two studies. However, the experiment did not study how listeners perceive the intended accents. Such data would have reinforced his results by making sure that the intended accent is also the perceived one. He also averaged the results of the recorded words in isolation, in the middle of a sentence, and at the end of a sentence. It would have been useful to see how intonational factors would have effected the various \( F_0 \) values.

Our Study

Methods. Since Quilis’ study in 1970, little research has been done on the Spanish accent. This study examines the relationship between tone as an accentual feature and tone as an intonational feature. The effect that this relationship has on duration and intensity was also monitored.

To examine this relationship a list of sentences was designed using many of the same words that Quilis used in his study, such as *habito/habitó* (See Appendix I). The recorded sentences all had falling final intonational groups. The words were placed in different positions within the sentences to test for possible contrasts in the frequency of the stressed vowel. Sentences were also created including words with unaccented as well as accented vowels, which were categorized according to their relationship within the stressed syllable (See Appendix II).

The sentences were read by three sociolinguistically equivalent Spanish speakers from Chihuahua, Mexico. The informants were recorded in the College of Humanities anechoic studio at Brigham Young University. The recordings were evaluated on the Visi-Pitch screen and calibrator, as well as
permanently recorded on a chart recorder. These evaluations provided quantified results for the $F_p$ in hertz, intensity in decibels, and duration in milliseconds.

**Results.** The results are given in chart form, by acoustic phenomenon. Frequency is given in hertz, intensity in decibels, and duration in milliseconds. Each chart is divided into sections according to stress (tonic/atonic) and position. Positions are final and non-final. The non-final is an average of all positions except final.

Our results show that placement of the word in the sentence does not affect the frequency, intensity nor duration of the segment unless it occurs in final position. In final, unstressed position, the segment's frequency and intensity are much lower than the average value in non-final positions, but its duration remained the same.

### Frequency in Hertz

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Atonic</th>
<th>Tonic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Final</td>
<td>Final</td>
</tr>
<tr>
<td>i</td>
<td>236</td>
<td>154</td>
</tr>
<tr>
<td>e</td>
<td>233</td>
<td>113</td>
</tr>
<tr>
<td>a</td>
<td>212</td>
<td>95</td>
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<tr>
<td>o</td>
<td>219</td>
<td>178</td>
</tr>
<tr>
<td>u</td>
<td>230</td>
<td>116</td>
</tr>
<tr>
<td>Avg.</td>
<td>226</td>
<td>131</td>
</tr>
</tbody>
</table>

### Intensity in Decibels

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Atonic</th>
<th>Tonic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Final</td>
<td>Final</td>
</tr>
<tr>
<td>i</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>e</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>a</td>
<td>27</td>
<td>11</td>
</tr>
<tr>
<td>o</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>u</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>Avg.</td>
<td>25</td>
<td>12</td>
</tr>
</tbody>
</table>
In final stressed position, frequency is observed to be slightly higher, intensity somewhat lower, and duration much longer than their average values in non-final positions. This raise in frequency is significant because those syllables occurred at the end of a falling intonational pattern. If the intonational and accentual patterns of a word were divorced, as suggested by Navarro, the frequency of final stressed vowels should fall. Our studies suggest that tone functions both in intonation and in accent.

In most languages, intensity falls in final position. In our results, the intensity in stressed final position is 116% greater than in unstressed final position. While the fall in unstressed final position may be considered normal, the relative lack of fall in stressed position indicates that intensity plays a much greater role in this position. The observed duration for stressed and unstressed vowels generally corroborates earlier findings by Clegg and Fails. The most significant observations were made in stressed final positions. On average, such vowels were 37% longer than stressed vowels in non-final position and 98% longer than unstressed vowels in the same position. These findings suggest that duration plays a greater role in accent in final position than non-final.

It is seen then, that except in final position, intonational and accentual patterns tend to coincide and reinforce each other. When these two patterns conflict, as in the final position, both intensity and duration have an enhanced role in the production of accent. Another important observation is that the absolute value of frequency was not seen to be a strong indicator of accent. No strong correlation between high frequency values and stressed syllables was observed. This finding contradicts the earlier studies. Additional experimentation is necessary to verify those results.
VI. CONCLUSIONS

Accent is a part of our basic communication. Phonologically it is composed of the acoustic elements of the sound wave: tone, intensity and duration. These elements can be analyzed by the Visi-pitch. A study of other languages reveals that tone is the predominant factor in the perception of stress. However, the results from studies on Italian and Welsh stress suggest that tone is only a feature of intonation and not accent. Like most languages, the intonational and accentual patterns in Spanish coincide. Because of this, it is difficult to determine whether tone functions solely in intonation or if it also functions in word stress. The results obtained by Whetten suggest that tone can function independently as an accentual cue.

Because of poor experimentation, the only valid result that can be obtained from the Bolinger and Contreras studies is that tone is more important than intensity and duration in Spanish word stress. Of greatest value is Bolinger's hypothesis on the function of tone, because it provides a foundation for further experimentation. Quilis' conclusions indicate that this hypothesis is valid. His conclusions also suggest that duration is a more important accentual factor than intensity.

Our study sheds additional light on the relationship between accentual and intonational patterns. In most cases, these two patterns coincide, but in final stressed positions in a sentence with a falling intonational pattern, they do not. In such positions, the frequency of stressed vowels maintained the same value as those in non-final positions. The frequency of nonstressed vowels in final position, however, fell. Therefore, frequency is seen to function in both accent and intonation.

The relationships shown in this study point out that in final stressed position within a falling intonational pattern, duration is of most importance, secondly intensity, and lastly frequency.
WORKS CITED


Contreras, Heles. (1963) "Sobre el acento en español." Boletín de Filología de la Universidad de Santiago, Chile. 15: 223-237.


Appendix I

A list of the sentences used in the experiment:

1. Habito en una pequeña casa en Provo.
2. Fijaron la fecha del ataque.
3. --¡Dáselo, le dije al niño, gritándole.
4. Habitó en una pequeña casa en Provo.
5. Su compañero nuevo partió diciendo, --cuídese del nuevo tatú.
6. El hábito no le permitía hacerlo.
7. "Oda a una tortuga" fue el título del poema que presenté.
8. Sé que el hábito le sirvió.
9. No sé en qué década se hará.
10. No le permitía hacerlo el hábito.
11. Sé que habitó en una pequeña casa.
12. Se capturó al jefe de la tribu.
13. Sé que habitó en una pequeña casa por un año.
14. Ocuparon el pueblo durante aquella época y me rendí
15. Tú eres un abogado distinguido.
16. Lo raro es que no sé dónde habitó.
17. íbamos a ver a los otros en un taxi.
18. Lo raro es que no sé dónde habitó.
Appendix II

A list of the syllables studied in the experiment. Each syllable is indicated in bold in the words below which were read in the sentences in Appendix I.

**ATONIC**

<table>
<thead>
<tr>
<th>Initial</th>
<th>Pretonic</th>
<th>Posttonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>habitó</td>
<td>hábito</td>
</tr>
<tr>
<td>e</td>
<td>pequeña</td>
<td>cuidese</td>
</tr>
<tr>
<td>a</td>
<td>habito</td>
<td>década</td>
</tr>
<tr>
<td>o</td>
<td>abogado</td>
<td>epoca</td>
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