MUSICAL TEXT-SETTING AS EVIDENCE FOR SYLLABIFICATION OF HIGHLY MORAIC STRUCTURES IN ENGLISH

by

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Abstract

In the standard generative perspective, English is a mora-sensitive language, permitting syllables with one or two moras (or in some perspectives, strictly two). However, structures are readily available in the lexicon which seem to have three moras in a single syllable. Lavoie and Cohn 1999 argue that these structures are unstable because they violate the mora-counting condition of English, and this violation motivates speaker-dependent variability.

Feature instability engenders a skepticism for speakers' own intuition about the syllabification of these so-called unstable structures. Thus, an alternative approach is necessary, whereby linguistic representation may be inferred from observable behavior beyond speech or writing. Through an exploratory study on pitch of performed music, and an experimental study on musical text-setting, I find evidence for the use of musical features and behavior as indicators of linguistic representation. Notably, findings from both research designs lend support to the claim that highly moraic structures in English are unstable and exhibit a dichotomy of syllabification between individual speakers.

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1 *Introduction*

How many syllables are in the word ‘fire’? How about ‘style,’ or ‘time’ or ‘wheel’ or ‘conspire’? The interested reader may be surprised to learn that English speakers show a diverse set of reactions to these questions. To some, there is a clear-cut answer: it’s ONE! (or, TWO!). Others may be unsure, or may have intuitions that seem to contradict their linguistic behavior. Others still may feel inclined to say, “I would be able to tell you if I had a clear definition of ‘syllable.’” One clear commonality from these words is a shared set of features within the final rime of the word. These words contain highly sonorous rimes; they either contain diphthongs, sonorous consonants in their codas, or a combination of the two. If there is some linguistic phenomenon creating ambiguity for these words, it likely originates from this shared sonority. After all, the sonority of nuclei is what drives syllables to exist at all (Lass 1984).

Unfortunately, it appears that speaker intuition is an unreliable marker of syllabic representation in the language. It is therefore necessary to find alternative environments in which information about linguistic representation may be available. One such area is composed music. There are many reasons why one may choose to investigate music as a keeper of linguistic information, particularly information related to syllabification. First, music is metrical; it is naturally divided into beats, much in the way that a sentence may be metrically divided by syllables. Second, the lyrical nature of sung music allows for direct comparison between language (i.e. the lyrics), and musical features (the corresponding or surrounding notes). What’s more, when it is composed by a single person, music can be representative of the cognitive tendencies of a single person, in the same way that speech samples are reflective of the cognitive structures of a single

speaker. For these reasons, music is a likely environment for observing the influence of linguistic representations.

In this paper, I suggest how music and musical behavior can be used as evidence of patterns of syllabification in English. In Section 2, I provide a summary of previous studies on this topic, paying particular attention to the ways in which music can answer phonologically-motivated questions. Section 3 describes an exploratory study relating performed musical pitch to syllabification of these types of words, and Section 4 describes the use of musical text-setting as an alternative approach to identifying syllabic representation. The relative merits of both studies and a qualitative comparison can be found in Section 5.

2 *Review of Relevant Literature*

2.1 The Syllable and Mora

Investigation in the syllabification patterns of English requires an understanding of the construction and behavior of syllables. The syllable is a word-internal feature which divides the phonological segments of an utterance into metrical beats. A syllable can be further divided into constituent parts: the onset, an initial consonant or consonant cluster, and the rime, consisting of a syllabic segment (the nucleus) and an optional final consonant or consonant cluster (the coda) (Lass 1984).

One salient feature of syllables is the mora. In general, the mora is the unit of syllabic 'weight' assigned to each segment in the rime of a syllable (Lass 1984). The constituent parts of a syllable become eligible to bear moras if they are contained in the rime (Hyman 1985). For example, the word 'car' [caɹ] is dimoraic, as both the [a] and [ɹ] have moras. Dimoraic syllables are also called *heavy*. The name 'Bri' [bɹi] has one

mora, assigned to the segment [i]. This syllable is *light*. Heavier segments like diphthongs and long vowels may be doubly weighted, e.g. the word 'day' [deɪ] is dimoraic because the diphthong [eɪ] is itself assigned two moras. The non-word [a:tʃ] would have three moras, two for [a:] and one for [tʃ]; trimoraic syllables of this type are called *superheavy* (Cohn 2003).

Moras are syllabic features which are both abstract and phonologically motivated (Lass 1984). What's more, they are language-specific. Hyman asserts that the "mora is claimed to be indispensable in prosodic phenomena of some languages but completely irrelevant in other languages" (1985, p. 81). If moras are a true cognitive feature, then some languages, like Japanese, display rule governance based on moraic assignment (Tsujimura 1996). In standard theory, English is said to accept no more than two moras per syllable. Some phonologists argue that English in fact requires dimoraic syllables (Cohn 2003). Other languages have no restrictions on the weight of syllables whatsoever.

2.2 Unstable Syllables

This description of moras across language is, however, insufficient. Lavoie and Cohn 1999 use this insufficiency to define what they refer to as sesquisyllables. These are word-internal structures which would be classified as single syllables by standard criterion such as ONSET, NOCODA, the Sonority Sequencing Generalization, etc. but which violate language-specific moraic rules. For example, one could place the diphthong [eɪ] in the nucleus of a syllable in English, and it should be assigned 2 moras. If that same syllable contains a highly sonorant coda, like [l], Lavoie and Cohn argue that it is insufficient to say that the second mora is shared between the second constituent

vowel and the coda, as in Figure 1:

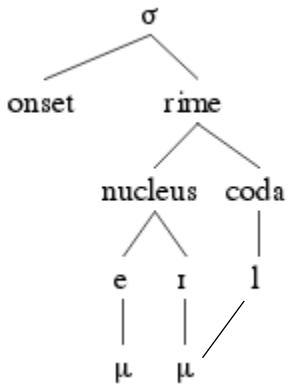


Figure 1

They would instead say that because [l] is so highly sonorous, it must have its own mora. The syllabification must be as shown in Figure 2.

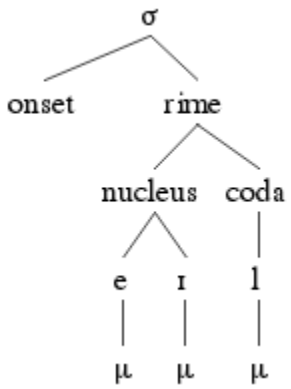


Figure 2

But then the syllable would be superheavy, and English does not formally allow for superheavy syllables. The syllable thus becomes *unstable*. It can either remain an ill-formed monosyllable, or the coda can become syllabic, splitting the original syllable in two. It is argued that unstable syllables do not behave uniformly across language communities, so a word like ‘grail’ [gɹeɪl] which would be classified as unstable may be one syllable for some speakers and two syllables for others (Lavoie, Cohn 1999).

2.3 Intuition, Behavior, and Representation

In identifying how one may isolate how syllable structure is conceived and perceived, it is useful to differentiate between three aspects of language knowledge. First, *linguistic intuition* may refer to a speaker's explicit thoughts and judgments about language features. For example, a speaker's intuition about the number of syllables in a word would be how many syllables they say are in the word when asked by an observer.

Linguistic behavior refers to how linguistic features are manifested in performance, e.g. how syllable structure affects the acoustic properties observed in laboratory speech. (An analogous study on the distinction between intuition and behavior as they relate to the target structures of this study can be found in Rodriguez 2017). One of the most important distinctions of vocabulary is the difference between linguistic intuition and *linguistic representation.* Representation refers to the tacit cognitive mapping of linguistic structures in the mind of the language speaker. For example, a speaker's grammar may store the word 'mother' as disyllabic within some parameter space set by their language's grammar. This may (and as Lavoie and Cohn 1999 suggests, often does) contrast with how many syllables they think are in the word 'mother.' Because we are interested in whether existing phonological theory can accommodate so-called unstable syllable structures, we must predict the linguistic representation that speakers of English have for the target syllables.

2.4 The Curious Case of 'fire'

The idea for this study came from the observation that speakers are less confident about their syllabic intuitions for words like 'fire,' which would be considered unstable, than they are for syllables that obey moraic rules. If this is systematically true, then using

speaker intuition as a marker for underlying representation will not yield a satisfying correspondence. The mora violations seem to create (or at least further) disjunctions between intuition, behavior, and representation. Thus, if we wish to understand the linguistic representations of unstable syllables like ‘fire’ in the minds of language users, we should not consider intuition as a first choice. If we cannot trust the speaker to know their own representation, then the only evidence we can collect concerning these structures is in behavior. We will see in Section 2.5 how the notion of behavior can extend beyond language to music, offering us an alternative environment to study linguistic patterns.

2.5. Music as Evidence of Linguistic Representation

The relationship between music and language has been examined, with many arguing that musical forms and linguistic representation influence one another in measurable ways. These arguments can be subdivided into two categories. First, there are those who argue that the musical forms which artists deploy are either influenced by or dependent on the language origin of the composer. For instance, Schellenberg 2012 posits that speakers of tonal languages have in some way a reduced infinitude of melodic combinations based on the tonal progression of lyric. Language constraint on music may or may not even include music for which there are no lyrics (Temperley, Temperley 2011).

There are also people who believe that musical forms can interact with and strengthen or muddle linguistic judgments. In Bravi 2015, musical forms were used to alternatively amplify or mask the prominence of syllabic peaks in lines of text. This suggests that there may be a bidirectional interaction between musical and linguistic

forms; language can imply the use of musical forms, and the integration of language in music can influence linguistic perception.

As stress and intonation are linguistic features dependent on syllabification, it is fruitful to remark on the potential musical indicators of these features. In Dell and Halle 2015 and Sui 2013, metrical position is noted as a probable indicator of linguistic stress. Both these studies argue that stressed syllables in language should and do correspond to strong metrical positions when set to music. Intonation in speech is a literal change in the pitch of voice, and so it seems natural to argue, as Schellenberg 2012 does, that change in musical pitch of a set text should correspond to places in the line were intonation would be predicted to change. It can be observed that in some musical traditions, it is even common for peaks in musical pitch to correspond to strong metrical position.

2.5.1 Text-Setting as a Salient Musical Feature

While the most analogous type of music to spoken language is live musical performance, it may not be the only musical context from which linguistic ties can be drawn. If one accepts the syllable as an integral cognitive feature of grammar, then the syllable should be present in written forms of language as well. It is not difficult to see this in action. For example, metrical poetry *can* be read and appreciated without being spoken. And one would expect that musical written forms would behave similarly in preserving metrical behavior.

One possible counterargument to this parallelism is found in the experiment described in Palmer and Kelly 1992. In their study, singers were asked to sing melodies based on written music, where language prosody either matched or went against musical emphasis. Subjects did show variability in note duration between identical melodies

based on the changes in prosody alignment. However, the discrepancy due to misalignment only occurred because singers were performing melodies which they themselves did not compose. If it is assumed, as Palmer and Kelly suggest, that prosody is a linguistic feature which corresponds to musical phrasal position, it may be presumed that such misalignments would not occur and the prosodic judgments of the musician would align with musical phrasing. Indeed, this parallelism is observed in the folk song set analyzed in Rodriguez-Vasquez 2010. The argument for text-setting will be resumed in Section 4.

3 *Exploratory Study in Musical Evidence of Syllabification*

3.1 Premise

Based on this evidence, it seems plausible that musical performance is a reliable indicator of linguistic intuitions and thus behavior. My research study in collaboration with Abby Kaplan, Jenica Jessen, and Joselyn Rodriguez aimed to exploit this as an exploratory means of estimating linguistic behavior at times when, as previously noted, speakers' intuitions about syllable behavior appear unclear or seem to undermine their linguistic performance. We posited that should distributions of selected musical features be comparable to the distributions of syllables as described in Lavoie and Cohn 1999, then those features could more strongly be suggested as indicators of syllabification. That is, if we were to find that some musical features displayed a division of speakers -- those who poly-syllabify superheavy syllables and those who do not -- it would suggest that feature would be an accurate marker of linguistic behavior.

The selection of a salient musical feature was of primary concern to our study. Based on the scope of the study, features were constrained to those aspects of music

which could be analyzed in existing musical performances. This eliminates features found in written music from consideration. The feature must also be related to musical text-setting. Of the remaining features, musical pitch was selected as the feature for examination. This choice was based on the Schellenberg 2012 study, where pitch was selected as an indicator of intonation, a syllabic feature. As stress is a phonological feature related to syllable structure (Lass 1984), it seemed equally plausible that musical pitch could also be used as an indicator of syllable count. Unlike the Schellenberg study, however, it was determined that the most relevant aspect of pitch would be the number of pitches assigned to a given word in the text, and not the relative frequencies of the pitches assigned to the word. It was assumed that any clear change in pitch could plausibly indicate syllable boundary. We therefore anticipated that the pitch count of a given word in sung musical performance would indicate the number of syllables a performer would assign *in representation* to the word in spoken language, regardless of relative pitch.

We also needed to identify target rimes for consideration. In accordance with the suggestions of Lavoie and Cohn 1999, the target rimes were diphthongs followed by a liquid. We chose [aiɹ] and [ail] as these targets. To obtain a set of control rimes, we selected rimes which were combinations of the component vowels of the target rime ([a] and [i]), the target codas ([ɹ] and [l]), and the pair consisting of the target diphthong and the nasals [m] and [n]. This yielded the following set of rimes (Table 1):

Table 1: Target Rimes			
aiɹ	aɹ	iɹ	ain
ail	al	il	aim

Our purpose was thus to analyze a body of existing data to see whether the

number of pitches associated to a target rime could be viewed as an indicator of underlying linguistic representation.

3.2 Research Design

Because our primary goal was to isolate the behavior of individual speakers, we decided that the body of music we included in the study should be restricted to works where the principal singer, lyricist, and composer were the same person. Based on this criterion, the pool of potential artists for consideration was limited to American singer-songwriters. Within this pool, twelve singer-songwriters were selected for analysis, each of whom had a large body of work and were well-known for writing their own music.

There were non-trivial limitations to the selection of these singer-songwriters. First, the small sample size makes it difficult to assert any meaningful comparisons based on demographic markers. For example, while it appeared impressionistically that artist age may bear influence on syllabification patterns, demographically-selected subgroups would be too small to be generalized in any meaningful way. The data may also suffer from a lack of diversity in the artist pool; most artists were male and white, with two females and one male of color in the artist sample. Table 2 gives the names of the selected artists, as well as the two- or three-letter abbreviations by which they are referred in subsequent figures.

Table 2: Sample Set of Artists			
Artist	*Abbreviation*	*Birth Year*	*Birthplace*
Beck Hansen	BH	1970	Los Angeles, CA
Ben Folds	BSF	1966	Winston-Salem, NC
Billy Joel	WMJ	1949	Hicksville, NY
Bob Dylan	BAD	1941	Duluth, MN
Bruce Springsteen	BJS	1949	Long Branch, NJ
Conor Oberst	CO	1980	Omaha, NE
Ingrid Michaelson	IEM	1979	New York City, NY
James Taylor	JVT	1948	Chapel Hill, NC
John Mayer	JCM	1977	Bridgeport, CT
Ryan Tedder	RTD	1979	Tulsa, OK
Stevie Wonder	SHM	1950	Saginaw, MI
Suzanne Vega	SNV	1959	Santa Monica, CA

3.3 Procedure

First, the works of each artist were identified, and works for which there were multiple attributed composers/writers were discarded. Lyrics for all remaining works were obtained through popular internet lyric sites, and words were highlighted if they met the following criterion:

1. the word ended in one of the target rime types (this was checked by cross-reference with the CMU pronouncing dictionary (Weide 2005))
2. the word did not end in any additional affixes (e.g. NOT ‘fires’)
3. the target rime was not polymorphemic (e.g. NOT ‘he’ll’ or ‘higher’)
4. the word was in English

This highlighted set became the set of all tokens to be analyzed. Coding of token data

was completed in three rounds, with each of the four researchers being primarily responsible for one artist's work each round.

For each artist, and for each song in that artist's body of work, the highlighted target words were marked for the number of pitches. The criterion for pitch count in ambiguous cases is summarized in Table 3:

Table 3: Criterion for Pitch Count

Scenario	Example	Determination
>2 distinct target pitches with movement	Artist slides from note to note, but the target pitches are clear.	Code as number of targets
1 distinct target pitch with movement	Artists hits a target pitch, but then slides off with no discernable lower target.	Code as 1 pitch
Scooping pitch prior to 'main' note	Artist sings with 'pop' style and does not initiate and sustain on the same note.	Code as 2 pitches IF the initial pitch is clear. Else, code as 1 pitch. Err towards 1 pitch in uncertain cases.
1 pitch, targeted twice	Artist hits a pitch, and then rearticulates that same pitch without intervening pitches.	Code as 1 pitch
target is pitched, but not in key	Artist is somewhere between singing and talking, nearer to talking.	Discard token

Each token was coded twice, once by the researcher assigned to that artist and once by a random second researcher. The coded pitch count was compared for the two researchers, and if there was a discrepancy, the token was heard by all four researchers and coded again after open discussion. Within the data set, there was initial discrepancy for approximately 20% of the coded tokens. The work of one artist was considered complete

when their entire body of work or 500 tokens had been coded twice. In total, this amounted to 6498 tokens collected from the bodies of work (an average of 541 tokens per artist).

3.4 Results

Figures 3-14 show the mean number of pitches each artist assigned to the target and control rimes. These numbers are corrected in two ways. First, to account for singers with highly melismatic singing/composition styles, the number of pitches for any given token was capped at 4. Thus, if a singer used 7 pitches to sing the world "all," this was encoded as 4 pitches. The data was also corrected for duplication. There was a concern that if an artist repeated some anomalous line many times, it would skew the data against their actual behavior. Duplication occurred often within the data set, due to the strophic nature of the majority of the songs coded. For example, in the song "All We Ever Do Is Say Goodbye" by John Mayer, the line "all we ever do is say goodbye" is repeated 14 times throughout the song, without significant variation. For duplicate sets like this, i.e. words that were sung in the exact same line and phrase setting, one of the tokens was randomly selected to serve as representative of the set.

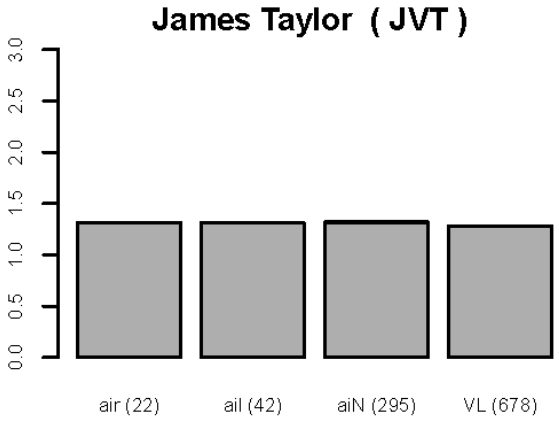
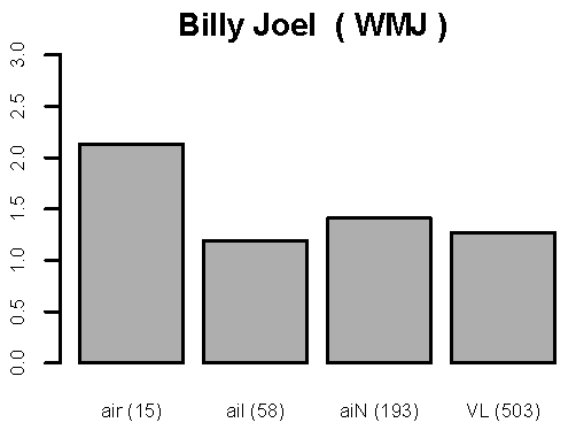


Figure 3



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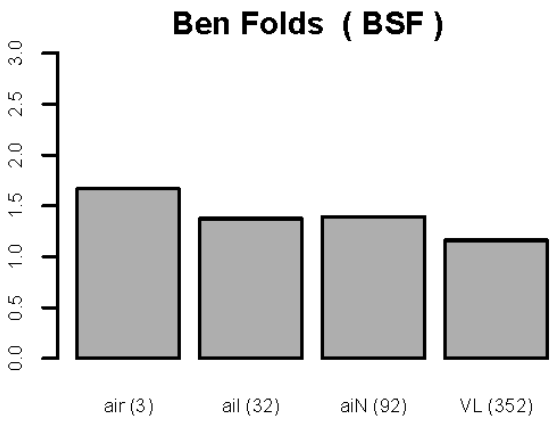

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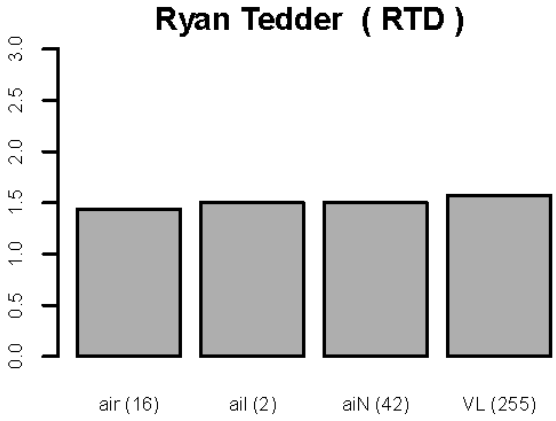

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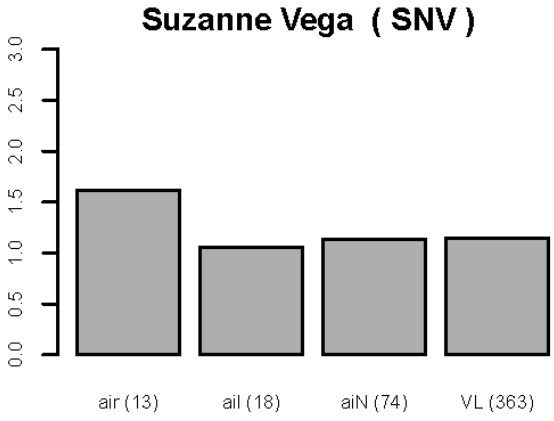

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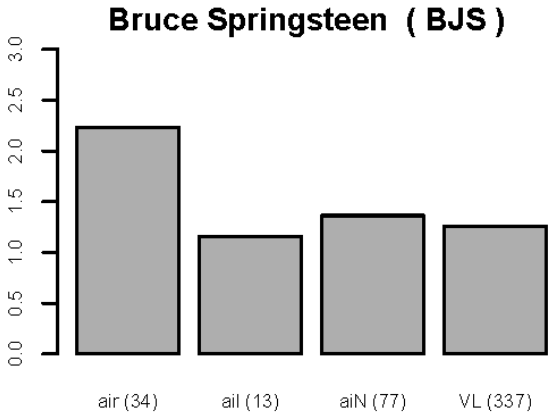

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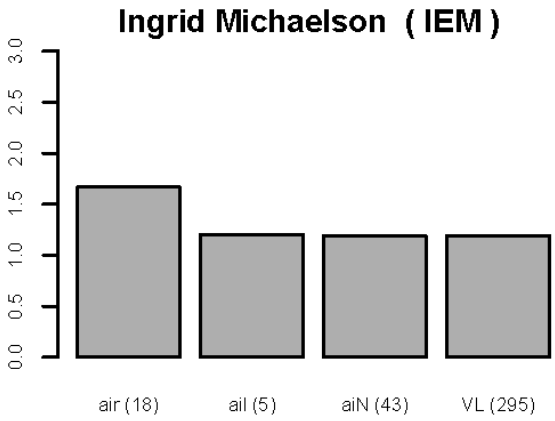

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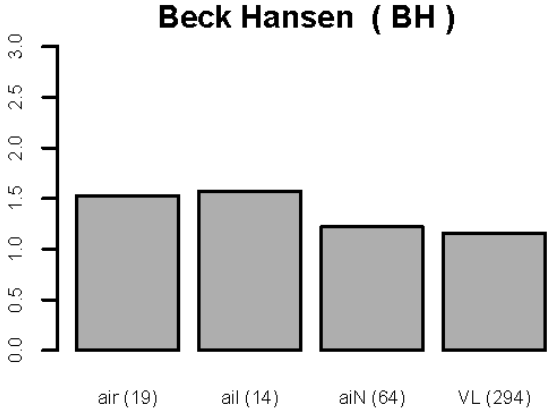
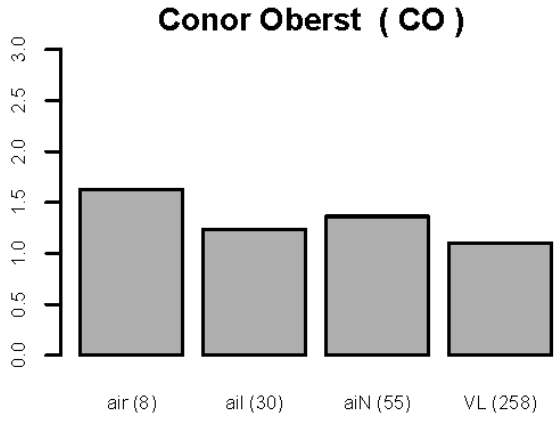


Figure 10



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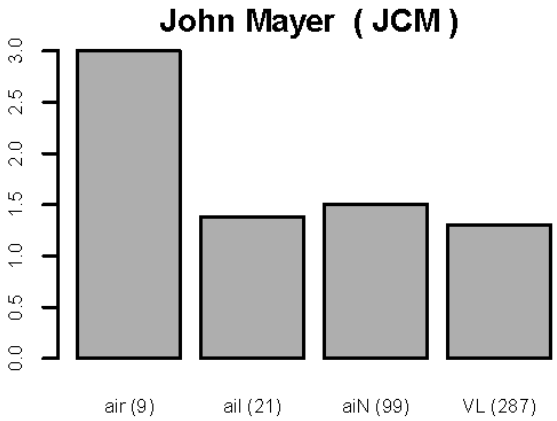

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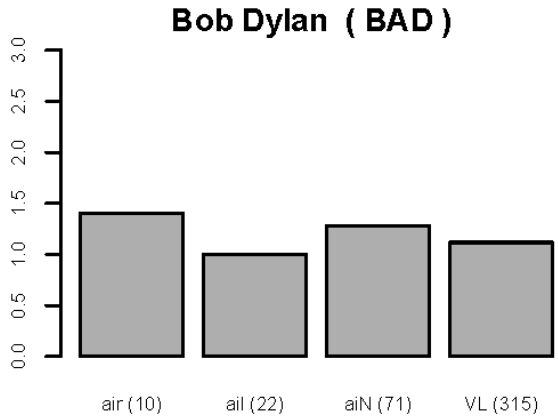

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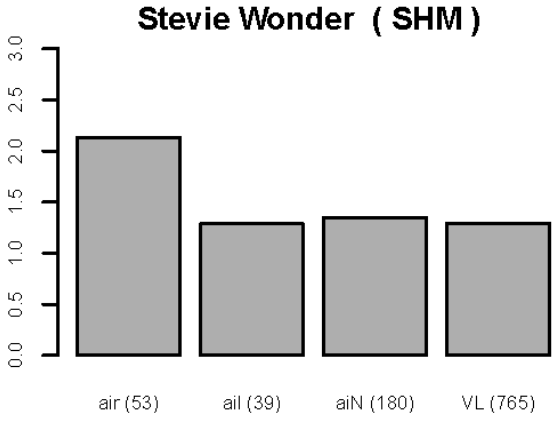


Figure 14

We see a division within the set of artists: for some there does seem to be a preference for multiple pitches on [aiɹ] (and to a lesser extent, [ail]) words, which for others there is no visible difference between the number of pitches assigned to each rime type. Based on our model, this suggests that artists for whom there is a difference based on rime type are likely to have polysyllabic forms in their linguistic representation. Artists for whom there is no difference should have a monosyllabic representation. This appears to be in accordance with the conclusion of Lavoie & Cohn 1999, that unstable moraic structures will not have uniform distributions across language users.

In fact, for five artists, Ben Folds, John Mayer, Conor Oberst, Billy Joel and Suzanne Vega, there was a statistically significant difference in the likelihood that [aiɹ] would be multi-pitched (and therefore polysyllabic) compared to the baseline ($\alpha = 0.05$). For Beck Hansen, there was a statistically significant difference in the likelihood that [ail] would be multi-pitched, with the same confidence. This is summarized in Figure 15, which presents an odds ratio of the rime types [aiɹ] and [ail] relative to the control (at baseline = 0).

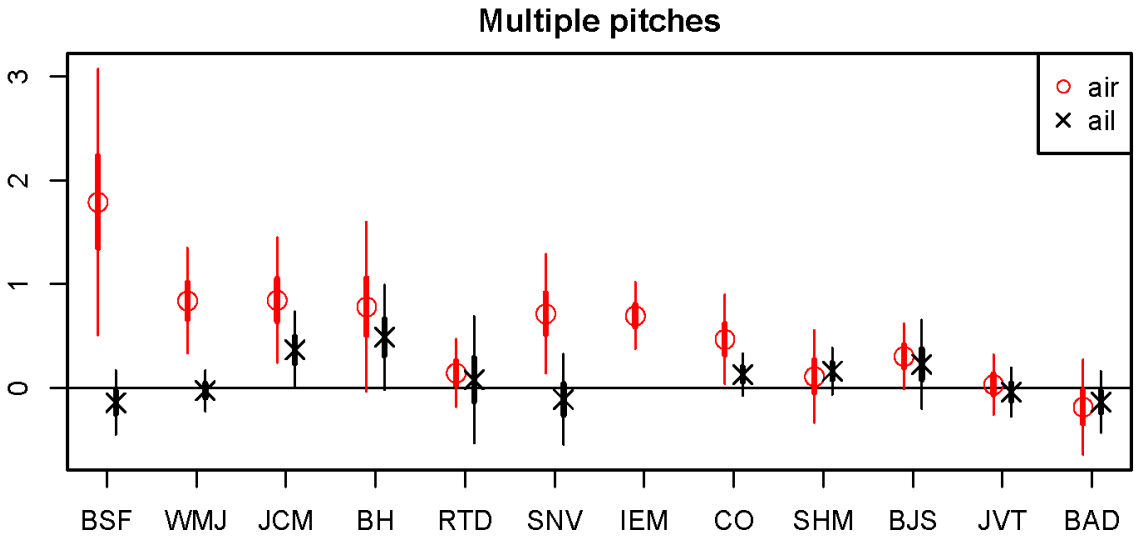


Figure 15

Figure 16 compares the same groups of tokens, but the y-axis on this figure represents the average additional number of pitches assigned to [aiɹ] and [ail] relative to the baseline.

That these figures are similar is encouraging to the validity of the statistical significance. If, for example, the estimates in Figure 15 had been much closer the baseline than those in Figure 16, it may suggest that there is some erroneous influence of melismatic song styles on the data. However, the comparability of these two figures supports the claim that these distributions of pitches are an accurate measure of the musical behavior, and a reasonable indicator of the underlying syllabic representation.

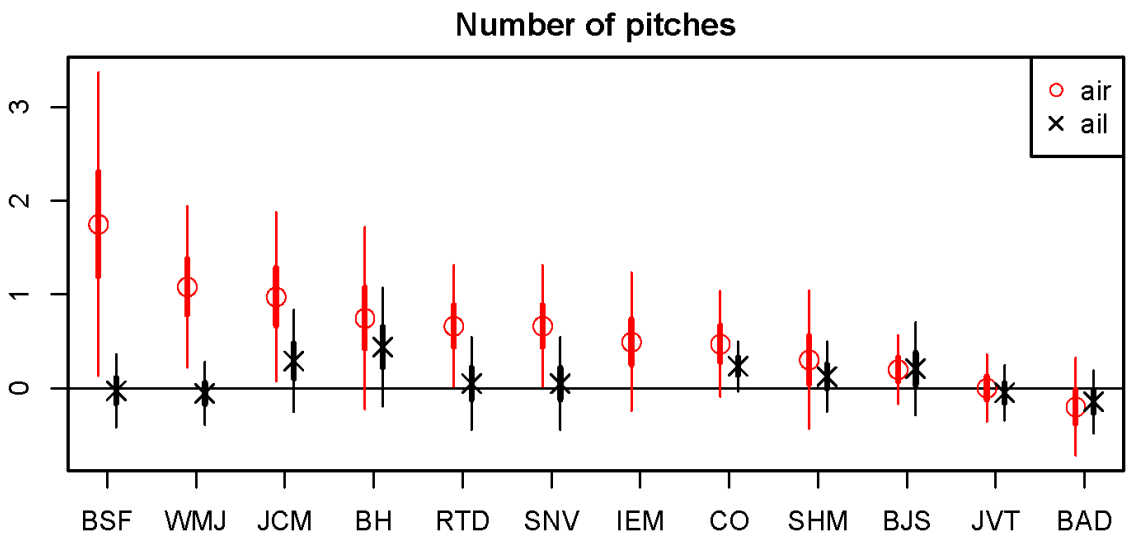


Figure 16

3.5 Discussion of Findings

There are several conclusions that can be made based on this data. First, there is a statistically significant bifurcation of artists, those for whom constructions of diphthong + liquid rimes are monosyllabic and those for whom they are polysyllabic. This supports the previous claim that syllabification of unstable structures is speaker-dependent. Since English only allows for dimoraic structures, and these sesquisyllables may be viewed as superheavy, the candidate syllables may be split to obey the moraic constraint (Lavoie, Cohn 1999).

Within the set of rime types following this form, there is a sequence impressionistically based on relative aggregate sonority of the contained segments, of which rimes types were likely to undergo poly-syllabification. When artists showed evidence of poly-syllabification, it was preferred that the rime undergoing syllable change be more highly sonorous. Thus, among the target times [aiɹ] was more commonly systematically syllabified (5 artists) than [ail] (1 artist). A similar observation can be made within the control group, whereby rimes with more sonorant constituents have a

higher mean pitch. For example, rimes containing diphthongs have higher mean pitch counts than rimes with monophthongs and more-sonorant codas.

In sum, concordance between the observed musical behavior and our assumptions of the possible syllabification of the target rimes leads us to conclude that this exploratory study shows a speaker-dependent alternation of syllabification of superheavy syllables in English. In addition, we are in the view that based on accordance of our findings with the assumptions, recorded musical pitch is a reasonable estimate of an individual speaker's underlying syllabic representation.

4 *Text-Setting Experiment*

4.1 Premise

In developing the analysis methods previously discussed, several issues arose that suggested a different methodology may be preferable. For example, using pitch as a musical indicator of syllabification requires that data recorders operate using an arbitrary set of parameters for what is considered a complete target pitch and what is not. As discussed in Section 3.3, tokens collected by pitch count were defined by such constraints as clear target pitches, containment of the target pitch in the song's key, and contrastive repetition; i.e., tokens were 'bad' if the pitches were unclear, outside of the melody space, or identical and adjacent. However, this constraint system was still vulnerable. Since pitch is not a discrete operation, qualitative judgments are to some degree necessary in determining pitch count of any given token. This led to discrepancies between the individual researchers' judgments. Even with multiple researchers coding each token, there was still an error created in the compromise of judgments.

It was therefore in our interest to investigate whether there exist other musical

features that could be used as indicators of syllabification. We were especially interested in musical features where dispute over the numeric value would be less likely, i.e., a feature with discrete, countable values. One such feature is the number of written musical notes assigned during composition to a given syllable. There are several plausible advantages to the use of written music as an indicator of syllabification. First, provided that notation standards are clearly defined, there is little foreseen ambiguity as to how many notes are assigned to a given word. (In fact, possible anticipated ambiguities, such as 'tied' notes or 'stacked' metrical patterns, were not observed in testing.) As composition theory often deals in descriptions of syllable, count of written notes is seemingly as plausible as count of performed pitches as an indicator of syllabification. Finally, by not requiring recorded works of music, analysis of written music offers a logistical advantage to the researcher.

It is also worth remarking that in some respects, count of written notes may be a better indicator of syllabification than count of performed pitches. In Schellenberg 2012, it is suggested that musical pitch can be used as an indicator of spoken intonation. Dell and Halle 2005 additionally argue that linguistic stress corresponds with phrasal stress (and thus pitch in many traditions). If these assertions are taken seriously, and musical pitch indicates inter-syllabic features, then there must also exist criticism for the use of musical pitch as indicative of the syllabification itself: it is therefore necessary to consider more carefully how music can serve as linguistic evidence. As Temperley and Temperley 2011 posited, the language traditions of the composer may influence which musical forms are used. It is not clear in their discussion how linguistic features are mapped onto music.

One possible solution is to consider a linear injective map from linguistic representations to musical performance, where each relevant linguistic feature corresponds to one (and only one) aspect of musical behavior. In this system, an aspect like pitch must be assigned only to one linguistic feature, e.g. stress. Since stress is an inter-syllabic feature, pitch must then be a sub-feature of the macro musical aspect corresponding to word boundary, musical phrase, for example. Similarly, inter-syllabic features must correspond to an "inferior" musical feature. If this solution is accepted, then pitch would not be a candidate for syllabification, based on the previous literature. While it seems plausible that there would exist a correlation between the scope of a linguistic feature and the scope of a musical one, accepting this description introduces a contradiction between Dell and Halle 2005 and Schellenberg 2012, which both use alignment of syllables to written notes as evidence for patterns of different linguistic features.

Another possible solution is to say that the map from language to music and vice versa is not bijective. In fact, musical features may indicate multiple linguistic features, and a linguistic feature may have evidence in multiple aspects of music. This view allows not only validates our choice of musical feature in the exploratory study, but also allows for a mapping between written note (as used in Temperley and Temperley 2011 to indicate stress) and syllabification.

4.2 Text-Setting Design

Based on the discussed issues in the exploratory study, and the advantages of written form discussed in Section 2.5.1, it was determined that it would be propitious to design a secondary study where both written samples of musical behavior and some

record of linguistic intuitions were available for individual speakers. I therefore endeavored to design a study where I could compare participants' musical alignment of target words to written notes with their explicit judgments about syllabification of the target structures.

While the use of existing strophic lines from the existing data was considered as the target lyrics of this experiment, this idea was ultimately rejected for two reasons. First, using existing lyrics would have introduced a potential that the participants would recognize the original lyric, and thus be influenced by the known melody. As the compositions needed to reflect the linguistic representation of a single songwriter, this was an unacceptable error. The second rationale in using previously non-existent lyrics was logistical. Recruitment and data collection for the study were in conjunction with the data collection of Rodriguez 2017, which required participants to make acoustic recordings of ≈40 words and then make explicit judgments about the syllable count of those words (comparing the acoustical behavior of speakers with their linguistic intuitions). Combined with the amount of time necessary to compose several short melodies, the study faced the problem of participant fatigue. By creating original lyrics for composition, it was possible to fit several more target rimes per phrase than could be found in the existing music library. Thus, a sufficient number of target rimes could be collected in fewer melodies, saving the participant time and energy. Creating original lyrics also allowed us to stipulate that the set of phrases be of reasonably variable lengths. The use of created lines follows the precedent of Sui 2013. However, this design introduces similar problems as were observed in Palmer and Kelly 1992. Eleven total phrases were composed for use in the study. They are provided in Table 4:

Table 4: Lyrical Phrases for Use in Text-Setting Study	
"all our dreams are done"	“climb while you fall"
"take time to live out all you deserve"	“require our hearts to heal"
"stoke the fire, I feel fine"	"hire me to replace the car tire"
"dear little paper doll"	“fan the fire and fire the fanner"
"while you conspire"	"catch me on the line, new telephone wire now"
"you tire of being here"	

Figure 17 shows the kind and frequency of target rimes found in the this set of phrases. Twenty-seven tokens were included, with roughly one half of tokens being targets [aiɪ] and [ail] and one half being a representative set of control rime types.

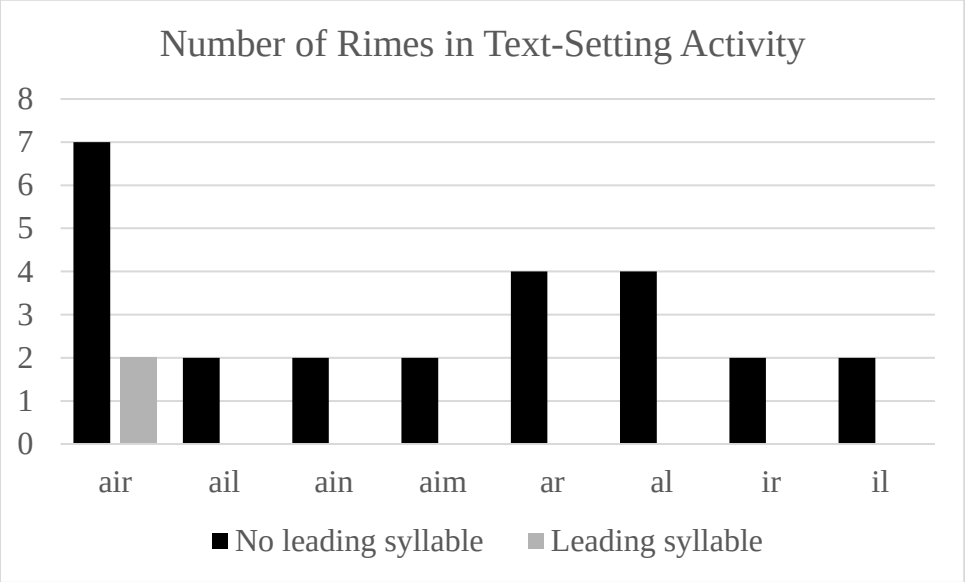


Figure 17

These rime types were distributed in the following list of words (Table 5):

Table 5: Target words			
all	dear	fire	our
are	doll	heal	require
car	fall	here	time
climb	feel	hire	tire
conspire	fine	line	while
			wire

Unfortunately, due to a software error, incomplete data was collected for the

token ‘car.’ Therefore, all ‘car’ tokens were excluded from final analysis. This word appeared once per subject in the data set.

Based on the exploratory study in Section 3, it was assumed that the rimes [aiɹ] and [ail] would be the most likely to show indicators of poly-syllabification, and so it was determined that the number of these times these rimes appeared in the musical lines should be comparable to the aggregate size of any segment-sharing pair of control rimes. For each of the words, participants were also asked explicitly how many syllables they thought were in the words in the target set.

4.3 Procedural Considerations

Data was collected from a sample of 20 native English speakers, from the student body of the University of Utah School of Music and the community at large. Participants were recruited through the solicitation of Music Department faculty and through fliers posted on the University of Utah campus and by word of mouth. Participants were offered $10 in compensation, which was to be distributed regardless of completion (no responses were incomplete). This was made possible by funding assistance from the Office for Undergraduate Research at the University of Utah. Each participant was asked to meet researchers in a reasonably quiet and private space to complete an interactive electronic survey on the researcher’s laptop computer, and most meetings occurred in private library study rooms at the University of Utah Marriott Library or at Salt Lake County libraries. Appendix A contains the screenshots for one subject in this survey. Source code for the survey is available in Appendix B.

First, subjects read a series of instructions about how to use the drag-and-drop composition screen to create original melodies. On the following screens, participants

saw a blank musical staff, a bank of notes and miscellaneous notational markers, a target phrase, and a lyric bank consisting of the words in the target phrase. In order to reduce temporal fatigue and elicit natural judgments, participants were asked to spend no more than five minutes composing a melody for each phrase. A small piano keyboard was provided for participants to use if they so desired.

During the compositional activity, a significant problem was noted that in standard Western musical notation, words that span multiple notes are often split with a hyphen at some proposed syllable boundary. There was concern that this notation style may overtly encourage participants to assign target words to a single pitch, since they have no clear boundary at which to hyphenate. For example, a participant assigning pitches to the lyric 'fire' may choose to assign only one pitch because their compositional training would tell them that a syllable must have a vowel, when in fact their linguistic representation may assign 'fire' multiple syllables. To correct for this, participants were prevented from splitting words into smaller segments, and were instead asked to place lyrics underneath the first note to which they corresponded in cases where the lyric spanned multiple pitches.

After the participant had created a melody for each of the target phrases (presented in a random order), they were given the option of taking a break. This was again to reduce possible fatigue. After their break, participants were given a series of words to record. This included only the ≈40 productions required for Rodriguez 2017. During this section, participants read the word to record at the top of the screen, and pressed a button on screen to record their sample. Recordings were defaulted to 3 seconds in length, and participants had the option to re-record any word they chose (this

rarely occurred). Only the last recording of each word was kept. Recordings were collected using a Rosetta Stone® Headset (Microphone frequency response: 20-20 kHz).

Once they finished the recordings, participants were again prompted to take a break if they wanted to. Then, they were given the following instruction for the explicit judgment of syllables:

> *"In the next activity, you will see a word in English at the top of the screen. In the text box, type the number of syllables you think are in the word, then hit 'Enter' on the computer keyboard. You will not be able to change your answers."*

No definitions were given of what a syllable was or should be, and participants were not offered any additional advice. This was, of course, dependent on the participants' knowledge of the concept of syllable. Interestingly, there were no complaints or voiced concerns about this problem in the exit questionnaire. Because the set of words to be judged needed to include both the target words from the text-setting activity and the acoustic recordings, each participant made ≈60 judgments (with possible repetition). After all judgments were completed, participants were directed without break to a seven-question questionnaire about their language background and musical experience. Answers to these questionnaires can be found in Appendix C.

For each of the activities, except the demographic questionnaire, the order of questions/activities were randomized. However, the order of the tasks themselves (composition, acoustic recording, judgments, and questionnaire) remained static. The static order of the first two activities was justified for convenience of interface design. The third activity, syllabic judgments, necessarily followed the first two activities, as being asked about the syllable feature may have primed participants to respond in an unnatural way otherwise.

Table 6 shows a typical timeline for subjects completing each activity. Most participants finished the activity in about an hour. The fastest participant completed the survey in approximately 30 minutes, and the slowest participants finished in approximately 1 hour 15 minutes.

Table 6: Typical Completion Timeline		
Activity	*Time*	*Running Time*
First set of instructions	1 min	1 min
Text-setting activity	40 min	41 min
Break/second set of instructions	1 min	42 min
Recording speech	3 min	45 min
Break/third set of instructions	1 min	46 min
Syllable judgments	6 min	52 min
Final instruction	1 min	53 min
Questionnaire	2 min	55 min

4.4 Results

For the purpose of analysis, each target from the composition and explicit judgment sections of the experiment were coded for subject number, word, rime type, and number of notes or number of syllables respectively. Two of the target words, 'require' and "conspire," had a leading syllable before the target rime. For occurrences of these words, 1 was subtracted from each corresponding value to account for the leading syllable. The entire set amounted to 540 compositional tokens, 27 per participant.

The raw data as described for both the text-setting and the explicit judgments can be found in Appendix D. In sum, 1019 tokens were recorded from the sample, an average of 50.95 tokens per participant. This variation between participants was due to the possible repetition introduced during the explicit syllable judgments. For example, if

a subject recorded the word ‘while,’ then they would be asked to judge the word ‘while’ at least twice. If a subject did not record themselves speaking the word ‘while,’ they would only judge its syllable count one time.

One of the vital purposes of this study was to see if different musical features showed the same distributions of syllabification as in the exploratory study. The distribution of rime types for each participant in the text-setting study are seen in Figures 18-37:

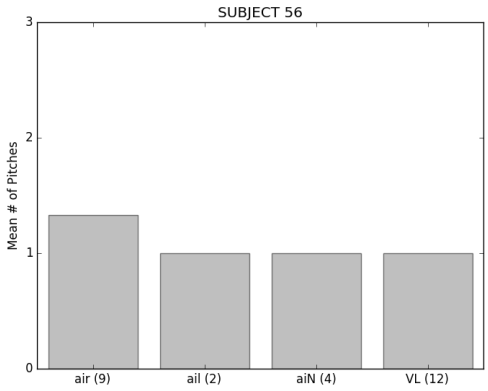


Figure 18

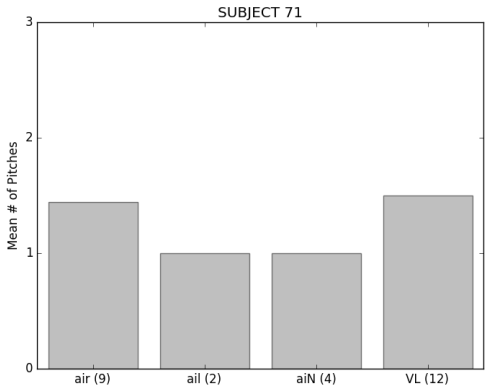


Figure 19

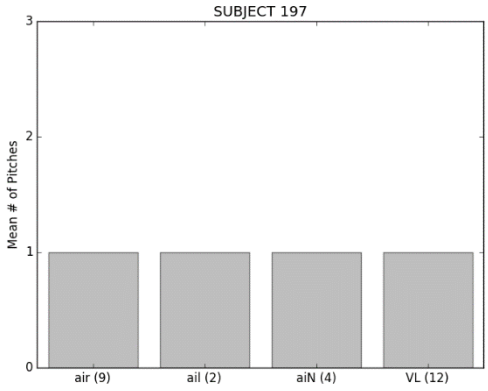


Figure 20

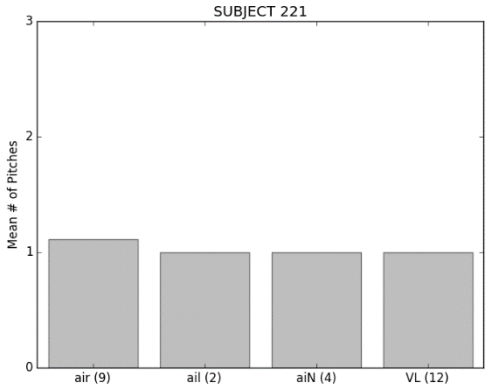


Figure 21

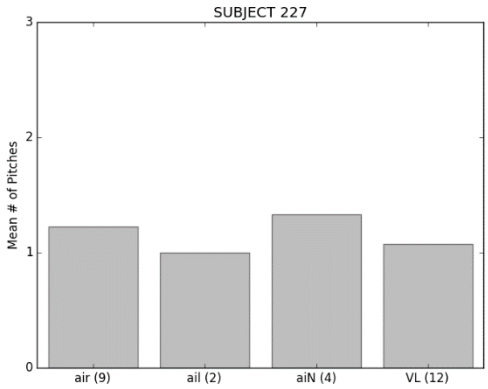


Figure 22

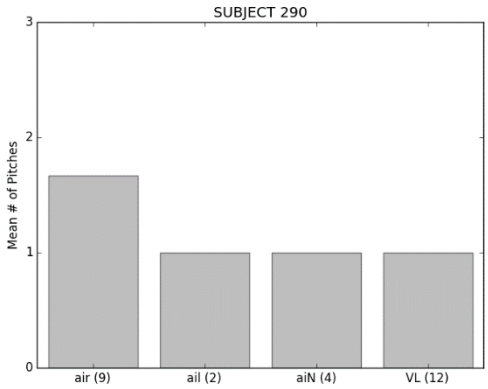


Figure 23

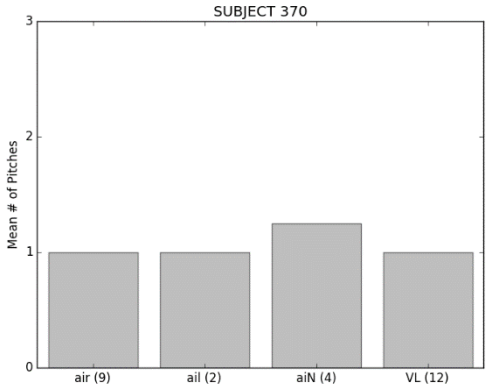


Figure 24

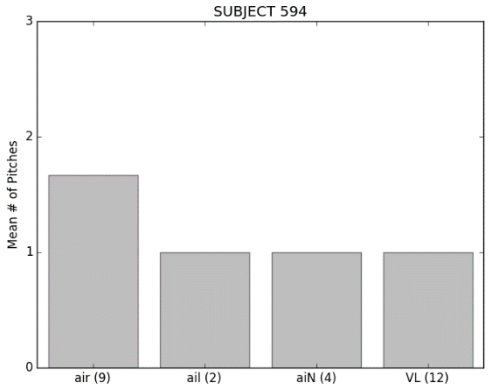


Figure 25

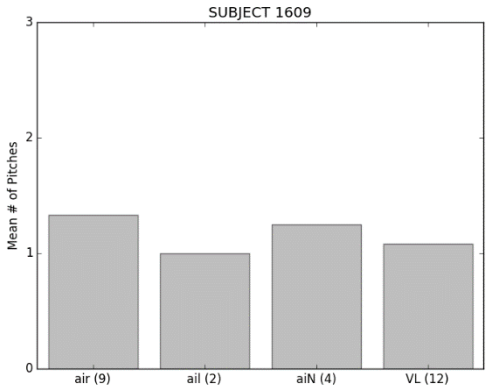
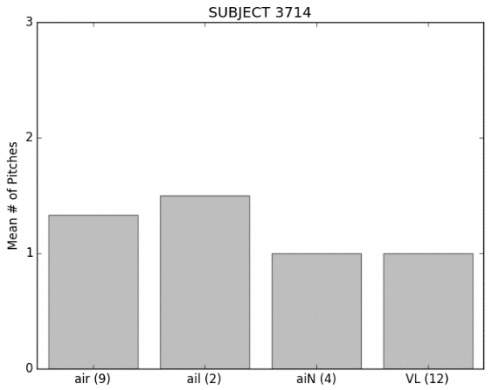


Figure 26



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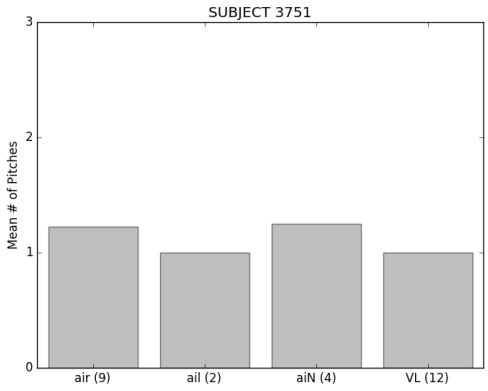

Figure 28

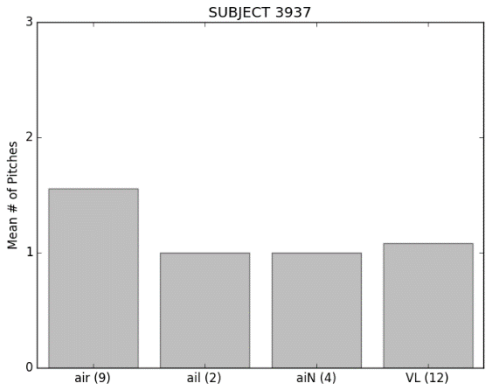

Figure 29

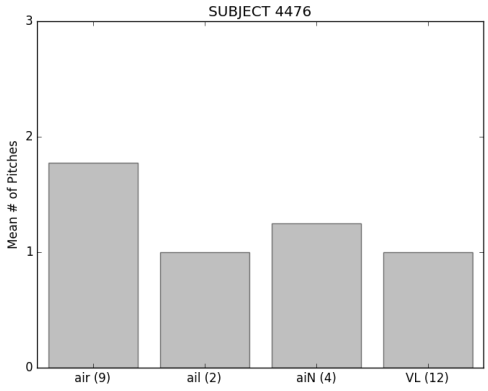

Figure 30

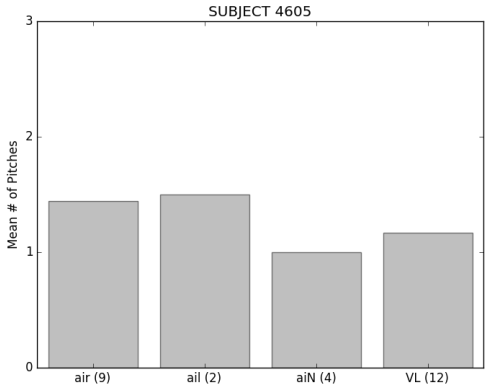

Figure 31

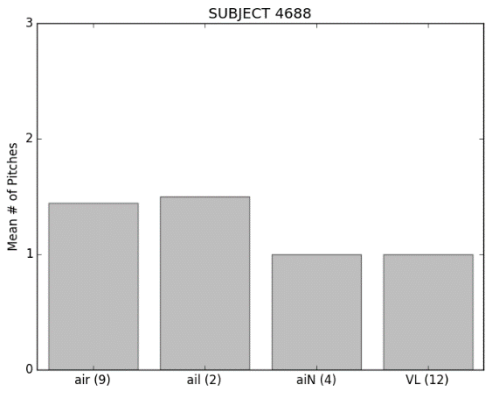

Figure 32

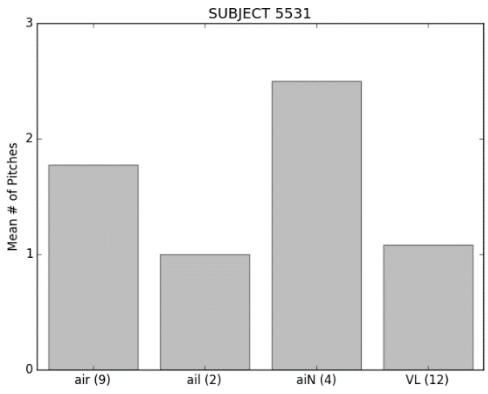

Figure 33

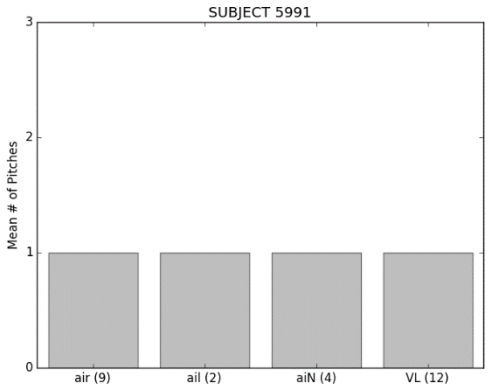

Figure 34

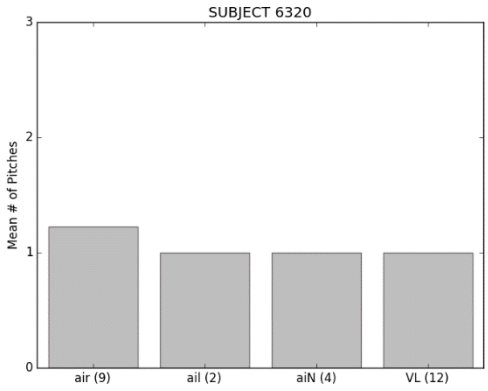

Figure 35

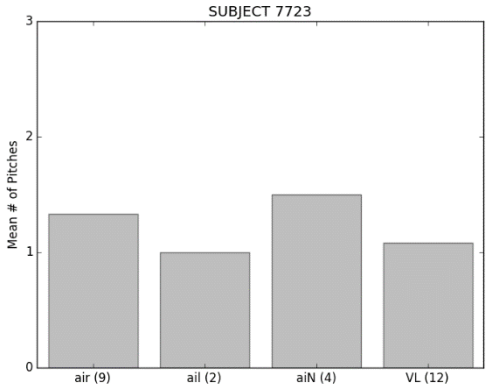

Figure 36

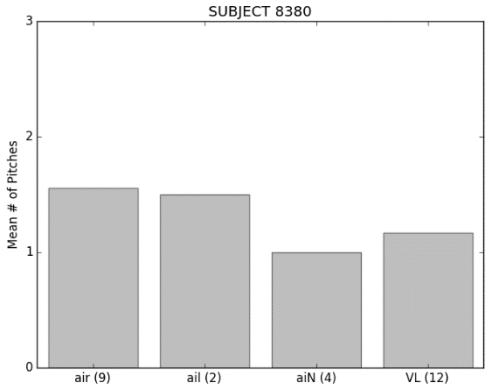

Figure 37

While the sample size of target tokens for each rime type does not merit any claims of significant weight (about structural weight), it can be seen impressionistically that the same patterns observed within the text-setting participant group was observed from the artists in the exploratory study. When a subject shows a sharp contrast for some rime type it is often the 'fire' words showing contrast (or at least both the [aiɹ] and some other rime type concurrently exhibit a higher mean number of notes). One difference between the text-setting subjects and the recorded artists is the variability for the rime type [ain]. In the exploratory study, [ain] remained consistently near the baseline, but among the research participants it was a more readily-chosen candidate for poly-

syllabification.

One interesting phenomenon concerning phrase structure was observed during the text-setting portion of the experiment. In the exploratory study, it was remarked that in certain circumstances, the syllabification of the target word seemed to be confirmed by its placement relative to polymorphemic words (e.g. if 'fire' was rhymed with 'higher' at the end of strophic lines). A similar pattern was observed in the text-setting for the phrase "fan the fire and fire the fanner." It seemed that the structure of the conjunction influenced the syllabification of these two 'fires.' In the first half of the phrase, 'fire' was treated in parallel with 'fan,' and was thus commonly monosyllabic. In the second half, 'fire' was contrasted with 'fanner,' and was more often polysyllabic. One such production is shown in Figure 38. Although this does not support the claim that syllabification of unstable rimes is speaker-dependent, it does offer evidence of the instability itself; one would expect that a stable syllable would not be at the mercy of phrase structure.

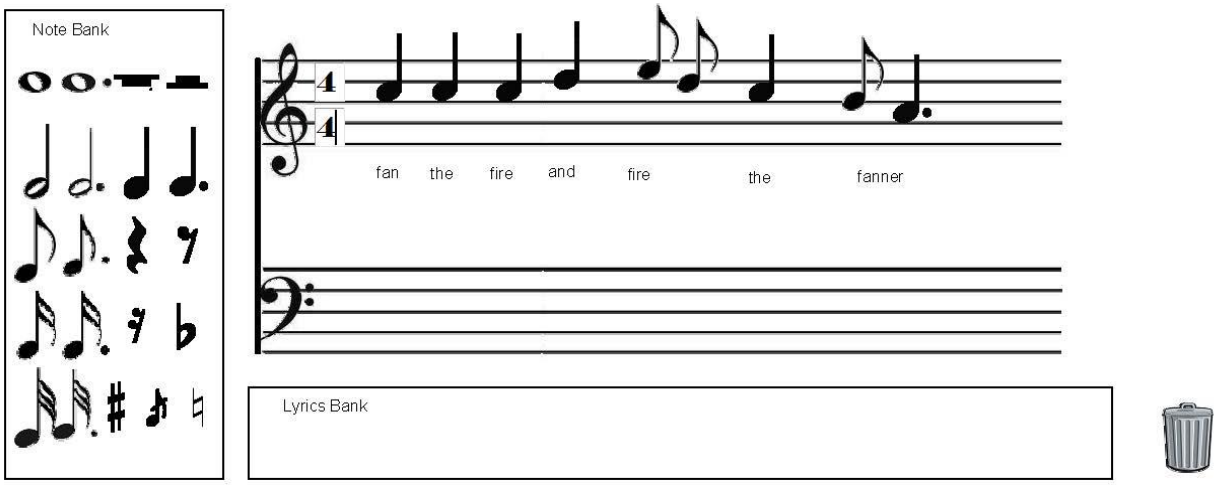

Figure 38: Phrase-Dependent Syllabification (SUBJECT 0056)

Another of the rationales for an experiment of this design style was the ability to

compare musical behavior to linguistic intuition. To do this, a second reading of the data was implemented. For each subject, the number of written notes assigned to each target word was coded as a compositional judgment. The elicited number of syllables for the targets during the syllable judgment activity was coded as an explicit judgment. In cases of multiplicity, i.e. a word (like 'are') appearing multiple times in the composition, or the subject being asked to judge the same word multiple times, the following procedure was followed:

- if possible, code the arithmetic mode of the values
- if there exist two or more modes for the data, code the arithmetic mean

Thus, for each subject, for each word, there were two saved values: a composition "average" and a judgment "average." To compare the assumed syllable count from the text-setting to the intuitive syllable count of the subjects for each word, a percentage was calculated of the number of words for which the speaker's musical data and explicit judgments elicited the same response. This is summarized in Table 7:

Table 7: Concordance of Text-Setting and Explicit Judgment

Subject #	Concordance
0056	88.8889%
0071	72.2222%
0197	94.7368%
0221	94.7368%
0227	68.75%
0290	88.8889%
0370	77.7778%
0594	94.4444%
1609	84.2105%
3714	70.0%
3751	82.3529%
3937	78.9474%
4476	77.7778%
4605	66.6667%
4688	72.2222%
5531	66.6667%
5991	44.4444%
6320	94.4444%
7723	72.2222%
8380	64.7059%

Relatively high concordance rates are encouraging, in that they offer hope that perhaps intuition is not such a bad indicator when it comes to sesquisyllables. However, the lower bound of concordance (44.44 %) still speaks to the value of alternative venues of data collection such as music.

4.5 Validity of Results

4.5.1 Assertions

Several claims were necessarily assumed for the purposes of this experiment. First, it was assumed that the target words were all pronounced in the same way, e.g. all speakers would always pronounce 'fine' as [fain]. While this could be checked in the case of performed music (in fact, the interested reader can find an alternative analysis of the data from Section 3 in Jessen 2017, where 'while' is allowed multiple pronunciations), in the text-setting experiment pronunciation information is unavailable. Indeed, the fact that speakers were asked to record a set of isolated words, some potentially being target times, may have primed them to make syllable judgments based on how they would pronounce the words in isolation. For example, a target like 'our,' which is commonly pronounced [aɪ] in continuous speech, is more likely to be pronounced [aʊɹ] in isolation. This rime is not present in our data set in any incarnation. If it were, the presence of a diphthong and a sonorant coda would surely make it more likely to be a target rime, and not a control (as it is claimed 'our' is).

We have also assumed positional independence. That is, the placement of a target word within a line of text is only anecdotally important. But Dell and Halle 2005 posit that musical phrasing is a linguistic marker. The "fan the fire" example from the data speaks to this. However, the assumption that syllable is causally phrase-dependent

invalidates the discussion in Section 4.1 about hierarchical mapping.

4.5.2 Limitations

As with the exploratory study, the scope of these findings is somewhat limited. While there is variation between the set of speakers in the sample, the lack of very strong statistical significance, coupled with a small sample size, means any conclusions difficult to generalize. Unfortunately, it is foreseen that any study of similar design would also be subject to such limitations, as the text-setting task takes considerable time and introduces ample opportunity for subject fatigue if too many tokens are attempted to be collected.

5 *Comparison of Methods*

If music is to be taken seriously as a means of examining linguistic representation, it is natural to ask what about music is most readily and accurately testable. This sections presents the advantages and disadvantages to the two design types outlined in this paper, and offers some recommendations for improvement.

One of the logistical advantages to using pre-recorded music is that a large body of samples is available to use. This set of samples is also acoustic, and so analyses based on sound patterns and timing are more easily uncovered. The subtlety involved in using target pitches as a syllabic indicator allows the researcher to work within shades of grey; pitch is not a discrete feature music, but continuous, and thus lends itself toward non-binary generalizations. The use of recorded music also offers the advantage of temporal references, as noted in Bravi 2015. One can not only assign relative timings to recorded music, but measure temporal distances between salient musical features.

However, there are disadvantageous weaknesses where a study of this design simply cannot compete with subject testing. The most obvious difference between the

exploratory study and the text-setting activity was the ability to ask questions of the text-setting subjects; it's not as if John Mayer or Bob Dylan are going to answer respond to e-mails about linguistics, but a college student in the lab will happily answer any questions as long as they are being given payment. The text-setting design thus allows the researcher to directly compare musical behavior with linguistic intuitions.

While it was originally assumed during the research design process that using counted notes instead of pitch as the salient feature because it was a binary trait, in practice this did not seem to be any great advantage. Even in written music, there were still lines with ambiguous structure, when notes didn't line up well with any of the lyrics, for example. Still, a remaining advantage to text-setting is that the researcher need not be reliant on whether there are enough songs containing whatever target word or phrase in which they are interested.

Both methods shared a set of unavoidable problems as well. In either study, you are likely to see unnatural speech patterns, whether it be because of performance standards in the recording studio or because participants talk funny when you pass a microphone their way, it is difficult to know whether public behavior (especially in music) is representative of natural speech.

6 *Conclusion*

At the close of this discussion, we many definitively answer: How many syllables are in the word 'fire'? I say with all confidence afforded me as an undergraduate researcher: one or two!

However, there are secondary questions which have much more interesting conclusions. For example, we have seen strong evidence that there are separate groups of

English speakers, those who mono-syllabify so-called sesquisyllables and those who tend toward poly-syllabification. In addition, sesquisyllables as a set can impressionistically show a correlation between sonority and syllable count.

The validity of these results, of course, rests on the assumption that musical behavior is in fact an indicator of linguistic representation. The agreement between the conclusions of examined literature, the results of the exploratory study, and the findings of the text-setting experiment support claims based on this assumption. The observed concordance between these three variables also supports future use of musical features to identify salient linguistic phenomena.

In sum, the highly moraic and therefore unstable nature of sesquisyllables causes English speakers to have unreliable intuitions about their syllabification, and it is therefore necessary to examine behavior outside of isolated speech to ascertain their cognitive representation of syllabification. There is a theoretical basis for the supposition that syllabification of highly moraic structures is speaker-dependent. Previous literature has suggested music as a behavior influenced by linguistic rules. Both the exploratory study in pitch count of performed music and the text-setting activity suggest music can indeed indicate linguistic representation, in particular syllabification.

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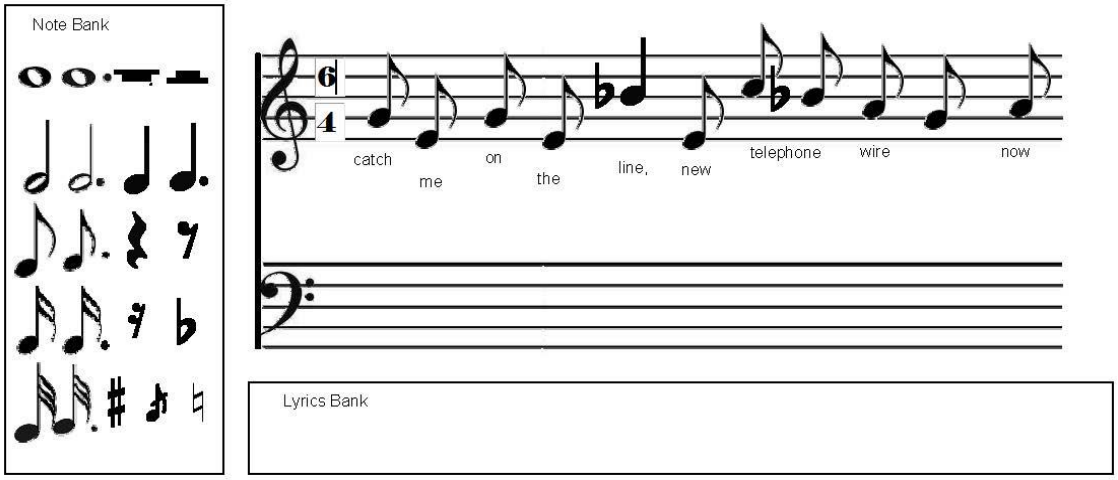
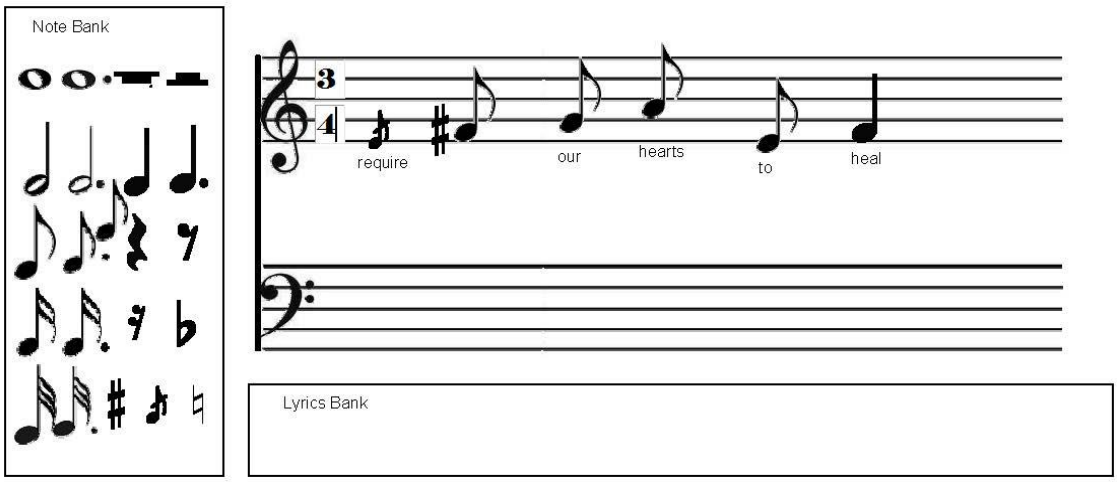
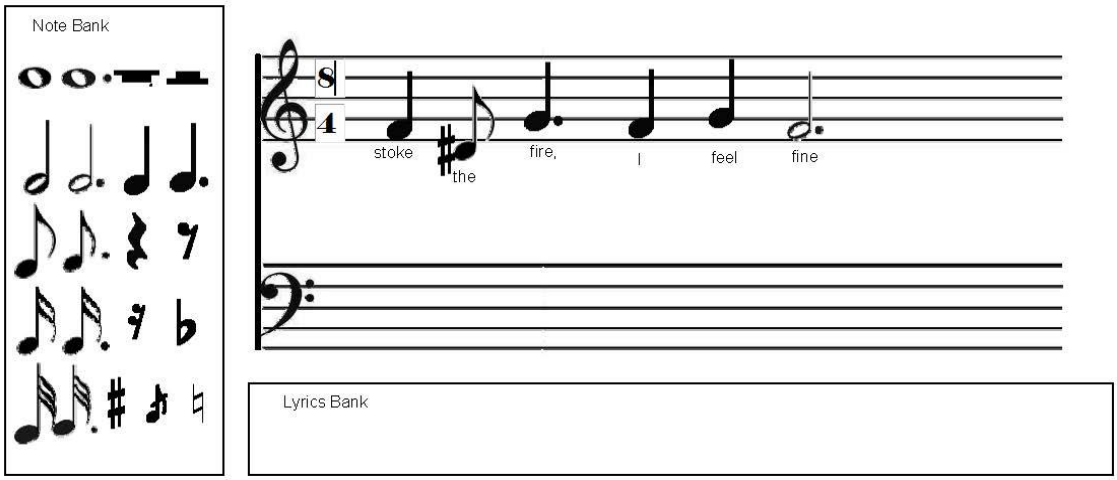
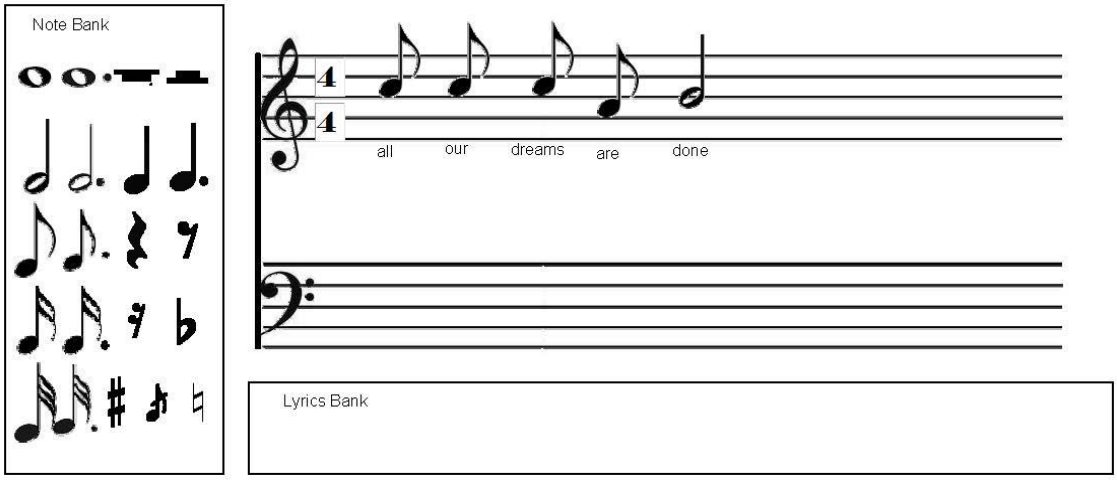
Appendix A: Selected Images of Text-Setting Survey

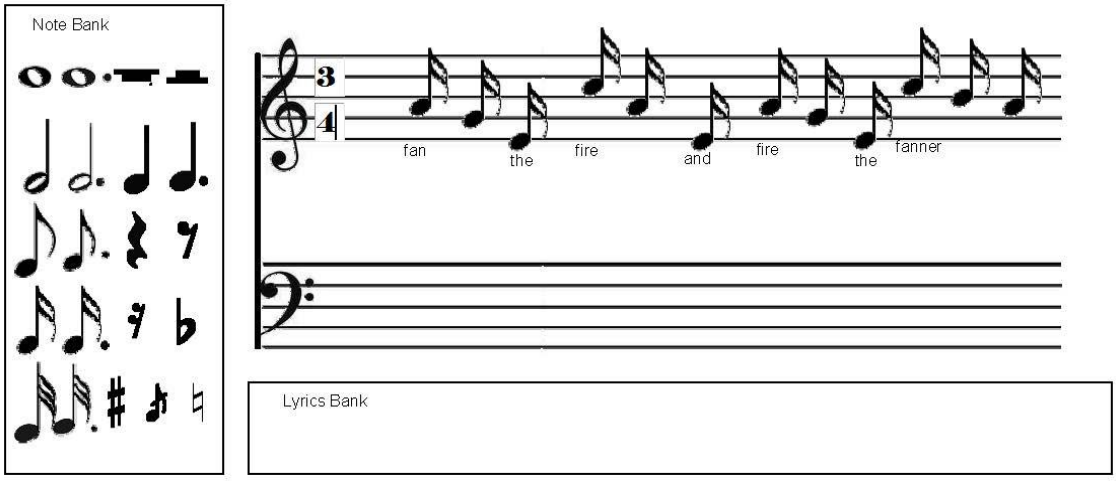
The following represents the complete text-setting productions of SUBJECT 4688.

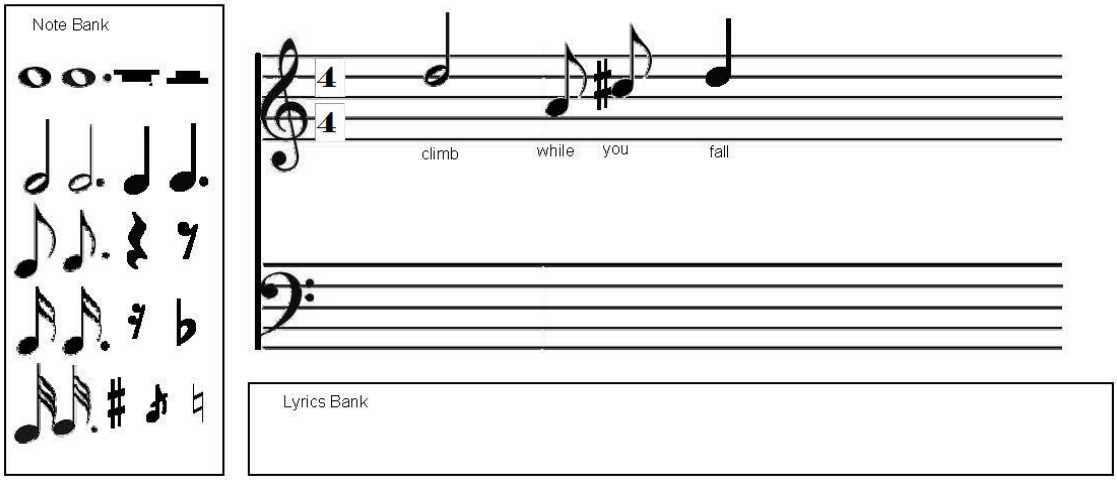


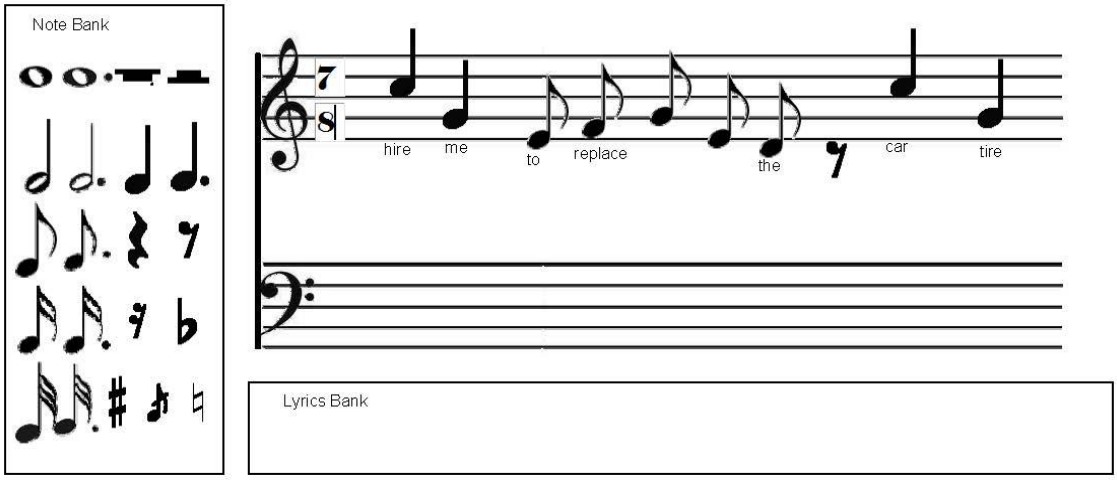


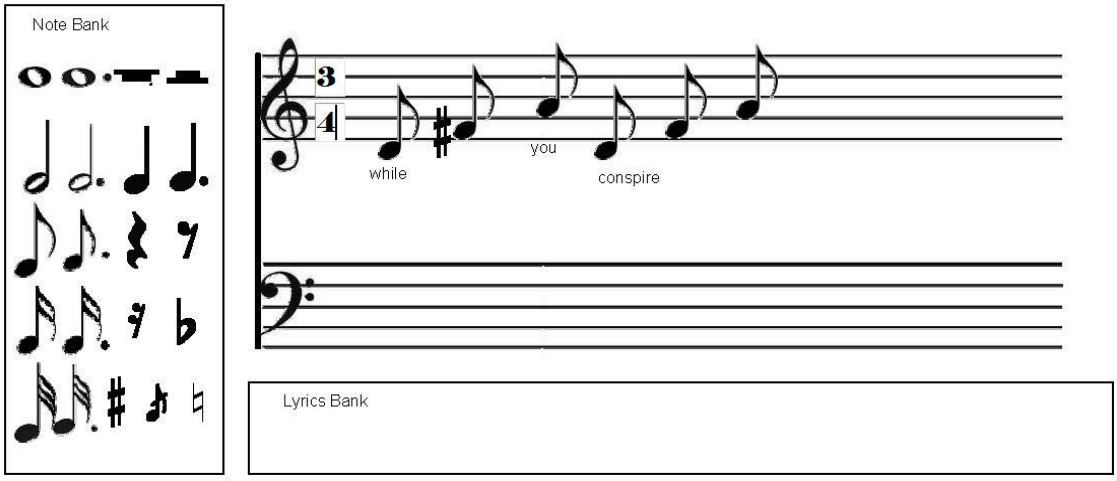

Note Bank
stoke
the
fire,
I
feel
fine
Lyrics Bank

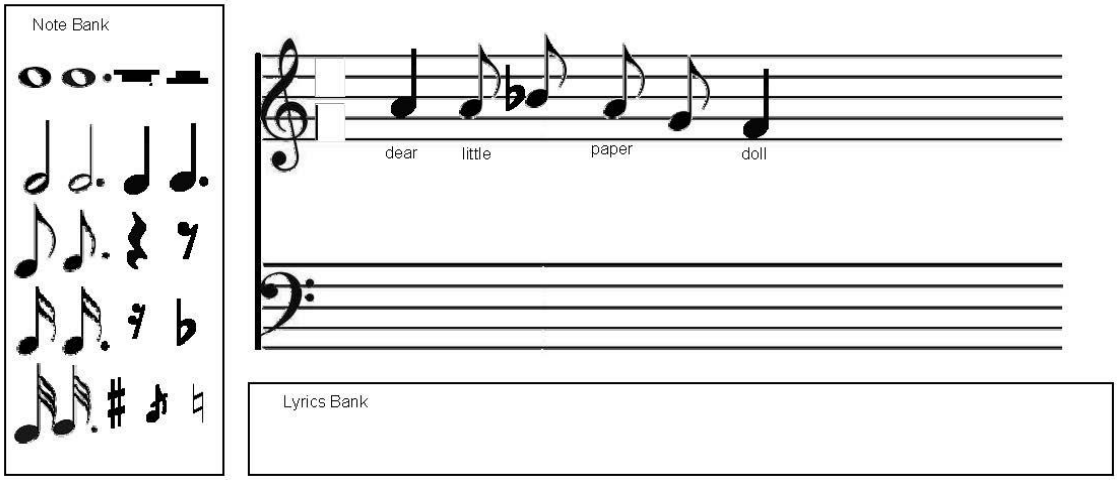

Note Bank
all
our
dreams
are
done
Lyrics Bank

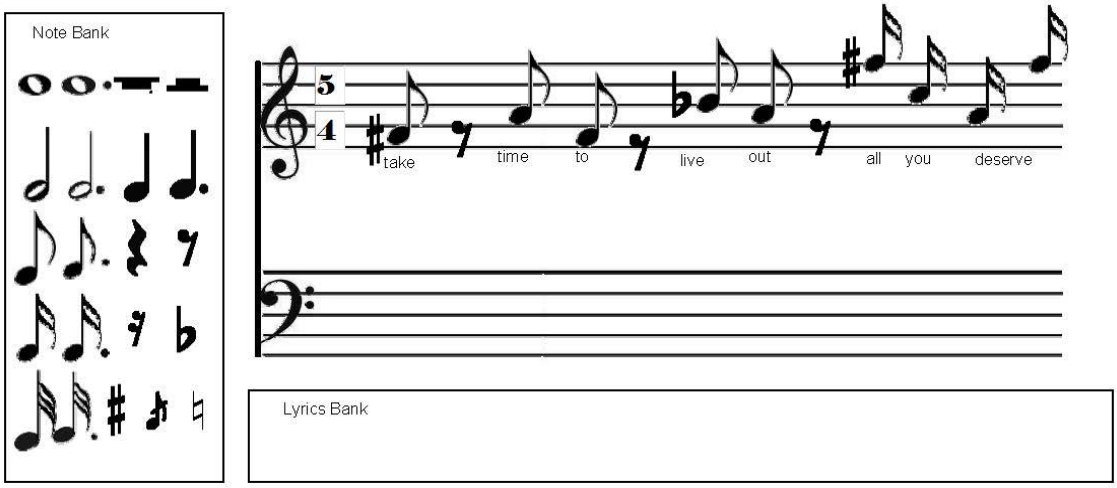

Note Bank
fan
the
fire
and
fire
the
fanner
Lyrics Bank

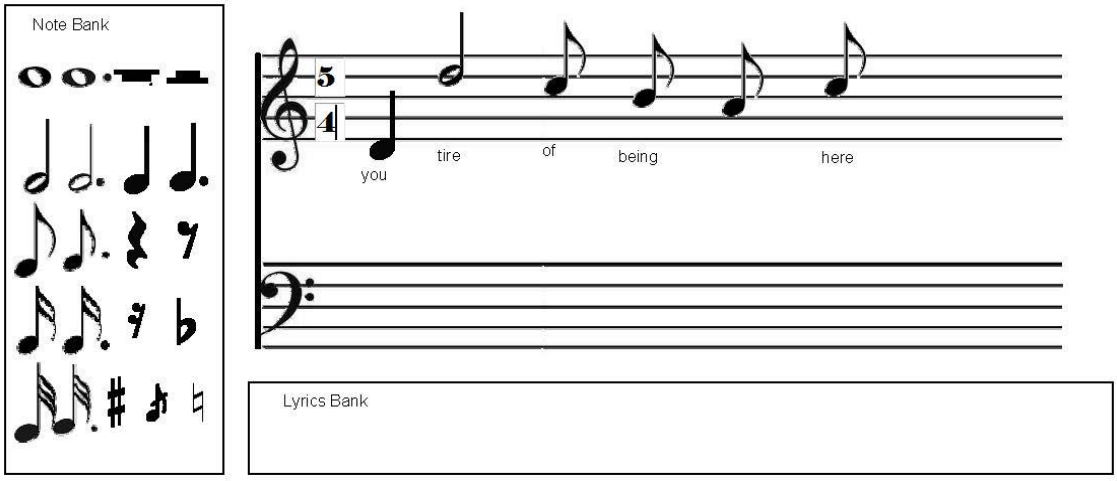

Note Bank
climb
while
you
fall
Lyrics Bank


Note Bank
hire
me
to
replace
the
car
tire
Lyrics Bank


Note Bank
while
you
conspire
Lyrics Bank


Note Bank
dear
little
paper
doll
Lyrics Bank


Note Bank
take
time
to
live
out
all
you
deserve
Lyrics Bank


Note Bank
you
tire
of
being
here
Lyrics Bank

Appendix B: Source Code for Text-Setting Survey

File: Research_Proj

```
from tkinter import *
from instructions_list import *
import textwrap
import gen_sub_nums
import pyaudio
import wave
import os

CHUNK = 1024
FORMAT = pyaudio.paInt16
CHANNELS = 2
RATE = 44100
RECORD_SECONDS = 2


class App(Frame):

    def __init__(self, master=None, *pargs):

        canvas_width = 1225
        canvas_height = 500

        Frame.__init__(self, master, *pargs)
        self.master.title("Music and Language Research Activity")
        self.master.minsize(1230, 665)
        self.grid(row=0)
        self.instruction = Label(text=first,
                                 wraplength=1230,
                                 bg="white")
        self.instruction.grid(row=0, column=0,
                              columnspan=2, padx=30, pady=15)
        self.master.configure(bg="white")
        self.counter = 0
        self.record_count = 0
        self.remaining = 0
        self.p = 0
        self.stream = 0
        self.subject_number = gen_sub_nums.generate_subject_number()
        self.log_file_name = str(self.subject_number) +
'_questionnare.txt'
        self.judgment_file = str(self.subject_number) + 'judgement.txt'
        self.continue_button = Button(
            text="I understand, continue.",
            bg="springgreen")
        self.continue_button.grid(row=2, column=1)
        self.continue_button.bind('<Button-1>,' self.cont)
        self.back_button = Button(text="Go back.", bg="tomato")
        self.back_button.bind('<Button-1>,' self.back)
        self.directory = ("C:\\Users\\Sara\\Dropbox\\fire_syllables\\"
                          "experiment\\SUBJECT_" + self.subject_number)
        os.makedirs(self.directory)
```

```
        # the composing canvas
        self.canvas = Canvas(width=canvas_width, height=canvas_height,
                             bg='white')

        # types of movement possible
        self.canvas.tag_bind("note", "<ButtonPress-1>",
self.on_note_press)
        self.canvas.tag_bind("note", "<ButtonRelease-1>",
self.on_note_release)
        self.canvas.tag_bind("note", "<B1-Motion>",
self.on_note_motion)
        self.canvas.tag_bind("lyric", "<ButtonPress-1>",
self.on_lyric_press)
        self.canvas.tag_bind(
            "lyric",
            "<ButtonRelease-1>",
            self.on_lyric_release)
        self.canvas.tag_bind("lyric", "<B1-Motion>",
self.on_note_motion)
        self.canvas.tag_bind("time_sig", "<Key-Return>",
                             self.change_time_signature)

        # things that can be dragged
        self.canvas.whole = PhotoImage(file="whole.png")
        self.canvas.half = PhotoImage(file="half.png")
        self.canvas.eighth = PhotoImage(file="eighth.png")
        self.canvas.sixteenth = PhotoImage(file="sixteenth.png")
        self.canvas.thirty2nd = PhotoImage(file="thirty2nd.png")
        self.canvas.quarter = PhotoImage(file="quarter.png")
        self.canvas.dotted_whole = PhotoImage(file="dot_whole.png")
        self.canvas.dotted_half = PhotoImage(file="dot_half.png")
        self.canvas.dotted_eighth = PhotoImage(file="dot_eighth.png")
        self.canvas.dotted_sixteenth =
PhotoImage(file="dot_sixteenth.png")
        self.canvas.dotted_thirty2nd =
PhotoImage(file="dot_thirty2nd.png")
        self.canvas.dotted_quarter = PhotoImage(file="dot_quarter.png")
        self.canvas.whole_rest = PhotoImage(file="whole_rest.png")
        self.canvas.half_rest = PhotoImage(file="half_rest.png")
        self.canvas.quarter_rest = PhotoImage(file="quarter_rest.png")
        self.canvas.eighth_rest = PhotoImage(file="eighth_rest.png")
        self.canvas.sixteenth_rest =
PhotoImage(file="sixteenth_rest.png")
        self.canvas.flat = PhotoImage(file="flat.png")
        self.canvas.sharp = PhotoImage(file="sharp.png")
        self.canvas.grace = PhotoImage(file="grace_note.png")
        self.canvas.natural = PhotoImage(file="natural.png")
        self.canvas.wholes = [self.canvas.whole,
self.canvas.dotted_whole,
                              self.canvas.whole_rest,
self.canvas.half_rest]
        self.canvas.second = [self.canvas.half,
self.canvas.dotted_half,
                              self.canvas.quarter,
self.canvas.dotted_quarter]
        self.canvas.third = [self.canvas.eighth,
self.canvas.dotted_eighth,
```

```
                                self.canvas.quarter_rest,
self.canvas.eighth_rest]
        self.canvas.fourth = [
            self.canvas.sixteenth,
            self.canvas.dotted_sixteenth,
            self.canvas.sixteenth_rest,
            self.canvas.flat]
        self.canvas.fifth = [
            self.canvas.thirty2nd,
            self.canvas.dotted_thirty2nd,
            self.canvas.sharp,
            self.canvas.grace,
            self.canvas.natural]
        self.e1 = Entry(self.canvas, bg='white,' font=cuter_big)
        self.e2 = Entry(self.canvas, bg='white,' font=cuter_big)
        self.make_note_bank()

        # things that can't be dragged
        self.trash_pic = PhotoImage(width=50, height=68,
                                    file="trash.png")
        self.canvas.create_image(1175, 450, image=self.trash_pic)
        self.staff_pic = PhotoImage(width=800, height=400,
                                    file="staff.png")
        self.canvas.create_image(650, 250, image=self.staff_pic,
tags="staff")
        self.canvas.create_text(75, 50, text="Note Bank",
                                font=cuter, justify=CENTER)
        self.canvas.create_text(325, 420, text="Lyrics Bank",
                                font=cuter, justify=CENTER)
        self.canvas.create_rectangle(10, 30, 225, 490)
        self.canvas.create_rectangle(250, 400, 1100, 490)
        self.canvas.create_window(330, 100, window=self.e1, width=30,
                                  tags="time_sig")
        self.canvas.create_window(330, 145, window=self.e2, width=30,
                                  tags="time_sig")
        # used for moving images
        self._drag_data = {"x": 0, "y": 0, "item": None}

    def cont(self, event):
        """Called to progress between activities and instructions"""
        self.counter += 1
        if self.counter == 1:
            self.back_button.grid(row=2, column=0)
            print('done')
        if self.counter in range(1, 5):  # instructions for composition
            self.instruction['text'] = compo_instructions[self.counter
- 1]
        if self.counter == 3:
            self.sample_img = PhotoImage(file="sample_1.png")
            self.sample = Label(image=self.sample_img, bg='white')
            self.sample.grid(row=1, column=0, columnspan=2)
        if self.counter == 4:
            self.sample.grid_forget()
        if self.counter == 5:  # set up composition
            self.canvas.grid(row=1, column=0, columnspan=2,
                             sticky=W + E, pady=10, padx=20)
            word_count = 20
```

```
            for word in compo_fillers[0]:
                self.canvas.create_text(400 + word_count, 455,
text=word,
                                        font=cuter, tags="lyric")
                word_count += 75
            self.instruction['text'] = compos[0]
            self.continue_button.destroy()
            self.back_button.grid_forget()
            self.continue_button = Button(text="I am done.",
                                          bg="springgreen")
            self.continue_button.grid(row=2, column=1)
            self.continue_button.bind('<ButtonPress-1>,'
self.change_text)
            self.continue_button.bind('<ButtonRelease-1>,' self.compo)
        if self.counter == 17:  # instructions for audio
            self.instruction['text'] = how_to_speak
        if self.counter == 18:
            self.instruction['text'] = how_to_record
            self.back_button.grid(row=2, column=0)
        if self.counter == 19:  # set up audio recordings
            self.back_button.grid_forget()
            self.instruction['text'] = words_to_record[0]
            self.continue_button.destroy()
            self.add_continue_button(event, "Continue", self.audio)
            self.continue_button.grid(row=2, column=2, padx=30)

            # add start, stop, and erase buttons
            self.start_button = Button(text="Record",
                                       bg="red", cursor='hand2')
            self.start_button.grid(row=2, column=1, padx=20)
            self.start_button.bind('<ButtonPress-1>,' self.recording)
            self.start_button.bind('<ButtonRelease-1>,' self.record)
            self.erase_button = Button(text="Start Over",
                                       bg="lightblue")
            self.erase_button.grid(row=2, column=0, padx=20, pady=20)
            self.erase_button.bind('<Button-1>,' self.erase_record)
        if self.counter == 63:  # move from recordings to judgments
            log_file = open(self.directory + "\\" + "record_list.txt",
'a+')
            '\n.'join(words_to_record)
            log_file.write('\n.'join(words_to_record))
            print('they used list ' + str(list_index))
            log_file.close()
            self.instruction['text'] = how_to_judge
        if self.counter == 64:  # set up judgments
            self.continue_button.destroy()
            self.instruction['text'] = "How many syllables are in the
word '" + \
                words_to_judge[0] + "'?"
            self.setup_entry(event)
        if self.counter == 129:  # how to end judgments
            user_answer = self.answer.get()
            log_file = open(self.directory + "\\" + self.judgment_file,
'a+')
            log_file.write(
                words_to_judge[self.counter - 65] + ": " + user_answer)
            log_file.write('\n')
```

```
            log_file.close()
            self.add_continue_button(
                event, "I understand, continue.", self.cont)
            self.answer_entry.destroy()
            self.instruction['text'] = intro_to_questionnaire
        if self.counter == 130:  # set up questionnaire
            self.setup_entry(event)
            self.continue_button.destroy()
            self.instruction['text'] = question_1

    def back(self, event):
        """Used to move backward in the activity"""
        if self.counter in range(1, 5) or self.counter == 18:
            self.counter = self.counter - 1
        if self.counter == 2:
            self.sample.grid_forget()
        if self.counter == 3:
            self.sample.grid(row=1, column=0, columnspan=2)
        if self.counter in range(1, 5):
            self.instruction['text'] = compo_instructions[self.counter
- 1]
        if self.counter == 0:
            self.back_button.grid_forget()
            self.instruction['text'] = first
        elif self.counter == 16:
            self.instruction['text'] = intro_to_recording
            self.back_button.grid_forget()
        elif self.counter == 17:
            self.instruction['text'] = how_to_speak
            self.back_button.grid_forget()
        elif self.counter == 60:
            self.instruction['text'] = intro_to_judgments

    def compo(self, event):
        """Used to progress through the composing part of the
activity"""
        self.counter += 1
        save_path = self.directory + "\\" + self.subject_number + \
            "_" + str(self.counter - 6) + ".ps"
        self.canvas.postscript(file=save_path)
        self.e2.delete(0, END)
        self.e1.delete(0, END)
        if self.counter in range(6, 16):
            self.continue_button['text'] = "I am done."
            self.instruction['text'] = compos[self.counter - 5]
            self.canvas.delete("lyric")
            self.canvas.delete("note")
            self.make_note_bank()
            word_count = 20
            for word in compo_fillers[self.counter - 5]:
                self.canvas.create_text(280 + word_count, 455,
text=word,
                                        font=cuter, tags="lyric")
                word_count += 80
        elif self.counter == 16:  # how to end composition
            self.canvas.grid_forget()
            self.continue_button['text'] = "I understand, continue."
```

```
            self.continue_button.unbind('<ButtonPress-1>')
            self.continue_button.unbind('<ButtonRelease-1>')
            self.continue_button.bind('<Button-1>,' self.cont)
            self.instruction['text'] = intro_to_recording

    def change_text(self, event):
        self.continue_button['text'] = "Saving..."

    def audio(self, event):
        """Used to progress through the recording portion"""
        self.counter += 1
        if self.counter in range(20, 62):
            self.start_button.configure(text='Record,' bg='red')
            self.instruction['text'] = words_to_record[self.counter -
19]
        if self.counter == 62:  # how to end audio
            self.continue_button.destroy()
            self.add_continue_button(
                event, "I understand, continue.", self.cont)
            self.instruction['text'] = intro_to_judgments
            self.start_button.destroy()
            self.erase_button.destroy()

    def recording(self, event):
        self.start_button['text'] = "Recording..."

    def record(self, event):
        """Records one word for 3 seconds"""
        self.start_button.configure(text="Record Finished.",
bg='tomato')
        self.record_count += 1
        self.p = pyaudio.PyAudio()
        self.stream = self.p.open(format=FORMAT,
                                  channels=CHANNELS,
                                  rate=RATE,
                                  input=True,
                                  frames_per_buffer=CHUNK)

        self.frames = []
        for i in range(0, int(RATE / CHUNK * RECORD_SECONDS)):
            data = self.stream.read(CHUNK)
            self.frames.append(data)
        self.stream.stop_stream()
        self.stream.close()
        self.p.terminate()
        file_name = "SUBJECT_" + self.subject_number + "_RECORDING_" +
\
            str(self.record_count) + "_WORD_" +
words_to_record[self.counter - 19] + ".wav"

        wf = wave.open(self.directory + "\\" + file_name, 'wb')
        wf.setnchannels(CHANNELS)
        wf.setsampwidth(self.p.get_sample_size(FORMAT))
        wf.setframerate(RATE)
        wf.writeframes(b'.'join(self.frames))
        wf.close()
```

```
    def erase_record(self, event):
        self.record_count -= 1
        self.start_button.configure(text='Record,' bg='red')

    def judgments(self, event):
        self.counter += 1
        self.continue_button.destroy()
        user_answer = self.answer.get()
        log_file = open(self.directory + "\\" + self.judgment_file,
'a+')
        log_file.write(words_to_judge[self.counter - 65] + ": " +
user_answer)
        log_file.write('\n')
        log_file.close()
        self.clear_field(event)
        if self.counter in range(65, 129):
            self.instruction['text'] = "How many syllables are in the
word '" + \
                words_to_judge[self.counter - 64] + "'"
        if self.counter == 128:
            self.answer_entry.bind('<Key-Return>,' self.cont)

    def questionnaire(self, event):
        self.counter += 1
        user_answer = self.answer.get()
        log_file = open(self.directory + "\\" + self.log_file_name,
'a+')
        log_file.write(user_answer)
        log_file.write('\n')
        log_file.close()
        self.clear_field(event)
        self.answer.set('')
        if self.counter == 137:
            self.instruction['text'] = finished
            self.answer_entry.destroy()
        elif self.counter in range(130, 137):
            self.instruction['text'] = questions[self.counter - 130]

    def add_back_button(self, event):
        self.back_button.grid(row=2, column=0)

    def add_continue_button(self, event, texts, binder):
        self.continue_button = Button(text=texts,
                                       bg="springgreen")
        self.continue_button.grid(row=2, column=1)
        self.continue_button.bind('<Button-1>,' binder)

    def setup_entry(self, event):
        self.answer_entry = Entry(bg='white,' justify='center')
        self.answer_entry.grid(row=2, column=0, columnspan=2)

        self.answer = StringVar()
        self.answer.set('(Enter text here)')
        self.answer_entry['textvariable'] = self.answer
        self.answer_entry.bind('<Button-1>,' self.clear_field)

        if self.counter == 64:
```

```
            self.answer_entry.bind('<Key-Return>,' self.judgments)
        elif self.counter == 130:
            self.answer_entry.bind('<Key-Return>,' self.questionnaire)

    def clear_field(self, event):
        self.answer.set('')

    def on_note_press(self, event):
        '''Begining drag of an object'''
        self.canvas.tag_raise("note")
        # record the item and its location
        self._drag_data["item"] = self.canvas.find_closest(event.x,
                                                           event.y)[0]
        self._drag_data["x"] = event.x
        self._drag_data["y"] = event.y
        self.make_note_bank()

    def on_lyric_press(self, event):
        # record the item and its location
        self._drag_data["item"] = self.canvas.find_closest(event.x,
event.y)[0]
        self._drag_data["x"] = event.x
        self._drag_data["y"] = event.y

    def on_note_release(self, event):
        '''End drag of an object'''
        if self._drag_data["x"] > (1100) and self._drag_data["y"] >
400:
            self.canvas.delete(self._drag_data["item"])
        # reset the drag information
        self._drag_data["item"] = None
        self._drag_data["x"] = 0
        self._drag_data["y"] = 0

    def on_lyric_release(self, event):
        '''this is a separate function so that ppl can't delete
lyrics'''
        self._drag_data["item"] = None
        self._drag_data["x"] = 0
        self._drag_data["y"] = 0

    def change_time_signature(self, event):
        time = self.e1.get()
        self.canvas.grid_forget(self.canvas.find_closest(event.x,
event.y)[0])
        self.canvas.create_text(event.x, event.y, text=time,
                                font=cuter, tags="time")

    def on_note_motion(self, event):
        '''Handle dragging of an object'''
        # compute how much the mouse has moved
        delta_x = event.x - self._drag_data["x"]
        delta_y = event.y - self._drag_data["y"]
        # move the object the appropriate amount
        self.canvas.move(self._drag_data["item"], delta_x, delta_y)
        # record the new position
        self._drag_data["x"] = event.x
```

```
        self._drag_data["y"] = event.y

    def make_note_bank(self):
        width_count = 40  # first row
        for im in self.canvas.wholes:
            self.canvas.create_image(width_count, 80 + 20, image=im,
                                     tag="note")
            width_count += 50
        width_count = 40  # second row
        for im in self.canvas.second:
            self.canvas.create_image(width_count, 80 * 2 + 20,
image=im,
                                     tag="note")
            width_count += 50
        width_count = 40
        for im in self.canvas.third:
            self.canvas.create_image(width_count, 80 * 3 + 20,
image=im,
                                     tag="note")
            width_count += 50

        width_count = 40
        for im in self.canvas.fourth:
            self.canvas.create_image(width_count, 80 * 4 + 20,
image=im,
                                     tag="note")
            width_count += 50

        width_count = 40
        for im in self.canvas.fifth:
            self.canvas.create_image(width_count, 80 * 5 + 20,
image=im,
                                     tag="note")
            width_count += 40


root = Tk()
cuter = font.Font(family="Arial", size=16, weight="normal")
cuter_big = font.Font(family="Elephant", size=20, weight="normal")
root.option_add("*Font", cuter)
app = App(master=root)
app.mainloop()
```

File: instructions_list

```
from making_test_lines import *
from random import shuffle
import numpy as np
import gen_sub_nums

# count = 0
first = (
    "Thank you for your willingness to participate in this study. All "
    "instructions will appear on screen, however you are welcome to ask
"
```

```
    "the researcher for clarification if something is unclear.  You
will "
    "NOT be recorded by any means unless explicitly stated. You may
stop "
    "participating at any time by letting the researcher know you do
not "
    "wish to continue.  You do not need to respond to any question you
do "
    "not want to.  Use the navigation buttons to progress through the "
    "activity.")

# count = 1
intro_to_music = (
    "The following is an activity in "
    "which you will see a line of text and "
    "an empty musical staff.  Your task is "
    "to compose a musical line to fit the "
    "given lyric.  Please spend no more than "
    "5 minutes on each line.  You can create"
    " your melody by dragging notes from the "
    "left onto the staff. Your composition will not be judged for its "
    "musicality or beauty. You are also welcome to use the piano
keyboard "
    "provided for you for this section if you find it helpful.")

# count = 2
splitting_words = (
    "The text will be displayed in a box below the staff. "
    "Drag the word from the box to above/below the note to which it "
    "corresponds. You MUST use ALL of the words"
    " provided IN ORDER.")

# count = 3
example_of_split = (
    "If you would like a word to span multiple notes, "
    "place the word underneath/above the FIRST note to which it "
    "corresponds. Place nothing underneath all following notes. Here is
an"
    " example of how a word should be split between"
    " multiple notes:")

# count = 4
finished_with_compose = (
    "If you need to delete a note, drag it into the "
    " trash box located in the right-bottom corner. When you are "
    "satisfied with your melody, select the 'I am done.' button at the
"
    "bottom of the screen.")

compo_instructions = [intro_to_music, splitting_words,
example_of_split,
                      finished_with_compose]

# count = 5-15
compo_1 = "all our dreams are done"
compo_2 = "take time to live out all you deserve"
compo_3 = "stoke the fire, I feel fine"
```

```
compo_4 = "dear little paper doll"
compo_5 = "while you conspire"
compo_6 = "you tire of being here"
compo_7 = "climb while you fall"
compo_8 = "require our hearts to heal"
compo_9 = "hire me to replace the car tire"
compo_10 = "fan the fire and fire the fanner"
compo_11 = "catch me on the line, new telephone wire now"

compos = [
    compo_1,
    compo_2,
    compo_3,
    compo_4,
    compo_5,
    compo_6,
    compo_7,
    compo_8,
    compo_9,
    compo_10,
    compo_11]
shuffle(compos)

words_from_compo = ['all,' 'our,' 'are,' 'time,' 'fire,' 'feel,'
'fine,'
                    'dear,' 'doll,' 'while,' 'conspire,' 'car,' 'tire,'
'here,'
                    'climb,' 'fall,' 'require,' 'heal,' 'hire,'
                    'tire,' 'line,' 'wire']

compo_fillers = []
for i in compos:
    compo_fillers.append(i.split())

# composings

# count = 16
intro_to_recording = (
    "You are finished with the composing portion of this "
    "activity. You are welcome to take a break if need be.  Click "
    "continue when you are ready.")

# count = 17
how_to_speak = (
    "For the next activity, you will be asked to "
    "read a line in English and speak it into the microphone. Speak "
    "naturally as if you were talking to a friend.")

# count = 18
how_to_record = (
    "The line to speak will be at the top of the screen. Press"
    " 'Record' to begin and 'Finish' to complete the recording.  When
you "
    "press finish, another line of text will appear for you to record.
If"
    " you wish to start a recording over again, press the 'Start Over'
"
```

```
    "button.  Press the 'Start' button when you are ready to start your
"
    "first recording.")

intro_to_judgments = (
    "You are finished with the recording portion of this "
    "activity. You are welcome to take a break if need be.  Click "
    "'Continue' when you are ready.")

how_to_judge = (
    "In the next activity, you will see a word in English at "
    "the top of the screen. In the text box, type the number of
syllables"
    " you think are in the word, then hit 'Enter' on the computer "
    "keyboard.  You will not be able to change your answers.")

# syllable judgments
"""three_syl_non = making_test_lines.listify('three_syl_non.txt')
three_syl_target = making_test_lines.listify('three_syl_target.txt')
two_syl_non = making_test_lines.listify('two_syl_non.txt')
two_syl_target = making_test_lines.listify('two_syl_target.txt')
one_syl_non = making_test_lines.listify('one_syl_non.txt')
one_syl_target = making_test_lines.listify('one_syl_target.txt')

all_judgments = three_syl_non + three_syl_target + two_syl_non +
two_syl_target + one_syl_non + one_syl_target
shuffle(all_judgments)

words_to_judge = np.random.choice(all_judgments,
                          10, replace=False)"""
list_a = listify('List_A.txt')
list_b = listify("List_B.txt")
list_c = listify("List_C.txt")
list_d = listify('List_D.txt')

lists = [list_a, list_b, list_c, list_d]

list_index = gen_sub_nums.which_list_to_use()

words_to_record = lists[list_index]

words_to_judge = words_to_record + words_from_compo

shuffle(words_to_judge)

# audio recordings
sents_to_record = words_to_judge

intro_to_questionnaire = (
    "You are finished with activity. Next we would "
    "like you to answer a couple questions.  If you wish to skip any "
    "question, just hit 'Enter' without typing a response.")

question_1 = "What is your native language?"
question_2 = "Do you speak any other languages?  If so list them
below."
question_3 = "Where were you born (country,state/province,city)?"
```

```
question_4 = "Where were you raised (country,state/province,city)?"
question_5 = "How long have you studied music composition/theory?"
question_6 = "What do you think we are testing with this study?"
question_7 = "Any other thoughts on the experiment?"

questions = [question_1, question_2, question_3, question_4,
             question_5, question_6, question_7]

finished = "Thank you.  Please let the researcher know you are
finished."
```

File: making_test_lines

```
from random import *


def listify(filename):
    log_file = open(filename)
    list_to_cat = []
    next = log_file.readline()
    while next != "":
        next = next[:-1]
        list_to_cat.append(next.lower())
        next = log_file.readline()
    shuffle(list_to_cat)
    return(list_to_cat)
```

File: gen_sub_nums

```
import os
from random import randint
from making_test_lines import *


def generate_subject_number():
    new_number = randint(0, 9999)
    bad_number = False
    with open('used_subject_numbers.txt,' 'a+') as openfileobject:
        for line in openfileobject:
            if line == str(new_number) + '\n':
                bad_number = True
        if bad_number:
            openfileobject.close()
            generate_subject_number()
            print('bad value')
        else:
            openfileobject.write(str(new_number) + '\n')
            openfileobject.close()
            return("{0:0=4d}".format(new_number))


def which_list_to_use():
    file = open('list_to_use.txt,' 'r+')
```

```
text = int(file.read())
file.close()
os.remove('list_to_use.txt')
count = (text + 1) % 4
new_file = open('list_to_use.txt,' 'w+')
new_file.write(str(count))
new_file.close()
return(count)
```

Appendix C: Questionnaire Responses

Questions:

1. *"What is your native language?"*
2. *"Do you speak any other languages? If so list them below."*
3. *"Where were you born (country,state/province,city)?"*
4. *"Where were you raised (country,state/province,city)?"*
5. *"How long have you studied music composition/theory?"*
6. *"What do you think we are testing with this study?"*
7. *"Any other thoughts on the experiment?"*

Subject 0056:

1. English
2. Very minimal Spanish
3. USA, UT, Salt Lake City
4. USA, UT, Murray
5. 4 years
6. The way we perceive sound and word structure
7. Not really, no. It was interesting

Subject 0071:

1. English
2. no
3. Utah
4. Salt Lake, Utah
5. 6
6. To see how many syllables are in the word
7. It's cool! Good luck

Subject 0197:

1. English
2. No
3. Ogden, Utah USA
4. Salt Lake City, Utah USA
5. 3 year
6. I have no idea

Subject 0221:

1. English
2. French; Italian; Spanish; German; Russian
3. Everett, Washington, USA
4. Marysville, WA & Idaha Falls, ID USA
5. 11 years
6. Language inflection as meausred by pitches in my compositions.
7. I'm interested to read the results. Especially your findings on the syllabification exercise.

Subject 0227:

1. English
2. Very poor Spanish
3. US, Georgia, Savannah
4. US, Georgia, Savannah and Utah, SLC
5. 6 years
6. Individual interpretation of words, in regard to musical perspective. Where emphasis is put on words, how this and the words themselves are conveyed musically, and maybe how this differs from person to person/composer to composer. Something like that.
7. Include natural accidental in note bank, hahaha. For some composers, time signature is very important, so that may be interesting to take into account as well in future tests. On a mental note, it

Subject 0290:

1. English
2. Portuguese
3. USA, Utah, Murray
4. USA, Utah, Sandy/Murray
5. 15 years
6. syllabication and intonation of English speech patterns

Subject 0370:

1. English
2. Arabic
3. Provo, Utah, USA
4. no
5. elementary and middle school
6. How people associate words with sounds
7. it was fun!

Subject 0594:

1. English
2.
3. South Korea, Seoul
4. United States
5. 1
6. connecting syllables to musical notes
7. Pretty interesting, although it'd be easier to do it on paper and with more space than the workspace on this program gave me

Subject 1609:

1. English
2. Some Mandarin, ASL
3. United States, UT, Lindon
4. United State, UT, Lindon
5. Not really, but I've been in choir since 7th grade, and now am in Chamber Choir so I know a lot but haven't formally studied it
6. Maybe the break up of syllables. Using music you could say "oh he broke fire into two notes, which means he probably thinks it has two syllables, but then in the reading and syllable counting, he gave a different response." Cause then you have three criterea to base how people think of syllables: musically, vocally, and in their heads-ally.
7. Does the musical line have anything to do with it? Or was the music part just a ruse to figure out if I know how many syllables fire has? (Also in the syllable counting, I put .5's on some words where I don't say them as a separate syllable but I would probably sing them that way, eg "My house is on fire." would have one syllable but when sung, "Like fire, dark fire..." each fire has two syllables.) And maybe if you make another survey thing, make the text box a little bigger because it's hard to see what I'm typing.

Subject 3714:

1. English
2. Partial Japanese
3. USA, CA, Lancaster
4. USA, CA, Thousand Oaks
5. 5-6 years
6. How language is intepreted through music.
7. Kind of fun to think about the idea behind this experiment.

Subject 3751:

1. english
2. Tongan
3. Salt Lake City, Utah
4. Utah, United States of America
5. 7 years
6. the pairing of language with music and how it functions or flows

Subject 3937:

1. English
2. Marshallese
3. USA, Utah, Salt Lake City
4. USA, Utah, Murray
5. 6 years
6. How people view certain words in that could be said with different number of syllables.
7. No

Subject 4476:

1. english
2. Hiligaynon
3. usa, st. louis missouri
4. usa, washington kennewick
5. 14 years
6. syllables
7. fun! also very interesting!

Subject 4605:

1. English
2. no
3. Canada, British Columbia, Kamloops
4. United States, Utah, Salt Lake City
5. 24 years
6. Intonation and rhythm of speech associated with culture
7. It may have been useful to have a full keyboard as well as instruction on whether to create a melody or a full staff of music

Subject 4688:

1. English, Spanish
2. Italian, French, Mandarin
3. USA, CA, San Diego
4. USA, CA, Chula Vista
5. 17 years
6. syllabic quality of "ambiguously syllabled" words
7. not that I can think of!

Subject 5531:

1. English
2. Chinese, ASL
3. American Fork, Utah, USA
4. Sandy, Utah, USA
5. 4 years
6. Where the peak of the musical phrase is versus the most significant part of the sentence
7. Not that I can think of

Subject 5991:

1. English
2. Vietnamese, Chinese
3. USA, CA/San Jose
4. Fremont
5. 6
6. something with linguistics
7. sara is the best and hope she can finish her thesis soon!!

Subject 6320:

1. Spanish & English
2. Besides those, a little French and Italian
3. Chile
4. Salt Lake City, Utah
5. 2 years
6. People's sense of harmony and rhythm with words
7. It showed me how fast I can come up with melodies.

Subject 7723:

1. English
2. German
3. philippines
4. USA, Utah
5. 3 years
6. Syllables
7. not really

Subject 8380

1. English
2. Esperanto
3. Ogden, Utah
4. USA, Utah, Roy
5. 3 years
6. Depending on how many notes are assigned to a single word gives clues as to how many syllables they are perceived to have.
7. Very interesting, would love to see the results!

Appendix D: Compiled data from text-setting experiment

TokenID	Subject	Word	Vowel	Coda	Count	Compo/ Judgment
1	0227	line	ai	n	2	c
2	0227	wire	ai	r	1	c
3	0227	fire	ai	r	1	c
4	0227	feel	i	l	1	c
5	0227	fine	ai	n	1	c
6	0227	dear	i	r	1	c
7	0227	doll	a	l	1	c
8	0227	hire	ai	r	1	c
9	0227	car	a	r	1	c
10	0227	tire	ai	r	2	c
11	0227	time	ai	m	1	c
12	0227	all	a	l	1	c
13	0227	climb	ai	m	1	c
14	0227	while	ai	l	1	c
15	0227	fall	a	l	1	c
16	0227	require	ai	r	2	c
17	0227	our	a	r	1	c
18	0227	heal	i	l	2	c
19	0227	fire	ai	r	2	c
20	0227	fire	ai	r	1	c
21	0227	while	ai	l	1	c
22	0227	conspire	ai	r	2	c
23	0227	all	a	l	1	c
24	0227	our	a	r	1	c
25	0227	are	a	r	1	c
26	0227	tire	ai	r	1	c
27	0227	here	i	r	1	c
28	0227	our	a	r	2	j
29	0227	tire	ai	r	2	j
30	0227	heal	i	l	1	j
31	0227	all	a	l	1	j
32	0227	while	ai	l	1	j
33	0227	our	a	r	1	j
34	0227	time	ai	m	1	j
35	0227	feel	i	l	1	j
36	0227	fall	a	l	1	j

37	0227	are	a	l	1	j
38	0227	doll	a	l	1	j
39	0227	dear	i	r	1	j
40	0227	our	a	r	2	j
41	0227	all	a	l	1	j
42	0227	while	ai	l	1	j
43	0227	climb	ai	m	2	j
44	0227	fire	ai	r	1	j
45	0227	here	i	r	1	j
46	0227	conspire	ai	r	3	j
47	0227	hire	ai	r	1	j
48	0227	all	a	l	1	j
49	4605	hire	ai	r	2	c
50	4605	car	a	r	1	c
51	4605	tire	ai	r	1	c
52	4605	tire	ai	r	1	c
53	4605	here	i	r	1	c
54	4605	line	ai	n	1	c
55	4605	wire	ai	r	2	c
56	4605	fire	ai	r	2	c
57	4605	fire	ai	r	1	c
58	4605	require	ai	r	3	c
59	4605	our	a	r	1	c
60	4605	heal	i	l	1	c
61	4605	dear	i	r	1	c
62	4605	doll	a	l	1	c
63	4605	fire	ai	r	1	c
64	4605	feel	i	l	1	c
65	4605	fine	ai	n	1	c
66	4605	climb	ai	m	1	c
67	4605	while	ai	l	2	c
68	4605	fall	a	l	1	c
69	4605	time	ai	m	1	c
70	4605	all	a	l	1	c
71	4605	all	a	l	1	c
72	4605	our	a	r	2	c
73	4605	are	a	r	2	c
74	4605	while	ai	l	1	c
75	4605	conspire	ai	r	2	c
76	4605	dear	i	r	2	j

77	4605	here	i	r	1	j
78	4605	our	a	r	2	j
79	4605	all	a	l	1	j
80	4605	are	a	r	1	j
81	4605	fall	a	l	1	j
82	4605	hire	ai	r	2	j
83	4605	doll	a	l	1	j
84	4605	tire	ai	r	2	j
85	4605	heal	i	l	2	j
86	4605	time	ai	m	1	j
87	4605	climb	ai	m	1	j
88	4605	feel	i	l	1	j
89	4605	fine	ai	n	1	j
90	4605	require	ai	r	3	j
91	4605	our	a	r	2	j
92	4605	while	ai	l	1	j
93	4605	all	a	l	1	j
94	4605	all	a	l	1	j
95	4605	conspire	ai	r	2	j
96	4605	our	a	r	1	j
97	4605	while	ai	l	1	j
98	4605	fire	ai	r	1	j
99	0594	tire	ai	r	1	c
100	0594	here	i	r	1	c
101	0594	while	ai	l	1	c
102	0594	conspire	ai	r	3	c
103	0594	hire	ai	r	2	c
104	0594	car	a	r	1	c
105	0594	tire	ai	r	2	c
106	0594	all	a	l	1	c
107	0594	time	ai	m	1	c
108	0594	dear	i	r	1	c
109	0594	doll	a	l	1	c
110	0594	climb	ai	m	1	c
111	0594	while	ai	l	1	c
112	0594	fall	a	l	1	c
113	0594	fire	ai	r	2	c
114	0594	fire	ai	r	2	c
115	0594	line	ai	n	1	c
116	0594	wire	ai	r	1	c

117	0594	fire	ai	r	1	c
118	0594	feel	i	l	1	c
119	0594	fine	ai	n	1	c
120	0594	all	a	l	1	c
121	0594	our	a	r	1	c
122	0594	are	a	r	1	c
123	0594	require	ai	r	3	c
124	0594	our	a	r	1	c
125	0594	heal	i	l	1	c
126	0594	fire	ai	r	2	j
127	0594	our	a	r	1	j
128	0594	hire	ai	r	2	j
129	0594	feel	i	l	1	j
130	0594	here	i	r	1	j
131	0594	fall	a	l	1	j
132	0594	conspire	ai	r	3	j
133	0594	dear	i	r	1	j
134	0594	all	a	l	1	j
135	0594	are	a	r	1	j
136	0594	tire	ai	r	2	j
137	0594	time	ai	m	1	j
138	0594	climb	ai	m	1	j
139	0594	while	ai	l	1	j
140	0594	while	ai	l	2	j
141	0594	heal	i	l	1	j
142	0594	feel	i	l	1	j
143	0594	doll	a	l	1	j
144	0594	all	a	l	1	j
145	0594	require	ai	r	3	j
146	0594	here	i	r	1	j
147	0594	our	a	r	1	j
148	0594	tire	ai	r	1	j
149	0594	fine	ai	n	1	j
150	1609	require	ai	r	2	c
151	1609	our	a	r	1	c
152	1609	heal	i	l	1	c
153	1609	climb	ai	m	2	c
154	1609	while	ai	l	1	c
155	1609	fall	a	l	1	c
156	1609	line	ai	n	1	c

157	1609	wire	ai	r	1	c
158	1609	fire	ai	r	1	c
159	1609	feel	i	l	1	c
160	1609	fine	ai	n	1	c
161	1609	dear	i	r	1	c
162	1609	doll	a	l	1	c
163	1609	fire	ai	r	1	c
164	1609	fire	ai	r	3	c
165	1609	time	ai	m	1	c
166	1609	all	a	l	1	c
167	1609	all	a	l	1	c
168	1609	our	a	r	1	c
169	1609	are	a	r	1	c
170	1609	hire	ai	r	2	c
171	1609	car	a	r	2	c
172	1609	tire	ai	r	1	c
173	1609	tire	ai	r	1	c
174	1609	here	i	r	1	c
175	1609	while	ai	l	1	c
176	1609	conspire	ai	r	2	c
177	1609	our	a	r	1	j
178	1609	while	ai	l	1	j
179	1609	while	ai	l	1	j
180	1609	feel	i	l	1	j
181	1609	are	a	r	1	j
182	1609	while	ai	l	1	j
183	1609	conspire	ai	r	2	j
184	1609	hire	ai	r	1	j
185	1609	dear	i	r	1	j
186	1609	fall	a	l	1	j
187	1609	heal	i	l	1	j
188	1609	fire	ai	r	1	j
189	1609	hire	ai	r	1	j
190	1609	our	a	r	1	j
191	1609	fire	ai	r	1	j
192	1609	all	a	l	1	j
193	1609	climb	ai	m	1	j
194	1609	require	ai	r	3	j
195	1609	fine	i	n	1	j
196	1609	time	ai	m	1	j

197	1609	doll	a	l	1	j
198	1609	line	ai	n	1	j
199	1609	here	i	r	1	j
200	1609	fine	ai	n	1	j
201	1609	tire	ai	r	1	j
202	1609	all	a	l	1	j
203	0221	fire	ai	r	1	c
204	0221	fire	ai	r	1	c
205	0221	time	ai	m	1	c
206	0221	all	a	l	1	c
207	0221	dear	i	r	1	c
208	0221	doll	a	l	1	c
209	0221	all	a	l	1	c
210	0221	our	a	r	1	c
211	0221	are	a	r	1	c
212	0221	while	ai	l	1	c
213	0221	conspire	ai	r	2	c
214	0221	hire	ai	r	1	c
215	0221	car	a	r	1	c
216	0221	tire	ai	r	1	c
217	0221	fire	ai	r	1	c
218	0221	feel	i	l	1	c
219	0221	fine	ai	n	1	c
220	0221	tire	ai	r	1	c
221	0221	here	i	r	1	c
222	0221	climb	ai	m	1	c
223	0221	while	ai	l	1	c
224	0221	fall	a	l	1	c
225	0221	line	ai	n	1	c
226	0221	wire	ai	r	2	c
227	0221	require	ai	r	2	c
228	0221	our	a	r	1	c
229	0221	heal	i	l	1	c
230	0221	feel	i	l	1	j
231	0221	fine	ai	n	2	j
232	0221	climb	ai	m	1	j
233	0221	fire	ai	r	1	j
234	0221	fall	a	l	1	j
235	0221	are	a	r	1	j
236	0221	doll	a	l	1	j

237	0221	while	ai	l	1	j
238	0221	while	ai	l	1	j
239	0221	heal	i	l	1	j
240	0221	all	a	l	1	j
241	0221	all	a	l	1	j
242	0221	while	ai	l	1	j
243	0221	our	a	r	1	j
244	0221	conspire	ai	r	2	j
245	0221	fine	ai	n	1	j
246	0221	hire	ai	r	1	j
247	0221	here	i	r	1	j
248	0221	our	a	r	1	j
249	0221	tire	ai	r	1	j
250	0221	fire	ai	r	1	j
251	0221	time	ai	m	1	j
252	0221	require	ai	r	2	j
253	0221	line	ai	n	1	j
254	0221	dear	i	r	1	j
255	0221	hire	ai	r	1	j
256	6320	while	ai	l	1	c
257	6320	conspire	ai	r	2	c
258	6320	time	ai	m	1	c
259	6320	all	a	l	1	c
260	6320	line	ai	n	1	c
261	6320	wire	ai	r	2	c
262	6320	fire	ai	r	1	c
263	6320	fire	ai	r	1	c
264	6320	tire	ai	r	1	c
265	6320	here	i	r	1	c
266	6320	fire	ai	r	1	c
267	6320	feel	i	l	1	c
268	6320	fine	ai	n	1	c
269	6320	climb	ai	m	1	c
270	6320	while	ai	l	1	c
271	6320	fall	a	l	1	c
272	6320	all	a	l	1	c
273	6320	our	a	r	1	c
274	6320	are	a	r	1	c
275	6320	require	ai	r	2	c
276	6320	our	a	r	1	c

277	6320	heal	i	l	1	c
278	6320	hire	ai	r	1	c
279	6320	car	a	r	1	c
280	6320	tire	ai	r	2	c
281	6320	dear	i	r	1	c
282	6320	doll	a	l	1	c
283	6320	fall	a	l	1	j
284	6320	are	a	r	1	j
285	6320	while	ai	l	1	j
286	6320	hire	ai	r	1	j
287	6320	all	a	l	1	j
288	6320	dear	i	r	1	j
289	6320	fire	ai	r	1	j
290	6320	doll	a	l	1	j
291	6320	while	ai	l	1	j
292	6320	climb	ai	m	1	j
293	6320	all	a	l	1	j
294	6320	tire	ai	r	1	j
295	6320	here	i	r	1	j
296	6320	tire	ai	r	1	j
297	6320	fine	ai	n	1	j
298	6320	here	i	r	1	j
299	6320	heal	i	l	1	j
300	6320	require	ai	r	2	j
301	6320	conspire	ai	r	2	j
302	6320	feel	i	l	1	j
303	6320	our	a	r	1	j
304	6320	our	a	r	1	j
305	6320	feel	i	l	1	j
306	6320	time	ai	m	1	j
307	8380	line	ai	n	1	c
308	8380	wire	ai	r	2	c
309	8380	time	ai	m	1	c
310	8380	all	a	l	1	c
311	8380	while	ai	l	2	c
312	8380	conspire	ai	r	3	c
313	8380	require	ai	r	3	c
314	8380	our	a	r	1	c
315	8380	heal	i	l	2	c
316	8380	hire	ai	r	2	c

317	8380	car	a	r	1	c
318	8380	tire	ai	r	1	c
319	8380	fire	ai	r	1	c
320	8380	feel	i	l	1	c
321	8380	fine	ai	n	1	c
322	8380	dear	i	r	1	c
323	8380	doll	a	l	1	c
324	8380	fire	ai	r	1	c
325	8380	fire	ai	r	2	c
326	8380	all	a	l	1	c
327	8380	our	a	r	2	c
328	8380	are	a	r	1	c
329	8380	climb	ai	m	1	c
330	8380	while	ai	l	1	c
331	8380	fall	a	l	1	c
332	8380	tire	ai	r	1	c
333	8380	here	i	r	1	c
334	8380	doll	a	l	1	j
335	8380	time	ai	m	1	j
336	8380	our	a	r	1	j
337	8380	all	a	l	1	j
338	8380	feel	i	l	1	j
339	8380	are	a	r	1	j
340	8380	while	ai	l	1	j
341	8380	tire	ai	r	1	j
342	8380	our	a	r	1	j
343	8380	conspire	ai	r	2	j
344	8380	climb	ai	m	1	j
345	8380	fire	ai	r	1	j
346	8380	hire	ai	r	1	j
347	8380	all	a	l	1	j
348	8380	fall	a	l	1	j
349	8380	heal	i	l	1	j
350	8380	our	a	r	1	j
351	8380	while	ai	l	1	j
352	8380	here	i	r	1	j
353	8380	require	ai	r	2	j
354	8380	all	a	l	1	j
355	8380	fine	ai	n	1	j
356	0056	dear	i	r	1	c

357	0056	doll	a	l	1	c
358	0056	fire	ai	r	1	c
359	0056	fire	ai	r	2	c
360	0056	hire	ai	r	2	c
361	0056	car	a	r	1	c
362	0056	tire	ai	r	1	c
363	0056	time	ai	m	1	c
364	0056	all	a	l	1	c
365	0056	fire	ai	r	1	c
366	0056	feel	i	l	1	c
367	0056	fine	ai	n	1	c
368	0056	require	ai	r	3	c
369	0056	our	a	r	1	c
370	0056	heal	i	l	1	c
371	0056	all	a	l	1	c
372	0056	our	a	r	1	c
373	0056	are	a	r	1	c
374	0056	line	ai	n	1	c
375	0056	wire	ai	r	1	c
376	0056	climb	ai	m	1	c
377	0056	while	ai	l	1	c
378	0056	fall	a	l	1	c
379	0056	tire	ai	r	1	c
380	0056	here	i	r	1	c
381	0056	while	ai	l	1	c
382	0056	conspire	ai	r	2	c
383	0056	fire	ai	r	1	j
384	0056	doll	a	l	1	j
385	0056	are	a	r	1	j
386	0056	fine	ai	n	1	j
387	0056	here	i	r	1	j
388	0056	tire	ai	r	1	j
389	0056	require	ai	r	2	j
390	0056	while	ai	l	1	j
391	0056	time	ai	m	1	j
392	0056	dear	i	r	1	j
393	0056	heal	i	l	1	j
394	0056	while	ai	l	1	j
395	0056	all	a	l	1	j
396	0056	fall	a	l	1	j

397	0056	all	a	l	1	j
398	0056	conspire	ai	r	2	j
399	0056	feel	i	l	1	j
400	0056	our	a	r	1	j
401	0056	hire	ai	r	1	j
402	0056	our	a	r	1	j
403	0056	all	a	l	1	j
404	0056	our	a	r	1	j
405	0056	climb	ai	m	1	j
406	0071	while	ai	l	1	c
407	0071	conspire	ai	r	3	c
408	0071	line	ai	n	1	c
409	0071	wire	ai	r	2	c
410	0071	dear	i	r	1	c
411	0071	doll	o	l	1	c
412	0071	hire	ai	r	1	c
413	0071	car	a	r	1	c
414	0071	tire	ai	r	1	c
415	0071	time	ai	m	1	c
416	0071	all	a	l	1	c
417	0071	climb	ai	m	1	c
418	0071	while	ai	l	1	c
419	0071	fall	a	l	1	c
420	0071	all	a	l	1	c
421	0071	our	a	r	2	c
422	0071	are	a	r	2	c
423	0071	fire	ai	r	2	c
424	0071	fire	ai	r	1	c
425	0071	tire	ai	r	1	c
426	0071	here	i	r	4	c
427	0071	require	ai	r	2	c
428	0071	our	a	r	2	c
429	0071	heal	i	l	1	c
430	0071	fire	ai	r	2	c
431	0071	feel	i	l	1	c
432	0071	fine	ai	n	1	c
433	0071	doll	a	l	1	j
434	0071	time	ai	m	1	j
435	0071	climb	ai	m	1	j
436	0071	all	a	l	1	j

437	0071	tire	ai	r	1	j
438	0071	our	a	r	1	j
439	0071	dear	i	r	1	j
440	0071	conspire	ai	r	2	j
441	0071	all	a	l	1	j
442	0071	while	ai	l	1	j
443	0071	fine	ai	n	1	j
444	0071	fall	a	l	1	j
445	0071	require	ai	r	2	j
446	0071	are	a	r	1	j
447	0071	tire	ai	r	1	j
448	0071	heal	i	l	1	j
449	0071	hire	ai	r	1	j
450	0071	here	i	r	1	j
451	0071	our	a	r	1	j
452	0071	feel	i	l	1	j
453	0071	feel	i	l	1	j
454	0071	while	ai	l	1	j
455	0071	fire	ai	r	1	j
456	0071	here	i	r	1	j
457	0197	our	a	r	1	c
458	0197	are	a	r	1	c
459	0197	all	a	l	1	c
460	0197	fire	ai	r	1	c
461	0197	fire	ai	r	1	c
462	0197	require	ai	r	2	c
463	0197	our	a	r	1	c
464	0197	heal	i	l	1	c
465	0197	here	i	r	1	c
466	0197	tire	ai	r	1	c
467	0197	all	a	l	1	c
468	0197	time	ai	m	1	c
469	0197	dear	i	r	1	c
470	0197	doll	a	l	1	c
471	0197	while	ai	l	1	c
472	0197	conspire	ai	r	2	c
473	0197	hire	ai	r	1	c
474	0197	car	a	r	1	c
475	0197	tire	ai	r	1	c
476	0197	climb	ai	m	1	c

477	0197	while	ai	l	1	c
478	0197	fall	a	l	1	c
479	0197	line	ai	n	1	c
480	0197	wire	ai	r	1	c
481	0197	fire	ai	r	1	c
482	0197	feel	i	l	1	c
483	0197	fine	ai	n	1	c
484	0197	our	a	r	1	j
485	0197	time	ai	m	1	j
486	0197	hire	ai	r	1	j
487	0197	while	ai	l	1	j
488	0197	fine	ai	n	1	j
489	0197	fine	ai	n	1	j
490	0197	fire	ai	r	1	j
491	0197	while	ai	l	1	j
492	0197	fire	ai	r	1	j
493	0197	doll	a	l	1	j
494	0197	feel	i	l	1	j
495	0197	conspire	ai	r	2	j
496	0197	heal	i	l	1	j
497	0197	our	a	r	1	j
498	0197	all	a	l	1	j
499	0197	hire	ai	r	1	j
500	0197	line	ai	n	1	j
501	0197	here	i	r	1	j
502	0197	require	ai	r	2	j
503	0197	tire	ai	r	2	j
504	0197	all	a	l	1	j
505	0197	dear	i	r	1	j
506	0197	fall	a	l	1	j
507	0197	climb	ai	m	1	j
508	0197	while	ai	l	2	j
509	0197	are	a	r	1	j
510	0290	hire	ai	r	2	c
511	0290	car	a	r	1	c
512	0290	tire	ai	r	1	c
513	0290	fire	ai	r	2	c
514	0290	feel	i	l	1	c
515	0290	fine	ai	n	1	c
516	0290	while	ai	l	1	c

517	0290	conspire	ai	r	3	c
518	0290	fire	ai	r	1	c
519	0290	fire	ai	r	1	c
520	0290	dear	i	r	1	c
521	0290	doll	a	l	1	c
522	0290	tire	ai	r	2	c
523	0290	here	i	r	1	c
524	0290	climb	ai	m	1	c
525	0290	while	ai	l	1	c
526	0290	fall	a	l	1	c
527	0290	line	ai	n	1	c
528	0290	wire	ai	r	2	c
529	0290	time	ai	m	1	c
530	0290	all	a	l	1	c
531	0290	require	ai	r	3	c
532	0290	our	a	r	1	c
533	0290	heal	i	l	1	c
534	0290	all	a	l	1	c
535	0290	our	a	r	1	c
536	0290	are	a	r	1	c
537	0290	time	ai	m	1	j
538	0290	hire	ai	r	2	j
539	0290	heal	i	l	1	j
540	0290	while	ai	l	1	j
541	0290	all	a	l	1	j
542	0290	climb	ai	m	1	j
543	0290	tire	ai	r	2	j
544	0290	all	a	l	1	j
545	0290	conspire	ai	r	3	j
546	0290	our	a	r	1	j
547	0290	fire	ai	r	2	j
548	0290	fine	ai	n	1	j
549	0290	tire	ai	r	2	j
550	0290	here	i	r	1	j
551	0290	our	a	r	1	j
552	0290	feel	i	l	1	j
553	0290	dear	i	r	1	j
554	0290	are	a	r	1	j
555	0290	doll	a	l	1	j
556	0290	here	i	r	1	j

557	0290	require	ai	r	3	j
558	0290	feel	i	l	1	j
559	0290	fall	a	l	1	j
560	0290	while	ai	l	1	j
561	0370	climb	ai	m	1	c
562	0370	while	ai	l	1	c
563	0370	fall	a	l	1	c
564	0370	require	ai	r	2	c
565	0370	our	a	r	1	c
566	0370	heal	i	l	1	c
567	0370	line	ai	n	2	c
568	0370	wire	ai	r	0	c
569	0370	dear	i	r	1	c
570	0370	doll	a	l	1	c
571	0370	all	a	l	1	c
572	0370	our	a	r	1	c
573	0370	are	a	r	1	c
574	0370	while	ai	l	1	c
575	0370	conspire	ai	r	3	c
576	0370	hire	ai	r	1	c
577	0370	car	a	r	1	c
578	0370	tire	ai	r	1	c
579	0370	tire	ai	r	1	c
580	0370	here	i	r	1	c
581	0370	time	ai	m	1	c
582	0370	all	a	l	1	c
583	0370	fire	ai	r	1	c
584	0370	feel	i	l	1	c
585	0370	fine	ai	n	1	c
586	0370	fire	ai	r	1	c
587	0370	fire	ai	r	1	c
588	0370	all	a	l	1	j
589	0370	dear	i	r	1	j
590	0370	feel	i	l	1	j
591	0370	time	ai	m	1	j
592	0370	all	a	l	1	j
593	0370	our	a	r	1	j
594	0370	our	a	r	1	j
595	0370	here	i	r	1	j
596	0370	hire	ai	r	2	j

597	0370	tire	ai	r	2	j
598	0370	are	a	r	1	j
599	0370	our	a	r	1	j
600	0370	while	ai	l	1	j
601	0370	fine	ai	n	1	j
602	0370	all	a	l	1	j
603	0370	while	ai	l	1	j
604	0370	fire	ai	r	1	j
605	0370	climb	ai	m	1	j
606	0370	heal	i	l	1	j
607	0370	conspire	ai	r	2	j
608	0370	fall	a	l	1	j
609	0370	require	ai	r	3	j
610	0370	doll	a	l	1	j
611	4476	climb	ai	m	1	c
612	4476	while	ai	l	1	c
613	4476	fall	a	l	1	c
614	4476	dear	i	r	1	c
615	4476	doll	a	l	1	c
616	4476	while	ai	l	1	c
617	4476	conspire	ai	r	4	c
618	4476	all	a	l	1	c
619	4476	our	a	r	1	c
620	4476	are	a	r	1	c
621	4476	fire	ai	r	3	c
622	4476	feel	i	l	1	c
623	4476	fine	ai	n	2	c
624	4476	tire	ai	r	2	c
625	4476	here	i	r	1	c
626	4476	line	ai	n	1	c
627	4476	wire	ai	r	1	c
628	4476	time	ai	m	1	c
629	4476	all	a	l	1	c
630	4476	fire	ai	r	1	c
631	4476	fire	ai	r	1	c
632	4476	require	ai	r	2	c
633	4476	our	a	r	1	c
634	4476	heal	i	l	1	c
635	4476	hire	ai	r	3	c
636	4476	car	a	r	1	c

637	4476	tire	ai	r	1	c
638	4476	fire	ai	r	1	j
639	4476	fire	ai	r	1	j
640	4476	climb	ai	m	1	j
641	4476	our	a	r	1	j
642	4476	dear	i	r	1	j
643	4476	heal	i	l	1	j
644	4476	doll	a	l	1	j
645	4476	doll	a	l	1	j
646	4476	fine	ai	n	1	j
647	4476	while	ai	l	1	j
648	4476	here	i	r	1	j
649	4476	all	a	l	1	j
650	4476	hire	ai	r	1	j
651	4476	while	ai	l	1	j
652	4476	all	a	l	1	j
653	4476	conspire	ai	r	2	j
654	4476	time	ai	m	1	j
655	4476	feel	i	l	1	j
656	4476	fall	a	l	1	j
657	4476	require	ai	r	2	j
658	4476	are	a	r	1	j
659	4476	our	a	r	1	j
660	4476	tire	ai	r	1	j
661	4688	line	ai	n	1	c
662	4688	wire	ai	r	2	c
663	4688	require	ai	r	2	c
664	4688	our	a	r	1	c
665	4688	heal	i	l	1	c
666	4688	fire	ai	r	1	c
667	4688	feel	i	l	1	c
668	4688	fine	ai	n	1	c
669	4688	all	a	l	1	c
670	4688	our	a	r	1	c
671	4688	are	a	r	1	c
672	4688	fire	ai	r	2	c
673	4688	fire	ai	r	2	c
674	4688	climb	ai	m	1	c
675	4688	while	ai	l	1	c
676	4688	fall	a	l	1	c

677	4688	hire	ai	r	1	c
678	4688	car	a	r	1	c
679	4688	tire	ai	r	1	c
680	4688	while	ai	l	2	c
681	4688	conspire	ai	r	3	c
682	4688	dear	i	r	1	c
683	4688	doll	a	l	1	c
684	4688	time	ai	m	1	c
685	4688	all	a	l	1	c
686	4688	tire	ai	r	1	c
687	4688	here	i	r	1	c
688	4688	our	a	r	2	j
689	4688	all	a	l	1	j
690	4688	fire	ai	r	2	j
691	4688	here	i	r	1	j
692	4688	our	a	r	2	j
693	4688	while	ai	l	2	j
694	4688	feel	i	l	1	j
695	4688	require	ai	r	3	j
696	4688	tire	ai	r	2	j
697	4688	time	ai	m	1	j
698	4688	dear	i	r	1	j
699	4688	hire	ai	r	2	j
700	4688	climb	ai	m	1	j
701	4688	all	a	l	1	j
702	4688	conspire	ai	r	3	j
703	4688	fine	ai	n	1	j
704	4688	fall	a	l	1	j
705	4688	are	a	r	1	j
706	4688	fire	ai	r	2	j
707	4688	heal	i	l	1	j
708	4688	doll	a	l	1	j
709	4688	while	ai	l	2	j
710	4688	doll	a	l	1	j
711	3751	hire	ai	r	2	c
712	3751	car	a	r	1	c
713	3751	tire	ai	r	1	c
714	3751	dear	i	r	1	c
715	3751	doll	a	l	1	c
716	3751	all	a	l	1	c

717	3751	our	a	r	1	c
718	3751	are	a	r	1	c
719	3751	require	ai	r	2	c
720	3751	our	a	r	1	c
721	3751	heal	i	l	1	c
722	3751	climb	ai	m	2	c
723	3751	while	ai	l	1	c
724	3751	fall	a	l	1	c
725	3751	fire	ai	r	1	c
726	3751	fire	ai	r	1	c
727	3751	time	ai	m	1	c
728	3751	all	a	l	1	c
729	3751	fire	ai	r	1	c
730	3751	feel	i	l	1	c
731	3751	fine	ai	n	1	c
732	3751	line	ai	n	1	c
733	3751	wire	ai	r	1	c
734	3751	tire	ai	r	2	c
735	3751	here	i	r	1	c
736	3751	while	ai	l	1	c
737	3751	conspire	ai	r	2	c
738	3751	our	a	r	1	j
739	3751	all	a	l	1	j
740	3751	fire	ai	r	1	j
741	3751	here	i	r	1	j
742	3751	dear	i	r	1	j
743	3751	time	ai	m	1	j
744	3751	while	ai	l	1	j
745	3751	all	a	l	1	j
746	3751	feel	i	l	1	j
747	3751	are	a	r	1	j
748	3751	climb	ai	m	1	j
749	3751	fall	a	l	1	j
750	3751	tire	ai	r	1	j
751	3751	doll	a	l	1	j
752	3751	heal	i	l	1	j
753	3751	here	i	r	1	j
754	3751	hire	ai	r	1	j
755	3751	fine	ai	n	1	j
756	3751	tire	ai	r	1	j

757	3751	our	a	r	1	j
758	3751	conspire	ai	r	2	j
759	3751	while	ai	l	1	j
760	3937	time	ai	m	1	c
761	3937	all	a	l	1	c
762	3937	tire	ai	r	1	c
763	3937	here	i	r	1	c
764	3937	require	ai	r	3	c
765	3937	our	a	r	1	c
766	3937	heal	i	l	2	c
767	3937	fire	ai	r	1	c
768	3937	fire	ai	r	1	c
769	3937	while	ai	l	1	c
770	3937	conspire	ai	r	3	c
771	3937	dear	i	r	1	c
772	3937	doll	a	l	1	c
773	3937	fire	ai	r	2	c
774	3937	feel	i	l	1	c
775	3937	fine	ai	n	1	c
776	3937	hire	ai	r	2	c
777	3937	car	a	r	1	c
778	3937	tire	ai	r	1	c
779	3937	line	ai	n	1	c
780	3937	wire	ai	r	2	c
781	3937	climb	ai	m	1	c
782	3937	while	ai	l	1	c
783	3937	fall	a	l	1	c
784	3937	all	a	l	1	c
785	3937	our	a	r	1	c
786	3937	are	a	r	1	c
787	3937	line	ai	n	1	j
788	3937	all	a	l	1	j
789	3937	here	i	r	1	j
790	3937	dear	i	r	2	j
791	3937	all	a	l	1	j
792	3937	our	a	r	2	j
793	3937	fine	ai	n	1	j
794	3937	are	a	r	1	j
795	3937	heal	i	l	2	j
796	3937	hire	ai	r	2	j

797	3937	fine	ai	n	1	j
798	3937	feel	i	l	1	j
799	3937	time	ai	m	1	j
800	3937	while	ai	l	1	j
801	3937	our	a	r	2	j
802	3937	tire	ai	r	1	j
803	3937	fire	ai	r	1	j
804	3937	while	ai	l	2	j
805	3937	while	ai	l	2	j
806	3937	fire	ai	r	1	j
807	3937	fall	a	l	1	j
808	3937	doll	a	l	1	j
809	3937	require	ai	r	3	j
810	3937	climb	ai	m	1	j
811	3937	conspire	ai	r	2	j
812	5531	require	ai	r	2	c
813	5531	our	a	r	1	c
814	5531	heal	i	l	1	c
815	5531	tire	ai	r	1	c
816	5531	here	i	r	1	c
817	5531	all	a	l	2	c
818	5531	our	a	r	1	c
819	5531	are	a	r	1	c
820	5531	while	ai	l	1	c
821	5531	conspire	ai	r	2	c
822	5531	line	ai	n	1	c
823	5531	wire	ai	r	2	c
824	5531	climb	ai	m	6	c
825	5531	while	ai	l	1	c
826	5531	fall	a	l	1	c
827	5531	fire	ai	r	2	c
828	5531	feel	i	l	1	c
829	5531	fine	ai	n	2	c
830	5531	hire	ai	r	2	c
831	5531	car	a	r	1	c
832	5531	tire	ai	r	3	c
833	5531	time	ai	m	1	c
834	5531	all	a	l	1	c
835	5531	fire	ai	r	3	c
836	5531	fire	ai	r	1	c

837	5531	dear	i	r	1	c
838	5531	doll	a	l	1	c
839	5531	doll	a	l	1	j
840	5531	conspire	ai	r	2	j
841	5531	require	ai	r	2	j
842	5531	our	a	r	1	j
843	5531	our	a	r	1	j
844	5531	all	a	l	1	j
845	5531	all	a	l	1	j
846	5531	while	ai	l	1	j
847	5531	fine	ai	n	1	j
848	5531	heal	i	l	1	j
849	5531	climb	ai	m	1	j
850	5531	feel	i	l	1	j
851	5531	fall	a	l	1	j
852	5531	doll	a	l	1	j
853	5531	hire	ai	r	1	j
854	5531	fire	ai	r	1	j
855	5531	dear	i	r	1	j
856	5531	fire	i	r	1	j
857	5531	tire	ai	r	1	j
858	5531	time	ai	m	1	j
859	5531	while	ai	l	1	j
860	5531	here	i	r	1	j
861	5531	are	a	r	1	j
862	5991	all	a	l	1	c
863	5991	our	a	r	1	c
864	5991	are	a	r	1	c
865	5991	require	ai	r	1	c
866	5991	our	a	r	1	c
867	5991	heal	i	l	1	c
868	5991	hire	ai	r	1	c
869	5991	car	a	r	1	c
870	5991	tire	ai	r	1	c
871	5991	climb	ai	m	1	c
872	5991	while	ai	l	1	c
873	5991	fall	a	l	1	c
874	5991	dear	i	r	1	c
875	5991	doll	a	l	1	c
876	5991	while	ai	l	1	c

877	5991	conspire	ai	r	3	c
878	5991	fire	ai	r	1	c
879	5991	feel	i	l	1	c
880	5991	fine	ai	n	1	c
881	5991	time	ai	m	1	c
882	5991	all	a	l	1	c
883	5991	fire	ai	r	1	c
884	5991	fire	ai	r	1	c
885	5991	tire	ai	r	1	c
886	5991	here	i	r	1	c
887	5991	line	ai	n	1	c
888	5991	wire	ai	r	1	c
889	5991	all	a	l	1	j
890	5991	fine	ai	n	1	j
891	5991	here	i	r	1	j
892	5991	all	a	l	1	j
893	5991	heal	i	l	2	j
894	5991	doll	a	l	1	j
895	5991	doll	a	l	1	j
896	5991	dear	i	r	2	j
897	5991	fire	ai	r	2	j
898	5991	while	ai	l	2	j
899	5991	hire	ai	r	2	j
900	5991	time	ai	m	2	j
901	5991	our	a	r	2	j
902	5991	while	ai	l	2	j
903	5991	fall	a	l	1	j
904	5991	our	a	r	1	j
905	5991	require	ai	r	3	j
906	5991	fire	ai	r	2	j
907	5991	conspire	ai	r	3	j
908	5991	climb	ai	m	1	j
909	5991	tire	ai	r	2	j
910	5991	are	a	r	1	j
911	5991	feel	i	l	2	j
912	7723	line	ai	n	1	c
913	7723	wire	ai	r	1	c
914	7723	fire	ai	r	2	c
915	7723	fire	ai	r	1	c
916	7723	time	ai	m	1	c

917	7723	all	a	l	1	c
918	7723	dear	i	r	2	c
919	7723	doll	a	l	1	c
920	7723	hire	ai	r	2	c
921	7723	car	a	r	1	c
922	7723	tire	ai	r	1	c
923	7723	climb	ai	m	3	c
924	7723	while	ai	l	1	c
925	7723	fall	a	l	1	c
926	7723	fire	ai	r	1	c
927	7723	feel	i	l	1	c
928	7723	fine	ai	n	1	c
929	7723	while	ai	l	1	c
930	7723	conspire	ai	r	3	c
931	7723	require	ai	r	2	c
932	7723	our	a	r	1	c
933	7723	heal	i	l	1	c
934	7723	tire	ai	r	1	c
935	7723	here	i	r	1	c
936	7723	all	a	l	1	c
937	7723	our	a	r	1	c
938	7723	are	a	r	1	c
939	7723	require	ai	r	2	j
940	7723	tire	ai	r	2	j
941	7723	fire	ai	r	1	j
942	7723	our	a	r	1	j
943	7723	climb	ai	m	1	j
944	7723	our	a	r	1	j
945	7723	all	a	l	1	j
946	7723	dear	i	r	1	j
947	7723	time	ai	m	1	j
948	7723	heal	i	l	1	j
949	7723	here	i	r	1	j
950	7723	while	ai	l	1	j
951	7723	our	a	r	1	j
952	7723	feel	i	l	1	j
953	7723	while	ai	l	12	j
954	7723	fall	a	l	1	j
955	7723	doll	a	l	1	j
956	7723	hire	ai	r	2	j

957	7723	all	a	l	1	j
958	7723	fine	ai	n	1	j
959	7723	conspire	ai	r	2	j
960	7723	are	a	r	1	j
961	7723	all	a	l	1	j
962	3714	time	ai	m	1	c
963	3714	all	a	l	1	c
964	3714	line	ai	n	1	c
965	3714	wire	ai	r	1	c
966	3714	tire	ai	r	2	c
967	3714	here	i	r	1	c
968	3714	dear	i	r	1	c
969	3714	doll	a	l	1	c
970	3714	climb	ai	m	1	c
971	3714	while	ai	l	1	c
972	3714	fall	a	l	1	c
973	3714	all	a	l	1	c
974	3714	our	a	r	1	c
975	3714	are	a	r	1	c
976	3714	fire	ai	r	1	c
977	3714	feel	i	l	1	c
978	3714	fine	ai	n	1	c
979	3714	require	ai	r	2	c
980	3714	our	a	r	1	c
981	3714	heal	i	l	1	c
982	3714	while	ai	l	2	c
983	3714	conspire	ai	r	2	c
984	3714	hire	ai	r	2	c
985	3714	car	a	r	1	c
986	3714	tire	ai	r	2	c
987	3714	fire	ai	r	1	c
988	3714	fire	ai	r	1	c
989	3714	here	i	r	1	j
990	3714	fall	a	l	1	j
991	3714	climb	ai	m	1	j
992	3714	tire	ai	r	2	j
993	3714	time	ai	m	1	j
994	3714	all	a	l	1	j
995	3714	fine	ai	n	1	j
996	3714	dear	i	r	1	j

997	3714	heal	i	l	1	j
998	3714	our	a	r	2	j
999	3714	feel	i	l	1	j
1000	3714	wire	ai	r	2	j
1001	3714	car	a	r	1	j
1002	3714	are	a	r	1	j
1003	3714	conspire	ai	r	3	j
1004	3714	while	ai	l	2	j
1005	3714	require	ai	r	3	j
1006	3714	doll	a	l	1	j
1007	3714	fire	ai	r	2	j
1008	3714	hire	ai	r	2	j
1009	3714	fire	ai	r	2	j
1010	3714	while	ai	l	1	j
1011	3714	line	ai	n	1	j
1012	3714	hire	ai	r	1	j
1013	3714	fine	ai	n	1	j
1014	3714	line	ai	n	1	j
1015	3714	tire	ai	r	1	j

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