JAPANESE PITCH-ACCENT: CROSS-LINGUISTIC PERCEPTIONS BY SPEAKERS OF STRESS- AND PITCH-ACCENT LANGUAGES

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By
Linda A. Lanz

Thesis Committee:

Leon A. Serafim, Chairperson
Alexander Vovin
Kimi Kondo-Brown

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ABSTRACT

This thesis investigates the perception of Japanese pitch accent by native speakers of pitch-accent languages and stress-accent languages. In particular, it seeks to determine whether or not pitch accent is a salient feature across language boundaries. An experiment was conducted to compare the correct perception of Japanese pitch accent by native speakers of three pitch-accent languages (Punjabi, Serbo-Croatian, and Swedish) and three stress-accent languages (English, Russian, and Samoan). For several reasons, this study employed the Kyoto dialect of Japanese, rather than the Tokyo dialect.

The experiment — conducted either in person or via the Internet — was unable to refute the null hypothesis that neither pitch-accent speakers nor stress-accent speakers would be more successful at accurately perceiving Japanese pitch accent. However, a statistical analysis employing ANOVA revealed that there was a significant correlation between accent category of the Japanese test items and the subjects' performance, regardless of native language.

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CHAPTER 1
INTRODUCTION

1.1. Introduction

A handful of studies (Aoki 1990, Shport 2001, Hirata 1999) have shown that learning Japanese pitch accent is difficult for students whose native language is English (i.e., a stress-accent language). One study on Japanese accent perception by native speakers of Korean, however, also showed that perception of Japanese pitch accents is difficult for learners (Sukegawa and Sato 1997). Sukegawa and Sato found that not only was pitch accent a difficult matter for non-native speakers of Japanese, but also that a language's system of timing may interfere with accent perception. In their research, the Korean subjects had the most errors perceiving Japanese accent in words that had a different number of syllables than moras (for example, two syllables but three moras), presumably because Korean does not have moraic timing. From studies such as these, it is clear that accent perception is a complex matter.

Little research, however, has been done on the perception of Japanese accent by native speakers of other languages, and none has been done on the possible role that accent type — stress-accent or pitch-accent — might play in accent perception. To this end, the author undertook a study on the perceptions of Japanese accent by native speakers of other pitch-accent languages, as well as stress-accent languages. Tonal languages, such as Chinese and Vietnamese, were not included in the present study.

The basic presumption behind the research idea was that speakers of other pitch-accent languages (such as Swedish, Serbo-Croatian, Punjabi, etc.) would be more

successful in perceiving Japanese pitch accents, due to the fact that they are already familiar — at least subconsciously — with the concept of pitch accent. In other words, to speakers of pitch-accent languages, pitch — rather than stress or tone — is the salient feature of accent. If this is indeed the case, this saliency of accent type may render, for example, native speakers of pitch-accent languages more able to recognize pitch distinctions in other languages. Furthermore, if this assumption is true, perhaps speakers of stress-accent languages may not even notice pitch accent since it is not a feature of their own languages. This lead to the following research question:

> Research Question 1) Between native speakers of pitch-accent and stress-accent languages, are there significant differences in the correct perception of Japanese pitch accent?

Based on this research question, then, is the first hypothesis:

> H_1) Native speakers of pitch-accent languages (who are unfamiliar with Japanese) will outperform native speakers of stress-accent languages (who are also unfamiliar with Japanese) in the correct perception of Japanese pitch accent.

Furthermore, I wanted to test the possibility that certain accent categories in Japanese would be more (or less) difficult for native speakers of languages other than Japanese. Since non-native speakers of a given language may not be able to pinpoint the relevant phonemic information — for example, they may not realize that voiced consonants in a language are phonemes, but consider them allophones of unvoiced consonants — it may be true that non-native speakers are also unable to identify salient drops in pitch, or at least be much less able to do so than native speakers. Also, certain accent categories may, for some reason or another, be more difficult than others for native speakers of stress-accent languages, as well as pitch-accent languages (other than Japanese).

> Research Question 2) For native speakers of pitch-accent and stress-accent languages, are there significant differences in the difficulty of perceiving the five accent patterns of Kyoto-type Japanese?

This second research question leads us to the second hypothesis:

> H_2) The differences in perception by accent category of the Japanese words will be significant for native speakers of stress-accent languages, as well as for pitch-accent languages other than Japanese.

In order to test these hypotheses, an experiment was performed (see Chapters 3 and 4 for methodology and results).

1.2. Japanese Pitch Accent In General

Japanese is the textbook example of a pitch-accent language: it is a language in which accentual distinctions are made via changes in fundamental frequency, rather than changes in intensity as in stress-accent languages. According to the *Routledge Dictionary of Language and Literature*, pitch accent is defined as "word accent in which the change of pitch is distinctive...In contrast to stress accent, the change in pitch is distinctive and, in contrast with tonal languages only one syllable per word has distinctive tone" (367). Japanese fits this definition in that changes in pitch are distinctive, not changes in intensity; furthermore, these distinctive pitch changes occur only once per word (or word plus enclitic), making Japanese a non-tonal language.

Depending on the dialect, Japanese pitch accent may be manifested as locus, register, or both (Hayata 26). In dialects in which locus is important, such as Tokyo Japanese, it is only the location of the pitch drop — drops in fundamental frequency, rather than rises, constitute 'accentedness' in Japanese — that is a salient feature. Martin notes that locus

of pitch fall is considered to be "accent," such that words with a pitch fall are "tonic" and those without a pitch fall are "atonic" (160). For example, in the Tokyo dialect, the often-cited minimal triad *hasi-ga* (LH(H)) 'edge-NOM', *hasi-ga* (LH(L)) 'bridge-NOM', and *hasi-ga* (HL(L)) 'chopsticks-NOM', differ in that 'edge' is unaccented due to lack of a drop in fundamental frequency, while 'bridge' and 'chopsticks' are both accented for having such a drop. Note that when the enclitic *ga* is not present —when the words are spoken in isolation, for example — the words 'edge' and 'bridge' both appear unaccented on the surface.

However, in register dialects/languages, such as the Shuri dialect of Ryukyuan (a Japonic language) or the Western Kyushu dialects of Japan proper, it is the initial register of the word that is important, not the location of the pitch change. The *Okinawago jiten* [Dictionary of Okinawan Language] by *Kokuritsu Kokugo Kenkyūjo* [The National Institute for Japanese Language] indicates that in the Shuri dialect, register is the only salient feature, since there are no distinctive pitch falls (53-57). In the Shuri dialect, there are two accent types, called 0 and 1 in the *Okinawago jiten*, which are described as "flat" and "falling"; these correspond to initial low register and initial high register, respectively (53). The "flat" category is described as starting with low or middle pitch and maintaining that pitch for the remainder of the word, while the "falling" category is described as starting with high pitch and falling either on the first or second mora. Thus for accent type 0, there are words such as in (1):

(1a) *sutumiti* (LLLL) 'morning'

(1b) *ʔami* (LL) 'rain'

whereas for words of accent type 1, after the initial high register, there is a fall whose location is completely arbitrary and may change from speaker to speaker (or even within one person's speech):

(2a) *hana* (HL) 'nose'

(2b) *tubuN* (HHL *or* HLL) 'to fly'

Locus is simply irrelevant in a register dialect such as Shuri: those words having initial high register are considered accented, and unaccented words are those that have initial low register (*Okinawago jiten*). Given that words with initial low register are more numerous than those of initial high register (*Okinawago jiten* 54), it makes perfect sense that initial high register words are more marked, and thus considered accented.

Finally, there are dialects, such as Kyoto Japanese, in which both locus and register are at work. Using the familiar *hasi* example once more, in Kyoto Japanese, there is a three-way distinction between these three lexical items, and an enclitic such as *ga* is not needed for it to be evident on the surface: *hasi* (HH) 'edge', *hasi* (HL) 'bridge', and *hasi* (LH) 'chopsticks' (Hirayama). It is clear that the two unaccented words —'edge' and 'chopsticks' are distinguished from one another by register, as the former has initial high register and the latter has initial low register. Furthermore, in Kyoto Japanese there is a fourth accent possibility for words of two moras: LF, where F 'falling' indicates that the pitch begins high but falls to low within the course of one mora. While there is not a *hasi* example corresponding to the LF pitch pattern (due to a lexical gap), this accent pattern is found in words such as *saru* 'monkey', where the first mora is low and the second is falling; when the enclitic *ga* is added to the end, the accent shifts to LH(L). Note that in

Kyoto Japanese, this falling pitch is only possible in a few words of two or three moras, so it is rather limited in scope.

Regardless of whether a particular variety of Japanese has locus-type pitch accent, register-type — or both — these features are lexically determined (Pierrehumbert and Beckman (214). Once locus and/or register are known, however, the accent pattern of the word is fully predictable (Vance 80).

1.3. Kyoto Japanese Pitch Accent

1.3.1. Locus and Register in Kyoto Japanese

Kyoto Japanese accent has two features: locus and register (Martin 142). Like Tokyo Japanese, the location of the fall in pitch (i.e., locus) is salient; those words lacking a fall in pitch are simply referred to as atonic, as the fall in pitch is what is considered to be 'accent' in Japanese. Moreover, Kyoto Japanese accent features initial register distinctions. By register, I mean the initial pitch height; in Kyoto Japanese, there is a distinction between initial high and initial low. This distinction between initial high and low pitch means that there can be two distinctive unaccented patterns in Kyoto Japanese — in Tokyo Japanese, only a word without a pitch drop can be unaccented, while in Kyoto Japanese, the unaccented words can be further distinguished as those with initial low register and those with initial high register. McCawley claims that the difference between initial low register and initial high register is that words with initial low register are actually 'preaccented,' or in other words, preceded by a fall in pitch that does not otherwise manifest itself on the surface (1968: 192). Regardless of its origin or

underlying nature, the initial register is a distinctive feature of Kyoto-type Japanese accent systems.

Martin notes that in contrast to Tokyo Japanese, where initial low pitch is non-distinctive, the high pitch is non-distinctive in Kyoto Japanese; what this means is that atonic words with initial low register in Kyoto Japanese will always have a high final mora (143). Further characteristics of Kyoto Japanese accent are that words (or phrases) may have two low-pitch sequences within the same word: "one assigned by the initial register and the other marking the locus" (Martin 143). Moreover, Martin concludes that, "A stretch of high pitch may be of any length only if it is a continuation of initial high pitch, for in a low-register word the high pitch is confined to a single syllable, either the one that precedes the distinctive locus or — nondistinctively — the last of the phrase" (143).

Both Tokyo-type dialects and Kyoto-type dialects are mora-based. Unlike Tokyo-type accents, however, where only vowels (or the first vowel in a VV sequence) can bear pitch drops, in Kansai-type accents, the second mora of a long vowel sequence, as well as the moraic nasal /N/, may bear accent (Haraguchi 101-102). According to Martin, however, the moraic obstruent /Q/ cannot bear accent, as it is a "silent mora" (144).

1.3.2. Accent of Nouns in Kyoto Japanese

The accent of nouns in Kyoto-type Japanese is somewhat more complex than that of Tokyo-type or Western Kyushu-type Japanese (or the Shuri dialect of Okinawan, as

discussed in section 1.2), simply because Kyoto Japanese has both register and locus, which necessarily cause more accent distinctions than a single-feature system.

First of all, a noun in Kyoto Japanese must have its initial register lexically specified as either high (H) or low (L) (Martin 159). Additionally, a noun must have its accent locus marked lexically (or its lack of accent, if such is the case). For example, among words of three moras in Kyoto Japanese, there are five accentual possibilities: HHH, HLL, HHL, LHH, and LHL (Iitoyo et al. 97). The first three are lexically specified to have initial high register, and furthermore the accent locus of each of these three high-register words is also specified, furthering distinguishing them from each other. The last two are lexically determined as initial low register — which automatically distinguishes them from the first three — but with the addition of accent, LHL is delineated from LHH.

We have just seen that for words of three moras in Kyoto Japanese, there are five accent possibilities. To determine the number of accent patterns for words of other lengths, Martin's formula $2n\text{-}1$ is used (157). According to him, the reason why the formula is not simply $2n$ is that "there is no oxytonic low to balance the prototonic high. Our missing category is partially filled at the morphophonemic level by words like *saru (ga)* 'monkey' ..." (Martin 157). Kyoto Japanese does have these falling (F) pitches, which Martin dubs "oxytonic" nouns, such as *saru* 'monkey', but they are limited to a small number of bimoraic words and a very small number of trimoraic words, described by Martin as follows:

> [the oxytonic noun] occurs only in low-register nouns of two syllables like saru' 'monkey' and mado' 'window' and in a very few three-mora nouns with a dependent middle mora: minna' 'all' (but mīnna in Osaka), noppo' 'gangly person', matti' 'matches', gittyo' 'a left-hander', makka' 'crimson'.... (147)

In his dictionary of accent and pronunciation, *Zenkoku akusento jiten*, Hirayama lists six possible types for words of three moras in Kyoto Japanese: the first five are those already given above by Iitoyo et al,. and the additional sixth pattern, LLF (category 1;3.5 in Hirayama's notation), is the "oxytonic" Martin noun pattern (Hirayama 90-91). Although a small number of words certainly does not make a category unimportant, Martin (157) and McCawley (1968: 198), among others, do not consider it an accent class of its own. It is possible that this is an allophonic category. At present, there is no satisfactory explanation for these oxytonic nouns in Kyoto-type dialects. However, since — as we will see in Chapter 3 — the test items used in the present study were limited to words of (C)VCVCV structure, whether or not there is an LLF accent category for words of three moras in Kyoto Japanese is not relevant for our purposes.

Finally, there is the issue of compound nouns in Kyoto Japanese. Regardless of the pitch pattern of the second word (or morpheme) in a compound word, "the accent of a compound noun has the same initial register as the first member" (Martin 159). Two other rules (at least) govern the accent patterns of compounds in Kyoto Japanese. First, when the second element forming the compound is unaccented (i.e., lacking in a fall of pitch), the compound itself will have an accent on the first mora of that second word (Martin 159). See (3) below:

(3a) *seiji* (HHH) 'politics'

(3b) *kyouiku* (HHHH) 'education'

(4c) *seiji-kyouiku* (HHH-HLLL) 'political training' (Martin 159)

Second, if the second element of a compound originally *did* have an accent, the locus of that accent is disregarded, and a new locus is placed after the first mora of the second word. See (5) below:

(5a) *mugi* (LH) 'barley'

(5b) *hatake* (LHL) 'field'

(5c) *mugi-batake* (LL-HLL) 'barley field' (Martin 159)

As has been shown in this section, Kyoto Japanese nouns have a twofold accent system, based on register and locus.

1.3.3. Accent of Verbs in Kyoto Japanese

Verbs in Kyoto-type Japanese are more straightforward than nouns, as there are simply two possibilities. In the non-past form, either the verb has initial high register or initial low register, but either way, it will be unaccented (McCawley 1968: 199; Haraguchi 107-108). For example, the verb *susum-u* (HHH) 'to advance' is unaccented with initial high register, and *kakus-u* (LLH) 'to hide' is unaccented with initial low register (Haraguchi 107). Martin refers to these two verb types as Type A (or "high atonic") and Type B ("low atonic"), and notes that there are more verbs of Type A in Kyoto Japanese than of Type B (154-155). There is also a clear correspondence between the two types of Kyoto Japanese verbs and the two types of Tokyo Japanese verbs: Type A (high unaccented) verbs in Kyoto Japanese correspond to unaccented verbs in Tokyo Japanese, but Type B (low unaccented) verbs in Kyoto Japanese correspond to accented

verbs in Tokyo Japanese (Martin 161). See Tables 1.1 and 1.2 for some examples of high unaccented and low unaccented verbs in Kyoto Japanese.

Table 1.1. Examples of Martin's Type A Verbs (154).

'wear'	'put'	'insert'	'change'	'begin'	'doubt'
ki-ru (HH)	ok-u (HH)	ire-ru (HHH)	kawar-u (HHH)	hajime-ru (HHHH)	utaga-u (HHHH)
ki (wa) (H(L))[1]	ōk-i (HL)	ī-re (HL)	kawar-i (HHL)	hajime (HHL)	utaga-i (HHHL)
ki-ta (HL)	ōi-ta (HLL)	ī re-ta (HLL)	kawat-ta (HLLL)	hajime-ta (HHLL)	utago[o]-ta (HHH[L]L)

Table 1.2. Examples of Martin's Type B Verbs (154).

'see'	'write'	'rise'	'hide'
mi-ru (LH)	kak-u (LH)	oki-ru (LLH)	kakure-ru (LLLH)
mi (wa) (H(L))	kak-i (LH)	oki (LH)	kakure (LLH)
mi-ta (HL)	kai-ta (LLH)	oki-ta (LHL)	kakure-ta (LHLL)

In the Kyoto dialect, moreover, verbs in the past tense maybe also be accented or unaccented, but in the case of accented past tense forms, the locus of the drop in pitch may vary depending on the verb's stem type (consonantal or verb) (McCawley 1977: 278).

[1] As Martin points out, the verb morphemes *–i* and *–ru* attach as High, thus altering the accent of the verb stem (155).

1.4. Justification for Using Kyoto Japanese

The reason for choosing Kyoto Japanese as the dialect for this study was twofold. First, scholars often ignore varieties of Japanese other than Tokyo Japanese. Thus more research on Kyoto Japanese and involving Kyoto Japanese — or any other dialect, for that matter — is needed to further our understanding of Japanese accent. Second — and probably more important — Kyoto Japanese was chosen because it has a more accent pattern possibilities. In Tokyo Japanese, a word of *n* syllables[2] has $(n + 1)$ possible accent patterns (Vance 80; Shibatani 177), while in Kyoto Japanese, a word of *n* moras has $(2n-1)$ possibilities (Martin 157). For example, in Kyoto Japanese, for nouns with three moras there are five possible accent patterns: HHH, LLH, HLL, HHL, or LHL, corresponding to Hirayama's accent types 0, 1, 2, 3, and 1;3 (Hirayama 90-91). See the following examples, which display the five possibilities for words of three moras in the Kyoto Japanese dialect (Hirayama 1964):

(6a)	*miyako*	'capital'	HHH (Accent type 0)
(6b)	*jisatsu*	'suicide'	LLH (Accent type 1)
(6c)	*gogatsu*	'May'	HLL (Accent type 2)
(6d)	*korera*	'these'	HHL (Accent type 3)
(6e)	*rekisi*	'history'	LHL (Accent type 1;3)

Shibatani notes that in the Tokyo-type dialects, there is the same number of pitch patterns as there are syllables; for example, given two syllables, there are two accent pattern possibilities, LH and HL (177). The word *ame* 'candy', for example, has the LH

[2] According to Shibatani, the pitch-bearing unit in Tokyo-type dialects is the syllable, while in Kyoto-type dialects it is the mora (178).

pattern, while its minimal pair *ame* 'rain' has the HL pattern (Shibatani 177). However, it must be mentioned than when enclitics such as *ga* follow the word, there are more possibilities, as illustrated by the formula $n + 1$ (Shibatani 177). In this case, words of two syllables actually have three pitch accent patterns in Tokyo Japanese, but without the enclitics following these words, the accent differences are not seen. The distinction between LH(L) and LH(H) can only be manifested if there is an enclitic following it, as the pitch height of the enclitic is the only surface evidence of a difference between these two types. For example, the minimal pair *hana* (LH) 'flower' and *hana* (LH) 'nose' appear to be identical in terms of pitch accent when in isolation, but when followed by *ga*, they have the distinct forms *hana-ga* (LHL) 'flower-NOM' and *hana-ga* (LHH) 'nose-NOM' (Shibatani 179). Relevant to the present study, in the Tokyo-type dialects, words of three syllables could only have the following four accent possibilities: HLL(L), LHL(L), LHH (H), and LHH(L).

For the purposes of statistical reliability, then, Kyoto Japanese is a better choice for an accent perception because with five possibilities (rather than the four of Tokyo Japanese), the subjects are less likely to guess correctly by chance. With four possibilities, a subject who merely guessed the answers would have a 25% chance of getting the correct answer, while with five possibilities, the likelihood drops to 20%.

CHAPTER 2
ACCENT SYSTEMS

The aim of this chapter is to briefly outline the stress-accent or pitch-accent systems of the languages included in the experiment, so that their inclusion as representatives of those two types can be justified. I will present first the stress-accent languages, and then the pitch-accent languages, in alphabetical order within those two categories.

2.1. Stress-Accent Languages

2.1.1. English

2.1.1.1. General Remarks on English Stress & Accent

Scholars overwhelmingly agree that English language has a stress accent system. However, there is no easy description of that system, and generalizations abound. What is agreed upon is that stress is the primary means of accenting in English. As opposed to a pitch-accent language, which uses frequency as a means of making syllables more prominent, English uses increased intensity – usually called 'stress' – to do the same thing (Wolak 8). As described by Giegerich:

> [E]very (lexical) word – noun, verb, adjective or adverb – has a stressed syllable, and where more than one syllable bears stress… one of these stresses will be the main stress, and the others subordinated. In phonetic terms, *stressed syllables in English are produced with a stronger burst in initiatory energy* – a more powerful contraction of the chest muscles – than unstressed syllables are…. On the acoustic side, this increased energy input results in greater loudness…and often – mainly in the case of primary stress – a change of pitch. (179; author's italics)

Yet while pitch (i.e., frequency) changes are not completely absent in English words, they are not considered to be the factor that English speakers use to discern 'stress' or 'accent'. Wolak claims that these frequency changes are, in fact, markers of English intonation, not stress; since syllables carrying primary stress are also the intonation carriers of the (lexical) word in question, their pitch may change. Conversely, secondary and other non-primary stresses in English cannot carry intonation, and so pitch changes do not accompany their stress (Wolak 10-11). It is the intensity of a stressed syllable that makes it distinguishable from its unstressed neighbors.

Another characteristic of stress in English is that the vowel qualities of unstressed syllables may be reduced (Wolak 11; Poldauf 15). Unstressed vowels may have several different unreduced forms, the most common of which is [ə]; others are [ʊ], [ɪ], and what Poldauf writes as ɪ̯ə which he calls "a sound between ɪ and ə [which is] sometimes realized as the one, sometimes as the other" (15). For example, in the word *acúte*, the first vowel is reduced, while the vowel in the primary-stressed syllable retains its full quality: [əˈkjuːt] (Poldauf 16).

English stress is not so straightforward as in some other stress-accent languages, such as Finnish and Samoan, perhaps in part due to its enormous inventory of loan words. According to Wijk, English stress is difficult to generalize because the English language possesses a complex mix of its native Anglo-Saxon with Norman French (and other languages). While Anglo-Saxon should have stereotypically Teutonic stress, with the primary (heavy) stress on the root, Norman French had a much more evenly-distributed stress (124). The result of so many words borrowed from other languages, particularly

the large influence of French, is that English stress is a complex phenomenon. While it is not arbitrary (Giegerich 180), the rules for stress placement are rather complicated and furthermore, it is only predictable some of the time (Ladefoged 43). A word rarely has *more* than two stresses, but it is possible; it is also possible for a word to have two stresses of equal intensity, known as 'double' stress or 'even' stress (Poldauf 15). When a word has secondary stress in addition to primary stress, it is usually separated from the primary stress by one syllable (Poldauf 15). In the next section, I will present some of the many stress placement rules of English.

2.1.1.2. Primary Accent in English

According to Alan Cruttenden, any description of English stress accent must take both word stems[3] and affixes into account. The following are his generalizations of English stress rules for word stems, in which the acute accent ´ indicates primary stress:

> A very simplified set of informal rules for stress placement in stems can then be stated as follows:
>
> (i) **Verbs and adjectives**:
>
> (a) Stress on the penultimate syllable when final syllable has a short vowel in an open syllable or is followed by no more than one consonant, e.g. *surrénder, pólish, astónish, rígid, explícit*
>
> (b) Otherwise, stress is on the final syllable (subject to rule (iii) below), e.g. *reláte, maintáin, sublíme, sevére, rejéct, defénd, abrúpt.*
>
> (ii) **Nouns**:
>
> (a) If the final syllable has a short vowel, disregard it and apply rules under (i) above, e.g. *élephant, móment, compléxion, surrénder.*
>
> (b) If the final syllable has a long vowel, it is stressed (subject to (iii) below), e.g. *políce, machíne, dispúte, campáign*
>
> (iii) **Words of more than two syllables with a long final vowel**:

[3] "Stems include not only single free morphemes like *blood, survive* and *chloroform* but also that part of a word remaining when an affix is removed, even though such a part cannot stand on its own, e.g. *ephemer-al, tremend-ous* and *kaleido-scope*" (Cruttenden 19).

> Stress on the antepenultimate syllable, e.g. *ánecdote, fáhrenheit, pédigree, órganise, éscalate, érudite.* (19)

Furthermore, Cruttenden provides the following generalizations for suffixes:

> Suffixes fall into three classes:
> (a) Suffixes which leave the stress on the stem unaffected, e.g. *fulfíl/fulfílment; úsual/úsually.*
> *(b)* Suffixes which themselves take the stress, e.g., *límit/limitátion; pícture/picturésque; Chína/Chinése.*
> (c) Suffixes which shift the stress on the stem, e.g. *ecónomy/económic; cúrious/curiósity; applý/ápplicant; maintáin/máintenance.* (20)

It is important to keep in mind that these stress rules are merely generalizations and are not intended to be a failsafe method of predicting stress placement. Moreover, Cruttenden's generalizations do not consider any stress other than primary, and indeed, polysyllabic English words usually have secondary stress.

2.1.1.3. Secondary Accent in English

Secondary stress placement is much more clear-cut than that of primary stress. As stated earlier, it is usually separated from the primary stress by one unstressed syllable, but other variations are, of course, possible (Poldauf 15). Most words with secondary stress are trisyllabic at the very least. If the word has three or more syllables, there are two general possibilities. First, if the word has two (and only two) syllables before the primary-accented syllable, then its secondary accent will normally fall on the first syllable, such as *rècolléction* and *dècompóse* (Wijk 136). Second, if the word has three or more syllables before the primary-accented syllable, then the secondary accent tends to

be on the syllable where the primary accent would be, were that word in its basic form. For example, in *consìderátion*, the secondary accent is on the second syllable from the beginning, which is where the primary accent is located in the verb from which is it derived: *consíder* (Wijk 136).

Clearly there are many complex rules governing stress placement in English words, and my description is far from complete. See Poldauf (1984) for an extremely thorough description of English stress placement rules. However, though my description of English is limited, it has been sufficient to establish English as a language in which stress-accent is not only present, but extremely productive. There are many minimal pairs distinguished by stress placement in English, making stress an extremely productive element of the language. For example, there are the words *próduce* (n.) and *prodúce* (v.); *cónvert* (n.) and *convért* (v.); and *présent* (n.) and *presént* (v.), which are all distinguished from their counterparts by stress placement.

2.1.2. Russian

2.1.2.1. General Remarks on Russian[4]

Russian is a stress-accent language, but like English, it does not have fixed stress. Indeed, Russian stress is even more mobile than that of English, and highly – if not entirely – unpredictable. Despite its highly mobile nature, though, Russian stress plays an important role in the language. Stress may occur on any syllable in a (lexical) word, yet for the same word in different declensions or conjugations, the stress may (and

[4] For the purposes of this paper, Russian transliteration was done using Library of Congress standards.

frequently does) move to another syllable to denote various grammatical forms (Avanesov 5). See the following examples (Avanesov 5):

(7a) *vodá* 'water' (nom. sing.)

(7b) *vódu* 'water' (accus. sing.)

(8a) *mór'e* 'sea' (nom. sing.)

(8b) *moria* 'sea' (nom. pl.)

According to Jones and Ward, Russian stress placement "is achieved by an increase in the force with which the breath-stream is emitted ...[T]he accent is realized as *stress*, i.e. the accented syllable is spoken with greater force than the unaccented syllables in the same word. It is for this reason that Russian is said to be a *stress*-accent" language (206; authors' italics). Thus Russian accent is realized through stress, i.e., greater intensity of articulation on stressed syllables.

2.1.2.2. Vowel Reduction in Unstressed Syllables

Russian stress (or lack of it) has an effect on vowel quality. Typically, the stressed vowel is loudest; the remaining unstressed vowels are reduced (Maltzoff 6). Much like in English, where unstressed vowels are frequently reduced to [ə], Russian unstressed vowels "lose their clarity" (Maltzoff 6). Or, to put it another way, Russian vowels are only 'properly' pronounced (i.e., not reduced) when they are stressed (Avanesov 60). For example, the /o/ phoneme in *dom* 'house/home' has three allophones, the first of which is found when stressed, and the other two when unstressed:

(9a) [o] as in *dóm* 'house/home'

(9b) [ʌ] as in *domá* 'at home'

(9c) [ə] as in *ná dom* 'to home' (Avanesov 60)

2.1.2.3. Mobile Stress

Russian stress accent is free and mobile, not fixed. Unlike languages such as Czech and Finnish, where the stress is fixed (always on the first syllable, for both of those languages), Russian stress has the potential to occur anywhere within a word while still remaining non-arbitrary (Jones & Ward 211); in other words, while speakers may not simply place the accent wherever they wish, the accent does move around. Stress in Russian is dubbed 'mobile' because it may occur on any syllable or morpheme (Avanesov 22), to the extent that the same word may have stress on different syllables in different declensions. The following examples illustrate one lexical item in three different declensions:

(10a) acc. sing. góru

(10b) gen. sing. gorý

(10c) nom. pl. góry (Jones & Ward 211)

In many instances, stress placement is the only factor serving to distinguish words that would otherwise constitute minimal pairs. Consider Table 2.1, with data from Avanesov (23):

Table 2.1. Minimal Noun Pairs Differentiated by Stress Placement.

	'torment'	'flour'
nom. sing.	múka	muká
gen. sing.	múki	mukí

Table 2.2 illustrates that the same differentiation via stress occurs with verbs as well:

Table 2.2. Verb Paradigms Differentiated by Stress Placement.

	'to steam'	'to soar'
infinitive	párit´	parít´
1st p. sing.	páriu	paríu
2nd p. sing.	párish´	parísh´

Nevertheless, although Russian stress is mobile, it is clearly not arbitrary – with few exceptions, each word has one correctly stressed pronunciation. In many cases, stress is used to distinguish minimal pairs. The following examples from Wade (14) illustrate this important point:

(11a) *órgan* 'organ (of the body)'

(11b) *orgán* 'organ (musical instrument)'

There are a few words, though, with alternate stressed pronunciations. According to Wade, these few words simply have varying stress that result in no change in meaning whatsoever:

(12) *tvoróg* 'cottage cheese'

(13) *tvórog* 'cottage cheese' (Wade 14)

However, words with alternate stress placement possibilities are very few in number and thus may be considered lexically variable. Indeed, according to Vovin (personal

communication), the variants in (12) and (13) are not variants at all, but forms found in two different sociolects. He notes that (13) is generally only found in uneducated speech, and that no one speaker alternates between (12) and (13) in his or her speech.

In addition to being mobile and non-arbitrary, Russian stress is also not predictable. As Hamilton points out, there is no way to determine stress placement based on the word itself, nor on the word class – one simply must know where each lexical item is to have its stress (147). While it is possible to notice patterns of stress placement (which will be discussed below), it is not possible to predict which pattern a word will manifest in all its declined or conjugated forms. For example, with the word *karandásh* 'pencil' (nom. sing.), it is not possible to predict the stress on its declined forms *karandashá* (gen. sing.) or *karandashéi* (gen. pl.). One can perhaps create a general rule (that stress shifts to the ending in declined forms); however, this general rule will certainly not hold true for all words, and as we will see in the next section, there is no way to predict which rule to apply to any word.

2.1.2.4. Stress Placement Rules of Russian

Russian words typically have only one stress. Clearly when it is the only stress in a word, its primacy is irrelevant; however, since there are instances of secondary, and even tertiary stress, I will call this typical single stress *primary* stress.

As mentioned above, although Russian stress is not fixed, it is possible to divide Russian lexical items into two rough categories: those which have stress on the same syllable in every declension or conjugation, and those that have stress on varying

syllables within a declension or conjugation paradigm (Avanesov 32). Avanesov gives the following example (Table 2.3) to show how "fixed stress" and "mobile stress" – his terms for these two large groups – in effect differentiate between grammatical forms as well as between lexical items (33):

Table 2.3. Fixed and Mobile Stress in Russian.

	Fixed stress	Mobile stress
nom. sg.	glúpost´ 'stupidity'	golová 'head'
gen.	glúposti	golový
inst.	glúpost´iu	golovói
gen. pl.	glúpostei	golóv
dat.	glúpostiam	golovám
prep.	glúpostiakh	golovákh

In seeking to describe Russian stress rules, Coats further divides the "fixed stress" and "mobile stress" groups into four stress pattern groups (1). Although these groups cannot help us predict stress (since Russian stress is entirely unpredictable), they do at least allow us to see that Russian stress is not placed entirely at random. Here are the four stress patterns outlined by Coats (1), the first two of which correspond to Avanesov's "fixed stress" and the last two of which correspond to Avanesov's "mobile stress":

(14a) **Stem-stressed type**: The same syllable of the stem is always stressed in all forms of the declension or conjugation paradigm.
Example: nom. sg. *doróga* 'road' → nom. pl. *dorógi*

(14b) **End-stressed type**: The final syllable is stressed in all forms of the paradigm.
Example: nom. sg. *kochergá* 'poker' → nom. pl. *kochergí*

(14c) **Mobile-stress type**: The final syllable is stressed in some forms of the paradigm, but the *initial* syllable is stress in other forms of the same paradigm.
Example: nom. sg. *golová* 'head' → nom. pl. *gólovy*

(14d) **Retracted-stress type**: The stress falls on the final syllable in some forms of the paradigm and on the final syllable of the *stem* in others.
Example: nom. sg. *kolbasá* 'sausage' → nom. pl. *kolbásy*

2.1.2.5. Secondary Stress in Russian

A secondary stress is also possible in Russian, although it is not common – especially for non-loan words – and frequently optional. Secondary stress, which Jones and Ward call "subsidiary stress," is much weaker in intensity than primary stress, which they term "major stress" (211). They mark secondary stress with a subscript tick [ˌ] and primary stress with a superscript tick [ˈ]; all marking is placed before the vowel (or the syllable containing that vowel) on which stress occurs. In my phonemic transcriptions, following the usage of Wade and others, I will use a grave accent for secondary stress and an acute accent for primary stress:

(15a) *samolètostroénie* 'aircraft construction'

(15b) *kartòfelekopálka* 'potato harvester'

Several types of words may have secondary stress in Russian, including (but not limited to): compounds, technical terms, loan words from other languages, and words containing foreign prefixes (Wade 14-15). The technical term *moròzoustóichiivyi* 'frost-proof' (Wade 15) is an example of a non-loan word with secondary stress. Wade notes that non-loan compounds containing a "polysyllabic gap between the natural stresses in the components," and compounds consisting of a truncated word plus a full word are candidates for secondary stress, such as *vrèmiapreprovozhdénie* 'pasttime' [a compound containing a polysyllabic gap] and *pàrtbilét* 'party card' [a compound from the truncated

adjective *partíinyi* and the noun *bilét*] (15). Some of the foreign prefixes that apparently trigger secondary stress include 'anti-', 'trans-', 'counter-', and 'ultra-'; examples include *àntikommunízm* 'anti-communism', *tránsatlantícheskii* 'transatlantic', *kòntrméry* 'counter-measures', and *ùl'trakorótkii* 'ultra-short' (Wade 15).

While Wade does point out that secondary stress is a possibility, he also notes that *secondary stress is frequently optional or only pronounced in certain speakers' careful* speech. He is unable to provide us with any indication of how to determine when secondary stress will occur and when it will not; however, he claims that in general, the newer a compound word, the more likely it will be to have secondary stress (15).

Avanesov, too, notes that secondary stress is often optional, but he also provides no rules by which to determine optionality. What Avanesov does note is that secondary stress, when it occurs, almost always occurs earlier in the word than the primary stress – in fact, as close to the beginning of the word as possible, such as in the adjective *dàl'nevostóchnyi* 'Far Eastern' (71). He then goes on to tell us that once compound *words have entered into more widespread usage, or lost their 'foreignness', they lose* their secondary stress, which is what happened in the case of *sadovód* 'gardener' (71). Furthermore, Avanesov does provide a little insight into when secondary stress occurs, or at least more than Wade: he says that the further primary stress is from the beginning of the word (i.e., any possible places for secondary stress to occur), the more likely that secondary stress will, in fact, occur (72). This tendency would explain why technical terms and compounds exhibit secondary stress, because by their very nature they are usually longer than more commonplace words.

2.1.2.6. Tertiary Stress in Russian

Finally, it appears that there are a few words in Russian that can have more than two accents, though they are few in number. As with secondary stress, it is rather unclear when tertiary stress occurs. Wade only mentions that it can occur in some undefined category of compounds, such as *àvtomòtoklúb* 'car & motorcycle club' (15). The only additional insights into tertiary stress are that in words with tertiary stress, it will always be the case that the last accent is the primary one, and that tertiary stress tends to occur only in words with three roots. Jones and Ward simply state that words with three accents are possible, in which case the final accent is the primary accent, as in *èlèktropàropodogrevátel'*[5] 'electrical steam preheater' and *àèrofòtosnímok*[6] 'aerial photograph' (211), but they do not provide any rules for understanding when tertiary stress may occur.

This is where Avanesov provides a little more insight than any others: he claims that any time a word has more than three roots — he does not specify whether they should be native roots or a mix of native and loans — tertiary stress is possible, though it may not occur at all (75). In other words, Avanesov is simply claiming that any word with enough syllables *might* have three stresses, as long as it has three roots. He gives the following example of a compound word with three stresses, where the first grave accent is meant to indicate tertiary stress (Avanesov 75):

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[5] The first vowel here — è — is actually *not* accented, but is the vowel Э, which is simply transliterated in this manner in the Library of Congress system.

[6] The second vowel here is another case where è is the transliteration of the unaccented vowel Э. The tertiary accent is on the first vowel.

(16) *èlèktromashinostroénie*[7] 'electrical (mechanical) engineering'

In conclusion, Russian is a stress-accent language in which primary stress alone is overwhelmingly more common than any combination of primary, secondary, and tertiary stress. Its stress is free (i.e., mobile) but not placed arbitrarily, and moreover, stress placement plays a valuable role in distinguishing otherwise minimal pairs. Russian stress can therefore be instrumental in determining a word's grammatical category.

2.1.3. Samoan

2.1.3.1. General Remarks on Samoan Stress

The Polynesian language Samoan is a textbook case of a stress-accent language. Simply put, in almost every case, stress is on the penultimate syllable. According to Mosel and Hovdhaugen, stress is realized phonetically in Samoan by intensity (37), precisely what is expected of stress-accent languages.

According to Marsack, "Every Samoan word has a strongly defined accent which almost invariably is on the penultimate syllable" (19).

(17a) *tíno* 'body'

(17b) *tipólo* 'lemon'

(17c) *fesoasoáni* 'help'

(17d) *togafíti* 'trick'

This generalization is also put forth by Mosel and Hovdhaugen, who state that "All Samoan word stems have one syllable with main stress. In most stems the stressed

[7] The first vowel (è) is again the transliteration of the unaccented vowel ə.

syllable is the penultimate syllable: *táma* 'boy'; *fále* 'house'; *nonófo* 'sit (non-singular)'" (28).

2.1.3.2. Secondary Stress in Samoan

Not much has been said about Samoan secondary stress in the literature; however, Mosel and Hovdhaugen claim that any word with three or more morphemes is a candidate for secondary stress. In such a case, the initial syllable would receive the secondary stress, while the primary accent would remain on the penultimate syllable; the primary stress and any possible secondary stress would be separated by one unstressed syllable (37).

(18) *fàilautúsi* 'secretary'

However, Mosel and Hovdhaugen also mention that in ordinary speech, secondary stress tends to be lost entirely (38).

2.1.3.3. Interaction of Long Vowels with Stress in Samoan

The only problematic part of any description of Samoan stress is how to deal with long vowels. However, as Mosel and Hovdhaugen show, if long vowels can be reanalyzed as two vowels in succession, the penultimate stress rule becomes an even stronger description of Samoan stress (28). According to them, stems with primary stress on the last vowel occur frequently, but in every case, they have long vowels in the final syllable. At first glance, words ending in long vowels appear to be breaking the neat-

and-tidy penultimate rule, because they appear to have stress on the last syllable. However, rather than analyzing a long vowel as a phonemic vowel in contrastive distribution to short vowels, if the long vowels are simply seen as a sequence of two identical short vowels, the penultimate stress rule holds true. Note the following example:

(19) *tamâ* /tamá:/ 'father' (Mosel & Hovdhaugen 28)

However, Mosel and Hovdhaugen claim that if *tamâ* ends with two identical vowels, rather than one long vowel, the stress placement does not violate the general penultimate rule:

(20) /tamáa/ (Mosel & Hovdhaugen 28)

2.1.3.4. Diphthongs and Stress in Samoan

Clearly, though, it is not always the case that a vowel sequence consists only of identical short vowels — Samoan does have non-identical sequences as well as diphthongs in its phonetic inventory. According to Marsack, in words of three or more syllables, the stress will always fall on the final syllable, rather than the expected penultimate syllable, but only if the final syllable is a diphthong (19):

(21a) *faifeáu* 'pastor'

(21b) *atamái* 'clever'

However, this hardly seems a surprise, since these words still fit the general stress rule — that stress occurs on the second vowel from the end.

2.1.3.5. Exceptions in Samoan Stress

As with any language, Samoan has exceptions to its typical stress pattern; however, for Samoan, most of the apparent exceptions are found in words of foreign origin. In such cases, the stress is placed in a manner to facilitate the closest possible resemblance to the donor language, rather than to the native Samoan phonological system. In the following example, the stress is placed on the final syllable, not the penultimate syllable, because doing so is closer to the English word from which it was borrowed (Marsack 20):

(22a) *kamupaní* 'company'

(22b) **kamupáni*

For the purposes of this research, the status of stress placement in loan words in Samoan is not important. Yet it would be interesting in further studies to examine the reasons behind loan-word stress placement in Samoan. Given that the English word *cómpany* has its stress on the initial syllable, why then does Samoan shift it to the final syllable as in (22a)? Is there a restriction in Samoan such that stress cannot be on the initial syllable? Or that it must be located on one of the two final syllables? The question remains unanswered, but perhaps future research could elucidate the matter.

2.2. Pitch-Accent Languages

2.2.1. Punjabi

2.2.1.1. Pitch in Punjabi

Punjabi is unique among its Indo-Aryan relatives (such as Hindi) for having what most scholars refer to as "tones." However, based on the descriptions I have found, I believe that Punjabi's tones are more accurately described as pitch accent.

The literature on Punjabi describes three so-called tones, which are customarily identified as Level, High-falling, and Low-rising (H. Bahri: 21). Apparently low-rising tone is not common to all varieties of Punjabi (H. Bahri 21), but in any case, the pitch-accent system in some form or another does exist in most varieties of the language. This pitch accent system is contrastive, as noted by the following minimal pairs (Malik 85)[8]:

(23a)	/kōʈaa/	'whip'
(23b)	/kóʈaa/	'leper'
(23c)	/kòʈaa/	'horse'
(24a)	/pōli:/	'hollow; soft'
(24b)	/póli:/	'a thorny plant'
(24c)	/pòli:/	'guileless'

The Punjabi pitch accents apparently have their origin in the loss of a distinction between aspirated and non-aspirated initial consonants. U. Bahri and P. Walia note the following: "These tones are phonetic realisations of pitch and duration and roughly correspond to the kh, dh, Dh, jh, gh series of consonants of Hindi and other North Indian

[8] Note that I have adjusted Malik's system of pitch notation to reflect that of Bhatia, since Bhatia's is the one that seems most appropriate and consistent.

languages" (Bahri & Walia, nonpaginated). Bhatia is one of many others who remarks that Punjabi uses pitch in place of the aspirated/unaspirated distinction found in its near-relatives, such as Hindi. He writes, "In place of Hindi voiced aspirates, Punjabi shows unvoiced unaspirated segments in initial position followed by low tone; and in non-initial position, it shows voiced unaspirated stops either preceded by high tone or followed by low tone" (Bhatia xxvi-xxvii). This use of pitch in place of an aspirated/unaspirated distinction would seem to indicate that these so-called tones are, in fact, pitches as found in a pitch accent system. However, Bhatia does not provide enough data to enable us to reach this conclusion for certain. Since aspiration — or lack thereof — may have nothing to do with this, since it is a common tendency for languages to have low tone after voiced consonants. The salient contrast here may be between voiced and unvoiced consonants. Pitch accents often arise due to the loss of consonant distinctions, including the loss of aspiration, but loss of aspiration is not the only possible answer. In any case, the fact that Punjabi has "tones", unlike its fellow Indo-Aryan languages, but lacks their range of consonant aspiration and voiced/unvoiced contrasts, would seem to imply that the pitch system arose out of a need to maintain, in another form, a distinction between consonants.

However, loss of a consonant distinction alone does not prove that Punjabi is a pitch-accent language, as the same loss has been known to produce a true tonal language. The most important factor for determining that these "tones' are actually pitch accent comes from the fact that, as U. Bahri states, "every word in Punjabi carries one of three pitch contours" (xviii). Given that Punjabi words are not solely monosyllabic (in fact, many

are polysyllabic), having one 'tone' per *word*, rather than one 'tone' per *syllable*[9] indicates that this 'tone' is indeed not the tone found in tonal languages, but the pitch found in pitch accent languages.

Furthermore, Gill and Gleason note that, "a Punjabi tone is normally realised over two syllables, its domain. Of these, the most important is the first, or onset syllable, and it is on this syllable that the "tone" is written in transcription" (25). While it may appear in examples that tone is only on one syllable, this is merely a case where transcription obscures the reality, which is that pitch accents are working across a polysyllabic domain. From the looks of it, pitch patterns spread rightward in Punjabi lexical items. I am certain that Punjabi is not a tonal language, but a pitch accent language (and perhaps also a stress-accent language, like Swedish and Serbo-Croatian).

2.2.1.2. Stress in Punjabi

In terms of stress (i.e., the familiar intensity-based "stress" accent such as in English and Russian), Punjabi is said to have a very weak system of stress. These stresses are present in addition to what have been called "tones," which will be discussed later.

According to H. Bahri, "stress is not very prominent in Panjabi [b]ut it is phonemic, as it contrasts" (20). He gives the following examples:

(25a) 'galá 'throat'

(25b) ga'lá 'melt'

(26a) 'talā 'sole'

[9] There is some evidence that Punjabi is moraic, rather than syllabic, but it is not of concern here (Bhatia 342).

(26b) ta'lá 'tank'

Yet the words in (26a) and (26b) are not truly minimal pairs, as they differ in pitch accent as well as supposed 'stress'. On the basis of examples (25) and (26), stress does not appear to be contrastive at all. What stress *does* seem to do is to help determine word class: stress distinguishes nouns from verbal forms, but within the word class 'Noun', for example, stress is not important when it comes to disambiguation of minimal pairs.

Bhatia also notes that stress has the function of differentiating word class and/or grammatical category in Punjabi. He says that, "In nouns, stress accent falls on the initial syllable and in the verb category (particularly imperative and causative) stress accent falls on the final syllable. The stressed syllable is marked by the symbol ['] " (343). See Table 2.4 for some of the examples given by Bhatia:

Table 2.4. Word Class Differentiation by Stress in Punjabi.

Nouns		Verbs	
'galaa	'throat'	*ga'laa*	'cause to melt'
'talaa	'sole'	*ta'laa*	'cause to fry'
'balaa	'evil spirit'	*ba'laa*	'call' (v.)

Bhatia also claims that stress is phonetically composed of some combination of length and pitch, saying that unstressed syllables lack length and high pitch (343). However, as Wells and Roach discovered through their experiments, length is not a salient feature of accent (whether stress or pitch) in Punjabi (85-88). Thus I seriously question the role of stress at all, aside from its grammatical differentiation, because if length is not a salient feature, Bhatia's argument leaves us with nothing but pitch upon which to judge syllables 'accented' or 'unaccented'.

Along these same lines, Malik makes a rather revealing statement when he gives his reasoning behind stating that any monosyllabic word must have primary stress in Panjabi. He claims that, "No word can be spoken without some kind of intonation, and an intonation necessarily presupposes a centre with strong stress" (80). However, to me this seems like a very weak argument, as if he is confusing sentence intonation with word stress, perhaps out of a determination to find stress where it may or may not truly exist. He himself notes that stress in Punjabi serves only to identify the grammatical category or word class of the words in question (73). At the very least, I posit that Punjabi is a system much like Swedish, in which both stress and pitch accents are present.

2.2.1.3. Characteristics of Each Pitch Type in Punjabi

There are nearly as many different systems of pitch-accent notation for Punjabi as there are different scholars arguing about them, but I will adopt that of Tej K. Bhatia, as it seems most straightforward and fitting. The 'tonal' system posited by Bhatia has three possible 'tones', i.e., pitch patterns: low tone /ˋ/, high tone /ˊ/, and mid tone /¯/ (343). These pitch accents occur in minimal triads such as the following from Bhatia (344):

(27a) /kòʈaa/ 'horse'

(27b) /kōʈaa/ 'whip'

(27c) /kóʈaa/ 'leper'

(28a) /kàʈ/ 'chisel'

(28b) /káʈ/ 'boil'

(28c) /kãʈ/ 'do'

The low tone is typically described as a low-rising tone, while the high tone is described as a rising-falling tone. Mid tone is not actually represented in transcription, since its placement is predictable: if a vowel does not have one of the other two pitch possibilities, then it has mid tone by default, making it unmarked (Bhatia 343-344). Indeed, T. Grahame Bailey describes a two-tone system in which the 'level' or 'mid' tone is really nothing other than "the ordinary tone of speaking [which] occur in stressed syllables only" (xv). In Bailey's system, the two tones are low rising and high falling (xv). Dulai also describes this "level" tone as "an intermediate in pitch between the high and low tones" (32). It would seem safe to say that Punjabi in fact has two pitch accent heights, High and Low, plus a neutral *or* that it has three pitch accent heights, High, Low, and Mid.

2.2.1.4. Pitch Accent Placement Rules in Punjabi

Because Punjabi is a pitch-accent language and not a tonal language, pitch phenomena do not occur on all syllables (or moras, as evidence seems to indicate that Punjabi is moraic); rather, any syllable not involved in a pitch accent pattern simply remains neutral, such as the syllable occurring just before the onset of pitch drop/rise (Gill & Gleason 25-26). Gill and Gleason do not claim that these neutral syllables lack pitch, but that they never participate in any contrastive function (26).

According to Bhatia, the pitch accents can occur in monosyllabic, bisyllabic, and trisyllabic words (343). However, the pitch accents require two syllables to be realized.

According to Gill & Gleason, the pitch accent has its onset on the initial or second syllable (or mora) of a word, followed by what they call "a tail" on the following syllable (25). Even if the final syllable of the word has the pitch onset, the tail will still be realized by one of two means: the tail will occur on the first syllable of the next word or enclitic, or, in the case where the pitch onset occurs in the last syllable of an utterance, lengthening takes place to allow for the tail (Gill & Gleason 25).

2.2.2. Serbo-Croatian

2.2.2.1 General Remarks on Serbo-Croatian Pitch Accent

Pitch accent in Serbo-Croatian[10] is the subject of heated debate, but most scholars disagree on the distribution of pitch accent systems among various dialects, rather than on the existence of pitch accent itself. The pitch accent system outlined by Garlén, as well as by Magner and Matejka, is the standard description of Serbo-Croatian accent, which was started by Vuk Karadžic and therefore known as the Vukovian system (Magner & Matejka 2). The Vukovian system is a pitch-accent system with so-called 'rising tone' and 'falling tone'; since long vowels are in contrastive distribution to short vowels, the combination of vowel length and two pitch possibilities yields a system of four surface pitch accent distinctions (Magner & Matejka 3). This four-way accent distinction is

[10] The name 'Serbo-Croatian' is used in the interests of simplicity and is not meant to imply that Serbian, Croatian, and/or Bosnian are not valid languages in their own sociopolitical contexts.

found in the Neoštokavian dialects, which includes 'standard' Serbo-Croatian (Magner & Matejka 20).

Neoštokavian or not, all dialects of Serbo-Croatian have pitch accent, contrary even to the beliefs that native speakers hold about their own language. Indeed, several of my Serbo-Croatian-speaking subjects told me after participating in the experiment that they were from Belgrade and that they did not speak a 'strange' dialect with accents – this despite the fact that linguistic studies show that Belgrade is not without pitch accent. It may indicate that native speakers are aware that other dialects have different pitch accent, yet they do not self-identify as pitch-accent speakers.

The various dialects differ mainly in whether the accent-bearing unit (ABU) is the syllable or the mora and in how many accents are differentiated (Babič 1). Garlén presents the traditional four-way accent notation system as seen in Table 2.5 (Garlén 128, my translation):

Table 2.5. Four-Way Accent Distinction of Neoštokavian Dialects in Serbo-Croatian.

ˋˋ	falling pitch on short accented vowel or on short syllabic /r/
ˋ	rising pitch on short accented vowel or on short syllabic /r/
̏	falling pitch on long accented vowel or on long syllabic /r/
́	rising pitch on long accented vowel or on long syllabic /r/

While Garlén specifies "short accented vowel" and "long accented vowel," it seems that what he really means is vowels that are ABUs (accent-bearing units). In other words, the pitch is not pasted on top of a pre-existing stress (i.e., intensity-based) accent;

rather, the pitch accent may only be applied to vowels – whether long or short – which are capable of being ABUs (Magner & Matejka 2). See Table 2.6 for examples of the four (Neoštokavian) accents in play (Garlén 128):

Table 2.6. Minimal Pairs Distinguished by Pitch Accent.

	Falling	**Rising**
Short	ȕmiti 'to reason; discuss' pȕčina 'water surface'	ùmiti 'to wash' pùčina 'large crowd'
Long	mȃjka 'mother; mamma' lȉčim 'I paint'	májka 'grandmother' líčim 'I resemble'

According to Magner and Matejka, linguist Roman Jakobson claimed that Standard Serbo-Croatian "employs phonologically the contrast between high pitch and low pitch rather than voice-loudness...[I]t is tone which phonologically characterizes word accent in Serbo-Croatian while stress is considered to be predictable and therefore redundant" (20). Thus unlike a stress-accent language, in Serbo-Croatian, intensity is not the key phonological characteristic of accent – instead, accent is manifested by the use of pitch. Many linguists label this accent in Serbo-Croatian 'tone', but I believe it must truly be pitch accent, because the pitch accent requires a bisyllabic environment (Magner & Matejka 20-23). This indicates that the pitch domain is not the syllable (or mora), but the word, and therefore it cannot be tonal in the sense of Chinese or Vietnamese. Ivič goes as far as to assert that it is not the pitch falling or rising within the syllable that is salient; rather, that the difference in pitch is "viewed as a contrast *between* two syllables rather than a contrast *within* the syllable initiating the accent" (Ivič 1965, qtd. in Magner & Matejka 28; my italics).

Babič points out that some dialects of Serbo-Croatian are syllable-based, while others are mora-based, and goes on to give the following basic outline of possible accent types across dialects (Babič 1; 3-9):

a. Syllable-based systems
    i. One tonal class (High only)
    ii. Two tonal classes (High and Low)
    iii. Accented final syllables allowed.
b. Mora-based systems
    i. One tonal class (High only)
    ii. Two tonal classes (High and Low)

However, since according to Lehiste and Ivič, more than half of all Serbo-Croatian varieties are of the Neoštokavian accent type, including Standard Serbo-Croatian, I will concentrate on describing solely Neoštokavian, which is moraic (1986: 1).

Lehiste and Ivič undertook a great number of experimental studies, finding among other things that fundamental frequency – not increased intensity – is the most important factor in the Serbo-Croatian accent distinction:

> According to our findings, the crucial difference between rising and falling accents lies in the pitch relationship between the stressed syllable and the posttonic syllable. In the case of the so-called falling accents, the accented syllable has relatively high pitch, which is followed by a syllable with low pitch. In the case of the so-called rising accents, both the accented syllable and the posttonic syllable have relatively high pitch (1978: 101).

Though Lehiste & Ivič use the conventional names for the four accents, they say that these names are not truly phonetically accurate (1986: 42). For example, their

measurements of fundamental frequencies showed that "short falling" is not so much consistently falling as possessing "relatively high fundamental frequency" (1986: 42). Furthermore, they found that phonetically speaking, 'falling accents' are characterized by *a high F_0 peak on the accent-onset syllable and low fundamental frequency on the* syllable following the accent onset; meanwhile, they found that for the 'rising accents', the syllable immediately following the accent-onset syllable had an F_0 peak "as high as or even higher than the F_0 peak reached during the accented syllable" (1986: 169).

Finally, to dispel any doubt that stress (i.e. intensity) is really at play in Serbo-Croatian, Lehiste and Ivič undertook more experimental work. They found that accented syllables do indeed have slightly higher intensity than the postaccentual syllables, but also found that speakers do not use that phonetic information – instead, Serbo-Croatian speakers focus in on pitch. Therefore, they concluded – and I must agree – "[T]hat intensity plays no systematic role in differentiating between rising and falling accents" (Lehiste & Ivič 1986: 169).

2.2.2.2. Pitch Accent Placement Rules in Serbo-Croatian

These are the pitch accent distribution rules for Standard Serbo-Croatian (Magner & Matejka 3):

- The two falling pitches can only occur in the first syllable of a word.
- Monosyllabic words have only falling pitch.
- No word accent can exist on the word's last syllable.
- Rising pitch can occur in all syllables except the last.

Similar rules are to be found in Figure 1, where I have reproduced the accent assignment rules given by Lehiste & Ivič (1978: 107):

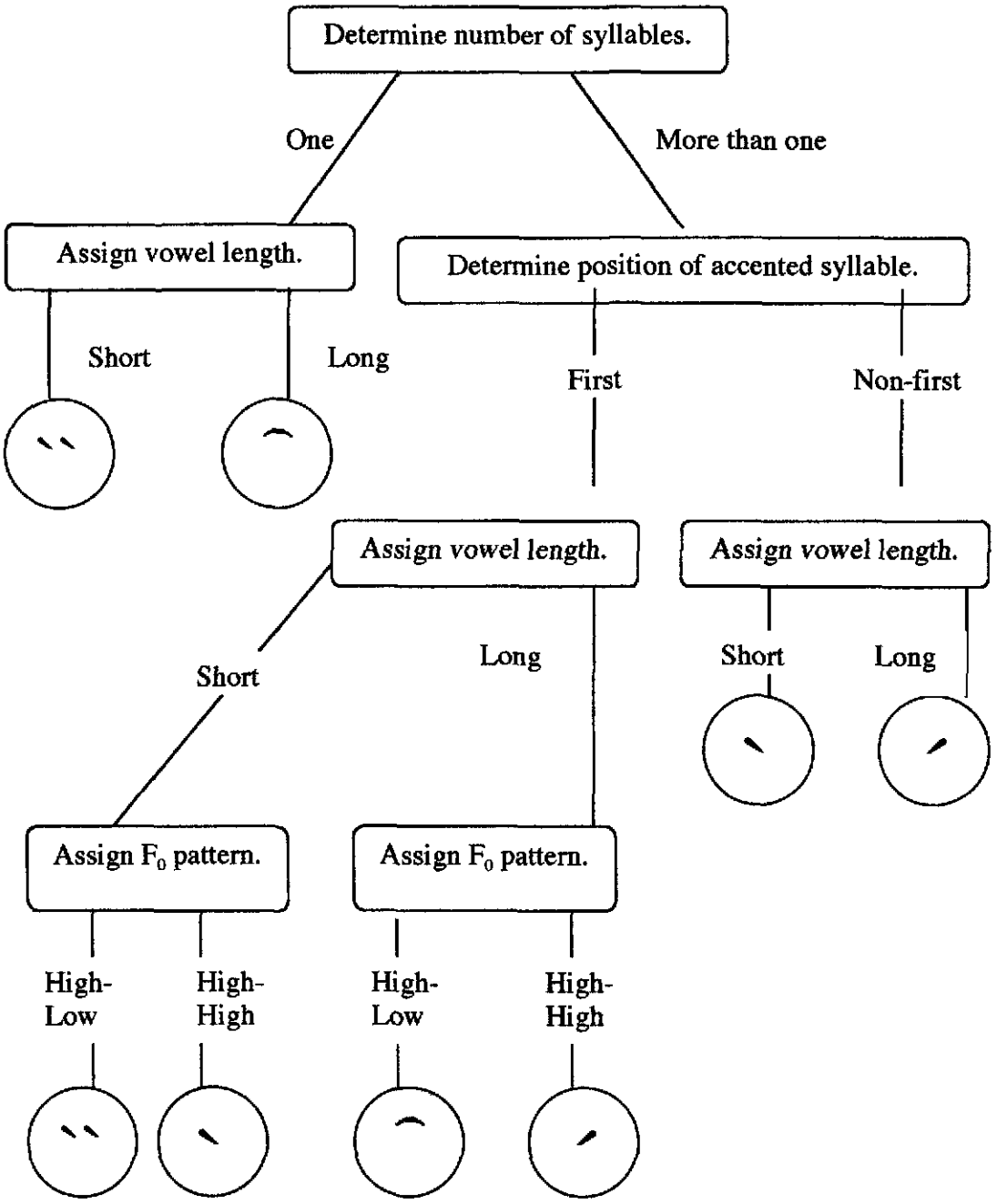


Figure 1. Pitch Accent Placement Rules for Neoštokavian Serbo-Croatian Dialects, Including Standard Serbo-Croatian (from Lehiste & Ivič 1978: 107).

2.2.3. Swedish

2.2.3.1. General Remarks on Swedish Accent

Swedish accent is the subject of much debate, but most scholars at least agree that it has 'tonal' or 'pitch accent' characteristics. Here I will introduce evidence indicating that Swedish is, in fact, a pitch-accent language, though it may not be a 'textbook example' like Japanese. All Swedish dialects other than Finland Swedish (the name referring to the variety of Swedish spoken by the Swedish ethnic minority in Finland) possess pitch accent, though the manifestations vary from region to region (Gårding 31). The following discussion of Swedish accent is based on Standard (Southern) Swedish.

One of the foremost experts on Swedish accents, Eva Gårding, starts out by stating that the so-called 'pitch' in discussions of Swedish accent refers to fundamental frequency, and not intensity; in other words, Swedish accent is not a correlate of intensity (i.e., dynamic stress) like that of Russian, Samoan, and English (Gårding 9). However, as I will point out, stress (which I define as prominence of a syllable by means of increased intensity) is not entirely absent from Swedish. What is important to note, however, is that, "[P]itch is considered to be of primary importance for the accent distinction in Swedish..." (Gårding 29).

Finally, Swedish is not a tonal language because the domain of the accent is larger than one syllable; two syllables are required for Accent II. Unlike Chinese, in which every syllable carries a tone, not every syllable in Swedish can have a 'tone' – in fact, only one pitch accent is permitted per word, as Leslie Bailey pointed out when she wrote, "not all TBUs, i.e., syllables, have the potential to carry tone" (105).

2.2.3.2. Characteristics Of Swedish Accent I And Accent II

Swedish pitch accent is a system comprised of two distinct pitch accents. Like some dialects of Japanese, Swedish pitch accent is a locus type system, because the location of the pitch drop is the means of differentiating the two accents (Pierrehumbert & Beckman 244). The two distinctive accents, commonly referred to as Accent I and Accent II (or acute and grave, respectively), differ mainly in the location of their fundamental frequency drop, but also in the number of syllables that they each require for realization.

According to Malmberg, Accent I requires only one syllable, while Accent II must occur over the domain of two syllables (1966: 105 and 1969: 147). For example, the minimal pair *bùren* 'carried' (Accent II) and *búren* 'the cage' (Accent I) have different accents due to their stem forms. In the case of *búren* 'the cage', the stem form is *bur* 'cage', which is only one syllable; however, the stem of *bùren* 'carried', is *bära* 'to carry', a two-syllable word (Malmberg 1966: 105).

Fundamental frequency is considered to be the main distinguishing feature between the actual shapes of Accent I and Accent II; in particular, it is the location of the frequency drop that distinguishes the two accents. Bruce's experimental work revealed that while both Accent I and Accent II have similar contour shapes, they are separate accents due to the different ways in which frequency behaves in each accent:

> In summary, the basic accent I-contour is characterized by a fall from an F_0-maximum in the pre-stress vowel to an F_0-minimum in the stressed vowel, while the basic accent II-contour contains a fall from an F_0-maximum in the stressed vowel to an F_0-minimum in the post-stress vowel. The fall appears to be somewhat steeper from accent I than for accent II. For both word accents the fall is preceded by a rise from the vowel preceding the pre-stress and the stressed vowel respectively. The F_0-maximum as well as the F_0-minimum target are assumed to be the same for accent I and accent II. (64)

Any treatment of Swedish stress must contain some discussion of the pitch contours, as they are normally referred to in the literature. Basically, in Standard Swedish, Accent I has a high frequency in the pre-accented syllable, and low (or dropping) frequency in the stressed syllable; in contrast, Accent II is high in frequency in the accented syllable, while low in the post-accent syllable (i.e., the second syllable of the two required for Accent II to manifest itself) (Bruce 133). In terms of F_0 contours, Bruce found that Accent I words have early peaks (sometimes to the extent that they spread leftward into the preceding syllable), while Accent II words have late peaks (Bruce 46-49). This reinforces the view that Swedish pitch accent is of the locus type, as the location of the peak is most important.

Yet many scholars, including Bruce and Malmberg, agree that the contour shapes themselves are unimportant. Bruce claims that the rise or fall of pitch itself is not salient, but that the location of a pitch height at a given time is the defining factor (132). This is to be expected of a locus-based pitch-accent system, since it only matters when the pitch drops, and the "rise or fall becomes a mere transition, which is necessary in order to go from one level to another" (Bruce 132).

Malmberg also claims that the pitch contours' shapes are not important, and like Bruce, he reduces them to a high-low pitch opposition: "an opposition between a high pitch (the positively marked grave accent) and a low pitch (the neutral acute accent)" (Malmberg 1969: 148, my translation).

2.2.3.3. Stress in Swedish

Swedish appears to be a hybrid language, so to speak, in terms of accent type, as it possesses both pitch-accent and stress-accent characteristics. Gårding claims that Swedish has stress of the intensity type, with a three-way distinction between primary, secondary, and unstressed syllable; however, she also notes that *only* those syllables carrying primary stress are eligible for pitch accent (6). Yet the existence of stress seems very minor compared to the existence of pitch accent, as Malmberg's experimental studies revealed that fundamental frequency, not intensity, is the "primary cue to the identification of accents" and that "intensity variations were irrelevant" (Malmberg 1966, qtd. in Gårding 60-61).

Stress in Swedish has a great deal to do with the origin of the word. Basically, for native Swedish terms, primary stress is usually on the first syllable, such as ***talet*** 'the speech' (Malmberg 1966: 101). In contrast, non-compound loan words (i.e., words of foreign origin) typically have primary stress on a non-initial syllable, as seen in words such as *kafé* 'café' and *intrésse* '(non-monetary) interest'. This is true so much so that primary stress on any other syllable but the first is a relatively good indicator of a word's origin (Malmberg 1966: 101). As we will see in the next section, stress does play a role in the manifestation of pitch accent in Swedish, indicating perhaps that Swedish is a language in transition from one system to another, or that stress-accent and pitch-accent systems form a continuum (such that Japanese would be on the far 'pitch-accent' end of the continuum, Russian would be on the opposite 'stress-accent' end, and Swedish would be somewhere in between).

2.2.3.4. Pitch Accent Placement in Swedish

Pitch accent placement in Swedish is relatively straightforward, especially for native Swedish (or Scandinavian) words. Gårding's research found that monosyllabic words always display Accent I, while any word with a bisyllabic stem must have Accent II; see Table 2.7 for examples (from Gårding 7).

Table 2.7. Swedish Accents I and II (Minimal and Near-Minimal Pairs).

Accent I	Accent II
ánd; ánden 'duck; the duck'	ànde; ànden 'spirit; the spirit'
tánk; tánken 'tank; the tank'	tànke; tànken 'thought; the thought'
ǻnder 'ducks' (n.)	ǻnde; ǻndar 'end; ends'
bönder 'peasants'	böna; bönor bean; beans

Moreover, Accent II is by no means restricted to words with bisyllabic stems. In fact, most non-loans words have Accent II if they have two or more syllables, such as *lèvande* 'alive/living' (Malmberg 1966: 110).

The reason why any monosyllabic stem must have Accent I (acute accent) is that Accent II requires two syllables; specifically, Accent II requires that there must be a syllable after the so-called 'accented' syllable (i.e., the syllable in which pitch accent is onset) (Bruce 17). From this observation, it also follows that any word with final accent must have Accent I.

Another generalization is that most words of foreign origin have Accent I, such as *pójke* 'boy' (a loan word from Finnish) (Malmberg 1966: 109), unless they are compounds. In compounds, though, pitch accent is also quite straightforward – almost all compound words in Standard Swedish have Accent II, regardless of whether the words (or stems) making up the compound have Accent I or Accent II in their non-compound forms (Bruce 19). For example, *tàxichaufför* 'taxi driver' has Accent II, though both of its components have Accent I when isolated: *táxi* and *chaufför* (Bruce 19). Accent II is not limited to loan-word compounds, moreover, as seen by non-loan compounds such as *òrdbok* 'dictionary' and *fòlkmusik* 'folk music' (Malmberg 1966: 110).

There are many more fine-tuned generalizations for pitch accent placement in Swedish, depending on the word's form in Old Norse, the word's definite form, and so on. For example, if a word has Accent I in its indefinite form, such as *hús* 'house', then it will also have Accent I in its definite form (*húset* 'the house'); the same certainty is not true for Accent II indefinite forms (Malmberg 1966: 108). However, for my purposes, it is not necessary to detail every possible accent placement variation, but simply to establish that Swedish is a pitch-accent language, and that furthermore, pitch accent placement is not a simple matter.

CHAPTER 3
METHODOLOGY

3.1. Method

3.1.1. Subjects

Subjects were recruited on the basis of their native language. There were two experimental groups: one group consisted of subjects whose native languages are considered to be stress-accent languages, while the other group was made up of subjects whose native languages are pitch-accent languages. A further criterion was that all the experimental subjects were not familiar with Japanese, nor had they ever studied Japanese. Any potential subject who could speak Japanese or had even studied Japanese was not permitted to participate in the experiment, because I wanted to reduce the possibility that previous knowledge of Japanese would influence any subject's performance on the experimental task.

I attempted to recruit a total of sixty subjects: thirty native speakers of pitch-accent languages, and thirty native speakers of stress-accent languages. Each group was further divided into three groups, each consisting of ten speakers of the same language, yielding the following: ten native speakers of English, Punjabi, Russian, Samoan, Serbo-Croatian, and Swedish, respectively. The motivation for splitting each of the groups into three subgroups was to facilitate finding native speaker subjects, given the location of the data collection. Although many languages are spoken in Hawai'i, there are few native speakers of languages such as Serbo-Croatian and Punjabi here. Therefore, by aiming for only ten speakers, then grouping the languages by pitch- or stress-accent, a larger set of

data could be analyzed. Furthermore, this opened up the possibility of between-language comparisons.

Though I aimed to collect data from sixty subjects, I was not able to find exactly ten per language. The final tally was 61 experimental subjects, plus three native speakers of Kyoto Japanese to serve as the sources for the baseline data. Table 3.1 shows the distribution of test subjects by native language:

Table 3.1. Number of Experimental Subjects per Native Language.

Native Language	**Number of Subjects**	**Accent Type**
English	14	Stress-accent
Punjabi	7	Pitch-accent
Russian	9	Stress-accent
Samoan	6	Stress-accent
Serbo-Croatian	8	Pitch-accent
Swedish	17	Pitch-accent

Finally, although the subjects with Swedish as their native language came from varying locations within Sweden, all were from areas in southern Sweden that have pitch accent. None were from non-pitch accent Swedish areas (such as Finland). The Serbo-Croatian speakers were also from various areas, and some self-identified as Serbo-Croatian speakers, while others considered themselves to be Serbian speakers or Croatian speakers. Within the area of pitch accent, it makes no difference whether Serbo-Croatian is a single language or two extremely close languages (Serbian and Croatian), and so the author will continue to use the term Serbo-Croatian for convenience.

3.1.2.1. Instruments

In order to increase the number of accent possibilities, Kyoto Japanese was chosen over Tokyo Japanese (see section 1.4). It was decided to focus on words of three moras, which would yield five different accent possibilities. All the words chosen were of the (C)VCVCV structure, meaning that they are both three moras and three syllables. In Kyoto Japanese, nouns with three moras may manifest any one of the following five accent patterns: HHH, LLH, HLL, HHL, or LHL, corresponding to Hirayama's accent types 0, 1, 2, 3, and 1;3 (Hirayama 90-91). These accent patterns are lexically determined; in other words, it is not possible to predict which words will have which pattern. The following examples from Hirayama's (1964) dictionary illustrate the five accent possibilities for nouns of three moras in Kyoto Japanese:

(30a)	*kodomo* 'child'	HHH (Accent type 0)
(30b)	*yanushi* 'landlord'	LLH (Accent type 1)
(30c)	*makura* 'pillow'	HLL (Accent type 2)
(30d)	*gozasho* 'throne'	HHL (Accent type 3)
(30e)	*kujira* 'whale'	LHL (Accent type 1;3)

Another reason for using only words of (C)VCVCV structure was that the Japanese phonemes /Q/ and /N/, as well as long vowels, are frequently difficult for non-native speakers of Japanese (Aoki 1990, Hirata 1999). Studies such as Sukegawa and Sato (1997), Nishinuma et al. (1996), and Shport (2001) have shown that /Q/, /N/, and long vowels are potential hindrances for non-native speaker perception of Japanese accent. In particular, Shport found that presence of long vowels or the moraic nasal /N/ had a

negative effect on JFL learners' perception of Japanese pitch accents. Her findings indicate that learners tend to perceive that the pitch level of a long vowel is the same as the pitch level of the preceding mora. For these reasons, it was felt that by choosing words that had neither /Q/, /N/, nor long vowels, any interference that these phonemes and long vowels might have caused in the accent perception was avoided.

A total of 75 Japanese words was used for the pilot study: 15 words per each of the five accent possibilities for three-mora words. The words were found by a systematic search of Hirayama's *Zenkoku Akusento Jiten* (All-Japan Accent Dictionary) (1964), and none of the words exhibit devoicing (which is to be expected, since Kyoto Japanese rarely utilizes devoicing). By choosing fifteen words, it was felt that any test items that were deemed problematic based on the results of the pilot study could be eliminated while still leaving sufficient test items for statistical significance. Accent type 3 proved to be quite troublesome, as there are comparatively few words belonging to it. Many of the words of accent type 3 are rather unusual and not found in daily conversation, but since this is a perception experiment, the words' frequency of use should not be important. For a complete list of all test items, including those eliminated after the pilot study, see Appendix A.

3.1.2.2. Reliablity of the Study

For the purpose of determining the reliability of this study, a Cronbach's Alpha analysis was performed. Cronbach's Alpha is a reliability measurement used to evaluate how well the test instrument measures the variable(s). The higher the alpha level, the

better the test instrument measures the variable(s), and the more reliable the study. In general, an alpha-level of .80 or higher is considered evidence of a study's reliability. Reliability can also be seen as the extent to which the test instrument produces consistent, accurate results. For this study, the Cronbach's Alpha measurement yielded an alpha of .9240, an extremely high alpha-level. From this result, it is clear that this experiment was very reliable indeed.

3.1.3. Procedure

A native speaker of Kyoto Japanese was recruited to record the test items for use in the experiment. Emi Yonekura is a graduate student who, prior to arriving in Hawai'i two years ago, had lived in Kyoto all of her life. Emi first examined the list of words found in Hirayama's dictionary and identified those words about whose pronunciation she did not agree with Hirayama. These items were then replaced with words such that Emi's pronunciation was in complete agreement with Hirayama's dictionary — in other words, only words whose accent type both Hirayama and Emi identified identically were used. Therefore, Emi's pronunciation, along with Hirayama's data, provided the preliminary baseline for the test items.

Emi recorded all the words for me in a quiet room with little to no distracting noises. Recording was done on a digital recorder, and all words were pronounced in isolation. Once the recording was finished, I used a sound-editing program on her computer to arrange all the items in random order. On the final recording, there were two examples, followed by the real test items. Each item was repeated twice with approximately three

seconds of silence in between. The repetition was done with the sound-editing program, so that the second pronunciation of the word was an identical copy of the first. The alternative would have been to have Emi repeat each word twice, but I wanted to eliminate any possibility that her pronunciation would have varied within one word.

Finally, there were two media for participating in this experiment. The first was a pen-and-paper test, in which a paper test instrument was created for the subjects to use in marking their responses. Participants listened to the recording, which totaled approximately 15 minutes, and marked their responses on the test instrument. One of the concerns about this experiment was how to explain the task to the subjects without biasing their responses. It was decided to provide two examples, and also that all words would be accompanied by a simple graphic representation illustrating each of the five accent patterns. In this way, it was hoped that the subjects could visualize their task without too much instruction from the author. See Figure 2 for an example. (A copy of the complete test instrument is included in Appendix B.)

Figure 2: Graphic Representations of the Five Accent Categories Included in the Experiment.

The second testing medium was an online experiment. The content —the recording of test items —was identical to the recording used in the paper test, the only difference being the method of answering. I decided to create an online experiment because many of the languages being used in this experiment (such as Serbo-Croatian) are not widely used in Hawai'i, and she therefore anticipated finding few native speakers. With the

online experiment, the author was able to increase the number of subjects to attain a sufficient number for statistically reliable results.

Online participants had the option of either having the test items embedded into the web page as .mp3 files or downloading all words in three larger bundles in .zip format. This was done to allow for varying Internet connection speeds. Regardless of the method of listening to the test items, the content was identical. In the online version, subjects listened to a word and clicked on their answer (A, B, C, D, or E). Before submitting their answers, subjects had every opportunity to change answers that the paper-test subjects had. As in the paper version, all words were accompanied by a simple drawing illustrating the accent pattern.

3.1.4. Online vs. In-Person Test Instruments

Critics may say that the online version is less reliable, because subjects may falsely state their native language or simply choose answers randomly, not truly listening to the test items. However, I would like to point out that even when participating in the experiment in person, a subject may still misrepresent his or her native language. Also, while in person I may be certain that participants heard all of the test items, there is still no way to know whether or not they truly answered based on what they heard, or whether they just answered willy-nilly.

Finally, to deal with any potential problems encountered by differences between the performance of the in-person subjects and the online subjects, the author ran a t-test to determine whether or not the testing medium (i.e., whether online test instrument or in-

person test instrument) played a role in the experiment results. 26 of the subjects participated in the experiment in person, using the pen-and-paper test, while the other 35 subjects participated using the Internet version (see Table 4.5).

Table 3.2. Comparison of In-Person and Online Subjects' Results.

Location	*n*	*M*	*SD*	*Std. Error Mean*
In person	26	28.154	12.964	2.542
Online	35	32.023	11.544	1.951

Table 3.3 Results of the T-Test

	df	F	sig.
Mean scores	59	.445	.224

While at first glance, the online subjects may appear to have outperformed the in-person subjects, the t-test revealed that neither the in-person group nor the online group did significantly better or worse than the other group. When equal variances were assumed, the significance result was .224. Assuming equal variances means that one is assuming that the variances between the two sets of data (in this case, between the online set and the in-person set) are roughly equal.

Since the alpha was set at 0.05, there was no significant difference between the performances of the online group and the in-person group (see Table 4.6). This, in turn, reveals that the testing medium itself was not a significant factor in this experiment. These results further validate the online experiment, as it clearly indicates that data collected via non-traditional means can still be valid.

3.2. Pilot Study

A pilot study was performed, testing three speakers of each of the six languages (English, Punjabi, Russian, Samoan, Serbo-Croatian, and Swedish), for a total of 18 subjects. The pilot study was done to ensure that the test items were not problematic and that the test itself was designed appropriately. Results of the pilot study showed a preliminary trend for pitch-accent speakers outperforming stress-accent speakers.

The pilot study also included a baseline data group, which consisted of three native speakers of the Kyoto variety of Japanese, all female graduate students at the University of Hawai'i between the ages of 20 and 30. Each woman in the baseline data group participated in the same experiment as the experimental groups using the same test instruments. They were not asked to produce the test items, in part because many of the words of accent type 3 are either archaic or very infrequently used, and in part because I wanted the baseline data group to participate in the same exact experiment as the experimental groups for the most accurate results possible.

Based on the responses of the native speaker baseline data group, a total of 13 words were eliminated from the final version. Any test item that did not have 100% agreement by all three native speakers was deemed unacceptable and eliminated. It was decided that 100% agreement was necessary on the basis that if native speakers are unable to distinguish accent category, it is unreasonable to expect non-native speakers to do so. As Table 3.2 shows, there were no items of type 1 eliminated, and only one item from type 1;3 was eliminated; the remaining eliminated test items were concentrated in three of the five categories.

Table 3.4. Eliminated Test Items by Accent Category.

Accent Pattern	Hirayama's Accent Type	Eliminated Item	Gloss
HHH	0	*todome*	(the) end; stop
HHH	0	*kasumi*	mist
HHH	0	*yubiwa*	ring
LHL	1;3	*naname*	obliqueness
HLL	2	*yamato*	(ancient) Japan
HLL	2	*kokoro*	heart; mind; spirit
HLL	2	*asahi*	morning sun
HLL	2	*hanabi*	fireworks
HLL	2	*buraku*	village subunit
HHL	3	*togoto*	from door to door
HHL	3	*sayaka*	clear; evident
HHL	3	*ichibu*	one part
HHL	3	*himago*	grandchild

Therefore, based on the results of the control group, 13 items were eliminated from the final study, resulting in an experiment with 62 test items. Of the 62 items that were included in the full experiment, 12 were accent category 0, 15 were accent category 1, 14 were of accent category 1;3, 10 were of accent category 2, and 11 were accent category 3.

The results of the experiment will be presented in detail in Chapter 4. One two-way analysis of variance (ANOVA) procedure with two independent variables ("accent category" as repeated measures and two "groups" which are independent" was conducted on the obtained scores.

CHAPTER 4
RESULTS AND DISCUSSION

4.1. Descriptive Statistics

After the data collection was complete, I tallied each subject's score, giving a correct answer a score of 1 and an incorrect answer a score of 0. A correct answer was one that was the same as that of the baseline data. A perfect score would have been 62. Mean scores and standard deviation were calculated for both experimental groups (Tables 4.1 and 4.2).

Table 4.1. Results of the Experiment by Language Group

	Pitch Accent	**Stress Accent**
n	32	29
M	30.47	30.28
SD	13.25	11.20
% Correct Responses	49.1%	48.8%

Table 4.2. Descriptive Statistics

Group	**Category**	**Minimum**	**Maximum**	***M***	***SD***
Stress-accent (n=29)	LHL	.07	1.00	.61	.29
	HHH	.00	.75	.40	.21
	HHL	.00	1.00	.44	.29
	HLL	.00	.66	.23	.17
	LLH	.13	1.00	.66	.25
Pitch-accent (n=32)	LHL	.00	1.00	.61	.32
	HHH	.08	1.00	.42	.24
	HHL	.09	1.00	.50	.32
	HLL	.01	.68	.18	.17
	LLH	.07	1.00	.65	.29

Preliminarily, it seems safe to say that hypothesis 1 was not refuted, as neither group significantly outperformed the other. Indeed, the two experimental groups were startlingly similar in their performance. However, in order to see whether or not there were any significant differences between the two experimental groups and between accent categories, an analysis of variance test (ANOVA) was performed.

4.2. Results of ANOVA

A two-way analysis of variance (ANOVA) was performed with the mean scores for both the two groups in order to reveal whether or not there were significant between-subject or within-subject factors. 'Between-subjects' in this case refers to the relationship between the two experimental groups, i.e., the pitch-accent group and the stress-accent group, while 'within-subjects' refers to the relationship between the five accent categories. Native language is a between-subjects variable because each subject falls into either one of the language groups or the other — *either pitch-accent or stress-accent*. The accent categories are a within-subject variable, however, because all of the subjects participating in the experiment dealt with all the accent categories.

The two-way ANOVA revealed that there was no significant difference between the performance of the pitch-accent group and the stress-accent group on the perception experiment (see Table 4.3):

Table. 4.3. Results of the Two-Way ANOVA.

Source	*SS*	*df*	*MS*	*F*	*p*	*Eta²*	*Power*
Within Subjects							
Category	8.796	4	2.199	55.918	.000	.487	1.000
Category x Group	8.239E-02	4	2.060E-02	.524	.719	.009	.175
Error	9.280	236	3.93E-02				
Between Subjects							
Group	7.47E-04	1	7.46E-04	.004	.950	.000	.050
Error	10.920	59	.185				

The two-way ANOVA with accent category as repeated measures revealed no significant main effect for group (F=.004, p=.950) and no significant interaction between category and group (F=.524, p=..719). However, the analysis did show that there was a significant main effect for accent category (F=55.918, p=.000). The Eta^2 values for the two-way ANOVA show that the main effect for accent category explains 48.7% of the variance.

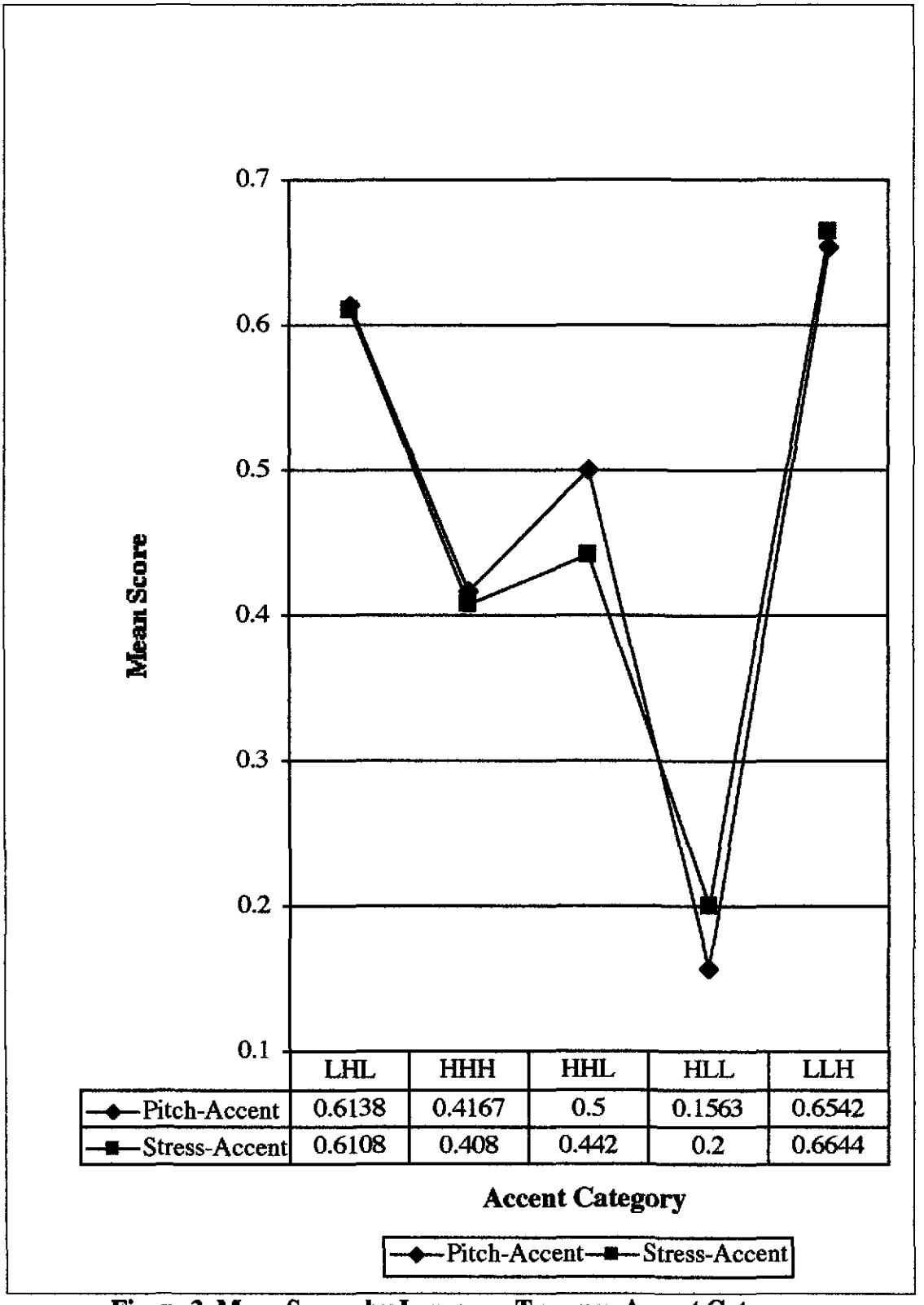
The dependent variable was the subjects' performance on the experimental task, and the independent variable was native language. It was a two-way ANOVA, rather than a one-way ANOVA, because the category of test items was also compared[11]. The alpha value was set at the standard .05, which means that in order to prove a factor was significant, its significance value in the ANOVA results must have been at .05 or lower. Therefore a significance value of less than .05 would be needed to refute the null hypothesis. The tests of within-subjects effects yielded a significance factor of .719 for language group and category, which clearly shows that language type (whether pitch- or stress-accent) in combination with accent category was not significant. Language group alone, with a significance factor of .950, was also not significant. Only accent category,

[11] Also, because a significant main effect for group was not found, a one-way ANOVA was not necessary.

with a significance of .000, was a significant variable in this experiment. Therefore, Hypothesis 1 was not supported.

Although there was no significant difference between the two groups based on type of accent in the native language, the two-way ANOVA did reveal that the accent category of the test items was a significant factor, thus supporting Hypothesis 2. Specifically, the two-way ANOVA showed that there was a significant correlation between the accent category of the word and the mean score: the significance factor for accent category was .000, obviously well within the alpha limit. This signifies that for both experimental groups, regardless of native language accent type, it was the accent category of the test items that yielded a high number of errors. For example, as seen in Figure 3, the mean scores for both the pitch-accent and stress-accent groups were lowest for accent category HLL (which corresponds to D on the test instruments)[12]:

[12] On the test instruments, the categories were labeled A, B, C, D, and E, corresponding to Hirayama's labels [1;3], [0], [3], [2], and [1], respectively.



	LHL	HHH	HHL	HLL	LLH
Pitch-Accent	0.6138	0.4167	0.5	0.1563	0.6542
Stress-Accent	0.6108	0.408	0.442	0.2	0.6644

Figure 3. Mean Scores by Language Type per Accent Category

The two-way ANOVA, then, shows that the accent categories followed this order of difficulty ('difficulty' being defined by the author as the highest number of errors), with HLL being the most difficult and LLH being the least: HLL (D), HHH (B), HHL (C), LHL (A), LLH (E). This hierarchy of difficulty was exactly the same for both the stress accent group and the pitch accent group (see below). The post-hoc comparison results suggest that there is a significant difference between accent categories 1 and 1;3, categories 0 and 3, and category 2.

(easiest)	**LLH = LHL > HHH = HHL > HLL**					(most difficult)
(category)	*1*	*1;3*	*0*	*3*	*2*	

Accent category 2 (HLL) was the most difficult for all participants, regardless of native language. This is in all probability the result of the participants' inability to recognize when pitch changes were noteworthy (i.e., phonemic) and when they were not. Many subjects had high rates of error on HLL test items, as well as HHL and HHH items. Since they are not native speakers of Japanese, regardless of whether they are familiar with pitch accent or not, they were not able to determine reliably when drops in pitch were important (i.e., phonemic) and when they were simply downdrift. Since the HHL and HHH items were all prone to being perceived as downdrift, they could be interpreted three ways by the subjects: as HLL, as HHL, or as HHH, and thus all three of those categories of test items were more likely to have high rates of errors. A subject, for example, might hear HHL but feel that she had heard HLL if the second mora were not quite as high as the first had been. In the case of LHL and LLH items, however, the subjects did not seem to have as much difficulty choosing. Perhaps this is because they

were more able to determine a rise in pitch. Moreover, distinguishing between LHL and LLH would not depend so heavily on the ability to rule out downdrift (if at all).

4.3. Discussion

> H_1) Native speakers of pitch-accent languages (who are unfamiliar with Japanese) will outperform native speakers of stress-accent languages (who are also unfamiliar with Japanese) in the correct perception of Japanese pitch accent.
>
> H_2) The differences in perception by accent category of the Japanese words will be significant for native speakers of stress-accent languages, as well as for pitch-accent languages other than Japanese.

Based on the mean scores and the ANOVA results, Hypothesis 1 was not supported. Neither the pitch-accent group nor the stress-accent group was able to correctly recognize Japanese pitch accents with significantly more accuracy than the other group.

The ANOVA results do indicate, however, that regardless of a subject's native language — whether a pitch-accent language or a stress-accent language — the accent category of the Japanese words was a statistically significant source of errors. Therefore Hypothesis 2 was supported. The hierarchy of difficulty, as shown by the results, is as follows:

(easiest) **LLH = LHL > HHH = HHL > HLL** (most difficult)

Thus accent categories 1 (LLH) and 1;3 (LHL) were not significantly more difficult than each other, but they were significantly easier than accent categories 0 (HHH) and 3

(HHL). In turn, accent category 2 (HLL) was significantly more difficult than all the other accent categories, regardless of subject's native language.

It is likely that in this case, the difficulty comes from the effects of downdrift, because three of the accent categories included in this study were very prone to downdrift mistakes. Namely, if a subject were unable to determine whether a drop in pitch was significant or simply the result of natural downdrift, he would be unable to distinguish HHH, HHL, and HLL with much success.

4.4. Implications

These research results have at least two implications for the language teaching field: First, it would seem that L2 learners of Japanese do not need different methods for learning Japanese accent perception based on their native language's accent type. While Nishinuma et al. (1996) concluded that "perception of tonal accent seems to be mother tongue dependent," the results of the present study support the opposite conclusion, that perception of pitch accent is not dependent on one's native language. Since the results supported Hypothesis 1, showing that pitch-accent speakers did not have some advantage over stress-accent speakers and vice versa, it would seem more fitting to assume that perception of (pitch) accent is not strongly linked to native language, if at all. However, one limitation of this study is that it did not include any type of treatment or training for the subjects; it may yet be true that native speakers of pitch-accent languages can be more easily trained to notice pitch-accent distinctions in other languages than native speakers of stress-accent languages. This aspect remains for future study.

Second, any Japanese accent instruction for non-native speakers should focus more on distinguishing the accent categories themselves, particularly the categories that are likely to be perceived as similar by non-native speakers, such as HHL and HLL. JSL and JFL accent instruction, therefore, should be devoted to helping learners not simply produce correct Japanese accent, but also to perceive it correctly in the first place. For many — if not most — learners, being able to perceive the differences between accent categories probably takes precedence to being able to produce those differences.

4.5. Limitations of This Study

There are at least two limitations to the results of this study: first, it only examined the perception of accent of one language, namely Japanese. Further study should be carried out to determine whether or not similar results would be achieved with a wider number of languages. In order to make any generalizations about the saliency of pitch accent from language to language, clearly we must investigate more pitch accent languages.

Second, the role of downdrift may have skewed the results. Perhaps if other, less similar accent categories had been chosen, the subjects' overall performance would have been higher. As it was, the results clearly showed that the accent categories had a strong significance. In further studies, perhaps the downdrift possibility could be explored in

detail. Use of computer analysis software such as PitchWorks could show whether or not downdrift is actually present in the test items, and if so, to what extent. It would then be possible to either support the idea that downdrift plays a role in accent perception of foreign (or second) languages or refute it.

Finally, it may be interesting to include subjects' musical abilities in a future study. After finishing the experiment, many of the subjects commented on how their musical abilities had come in handy, or how they thought they would have performed better if they have been more talented at music. It could be fruitful to examine whether or not musical talent or knowledge interacts with subjects' abilities to correctly perceive pitch accents. Of course, there are people who can hear pitches in language despite possessing little or no musical ability, and the opposite is also true (that some people are musically talented but unable to perceive and/or produce pitch levels), so clearly musical ability is not a solution. However, it may prove interesting to study that aspect as well. Such considerations, however, will have to wait for future study.

4.6. Conclusion

This study was an attempt to further our understanding of how accent is perceived by people with different language backgrounds. In particular, it sought to determine whether

or not Japanese pitch accents would be easier to perceive for native speakers of pitch-accent languages than for native speakers of stress-accent languages. Using an experiment designed to measure accurate perception of Japanese pitch accent patterns, 61 sets of data were collection to be analyzed by statistical means. The results were not as expected, mainly in that there was no statistically significant difference between the performance of the native speakers of pitch-accent languages and those of stress-accent languages. Therefore, the null hypothesis was not disproven.

However, statistical analysis did uncover something of value. Namely, it was discovered that regardless of the type of accent in one's native language (i.e., either stress-accent or pitch-accent), when it comes to perceiving pitch accents in Japanese, it is the accent category of the words themselves that is the source of perception difficulty. There is still more research to be done to further understand the phenomena involved in foreign and second language accent perception, yet it seems that at least preliminarily, we can claim that considerations inside a language, such as various accent categories, are more important than what type of accent a language utilizes.

APPENDIX A

TEST ITEMS

Note: Double-starred items indicate items that were eliminated from the final study based on the results of the pilot study. *Kanji* characters are included to differentiate potential homonyms.

Category	Test Item	Romanization	Gloss
HHH	やまて 「山手」	*yamate*	residential area; uptown
HHH	こども 「子供」	*kodomo*	child(ren)
HHH	あたり 「当たり」	*atari*	hit; success
HHH	こがね 「小金」	*kogane*	small change (money)
HHH	きもの 「着物」	*kimono*	kimono
HHH	はがき 「葉書」	*hagaki*	postcard
HHH	みやこ 「都」	*miyako*	capital city
HHH	はじめ 「初め」	*hajime*	beginning
HHH	さかな 「魚」	*sakana*	fish
HHH	さくら 「桜」	*sakura*	cherry blossom
HHH	まつり 「祭」	*matsuri*	festival
HHH	いなか 「田舎」	*inaka*	countryside
**HHH	とどめ 「止め」	*todome*	(the) end; stop
**HHH	かすみ 「霞」	*kasumi*	mist
**HHH	ゆびわ 「指輪」	*yubiwa*	ring
HHL	これら 「此れ等」	*korera*	these
HHL	そのた 「その他」	*sonota*	et cetera; for that reason
HHL	それじゃ 「それでは」	*soreja*	in that case
HHL	このよ 「この世」	*kono yo*	this night
HHL	さだか 「定か」	*sadaka*	definite; sure

HHL	へやぎ 「部屋着」	*heyagi*	dressing gown
HHL	いわば 「言わば」	*iwaba*	so to speak
HHL	そのば 「その場」	*sonoba*	in that case; temporarily
HHL	ござしょ「御座所」	*gozasho*	throne
HHL	どれか 「どれか」	*doreka*	which (interrogative)
HHL	ふだしょ「札所」	*fudasho*	a temple which issues amulets
**HHL	とごと 「戸毎」	*togoto*	door-to-door
**HHL	さやか 「明か」	*sayaka*	clear; evident
**HHL	いちぶ 「一部」	*ichibu*	one part
**HHL	ひまご 「曾孫」	*himago*	grandchild
HLL	ごがつ 「五月」	*gogatsu*	May
HLL	じぶつ 「事物」	*jibutsu*	affairs; things
HLL	まくら 「枕」	*makura*	pillow
HLL	おとこ 「男」	*otoko*	man; male
HLL	わさび 「山葵」	*wasabi*	wasabi horseradish
HLL	ほくぶ 「北部」	*hokubu*	north; northern part/region
HLL	ぼこく 「母国」	*bokoku*	mother tongue; native language
HLL	かがく 「科学」	*kagaku*	science
HLL	めがね 「眼鏡」	*megane*	eyeglasses
HLL	いのち 「命」	*inochi*	life
**HLL	やまと 「大和」	*yamato*	(ancient) Japan
**HLL	こころ 「心」	*kokoro*	heart; mind; spirit
**HLL	あさひ「朝日」	*asahi*	morning sun
**HLL	はなび 「花火」	*hanabi*	fireworks
**HLL	ぶらく 「部落」	*buraku*	village subunit
LHL	くじら 「鯨」	*kujira*	whale
LHL	はさみ 「鋏」	*hasami*	scissors

LHL	むなげ 「胸毛」	*munage*	chest hair
LHL	うしろ 「後ろ」	*ushiro*	back; behind
LHL	おかし 「お菓子」	*okashi*	candy; sweets
LHL	くらげ 「水母」	*kurage*	jellyfish
LHL	はなし 「歯無し」	*hanashi*	toothless
LHL	おばけ 「お化け」	*obake*	monster; ghost
LHL	とかげ 「蜥蜴」	*tokage*	lizard
LHL	たまご 「卵」	*tamago*	egg
LHL	れきし 「歴史」	*rekishi*	history
LHL	たぬき 「狸」	*tanuki*	raccoon dog; tanuki
LHL	なかま 「仲間」	*nakama*	colleague; peer
LHL	なかび 「中日」	*nakabi*	the middle day
**LHL	ななめ 「斜」	*naname*	obliqueness
LLH	もぐら 「土竜」	*mogura*	mole (animal)
LLH	せびろ 「背広」	*sebiro*	(business) suit
LLH	なつめ 「棗」	*natsume*	jujube (tree)
LLH	なにわ 「浪速」	*Naniwa*	former name of Ōsaka region
LLH	おなか 「お腹」	*onaka*	stomach; belly
LLH	うなぎ 「鰻」	*unagi*	eel
LLH	カラス 「烏」	*karasu*	crow; raven
LLH	まぐろ 「鮪」	*maguro*	tuna
LLH	よやく 「予約」	*yoyaku*	reservation; promise
LLH	おとな 「大人」	*otona*	adult
LLH	かさく 「家作」	*kasaku*	house for rent
LLH	やぬし 「家主」	*yanushi*	landlord
LLH	しりつ 「私立」	*shiritsu*	private
LLH	にがて 「苦手」	*nigate*	poor (at); bad (at)
LLH	じさつ 「自殺」	*jisatsu*	suicide

APPENDIX B
TEST INSTRUMENT

AGREEMENT TO PARTICIPATE IN: "JAPANESE PITCH-ACCENT: CROSS-LINGUISTIC PERCEPTIONS BY SPEAKERS OF STRESS- AND PITCH-ACCENT LANGUAGES"

Linda Lanz, M.A. Candidate
Dept. of East Asian Languages & Literatures, University of Hawai'i Mānoa
1890 East-West Road, Moore Hall #382
Honolulu, HI 96822
956-2083 lanz@hawaii.edu

The purpose of this research project is to explore whether or not pitch accent has characteristics that are common across pitch-accent languages. In other words, I want to study whether or not pitch accent, a type of language accent, is recognizable across a wide variety of languages. The test language being used is Japanese, a pitch-accent language, and it is hoped that the participants will come from six particular languages. I hope to recruit 60 participants for this research project.

You will be asked to do two things: 1) fill out a language background survey, and 2) listen to Japanese words, then mark your perceptions of those words on a test form. The entire task will take approximately 15 to 20 minutes.

The researcher believes that there is little or no risk involved for participants of this study. All personal information that you provide will be kept confidential to the extent allowed by law, and all efforts will be taken to protect your privacy. For example, in place of your name, a privacy code will be used, and any information that might allow you to be identified will be replaced with Xs.

Participation in this research project may not be of direct benefit to you, but the researcher hopes that the results will allow us to better understand language in general, and specifically pitch accent. The results of this study could also help teachers provide better teaching methods for language learning.

Your participation in this study is voluntary & can be terminated at any time. If you have any questions about this research project, please feel free to contact the researcher at the address listed above.

CONSENT FORM

I certify that I have read and that I understand the foregoing, that I have been given satisfactory answers to my inquiries concerning project procedures and other matters and

that I have been advised that I am free to withdraw my consent and to discontinue participation in the project or activity at any time without prejudice.

I hereby give my consent to participate in this project with the understanding that such consent does not waive any of my legal rights, nor does it release the principal Investigator or the institution or any employee or agent thereof from liability from negligence.

Your signature:_____
Date:_____

(If you cannot obtain satisfactory answers to your questions or have comments or complaints about your treatment in this study, contact: Committee on Human Studies, University of Hawaii, 2540 Maile Way, Honolulu, HI 96822. Phone: (808)-956-5007.)

Part I: Language Background Information

1) What is your native language? _____

2) What other languages do you speak? _____

3) Have you ever studied Japanese? _____

   a. If yes, how long? _____

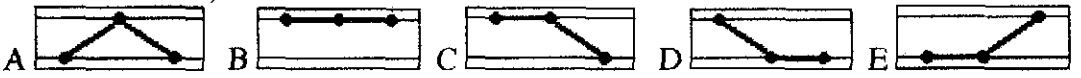
Part II: Listening Task

Introduction: In Japanese, there is a type of accent called pitch accent, which is similar in function to stress accent in English (for example, we say **SYL**-la-ble, rather than sy-**LA**-ble). In Japanese, words are accented by pronouncing them with various patterns of high and low pitch.

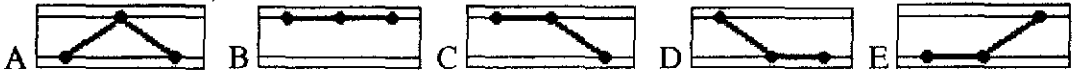
During the listening task, you will hear one Japanese word at a time and be asked to choose which pitch accent pattern that you think you heard. For practice purposes, there will be two example words to begin with.

On the answer sheet, there are four options per word. Please choose the **one** that best represents the accent pattern (in other words, the mix of high and low) that you think you heard in each word. *Please choose only **one** answer per word.*

EXAMPLE 1) ma **MA** ma → *Choose A.*

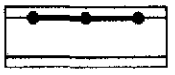
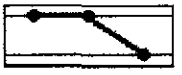
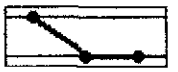
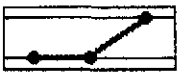


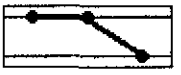
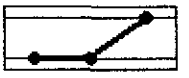
EXAMPLE 2) **LA LA** la → *Choose C.*

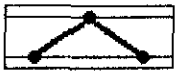
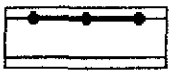
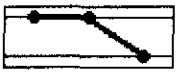
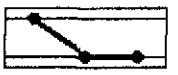
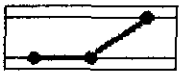


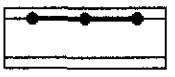
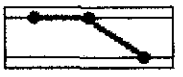
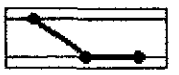
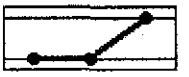
Now it's time for the test to begin – if you have any questions, please ask the researcher now.

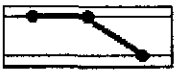
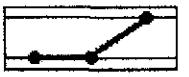
(Please turn the page, where the answer sheet begins.)

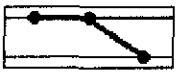
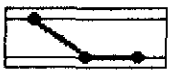
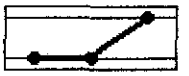
1) A  B  C  D  E 

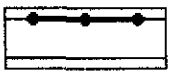
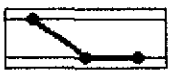
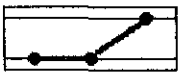
2) A  B  C  D  E 

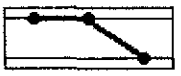
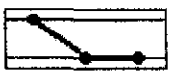
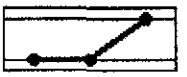
3) A  B  C  D  E 

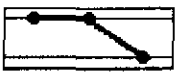
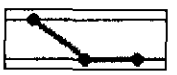
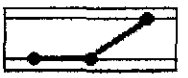
4) A  B  C  D  E 

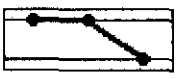
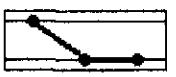
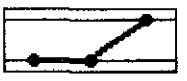
5) A  B  C  D  E 

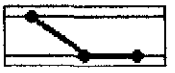
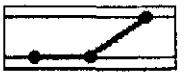
6) A  B  C  D  E 

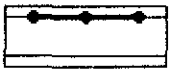
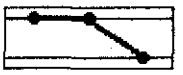
7) A  B  C  D  E 

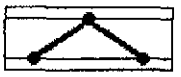
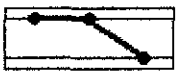
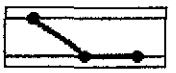
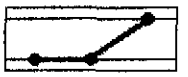
8) A  B  C  D  E 

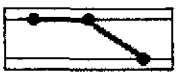
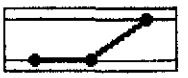
9) A  B  C  D  E 

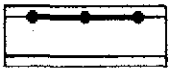
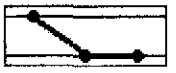
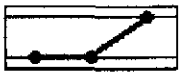
10) A  B  C  D  E 

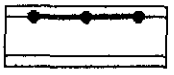
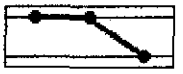
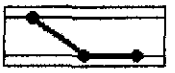
11) A  B  C  D  E 

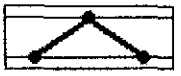
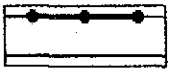
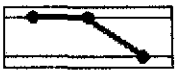
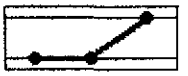
12) A  B  C  D  E 

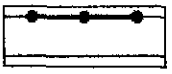
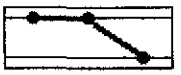
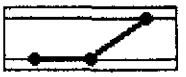
13) A  B  C  D  E 

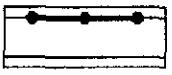
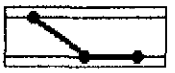
14) A  B  C  D  E 

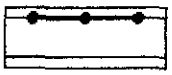
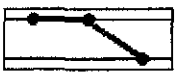
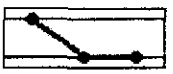
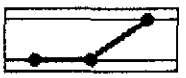
15) A  B  C  D  E 

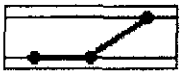
16) A  B  C  D  E 

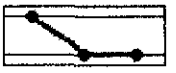
17) A  B  C  D  E 

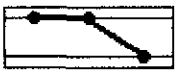
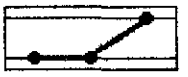
18) A  B  C  D  E 

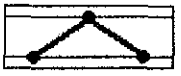
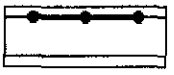
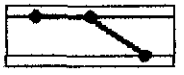
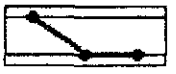
19) A  B  C  D  E 

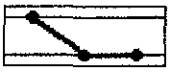
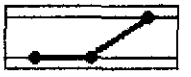
20) A  B  C  D  E 

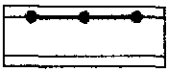
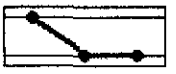
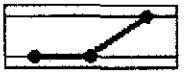
21) A  B  C  D  E 

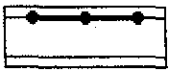
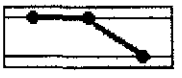
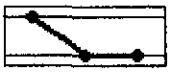
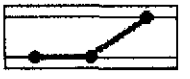
22) A  B  C  D  E 

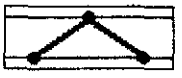
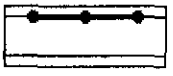
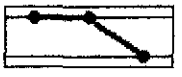
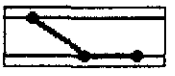
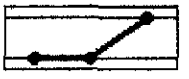
23) A  B  C  D  E 

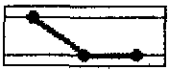
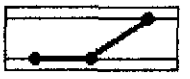
24) A  B  C  D  E 

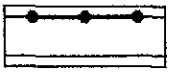
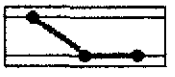
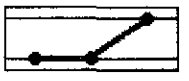
25) A  B  C  D  E 

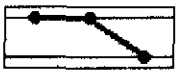
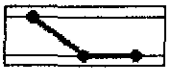
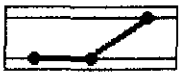
26) A  B  C  D  E 

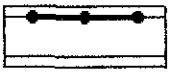
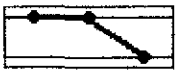
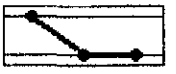
27) A  B  C  D  E 

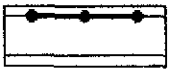
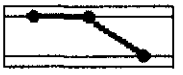
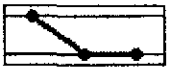
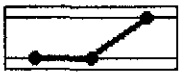
28) A  B  C  D  E 

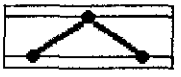
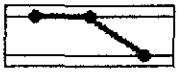
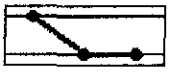
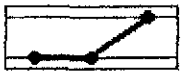
29) A  B  C  D  E 

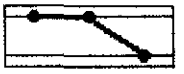
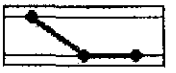
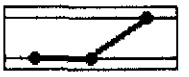
30) A  B  C  D  E 

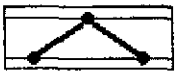
31) A  B  C  D  E 

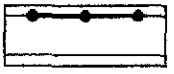
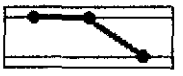
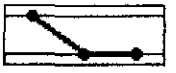
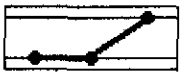
32) A  B  C  D  E 

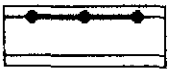
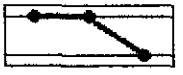
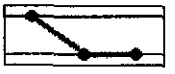
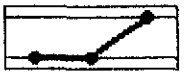
33) A  B  C  D  E 

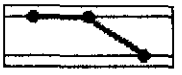
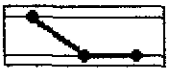
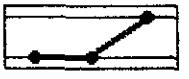
34) A  B  C  D  E 

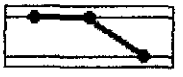
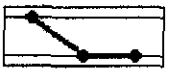
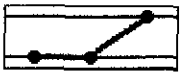
35) A  B  C  D  E 

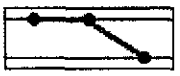
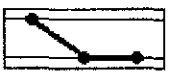
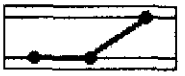
36) A  B  C  D  E 

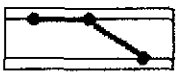
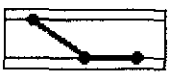
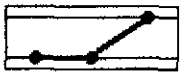
37) A  B  C  D  E 

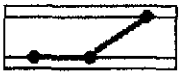
38) A  B  C  D  E 

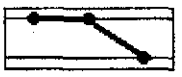
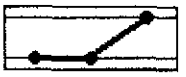
39) A  B  C  D  E 

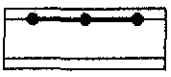
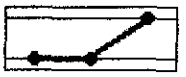
40) A  B  C  D  E 

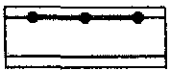
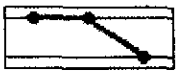
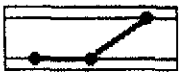
41) A  B  C  D  E 

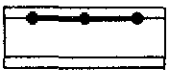
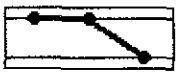
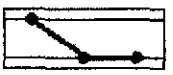
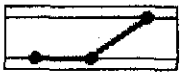
42) A  B  C  D  E 

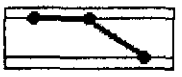
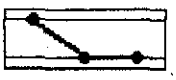
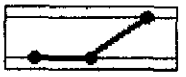
43) A  B  C  D  E 

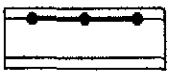
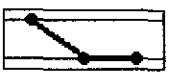
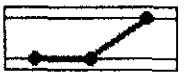
44) A  B  C  D  E 

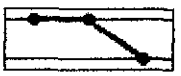
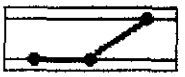
45) A  B  C  D  E 

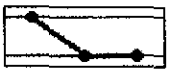
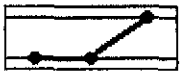
46) A  B  C  D  E 

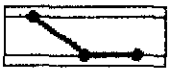
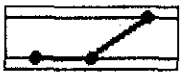
47) A  B  C  D  E 

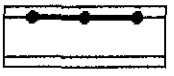
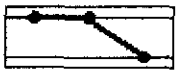
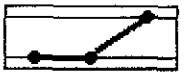
48) A  B  C  D  E 

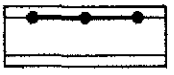
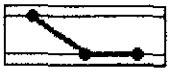
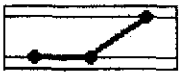
49) A  B  C  D  E 

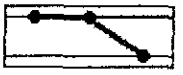
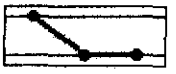
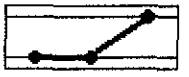
50) A  B  C  D  E 

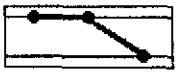
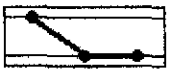
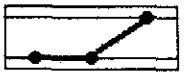
51) A  B  C  D  E 

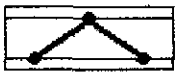
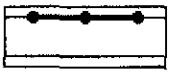
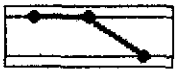
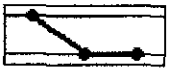
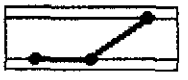
52) A  B  C  D  E 

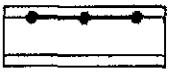
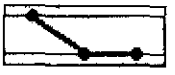
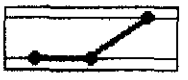
53) A  B  C  D  E 

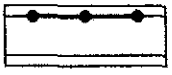
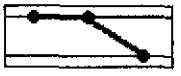
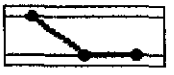
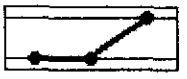
54) A  B  C  D  E 

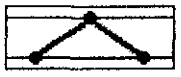
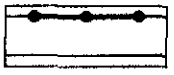
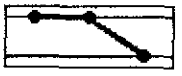
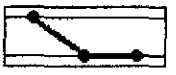
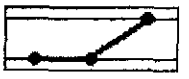
55) A  B  C  D  E 

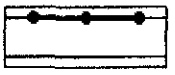
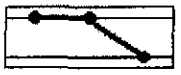
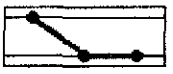
56) A  B  C  D  E 

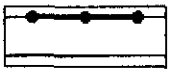
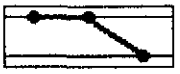
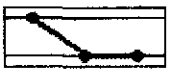
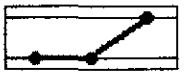
57) A  B  C  D  E 

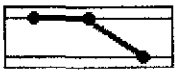
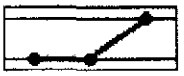
58) A  B  C  D  E 

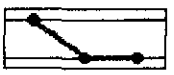
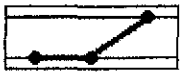
59) A  B  C  D  E 

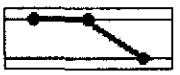
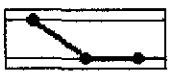
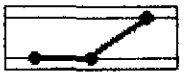
60) A  B  C  D  E 

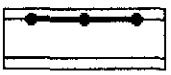
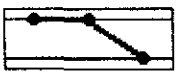
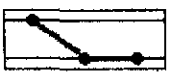
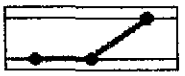
61) A  B  C  D  E 

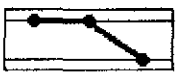
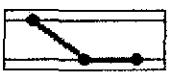
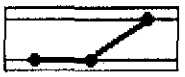
62) A  B  C  D  E 

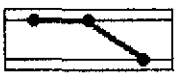
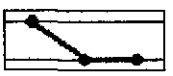
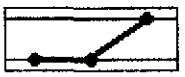
63) A  B  C  D  E 

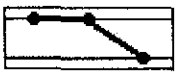
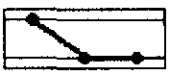
64) A  B  C  D  E 

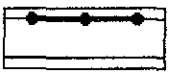
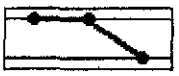
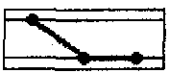
65) A  B  C  D  E 

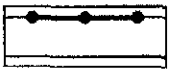
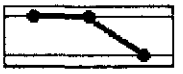
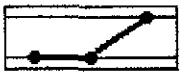
66) A  B  C  D  E 

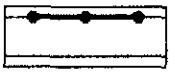
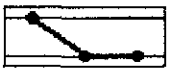
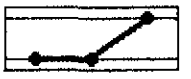
67) A  B  C  D  E 

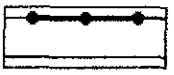
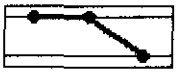
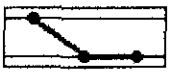
68) A  B  C  D  E 

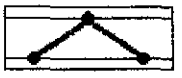
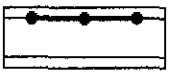
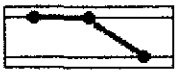
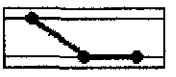
69) A  B  C  D  E 

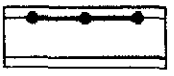
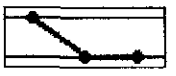
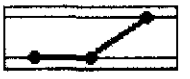
70) A  B  C  D  E 

71) A  B  C  D  E 

72) A  B  C  D  E 

73) A  B  C  D  E 

74) A  B  C  D  E 

75) A  B  C  D  E 

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