A TURKISH DATABASE FOR PSYCHOLINGUISTIC STUDIES: A CORPUS BASED STUDY ON FREQUENCY, AGE OF ACQUISITION, AND IMAGEABILITY

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

A TURKISH DATABASE FOR PSYCHOLINGUISTIC STUDIES: A CORPUS BASED STUDY ON FREQUENCY, AGE OF ACQUISITION, AND IMAGEABILITY

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Psycholinguistic databases are reliable and practical sources for research purposes, since they provide standardized stimuli for scientific studies. The objective of the present thesis is to initiate a Turkish psycholinguistic database. Three variables are included in addition to quantitative variables (number of letters etc.): frequency, age-of-acquisition (AoA), and imageability. Frequency values are extracted from two sources; a child literature corpus (CLC) that is created for the purposes of the current thesis, and a web based corpus that represents adult language use (BOUN Corpus). Imageability ratings are collected from adult population with a questionnaire.

The main research in the thesis is to compare two methods to obtain AoA values: to collect rated AoA with a questionnaire conducted on adult population, and to compare frequencies from adult and child language corpora. First, the frequency counts from CLC are compared to child speech frequencies. They seem to be correlated; therefore CLC is found to be a suitable source for acquisition data. Afterwards, frequency counts from CLC are compared to BOUN Corpus frequencies to obtain AoA data. The frequency values from both corpora, AoA values obtained from questionnaire, and imageability values are put together for the purpose of creating the Turkish psycholinguistic database.

Keywords: frequency, age of acquisition, imageability, psycholinguistic database, corpus

ÖZ

PSİKODİLBİLİMSEL ÇALIŞMALAR İÇİN TÜRKÇE VERİTABANI: SIKLIK, KELİME EDİNİM YAŞI VE İMGELEM DEĞERLERİ ÜZERİNE DERLEME DAYALI BİR ÇALIŞMA

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Psikodilbilimsel veritabanları, bilimsel çalışmalarda kullanıma yönelik standardize edilmiş uyaran sağladıkları için araştırma açısından güvenilir ve kullanışlı kaynaklardır. Bu tezin hedefi Türkçe için psikodilbilimsel veritabanı geliştirmektir. Bu veritabanı nicel değişkenler (kelimelerin harf sayısı, vb) dışında üç değişken içerecektir: Kelime sıklık değeri, kelime edinim yaşı (KEY) ve imgelem değeri. Kelime sıklık değeri, tezin amacına yönelik olarak oluşturulmuş çocuk edebiyatı derlemi (ÇED) ve yetişkin dil kullanımını temsil eden internet tabanlı bir veritabanından (BOUN Derlemi) oluşan iki kaynaktan elde edilecektir. İmgelem değerleri, yetişkin katılımcılara uygulanacak bir anket yoluyla toplanacaktır.

Bu tezdeki ana çalışma, KEY değerleri edinmekte kullanılacak iki farklı yöntemin karşılaştırılmasıdır: Yetişkin katılımcılara uygulanacak bir anketle oylanan KEY değeri toplamak; yetişkin ve çocuk dili derlemlerinden sıklık değerlerini karşılaştırmak. Öncelikle, ÇED'den edinilen sıklık değerleri ile çocuk konuşma kayıtlarından elde edilen sıklık değerleri karşılaştırılmıştır. Bu değerlerin pozitif korelasyon gösterdiği görüldüğünden dolayı, KEY değerlerini elde etmek için ÇED'in uygun bir kaynak olacağı sonucuna varılmıştır. Daha sonra, ÇED'den edinilen sıklık değerleri, yetişkin dil kullanımını temsil eden BOUN Derlemi'nden edinilen sıklık değerleriyle karşılaştırılmıştır. Her iki derlemden elde edilen sıklık değerleri, anket

cevaplarından edinilen KEY değerleri ve imgelem değerleri Türkçe psikodilbilimsel veritabanı oluşturmak amacıyla bir araya getirilmiştir.

Anahtar Kelimeler: sıklık, kelime edinim yaşı, imgelem, psikodilbilimsel veritabanı, derlem

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LIST OF ABBREVIATIONS

AoA	Age of acquisition
BOUN	Boğaziçi University
CHILDES	Child Language Data Exchange System
CLC	Child Literature Corpus
METU	Middle East Technical University
OCR	Optical character recognition
POST	Part-of-speech tagging

CHAPTER 1

INTRODUCTION

Psycholinguistic databases are practical tools at the stimuli preparation stage of experimentation in linguistic research. These databases contain a range of variables for a range of stimuli options. For instance, frequency is a variable that can be available for word roots, syllables, suffixes, etc.; whereas concreteness (the property of being concrete or abstract) variable can be available for only word roots. All variables are standardized for suitable stimuli options in a database, which means they are ready to use for any researcher in need of linguistic stimuli. Researchers can use these databases to choose and manipulate variables that suit their experimental purposes from a large pool of data. Moreover, using one collective database makes it possible for the results from various research to be compatible and comparable. The alternative way in stimuli preparation is to conduct preliminary experiments in order to determine the proper stimuli for main experiments but this consumes both time and sources. A database would make it possible to skip the preliminary experiment stage.

Linguistic variables are usually language-specific. Although there are several sources available for various linguistic variables for Turkish, they have not been organized as a database yet. Furthermore, the sources on psycholinguistic variables are very limited. The primary aim of the current study is to start to build a Turkish psycholinguistic database. It is designed to be the basis for experiments providing standard variable ratings for word roots. Three variables that are frequently encountered in linguistic research are: age of acquisition (AoA), frequency, and imageability. This thesis concentrates on obtaining data on these variables and includes the results in the database. These variables and the reasoning behind their selection are thoroughly explained in Chapter 2. Moreover, quantitative variables such as number of letters, phonemes, and syllables will also be included in the database.

The secondary aim of the study is to investigate two methods of obtaining AoA values: a questionnaire-based measure of AoA and a measure of AoA based on corpus frequencies. The first method is found to be a valid method and commonly

used to obtain AoA values by others (Kuperman, Stadthagen-Gonzalez & Brysbaert, 2012). The second method (the corpus-based method) is also used by Carroll and White (1973). Detailed description of our corpus-based method and White's method can be found in Chapter 2. The purpose of this investigation is to determine if the corpus frequencies reveal valid information on AoA values of the words. The corpus that is used here is a child literature corpus (CLC) which is formed using 535 children's books for the purpose of this thesis. Detailed information on this corpus is given in Section 3.1. The word frequency counts from this corpus are compared to the word frequency counts from a web based corpus representing adult language use; Boğaziçi University (BOUN) Corpus. The result of this comparison reveals a distinction between word usage in CLC and BOUN Corpus. The distinction is assumed to be a distinction for early acquired vs. late acquired words.

This study will fill an important gap in the literature because there are only a few sources currently available for use by Turkish psycholinguists. Furthermore, there are not any sources that include information from children. Our study is not based on child data either; we assume that child-directed language in children's literature is a first step towards this goal. Three of the existing sources are Göz (2003), Tekcan & Göz (2005), and Turkish National Corpus (Aksan, Aksan, Koltuksuz, Sezer, Mersinli, Demirhan, et al., 2012). Göz (2003) is a book that contains word frequency values for 22,693 words; we can find the imageability, concreteness, and word frequency values in addition to association sets for 600 word in Tekcan & Göz (2005). These books do not include data from children. Turkish National Corpus is a source that includes 48 million words in total from 4,438 data source. Additionally, there are various listing options such as subject, writer's gender, audience, type of literature, etc. This corpus is based on adult data as well.

Additionally, a recent development in Turkish linguistic research field was the introduction of a tool; KelimetriK. It is a tool that offers researchers a chance to get lists of words with certain criteria. Moreover, it has an add-on feature for pseudoword generation. KelimetriK is the first online tool that can be used in Turkish psycholinguistic studies. The variables included are word frequency, bigram and trigram frequency, orthographic neighborhood, orthographic Levenshtein distance 20, adjacently transposed letter similarity, and subset/superset similarity (Uyumaz, Bozşahin & Zeyrek, 2014). The database from the current thesis is planned as an online source that puts multiple variables in one place. Furthermore, it is designed so that future studies can expand the database by adding more variables or sources to it.

When a researcher needs a different kind of linguistic variable to use in a certain experimental stimuli, s/he usually needs to conduct a preliminary experiment to standardize a data set specifically designed for that study's purpose. This can cause inconsistencies between studies with the same goal because there is not a standard set for a common purpose. Therefore, a Turkish psycholinguistic database will not only be practical but it will also provide a consistency between studies with a similar purpose.

In addition, there is a byproduct from this study which can be an important resource in the field of linguistics: a silver standard morphologically parsed data from child literature. In the process of creating CLC, parsing and disambiguation algorithms were used in order to attain the word roots in CLC. The parsing algorithm provided various possible parses for texts and the disambiguation algorithm chose the correct parse from the possible options. These algorithms do not work with 100% accuracy, but it is claimed that an accuracy rate around 87% is possible (Eryiğit, 2012). However the preliminary analyses in this study have shown an accuracy of 69% (See Section 3.1 for detailed information). Therefore we hypothesized that a new training data set formed from child literature would increase this accuracy. The silver standard data is created as part of this training set. A gold standard data would be the parsed text that is annotated with 100% accuracy and precision and it would be ideal for a training set, however due to computational limitations, not every annotation in our data was accurate. Therefore we refer to it as silver. Detailed information about the silver standard data can be found in Section 3.1.2.

This thesis has the following structure: Chapter 2 introduces the literature review on frequency, AoA, and imageability variables. In Chapter 3, the corpus created for the purposes if this thesis using child literature is introduced; the hypotheses are discussed; the methods and sources that are used in this thesis are explained; the questionnaire formation and implementation are conveyed. In Chapter 4, the results are reported; the correlations and multiple regressions are given. Finally in Chapter 5, the results are explained; conclusions are drawn; the limitations of this thesis are discussed, and further studies are suggested.

CHAPTER 2

BACKGROUND REVIEW ON VARIABLES IN THIS THESIS

Linguistic properties of words need to be carefully controlled in a scientific research, because there are numerous confounding variables that may interact with the results. The most common property, and possibly the first one in literature, that can be a confounding variable is frequency of a word. Word frequency can be defined as the occurrence of a word in spoken or written language, or both spoken and written language, depending on the researcher's purpose. Frequency was found to be a strong predictor in word naming and picture naming tasks with healthy participants (Oldfield & Wingfield, 1965; Forster & Chambers, 1973). The effect of frequency has been studied on aphasia patients with naming tasks as well (Kay & Ellis, 1987; Howard, Patterson, Franklin, Morton, & Orchard-Lisle 1984, cited in Bird, Franklin & Howard, 2001). These studies reveal that word frequency plays a certain role in word processing. However, several studies later have claimed that word frequency variable in these studies is strongly related to the AoA variable (Morrison, Ellis, & Quinlan, 1992; Morrison & Ellis, 1995; Morrison et al. 1997).

The AoA value of a word indicates the age in which a child acquires that word. Acquisition does not necessarily require being able to use a word; comprehension in a context, or being able to define a word can be different definitions for word acquisition (Ghyselinck et al., 2000). Research have found that words that are acquired early tend to have higher frequency values, and words that are acquired late in life have lower frequencies (Morrison et al., 1997; Ghyselinck et al., 2000; Bird et al., 2001). Furthermore, early acquired words tend to be reproduced more than late acquired ones in a word completion task (Gilhooly, 1978). However, frequency and AoA are demonstrated to have independent effects in word naming and word recognition tasks (Morrison et al. 1992; Howard, Best, Bruce, & Gatehouse 1995; Morrison & Ellis, 1995; Nickels & Howard 1995; Lambon Ralph, Graham, Ellis, & Hodges 1998; Turner, Valentine & Ellis, 1998; Brysbaert, Lange & Van Wijnedaele, 2000; Gilhooly & Logie, 1980b). Therefore, the effects of AoA and frequency variables need to be examined individually in linguistic studies.

In addition to the interaction between word frequency and AoA, there is another variable that needs to be considered together with AoA: imageability. It indicates how easily a word can form a visual or auditory image in someone's mind when they encounter with the word (Paivio et al., 1968). The imageability value is found to be correlated with word AoA (Gilhooly & Logie, 1980a; Morrison et al., 1997; Ghyselinck et al., 2000), however the correlations are not consistent with each other (Ghyselinck et al., 2000). Furthermore, the word AoA was suggested to be a significant variable when the imageability values were taken into account (Coltheart et al., 1988; Brysbaert et al, 2000a; Ghyselinck et al., 2000). The correlation between word AoA and imageability suggests that imageability is potentially a confounding variable and should be taken into account for the purposes of a scientific research.

These three variables (frequency, AoA, and imageability) will be explained in detail in the following sections.

2.1. Word Frequency

There are two kinds of word frequency values in the related literature: objective and subjective frequency values. Objective frequency is the actual number of times a word occurs in a specific text data or transcribed speech data. It can be extracted directly from the data through counting algorithms, hence the objectivity. It is sometimes referred to as lexical familiarity, or printed frequency (Gernsbacher, 1984). In this thesis, the term w*ord frequency* will be used to indicate objective frequency henceforth.

Subjective frequency, on the other hand, is the values that are collected by asking participants to rate the words on the basis of their daily interactions with the words, i.e. how often the participants come across a word determines the subjective frequency value of that word (Gernsbacher, 1984). It can be referred to as experiential familiarity, rated frequency, or *word familiarity*. In this thesis, word familiarity will be used to refer subjective frequency. Word familiarity was suggested to explain the variance in word processing time better than word frequency (Gernsbacher, 1984). However, word familiarity values were recently found to be subordinate to word frequency counts. It is suggested that the significance of familiarity ratings over frequency values depends on the quality of the frequency value (Brysbaert & Cortese, 2011). Brysbaert and New (2009) reported that the quality of word frequency measures depends on the size and source of the corpus. The word frequency counts used in studies that investigated the frequency versus familiarity were usually taken from Thorndike & Lorge (1944) and Kučera & Francis (1967), which are relatively limited in the number of words compared to contemporary sources. Therefore, when the quality is increased by using larger and extensive sources for frequency counts, the familiarity ratings become less explanatory in word processing tasks (Brysbaert & Cortese, 2011). However, frequency counts did not always affect the results in the same way; word frequency

effects were observed to be stronger for low-frequency words than high-frequency words. This effect of frequency needs attention in word processing research (Keuleers, Diependaele & Brysbaert 2010). In conclusion, the word frequency variable needs to be controlled for in many aspects, such as objectivity and quality of the source.

2.2. Age of Acquisition

Studies have shown that the word frequency effect observed in previous research is in fact a combination of word frequency and AoA variables (Ghyselnick et al., 2000). High frequency words tend to be acquired earlier in life than low frequency words, but there are exceptions to this rule. For instance *puppy* is a low frequency word that is acquired early in life, and *income* is a high frequency word that is acquired late. Morrison & Ellis (1995) used these exceptions to discriminate the effects of frequency and AoA on word processing. Later studies confirmed the separate and interactive effects of these variables (e.g. Turner et al., 1998; Brysbaert et al., 2000a; Bonin, Chalard, Méot & Fayol, 2001; Brysbaert & Ghyselinck, 2006). Carroll and White (1973) found that the latencies in a picture-naming task can be explained by word AoA rather than word frequency. Similar results indicating the significance of AoA values were observed in other languages aside from English (Barry, Morrison & Ellis, 1997; Ellis & Morrison, 1998); such as French (Alario & Ferrand, 1999), and Spanish (Cuetos, Ellis & Alvarez, 1999). The effect of AoA was further investigated using different tasks such as the word association task (van Loon-Vervoorn 1989, cited in Ghyselinck et al. 2000; Brysbaert et al., 2000b), a semantic categorization task (Brysbaert et al., 2000b), and a face categorization task (Lewis, 1999). Later studies have confirmed word AoA to be a significant variable in word processing when familiarity and frequency are taken into account (Ghyselinck et al., 2000). In addition, AoA is suggested to be a significant variable because it represents a different aspect of a word, which is "the cumulative frequency" (Lewis, 1999), i.e. we have more experience with early acquired words than late acquired words, and the amount of experience can have an effect on word processing. The fact that these variables have tangled effects in linguistic research means that we need to consider effects of AoA aside from word frequency.

The AoA variable is often divided into two like word frequency: *objective AoA* and *rated AoA*. Objective AoA refer to the actual AoA values obtained from child participants using picture-naming paradigm, whereas rated AoA is obtained by asking adult participants to estimate their ages in the time of acquisition (Morrison et al., 1997). The first attempt to collect AoA values was made by Carroll and White (1973). They asked adult participants to estimate the AoA values of 103 picturable nouns on an 8-point Likert scale. Rated AoA scores were collected later by various researchers using a similar method (e.g. Gilhooly & Hay, 1977; Lyons, Teer & Rubenstein, 1978; Winters, Winter & Burger, 1978; Gilhooly & Logie, 1980b). The

reliability assessments were reported by using Ebel's method (Carroll & White, 1973), or Cronbach's (1951) alpha (Rubin, 1980), or intergroup reliability (Gilhooly & Hay, 1977; Gilhooly & Logie, 1980a; Winters et al., 1978); they all pointed to a reliable rating of AoA by this method. Validity assessments were also needed because the values concerned child word acquisition and collected from an adult population. Several validity studies were conducted. For instance, Gilhooly and Gilhooly (1980) collected rated AoA values for 53 words. Then they did a vocabulary test on primary school children, asking them to define 48 words. Their multiple regression analysis led to the conclusion that rated AoA measures were valid. Another validity study was by Morrison et al. (1997). They conducted an experiment with 280 children aged between 2:6 and 10:11 years. After that, they collected rated AoAs from 20 undergraduate students and compared the two measures. They reported that the objective and rated measures of AoA are significantly correlated ($r = 0.759$, $p<0.05$) (Morrison et al., 1997). These studies revealed the validity of this method. Rated AoA was therefore an acceptable measure for the AoA variable.

There is another method to obtain a rather objective value for AoA. Carroll and White (1973) took word frequency counts from corpora of children's vocabulary (Rinsland 1945, Dale 1948 cited in Carroll & White, 1973) to assign AoA values to words that are reported to be known in reading and used in writing by grade school children. They used these frequency counts for validity testing, which was affirmative. However, the aforementioned corpora are designed for teachers to assist them in teaching vocabulary to children (i.e. the words in this corpora are words that *should be* known by children at a certain age, not the words that *are* known), therefore it might not be an ideal measure of AoA values.

The present study aims to apply a corpus method and compare the results with traditionally collected rated AoA values. The method devised for this thesis is as follows: First, with the assumption that it is possible to deduce word acquisition information from children's books, a child literature corpus (written for children between the ages 3-12) was created. We will refer to this corpus as CLC. Then samples of child speech data were collected from Child Language Data Exchange System (CHILDES) database and Middle East Technical University (METU) Kindergarten students (Refer to Section 3.2 for detailed information). Frequency values from CLC and these speech samples were compared in order to look for a correlation between child literature and children's speech. A high correlation would be interpreted as CLC representing children's language. Then the frequency counts from CLC will be compared to a web based corpus representing adult language use, namely BOUN Corpus. We predict that this will provide a distinction between early and late acquired words. At the next step, an AoA questionnaire will be conducted on adult population in order to examine the validity of the prediction from corpus analysis. These steps are explained clearly in Chapter 4.

2.3. Imageability

Imageability is another common variable that should be taken into account in psycholinguistic research. It can be defined as "the ease with which a word gives rise to a sensory mental image" (Paivio et al., 1968). For instance, when a person encounters the word *blanket*, an image of a blanket forms easily and instantly in their mind. This indicates that *blanket* is a highly imageable word and would have a higher rating on an imageability scale. On the other hand, the word *honor* does not form a mental image as easy as *blanket*. It means that *honor* would have a lower value on the scale. Imageability should not be confused with concreteness, which refers to the actual sensory experience of the objects. It was found that words which have low values on concreteness scales such as *anger* might have high imageability values (Paivio et al., 1968). Nevertheless, some researchers use the terms imageability and concreteness interchangeably because of the strong correlation between them (Reilly & Kean, 2007). In this thesis, we use the concept imageability; not concreteness.

Research show that imageability is an effective variable in various tasks such as word naming, association, and picture naming in both healthy and aphasic participants (Franklin, Howard & Patterson 1994, 1995 cited in Bird et al. 2001). Imageability and AoA values are also found to be intercorrelated (e.g. Coltheart, Laxon & Keating, 1988; Gyhselnick et al., 2000; Cortese & Fugett, 2004; Stadthagen-Gonzalez & Davis, 2006; Ma, Golinkoff, Hirsh-Pasek, McDonough & Tardif, 2009). For example for Chinese, it was found that noun and verb AoA values could be predicted by imageability values (Ma et al., 2009). The relationship between imageability and AoA was found in child reading tasks as well (Coltheart et al., 1988). Moreover, imageability and concreteness were suggested to be critical variables in learning and memory tasks, as well as semantic retrieval tasks (Paivio, 1969; Paivio, Clark, Digdon & Bons, 1989). There is apparently a role of imageability in linguistic research, therefore it should be considered together with frequency and AoA.

The common method for obtaining imageability values is asking participants to fill a questionnaire by rating a number of words on a scale. In the current study, this method is used with a 7-point Likert scale. Details of the method will be given in the next chapter.

CHAPTER 3

METHODOLOGY

This chapter explains the methods used in the current thesis. The computational procedures used to build CLC are explained in Section 3.1; the silver standard data which is a byproduct of the procedures is in 3.1.2. Details of child speech data -i.e. how it is collected and where it is used- are in Section 3.2. Information on the adult data that is used in this thesis is given in Section 3.3. The method for obtaining corpus-based AoA values is explained in Section 3.4. Finally, the details of AoA and imageability questionnaires and their implementation, i.e. the experimental procedure, are provided in Section 3.5.

3.1. Steps in Creating the Child Literature Corpus (CLC)

We first created a corpus of child literature. We collected 536 books for children from 5 publishers (See Acknowledgements for the titles). There were a collection of 115 authors. There were 5 age groups for the books: 3 to 5 year-olds, 5 to 8 year-olds, 8 to 10 year-olds, 10 to 12 year-olds, and above 12 year-olds. These groups were determined by the publishers, we did not do any additional classification. Age groups for 74 books were not stated by the publishers. 531 of the books were soft copies in the form of pdf files, and five of them were hard copies. The hard copies were scanned using an Epson Perfection V33 scanner. ABBYY FineReader 12 was used for the optical character recognition (OCR) process. The inaccuracies in the OCR files were monitored and corrected manually, and then the final texts were saved as txt files. The 531 pdf files were conversed to txt files using Xpdf 3.03. Inaccurate lines and Turkish characters were checked and adjusted manually using Notepad ++. Moreover, book parts such as preface, index, and dedication were excluded from the analysis, because the CLC is planned to cover only literary pieces that targets children. One book was excluded from the procedure because it was an interactive book with questions and answers, therefore it did not meet the requirements of being merely a narrative.

The second step was part-of-speech tagging (POST). As part of the POST procedure, the text needed to be parsed. For the parsing process, the algorithm from Sak, Güngör & Saraçlar (2008) was used. The parser requires a certain format, therefore the pdf files were conversed to txt files, and the punctuation was adjusted according to the format. For the disambiguation part of the POST process, the perceptron from Sak, Güngör & Saraçlar (2007) was used. All 535 books were combined to one txt file and the parsing algorithm was run. The output file was disambiguated afterwards with an accuracy of 69%[1]. Eryiğit (2012) reports an accuracy of 87.67% for the BOUN Corpus using the perceptron model, however Sak et al.'s model was created using adult written sources. The rather low accuracy rate we have obtained could be a result of these adult language based training and development sets in the model. Therefore, a new model is created using the data formed from child literature. The POST procedure is repeated using the updated model, in order to increase the accuracy rate. The next sub-section explains our new model based on CLC.

3.1.1. The New Model from Child Literature

The model consists of a training set and a development set. The training set has 18,218 words; the development set has 1,927 words. These words were parsed using Sak et al.(2008)'s algorithm, however 5,026 words in the training set underwent an extra process. These 5,026 words were initially planned to be a gold standard data in order to increase the accuracy of the perceptron, however due to technical reasons, the product was a silver standard. Detailed information on the silver standard data and the technical reasons is given in Section 3.1.2. The parses for 5,026 words in the silver standard data were manually screened and corrected.

The disambiguation process was repeated using this model on the rest of CLC -which consists of 5,868,601 words after the model formation. The accuracy of disambiguation was 87.93% this time. A random sample of 200 words from the output data was manually screened by the author. It was observed that although some basic errors were present this time as well, the algorithm was mostly successful with the word roots. Since the present study is mainly interested in noun roots, the data was found to be usable in further analyses. However, the roots of a list of words were not correct. They were replaced with correct morphological parses before following through the analyses. The replacements can be found in Appendix B. These replacements were applied to every output from the perceptron. Moreover, the perceptron tags the words that it does not recognize with [Unknown] tag. These words were removed from every output before further analyses as well. There were a

[1] Murathan Kurfalı (MSc student at METU Cognitive Science and Research Assistant at EDMER) took part in these computational analyses procedure. His efforts in the process are noteworthy and much appreciated.

total of 4,388,149 word tokens left after the [Unknown] tagged words were removed from the CLC data.

3.1.2. The Silver Standard Data

In order to create a gold standard data, 26 of the books were used. The numbers of words from each age group were kept approximate to provide a balanced sample for the model. As the age of the audience increases, the number of words in a book also increases. Therefore, 11 of the books (from 3-5 and 5-8 age groups) were entirely included and 15 (from age groups) were partially included to keep the sample balanced. The books were selected according to their total number of words among younger age-groups and randomly among older age-groups. Table 3.1 shows the number of words in each age-group. A complete list of 26 books and their age-groups can be found in Appendix C. Total number of words included in the data is 5,026. These words were disambiguated by the perceptron and the output was manually reviewed by the author using LibreOffice Calc. The tags that were found to be erroneous were screened by a colleague[2]. The errors that still remained ambiguous or undecided were consulted with the supervisors of the thesis. The final product used in the training set was unfortunately not a gold standard data because the correct tags could not be added to the algorithm's lexicon. The gold standard data project was temporarily suspended due to timing issues of the thesis project, and the silver standard data was used as part of the training set in the model.

Table 3.1. The number of words for each age-group in the silver standard data

Age groups	# of words
3 – 5 ages	977
5 – 8 ages	960
8 – 10 ages	834
10 – 12 ages	782
Above 12	727
Age-group unavailable	746
Total	5026

3.2. Child Speech Data

An ideal corpus to derive the AoA values from would be a child speech corpus; however child speech data in Turkish are very limited. Therefore, we decided to use children's books despite the fact that they are not direct sources for children's

[2] Murathan Kurfalı

word acquisition. We consider them language directed to children. In an attempt to see the correlation between these books and child's actual speech, child speech data were collected from two sources. A major part of the speech data used in the study is taken from the CHILDES database (MacWhinney, 2000). The rest was naturally occuring data recorded by another colleague[3], at METU Kindergarten; transcribed by him; and proofread by the author. The age range of the total speech data is 1;4 to 4;8.

The CHILDES database is a corpus that contains child data on first language acquisition for various languages. It is an open source and researchers around the world can contribute to it within certain upload rules. There are two files in the database for Turkish language: Aksu.zip[4] and Turkay.zip[5]. Both files were used in this study.

The recordings at METU Kindergarten were made in November 2013 under approval of METU Human Subject Ethics Committee. There are six recordings in total. Half of them are from "story reading and reading comprehension" sessions, and the other half are from "drawing about a certain topic" sessions. These are the recordings of the kindergarten's weekly activity sessions. There were not any manipulations while recording. In the reading and comprehension session, the teacher reads a book and asks children several questions, children answer spontaneously, sometimes they talk among each other. The stories were of the teacher's choice. During the drawing session, children were given a topic, e.g. nature, about which they were asked to produce drawings. After they drew, they were asked to talk about their drawings. The teacher did not interfere. The researcher was passively present in the classroom during both types of recording sessions.

3.2.1. Speech Data versus CLC

All the transcribed speech data were parsed and disambiguated using Sak et al. (2007; 2008) algorithms with an accuracy of 94.29%. The punctuation marks, numeric characters, and the words tagged [Unknown] were removed from the output. The remaining data contained 33,845 word tokens and 1,912 word types.

Table 3.2. Word token and type counts from speech data, children's books, and the overlap between them

	Word tokens	**Word types**
Speech data (1;4 - 4;8 ages)	33,845	1,912
Children's books (3 - 5 ages)	22,274	2,170
Speech & Books	–	1,060

[3] Gökhan Gönül (Research assistant at METU Cognitive Science Department)
[4] Created by Ayhan Aksu-Koç, 2004.
[5] Created by Feyza Turkay, 2012.

Since the speech data was from children aged 1-5, it was planned to be compared with books that were intended for children in the 3-5 age range. There were 10 books in this category. They were parsed and disambiguated using Sak et al. (2007; 2008) algorithms with an accuracy of 92.65% After removing punctuation, numeric characters and [Unknown] tags from the output, the word token count was 22,274 and the word type count was 2,170. To compare these to the speech data, the words that are present in both speech and book data were listed. Table 3.2 shows the counts of word type and tokens for speech data, children's books, and the overlap between them. Base-10 logarithm transformations of normalized frequency values were calculated for these overlapping words because the frequencies were highly skewed. The transformation displayed a normal distribution of frequency values. The results of this comparison between speech and CLC data can be found in Section 4.1.

3.3. Adult Data: BOUN Corpus

A section from BOUN Corpus that is being used as part of a project by Köprü, Bozşahin, & Şirin (2014) was used. We will refer to this as the BOUN sub-corpus. The aim was to compare the frequency values from this corpus with the frequency values from CLC to infer AoA values. We hypothesized that the words which have higher frequency in CLC are acquired earlier and should have lower AoA values, whereas the words which have higher frequency in BOUN sub-corpus are acquired late and should have higher AoA values. (also see Section 3.4). The BOUN sub-corpus consists of 4,208,493 words in total. It was parsed using Sak et al. (2008) algorithm. The training set for perceptron had 687,155 words, and the development set had 38,258. The disambiguation was completed with Sak et al. (2007)'s algorithm. The accuracy was 64.01% this time. The data was used despite the low accuracy rate because of the aforementioned reasons (i.e. successfully parsed word roots). There were 2,832,025 word tokens after the [Unknown] tagged words were removed from the data.

3.4. Corpus-based AoA Values

The BOUN sub-corpus (2,832,025 word tokens) and CLC (4,388,149 word tokens) were parsed and disambiguated as described above. The raw frequency counts were listed for the rest of the output data. Then, normalized frequencies for these words were calculated per million words. At this point, the words that are present in both corpora were listed. There were 8,844 words in this overlap between them. These words were split into two categories: words that have higher frequency in CLC than BOUN sub-corpus, and words that have lower frequency in CLC than BOUN sub-corpus. Base-10 logarithm transformations were calculated for both lists. Histogram analyses showed that both lists had a normal distribution. The next step was to conduct a questionnaire on adult Turkish native speakers using a selection of

words from these lists. We expected the questionnaire results to produce rated AoA values so that these values could be compared with corpus-based AoA information. More detail on the questionnaire is given in the next section. The comparison between corpus-based and rated AoA is provided in Section 4.2.

3.5. AoA and Imageability Questionnaires

Rated AoA values are reported to be valid measurements for the AoA variable (Gilhooly & Gilhooly, 1980; Morrison et al., 1997). Therefore, we decided to use this method for validation of the corpus-based method designed in the current thesis.

In order to collect rated AoA, a questionnaire was created using 300 words from the aforementioned corpora, i.e. BOUN sub-corpus, and CLC. The exact steps for word selection are described in detail below. The word list can be found in Appendix A. This questionnaire was distributed to participants via a website designed for surveys (http://www.qualtrics.com/). The rated AoA values and corpus-based AoA values are then compared to each other and the results are reported in Chapter 4.

To collect imageability values, conducting a questionnaire on adults is a viable method, too (e.g. Bird et al. 2001). In order to create the imageability questionnaire, the same set of 300 words used in AoA questionnaire was used. The same website (http://www.qualtrics.com/) was used to distribute this questionnaire.

In the following sub-sections, detailed information on the participants in the questionnaires, words used in the questionnaires, and experimental procedures are given.

3.5.1. Materials

We decided to use common nouns in the questionnaires, therefore the words from POS tagged BOUN sub-corpus and CLC were filtered before the word selection process.

1. Only the words that were tagged [Noun] were included with three exceptions: 'önce', 'sonra', 'üzeri'. These words were tagged as nouns by the parser, but they were listed under different tags in Turkish grammars, e.g. Göksel & Kerslake (2005). These three nouns were removed from the data.
2. Words that started with capital letters were excluded, assuming they were not common nouns.
3. The parser gave numbers to some words that have synonyms, e.g. sır(I) [Noun] and sır(II)[Noun]. Therefore, words that were numbered by the parser were excluded to avoid ambiguity among the questionnaire items. However, words that have synonyms and were not numbered by the parser could not be detected. Unfortunately, there is not a controlled omission of synonyms.
4. Names of the months and names of the days were manually excluded.

5. Compound words were manually screened at the end of the selection process and excluded from the selection, because they are morphologically complex words. In addition, research suggest that they are processed different than single words (e.g. Fiorentino & Poeppel, 2007).
6. Ethically inappropriate words were manually excluded.

The frequency counts of the remaining words, i.e. nouns, were pre-processed as follows:

1. The words that were in both corpora were listed with their frequency values. Base-10 logarithm transformation was applied to these values because the distribution was highly skewed. Normal distribution was achieved as a result of the transformation.
2. This list was separated into two categories: words that have higher frequency in CLC than the BOUN sub-corpus, and words that have higher frequency in BOUN sub-corpus than CLC.
3. Histogram analyses showed that both lists had normal distributions.
4. Quartile analyses were performed on the log 10 transformed frequency values for both lists separately. Table 3.3 shows the percentages for both lists.
5. The words that were not shared by both corpora, meaning the rest of the words, were also listed separately. Base-10 logarithm transformation was applied to their frequency values.
6. Quartile analyses were performed on non-shared words from CLC and non-shared words from BOUN sub-corpus separately.

Table 3.3. The margin values from quartile analyses on log 10 transformed frequencies on CLC & BOUN sub-corpus

	25%	**50%**	**75%**
CLC>BOUN (List A1)	0.613	1.221	1.8377
BOUN>CLC (List A2)	0.422	1.1814	1.9935

At this point, there are four lists and their quartile analyses with log 10 transformed frequency values:

- List A1 contains nouns that are shared by both corpora where the frequency values from *CLC* are higher than BOUN sub-corpus. These words are assumed to be *acquired early* in life, in other words they are expected to have lower AoA ratings.
- List A2 contains nouns that are shared by both corpora where the frequency values from *BOUN sub-corpus* are higher than CLC. These are assumed to be *acquired late* in life, in other words they are expected to have higher AoA ratings.

- List B contains nouns from CLC minus the shared nouns. These are assumed to be *acquired early* in life.
- List C contains nouns from BOUN sub-corpus minus the shared nouns. These are assumed to be *acquired late* in life.

In List A1 and A2, 24 words were selected randomly[6] from each quartile; whereas in List B and C, 8 words were selected randomly from each quartile. The purpose here was to keep the number of items reasonable for a questionnaire and have a balanced frequency sample from each list. There were 96+96 words from A1 and A2; 32+32 words from B and C. In total, 256 words were selected from both corpora. The remaining 44 words were randomly selected out of 260 words from a study by Raman, Raman & Mertan (2014). In this study, they collected rated AoA among other values (name and image agreement, visual complexity, conceptual familiarity) for 260 Turkish names for common objects. The purpose of including words that already have rated AoA values was to control for our participants' consistency, in other words we expected to check whether the participants are paying attention to their responses using these control words (Kuperman et al., 2012). In Section 4.2, the control words and Raman norms (rated AoA values from Raman et al., 2014) are compared with each other for validity.

Using these 300 words, two questionnaires (one for AoA and one for imageability) were created on the Qualtrics website. METU Human Subjects Ethics Committee approval was obtained for conducting both of the questionnaires.

3.5.2. Participants

There were 47 participants in the AoA questionnaire. Four of the participants' data was not included in the analysis because they included inconsistent AoA information, i.e. the AoA value they entered exceeded their age values in the demographic forms. From the 43 remaining participants; 28 were female and 15 were male. Their age range was 19 to 55, and the mean age was 28.63. The education levels were as follows: 4 associate degree, 1 bachelor's degree, 25 master's degree, and 13 doctorate.

There were 28 participants in the imageability questionnaire: 17 female, 11 male. The age range was 18 to 48, and mean age was 28.43. The education levels were as follows: 1 high school graduate, 21 bachelor's degree, and 6 master's degree.

All the participants took part in the questionnaires voluntarily.

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[6] For randomization, a website that gives random number sequences was used (http://www.random.org/). For each list, a random number sequence was taken, the sequence and words were put in two columns in a LibreOffice Calc sheet, and then the sequence was ordered ascending. First x number of words were taken from the re-ordered lists.

3.5.3. Procedure

The questionnaires were conducted online. They were made available to participants via social media and e-mail groups. Participants were required to read a consent form at the beginning of each questionnaire and accept the terms before starting with the questions. The consent form can be seen in Appendix D. After the consent form, there were explanations on how to proceed with the questions.

In the AoA questionnaire, first the term AoA was described. Then 8 sample words and their age ranges were presented from Raman et al. (2014) in order to set an example for the ratings. The sample words were different from the control words. These can be referred to as calibrator words because they help the participants calibrate their responses (Kuperman et al., 2012). The words can be seen in Appendix E in the instructions. The participants were asked to complete the questionnaire in an environment where they were not distracted too much. They were not required to complete the questionnaire in one block session, they were told that they could take breaks during the rating. They were instructed to enter the age they think they had learned the words and '0' for any words they did not know. They were required to enter the numbers manually in a text box below each item. After these instructions, the word lists were presented in 6 pages with 50 words in each (300 words in total). The word order was randomized by Qualtrics website for each participant. At the end of the questionnaire there was a demographic information form that can be seen in Appendix F. The participants were asked to enter their level of education in addition to their age and gender as demographic information. Moreover, the place they lived when they were between the ages 0-12 were asked for the purposes of possible geographical differences.

In the imageability questionnaire, the instructions (Appendix G) were partially adapted from Paivio et al. (1968). First, the term imageability was described with two examples. Then the participants were instructed to assign a number between 1 (for the easiest imageability) and 7 (for the hardest or no imageability) for the imageability values of words. They were asked to rate only the presented words and not any associated words. They were not required to complete the questionnaire in one block session, they were told that they could take breaks during the rating. After these instructions, the word lists were presented in 6 pages with 50 words in each. A sample from the questionnaire page format can be found in Appendix H. The word order was randomized by the website Qualtrics for each participant. At the end of the questionnaire there was the same demographic information form used for the AoA questionnaire.

CHAPTER 4

RESULTS

In this chapter, first, the comparisons between child speech and children's books are explained (Section 4.1). Then, corpus-based and rated AoA values are given in Section 4.2. The correlations and multiple regressions between rated AoA, CLC and BOUN sub-corpus frequencies, and imageability are reported in sub-sections 4.2.1 and 4.2.2. The imageability correlations and multiple regression analyses with AoA and frequency values (CLC and BOUN sub-corpus) are reported in Section 4.3.

4.1. Child Speech versus CLC

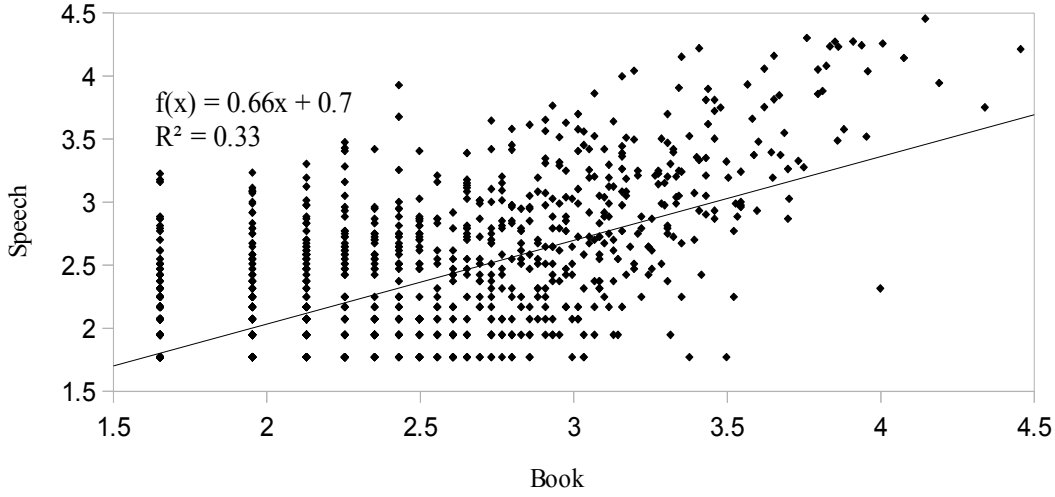

Figure 4.1. The relationship between frequency values in child speech and children's books

Figure 4.1 shows the relationship of log 10 transformed frequency values between child speech data (1-4 ages) and children's books (3-5 ages). It is observed

that an increase in child speech frequencies is met with an increase in child book frequencies. This was confirmed by a statistically significant positive correlation (r (1060) = 0.58, p<0.01).

4.2. Corpus-based AoA versus Rated AoA

The correlation analysis for comparing the control words and Raman norms revealed a strong positive correlation (r (44) = 0.84, p<0.01). It points to the reliability of the participant responses. Moreover, split-half reliability was checked using the reliability analysis on SPSS. The questionnaire was found to be highly reliable (22 items, $\alpha = 0.97$).

Table 4.1. Pearson's correlation coefficients for high- and low-frequency nouns for shared items by CLC and BOUN sub-corpus (p-values are reported in parentheses)

	List A1 (CLC > BOUN, Early acquired)	**List A2 (BOUN > CLC, Late acquired)**
High frequency (Above 50%)	-0.39 (0.006)	-0.44 (0.002)
Low frequency (Below 50%)	-0.23 (0.067)	-0.32 (0.029)

In order to test the assumptions that nouns in List A1 would have lower rated AoA values and nouns in List A2 would have higher rated AoA values, correlation analysis was performed for each quartile in both lists. This did not reveal any significant results. Another correlation analysis was performed for 50% segments in both lists. The result of this analysis is summarized in Table 4.1. It seems that for high-frequency nouns in List A1, as frequency increases rated AoA decreases (r (48) = -0.39, p<0.01). The same effect was observed for high-frequency nouns in List A2; as frequency increases rated AoA decreases (r (48) = -0.44, p<0.01). There was not a significant effect for low-frequency nouns in List A1 (r (48) = -0.23, p = 0.067). On the other hand, there was a statistically significant correlation between frequency and rated AoA among low-frequency nouns in List A2 (r (48) = -0.32, p<0.05). These results point out that as the frequency increases, rated AoA decreases.

When the items that have SD values higher than 2.01 are removed from the above analyses, only one significant result remains: as the frequencies increase, the rated AoA values decrease for high-frequency nouns in List A2 (r (8) = -0.78, p<0.05). However, because the number of items is dramatically decreased after item removal, the results might not be noteworthy.

4.2.1. AoA and Frequency

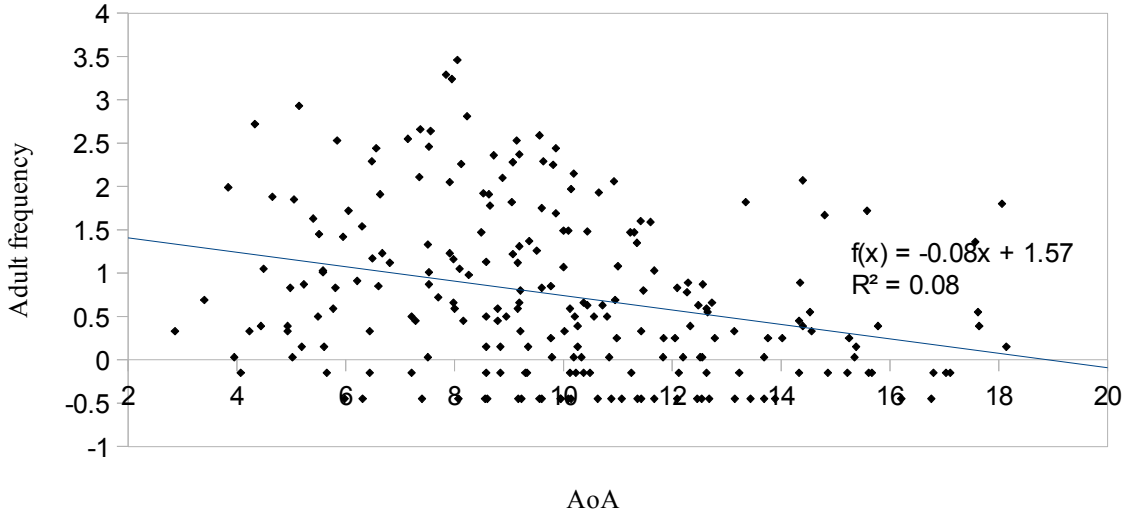

Figure 4.2. The relationship between rated AoA and BOUN sub-corpus frequencies

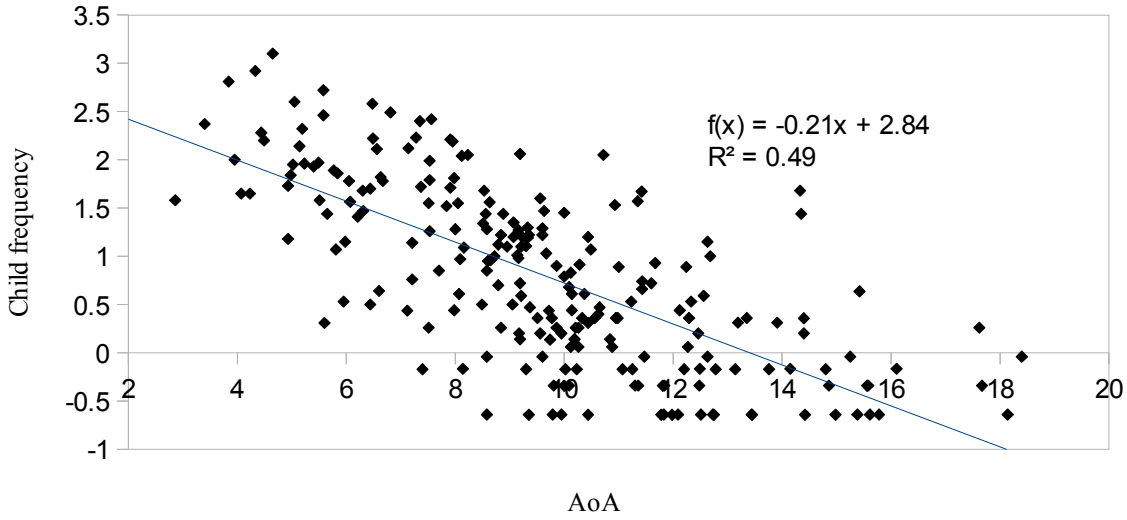

Figure 4.3. The relationship between rated AoA and CLC frequencies

Frequency and AoA values are reported to have a strong relationship (e.g. Morrison et al., 1997). Therefore correlation analyses were conducted without including the corpus-based distinctions above (i.e. BOUN > CLC vs. CLC > BOUN).

The frequencies from BOUN sub-corpus and CLC were inspected separately. Figure 4.2 shows the relationship between BOUN sub-corpus frequencies and rated AoA values. There is a statistically significant correlation between these variables (r (224) = -0.29, $p<0.01$). It can be seen that as AoA increases, frequency decreases. There is a stronger correlation between CLC frequencies and AoA values (r (224) = -0.70, $p<0.01$). Figure 4.3 shows the relationship between CLC frequencies and AoA ratings. Note that 32 words are different in these lists because these are the words from Lists B and C (non-shared words).

4.2.2. AoA, Imageability, BOUN sub-corpus Frequency, and CLC Frequency

Two standard multiple regression analyses were conducted: one to evaluate how well imageability and the BOUN sub-corpus frequency predicted the AoA values, the other to evaluate how well imageability and CLC frequency predicted the AoA values. Using the enter method, it was found in the first analysis that imageability and BOUN sub-corpus frequency explain a significant amount of the variance in AoA (F (2, 219) = 112.1, $p<0.01$). The multiple correlation coefficient was 0.71, indicating that approximately 50% of the variance of the AoA can be accounted for by the linear combination of imageability and BOUN sub-corpus frequency. The analysis showed that imageability (β = -0.17, t (218) = -3.45, $p<0.01$) and BOUN sub-corpus frequency (β = -0.66, t (218) = -13.7, $p < 0.01$) significantly predicted AoA. It was found in the second analysis that imageability and CLC frequency also explain a significant amount of the variance in AoA (F (2, 219) = 212.94, $p<0.01$). The multiple correlation coefficient was 0.81, indicating that approximately 66% of the variance of the AoA can be accounted for by the linear combination of imageability and CLC frequency. The analysis showed that imageability (β = -0.47, t (218) = -10.97, $p<0.01$) and CLC frequency (β = -0.51, t (218) = -11.97, $p < 0.01$) significantly predicted AoA.

4.3. Imageability

Split-half reliability in imageability questionnaire was checked using SPSS reliability analysis. The questionnaire was found to be highly reliable (14 items, $\alpha = 0.92$).

In the following sub-sections, interactions between imageability and rated AoA, and imegability and frequency will be explained.

4.3.1. Imageability and AoA

The relationship between imageability and rated AoA values can be seen in Figure 4.4. It can be seen that as AoA increases, imageability decreases. This is supported by a strong negative correlation (r (300) = -0.77, $p<0.01$).

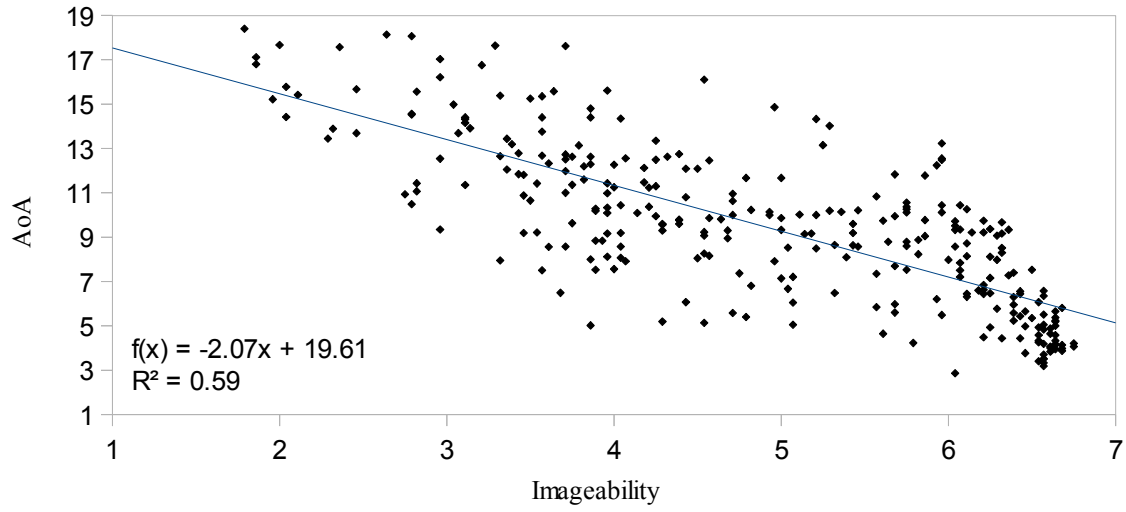

Figure 4.4. The relationship between imageability and rated AoA values

4.3.2. Imageability and Frequency

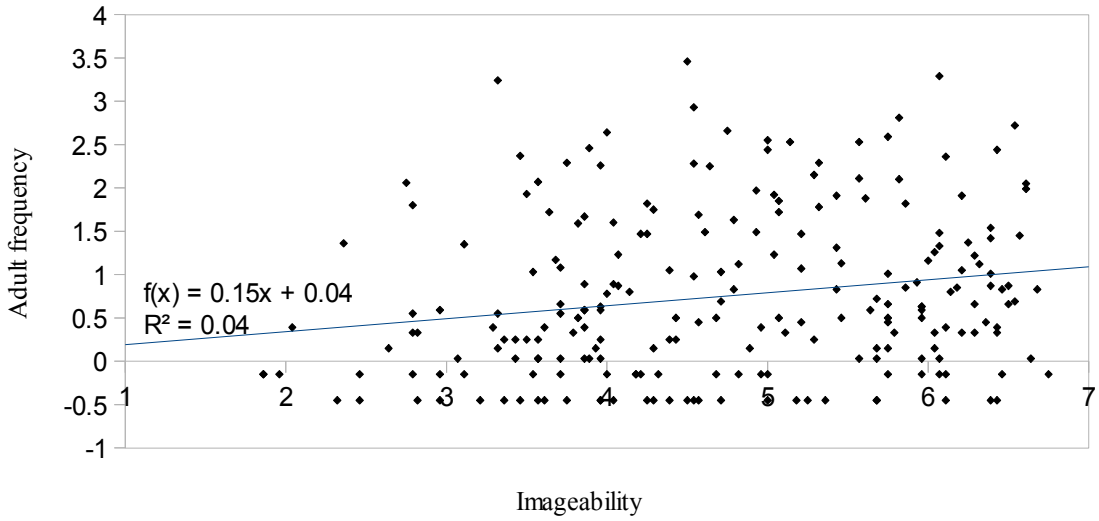

Figure 4.5. The relationship between imageability and BOUN sub-corpus frequency

In order to compare imageability values to the frequency values, BOUN sub-corpus and CLC frequencies are analyzed separately. Figure 4.5 shows the relationship between frequency values from BOUN sub-corpus and imageability. Although the correlation is statistically significant, the coefficient is rather low (*r*

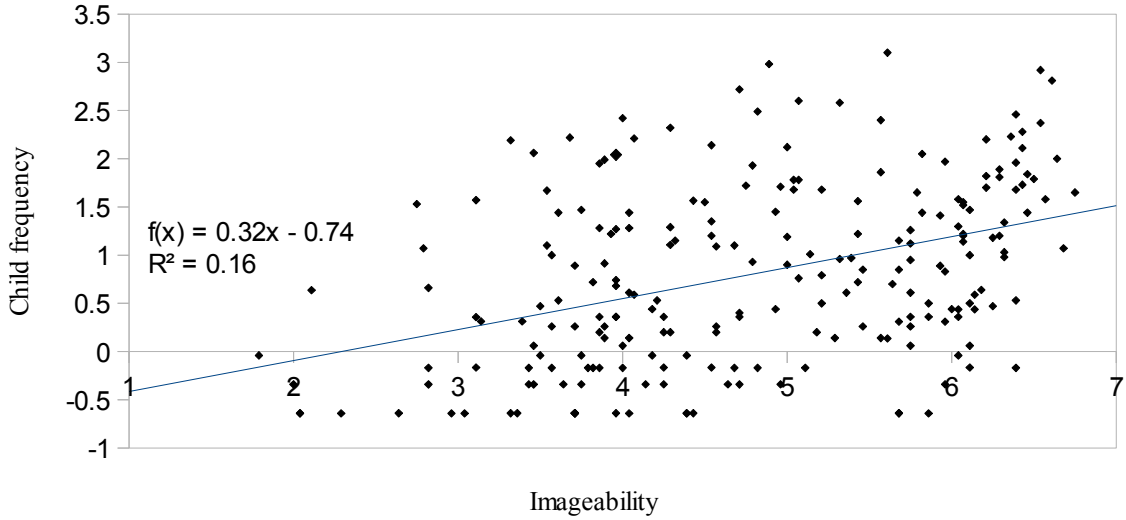

Figure 4.6. The relationship between imageability and CLC frequency

(224) = 0.19, p<0.01). Figure 4.6 shows the relationship between CLC frequencies and imageability. It can be seen that the correlation is slightly higher than BOUN sub-corpus but still low in general (*r* (224) = 0.41, p<0.01). Note that 32 words are different in these lists because these are the words from Lists B and C (non-shared words).

4.3.3. Imageability, AoA, BOUN sub-corpus Frequency, and CLC Frequency

Two standard multiple regression analyses were conducted: one to evaluate how well AoA and BOUN sub-corpus frequency predicted the imageability, the other to evaluate how well AoA and CLC frequency predicted the imageability. Using the enter method, it was found in the first analysis that AoA and BOUN sub-corpus frequency explain a significant amount of the variance in imageability (F (2, 219) = 100.83, p<0.01). The multiple correlation coefficient was 0.69, indicating that approximately 48% of the variance of the imageability can be accounted for by the linear combination of AoA and BOUN sub-corpus frequency. The analysis showed that AoA significantly predicted imageability (β = -0.70, t (218) = -13.70, p<0.01), however BOUN sub-corpus frequency did not significantly predict imageability (β = -0.02, t (218) = -0.36, p = 0.73). It was found in the second analysis that AoA and CLC frequency also explain a significant amount of the variance in imageability (F (2, 219) = 89.14, p<0.01). The multiple correlation coefficient was 0.67, indicating that approximately 44% of the variance of the imageability can be accounted for by the linear combination of AoA and CLC frequency. The analysis showed that AoA (β = -0.76, t (218) = -10.97, p<0.01) and CLC frequency (β = -0.14, t (218) = -2.04, p < 0.05) significantly predicted imageability.

CHAPTER 5

CONCLUSION AND DISCUSSION

In this thesis, the main aim was to build the preliminaries of a Turkish psycholinguistic database. Frequency, AoA and imageability variables were collected for this purpose. The second aim was to check the validity of a rather new method to obtain AoA values; a corpus-based method. This method was basically to compare frequency values from an adult language corpus to a child language corpus. The ideal way for this would be to use spoken language corpora for adults and children however this was not possible. Therefore written language corpora were used with the assumption that it can represent the properties of language in general. We used BOUN Corpus to represent the adult language. CLC that consists of 536 children's books was created to represent children's language. Children's books were assumed to be a sample of child language. A correlation analysis between child speech and books was conducted to support this assumption. In the process of creating CLC, a silver standard data using 5,026 words from children's books was formed as a byproduct of the thesis. We assumed that high-frequency words from CLC would be early acquired words, thus have low AoA values; whereas high-frequency words from BOUN sub-corpus would be late acquired, thus have high AoA. Using the frequency values from BOUN sub-corpus and CLC, we obtained corpus-based AoA values. 300 nouns among these words were selected for rated AoA questionnaire (Section 3.5 explains the selection criteria in detail). The ratings from this questionnaire were compared to the corpus-based AoA values. Moreover, imageability ratings were collected for the 300 nouns.

The results of the analyses showed us that high-frequency nouns from CLC got low AoA ratings in the questionnaire. However the high-frequency nouns from BOUN sub-corpus did not get high AoA ratings contrary to expectations. The low-frequency nouns from both corpora displayed similar tendencies (as frequency increases, AoA decreases), although the correlations were not significant for CLC. It seems that the corpus-based method may be inconclusive for low-frequency nouns without further data from new participants -i.e. the number of participants that rated low-frequency items with values other than '0' can and should be increased for conclusive results. For the high-frequency nouns, it can be concluded that nouns

from CLC are consistent with AoA ratings from the questionnaire. However, it seems that late acquired words could not be determined by frequency values from BOUN sub-corpus. To sum up, it was possible to infer acquisition information from high-frequency nouns in CLC; they were found to be early-acquired nouns. The fact that frequency is negatively correlated with AoA interferes with the attempt to extract information on late-acquired nouns from BOUN sub-corpus.

For a more general comparison between frequency and AoA, a correlation analysis without the criteria above was conducted. There was a strong negative correlation between AoA and CLC frequencies, while the correlation between AoA and BOUN sub-corpus frequency was not as strong as CLC frequencies. Research show that high-frequency words would have low AoA values indeed (e.g., Ghyselinck et al., 2000). Multiple regression analyses also supported the results of the correlation analyses, and the direction and significance of these relationships did not change. These results show that nouns that are acquired early in life are usually high-frequency nouns. The fact that CLC frequencies are strongly correlated with acquisition data would indicate that children's books can indeed be a sufficient source for child language acquisition information. The reasoning behind this could be as follows: if rated AoA values are collected from adult population (i.e. they are adult estimates of acquisition), and the authors are also from adult population, then the children's books they wrote includes a language simplified according to their estimates. These books were used to create CLC and the analyses confirmed that they seem to be acceptable source for AoA.

The relationships between imageability, AoA, and frequency were explored. Imageability ratings were highly correlated with AoA ratings. As the imageability increased, AoA decreased which was expected from previous research (e.g., Stadthagen-Gonzalez & Davis, 2006). This indicates that highly imageable nouns tend to be acquired early in life, which makes high imageability a factor for easier acquisition besides high frequency. Furthermore, as imageability increased, frequency from CLC increased as well. However the correlation between imageability and BOUN sub-corpus frequency values was low with regard to CLC frequencies. Further analyses with multiple regression revealed that when the effect of AoA was suppressed, the significant relationship between BOUN sub-corpus frequency and imageability disappeared. Moreover, while CLC frequency and imageability relationship remained significant, the direction of the relationship changed. Without the effect of AoA, as CLC frequency increased, imageability decreased. The strong correlation between AoA and imageability might be a reason for this change. There is also a strong correlation between CLC frequency and AoA which might have an effect on this change.

As a result of the database work, we have frequency values per million words for 19,246 word types from CLC, and for 11,349 word types from BOUN sub-corpus; rated AoA and imageability values for 300 nouns. Additionally, 8,844 word types have frequency values from both corpora. Table 5.1 summarizes the

information on word numbers in the database. The database is available in the form of an excel sheet. It will be shared upon request to the author[7] or the supervisor[8]. The limitations mentioned above should be kept in mind when using the data. The information on how many participants rated the words is also available for each word.

Table 5.1. The number of words in the database with frequency, AoA, and imageability values

	# of word types
CLC frequency	19,246 (4,388,149 token)
BOUN sub-corpus frequency	11,349 (2,832,025 token)
CLC & BOUN sub-corpus frequency	8,844
Rated AoA	300
Imageability	300

The next sections cover the limitations of this thesis and suggest possible further research options.

5.1. Limitations

There are some factors that should be considered with regards to the results of this study. The fact that the sources of adult and child language samples are different might have an influence on the results. The source for adult language is collected from online news reports, while the source for child language consists of literature pieces written by adults. Despite the genre difference, the relationships between frequencies, AoA, and imageability were as expected. However the results concerning BOUN sub-corpus frequency values were weak or absent compared to the results with CLC frequency values. Further studies using adult literature pieces as the source of adult language sample could clarify the inconclusive results.

Another factor that should be taken into account is the authors of children's books. The 26 books used in silver standard data were selected according to their word token counts. It might be suggested that using a variety of authors in each age group would generate a better sample for a standard data because different authors might prefer to include different linguistic properties in their books. However the silver standard data in this study was used in the training data set that consisted of 18,218 word tokens, therefore the diversity of authors might not have a significant

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effect in the current thesis. Future studies in which literature pieces are to be used should consider the variation of authors for improved samples.

Most participants in the current study could not rate the low-frequency nouns because they did not know them. With more participants, this number could increase for better results that improve the corpus-based AoA values.

5.2. Further Research

In summary, the current thesis collected imageability and AoA values for 300 nouns; investigated a corpus-based method for AoA; initiated a psycholinguistic database for Turkish studies; in addition, it created a CLC from children's books and created a silver standard data of CLC. The next step would definitely be to add more words and more variables to the database. For instance, emotional assessments for stimuli are commonly needed in research and each researcher has to do a preliminary experiment for this. It would be reasonable and practical to have them in the database. We included only nouns in the questionnaires because it would be possible to cover more age ranges in terms of rated AoA. This coverage made it easier to see the comparisons between rated AoA and corpus-based AoA. Lexical categories other than nouns could be investigated. Moreover, the age-groups in CLC could be a beneficial source of investigation. In the current thesis, the age-groups of CLC are not considered when the AoA information is extracted from corpora, because these groups were indicated by publishers and there were not any standard norms with regards to classification. Future studies should consider testing the hypothesis that there is a significant overlap between CLC age-groups and developmental stages in child language acquisition. The linguistic preferences of individual authors or differences between authors could also be a future research ground. Last but not least, to collect imageability data from children and compare it to the adult imageability data would suggest further understanding of the relationship between AoA and imageability in addition to imageability itself.

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APPENDICES

APPENDIX A: WORD LIST FOR BOTH QUESTIONNAIRES

1. ada
2. adaptasyon
3. afet
4. aft
5. ağaç
6. ajan
7. akaç
8. aktarım
9. ala
10. alabora
11. alay
12. alım
13. amaç
14. amblem
15. amir
16. amirlik
17. anahtar
18. argo
19. arka
20. arsa
21. asa
22. ast
23. ayak
24. ayı
25. ayıp
26. ayna
27. azamet
28. bacak
29. badminton
30. baharat
31. bakalit
32. bakla
33. bar
34. bariyer
35. bas
36. basımcılık
37. bayrak
38. bebek
39. beden
40. beka
41. bira
42. blöf
43. blok
44. bor
45. boşaltım
46. boya
47. broş
48. burç
49. büro
50. burun
51. cadı
52. çatal
53. çaydanlık
54. cesaretsizlik
55. çeşme
56. ceza
57. cila
58. çilek
59. cıva
60. çorap
61. çörek
62. dadı
63. dâhi
64. dalgınlık
65. dansçı
66. darı
67. deve
68. dikkatsizlik
69. dilek
70. diploma
71. dem
72. doktora
73. dolaşım
74. domuz
75. dondurucu
76. dörtgen
77. dram
78. ebat
79. eğitmenlik
80. eko
81. emlakçı
82. enkaz
83. eşek
84. eşey
85. esna
86. eten
87. evinç
88. evrak
89. eylem
90. falaka

91. fani
92. farz
93. feda
94. fener
95. filolog
96. fiş
97. fıçı
98. folklor
99. gaddarlık
100. gaf
101. gasp
102. gen
103. gereksinim
104. gevşeklik
105. geyik
106. giyecek
107. göç
108. görkem
109. gözlük
110. guru
111. hain
112. havza
113. haya
114. hektar
115. hendek
116. hin
117. hit
118. homojenlik
119. içme
120. idam
121. ideal
122. ihya
123. iktiza
124. inanılmazlık
125. iris
126. istiklal
127. ısı
128. ısrar
129. ıstakoz
130. jön
131. judo
132. kabile
133. kalamata
134. kapitalizm
135. karpuz
136. karşılık
137. karton
138. kasa
139. kaşan
140. kaya
141. kazak
142. kelebek
143. kil
144. kilit
145. kilo
146. kıskaç
147. kıtlık
148. kıyak
149. klan
150. kokpit
151. koltuk
152. konsorsiyum
153. köşk
154. koşum
155. kreş
156. kriminoloji
157. kuğu
158. kuka
159. kuraklık
160. kuzen
161. lanet
162. lime
163. madenci
164. mal
165. mama
166. mandıra
167. mâni
168. mantar
169. marul
170. mas
171. masumiyet
172. meclis
173. medya
174. merdane
175. merdiven
176. meşrubat
177. mevzuat
178. mezalim
179. mil
180. mink
181. modül
182. motor
183. motosiklet
184. muamele
185. muhtaç
186. müktesebat
187. muştu
188. naif
189. nan
190. net
191. niş
192. nitelik
193. nota
194. ödül
195. ofis
196. olanak
197. onay
198. önerge
199. ormancılık
200. otobüs
201. para
202. parite
203. parmak
204. paye
205. pencere
206. plaket
207. post
208. rahibe
209. repo
210. rom
211. saat
212. şaheser
213. şaka
214. saki
215. şamandıra
216. santral

217. şapka
218. sarkaçlı
219. savmacılık
220. seçim
221. sefa
222. şeftali
223. sel
224. sema
225. sera
226. sevk
227. şike
228. silsile
229. sirk
230. site
231. şive
232. sivil
233. sığa
234. sıhhat
235. sıpa
236. solo
237. sözcük
238. sucu
239. süit
240. suma
241. sunu
242. sürpriz
243. şut
244. tabu
245. tahmin
246. tahsisat
247. taka
248. takoz
249. takviye
250. talk
251. tane
252. tanı
253. tartım
254. tatlı
255. tavuk
256. tekbir
257. tekerleme
258. temas
259. tercüman
260. tere
261. tez
262. tıkaç
263. toksikolog
264. topaç
265. topluluk
266. törpü
267. tüfek
268. tuğ
269. tur
270. tüyo
271. tuzluk
272. uçuk
273. uğraş
274. ülkü
275. üstat
276. usul
277. uzam
278. üzüm
279. vaşak
280. vasi
281. vazo
282. vekil
283. vida
284. vücut
285. yalı
286. yansıtıcı
287. yarı
288. yastık
289. yazar
290. yelek
291. yönetici
292. yönetmelik
293. yüksük
294. yuna
295. zamk
296. zebra
297. zencefil
298. zoka
299. zürafa
300. zurnacı

APPENDIX B: LIST OF WORDS REPLACED IN THE PERCEPTRON'S OUTPUT

	Word	False parse	Replacement
1	ise	i[Verb]+[Pos]+sA[Cond]+[A3sg]	ise ise[Conj]
2	onla	on[Adj]-[Noun]+[A3sg]+[Pnon]+YlA[Ins]	onla o[Pron]+[Pers]+[A3sg]+[Pnon]+YlA[Ins]
3	onsuz	on[Adj]-[Noun]+[A3sg]+[Pnon]+[Nom]-sHz[Adj+Without]	onsuz o[Pron]+[Pers]+[A2sg]+[Pnon]+[Nom]-sHz[Adj+Without]
4	Onsuzuz	on[Adj]-[Noun]+[A3sg]+[Pnon]+[Nom]-sHz[Adj+Without]-YHz[Verb+Pres+A1pl]	Onsuzuz o[Pron]+[Pers]+[A3sg]+[Pnon]+[Nom]-sHz[Adj+Without]-YHz[Verb+Pres+A1pl]
5	onunla	on[Adj]-[Noun]+[A3sg]+Hn[P2sg]+YlA[Ins]	onunla o[Pron]+[Pers]+[A3sg]+[Pnon]+NHn[Gen]+YlA[Ins]
6	onunlaydı	on[Adj]-[Noun]+[A3sg]+Hn[P2sg]+YlA[Ins]-YDH[Verb+Past]+[A3sg]	onunlaydı o[Pron]+[Pers]+[A3sg]+[Pnon]+NHn[Gen]+YlA[Ins]-YDH[Verb+Past]+[A3sg]
7	onunlayken	on[Adj]-[Noun]+[A3sg]+Hn[P2sg]+YlA[Ins]-[Verb]-Yken[Adv+While]	onunlayken o[Pron]+[Pers]+[A3sg]+[Pnon]+NHn[Gen]+YlA[Ins]-Yken[Adv+While]
8	onunlaymış	on[Adj]-[Noun]+[A3sg]+Hn[P2sg]+YlA[Ins]-YmHş[Verb+Narr]+[A3sg]	onunlaymış o[Pron]+[Pers]+[A3sg]+[Pnon]+NHn[Gen]+YlA[Ins]-YmHş[Verb+Narr]+[A3sg]
9	sana	san[Noun]+[A3sg]+[Pnon]+YA[Dat]	sana sen[Pron]+[Pers]+[A2sg]+[Pnon]+YA[Dat]
10	üzer	Üzer[Noun]+[Prop]+[A3sg]+[Pnon]+[Nom]	üz[Verb]+[Pos]+Hr[Aor]+[A3sg]
11	üzeri	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg]+[Nom]	üzeri[Noun]+[A3sg]+[P3sg]+[Nom]
12	üzerimde	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg]+NDA[Loc]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NDA[Loc]
13	üzerimdeki	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg]+NDA[Loc]-ki[Adj+Rel]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NDA[Loc]-ki[Adj+Rel]
14	üzerimdeki	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg]+NDA[Loc]-ki[Adj+Rel]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NDA[Loc]-ki[Adj+Rel]

	Word	False parse	Replacement
15	üzerimdekileri	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg] +NDA[Loc]-ki[Adj+Rel]+lAr[A3pl]+[Pnon] +NH[Acc]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NDA[Loc]-ki[Adj+Rel]+lAr[A3pl]+[Pnon]+NH[Acc]
16	üzerimden	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg] +NDAn[Abl]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NDAn[Abl]
17	üzerimdeydi	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg] +NDA[Loc]-YDH[Verb+Past]+[A3sg]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NDA[Loc]-YDH[Verb+Past]+[A3sg]
18	üzerime	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg] +NA[Dat]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NA[Dat]
19	üzerimi	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg] +NH[Acc]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NH[Acc]
20	Üzerimin	Üzer[Noun]+[Prop]+[A3sg]+Hm[P1sg] +NHn[Gen]	üzeri[Noun]+[A3sg]+Hm[P1sg]+NHn[Gen]
21	üzerimizde	Üzer[Noun]+[Prop]+[A3sg]+HmHz[P1pl] +NDA[Loc]	üzeri[Noun]+[A3sg]+HmHz[P1pl]+NDA[Loc]
22	üzerimizdeki	Üzer[Noun]+[Prop]+[A3sg]+HmHz[P1pl] +NDA[Loc]-ki[Adj+Rel]	üzeri[Noun]+[A3sg]+HmHz[P1pl]+NDA[Loc]-ki[Adj+Rel]
23	üzerimizden	Üzer[Noun]+[Prop]+[A3sg]+HmHz[P1pl] +NDAn[Abl]	üzeri[Noun]+[A3sg]+HmHz[P1pl]+NDAn[Abl]
24	üzerimize	Üzer[Noun]+[Prop]+[A3sg]+HmHz[P1pl] +NA[Dat]	üzeri[Noun]+[A3sg]+HmHz[P1pl]+NA[Dat]
25	üzerimizi	Üzer[Noun]+[Prop]+[A3sg]+HmHz[P1pl] +NH[Acc]	üzeri[Noun]+[A3sg]+HmHz[P1pl]+NH[Acc]
26	üzerinde	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]	üzeri[Noun]+[A3sg]+[Pnon]+NDA[Loc]

	Word	False parse	Replacement
27	üzerindedir	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-DHr[Verb+Pres+Cop]+[A3sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- DHr[Verb+Pres+Cop]+[A3sg]
28	üzerindeki	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-ki[Adj+Rel]	üzeri[Noun]+[A3sg]+[Pnon]+NDA[Loc]- ki[Adj+Rel]
29	üzerindekiler	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-ki[Adj+Rel]+lAr[A3pl]+[Pnon]+ [Nom]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- ki[Adj+Rel]+lAr[A3pl]+[Pnon]+[Nom]
30	üzerindekileri	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-ki[Adj+Rel]+lAr[A3pl]+[Pnon] +NH[Acc]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- ki[Adj+Rel]+lAr[A3pl]+[Pnon]+NH[Acc]
31	üzerindekin- den	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-ki[Adj+Rel]+NDAn[Abl]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- ki[Adj+Rel]+NDAn[Abl]
32	üzerindekini	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-ki[Adj+Rel]+NH[Acc]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- ki[Adj+Rel]+NH[Acc]
33	üzerindekinin	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-ki[Adj+Rel]+NHn[Gen]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- ki[Adj+Rel]+NHn[Gen]
34	üzerinden	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDAn[Abl]	üzeri[Noun]+[A3sg]+[Pnon]+NDAn[Abl]
35	üzerindesin	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-sHn[Verb+Pres+A2sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- sHn[Verb+Pres+A2sg]
36	üzerindeydi	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YDH[Verb+Past]+[A3sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- YDH[Verb+Past]+[A3sg]
37	üzerindeydik	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YDH[Verb+Past]+k[A1pl]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]- YDH[Verb+Past]+k[A1pl]

	Word	False parse	Replacement
38	üzerindeydiler	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YDH[Verb+Past]+lAr[A3pl]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-YDH[Verb+Past]+lAr[A3pl]
39	üzerindeyim	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YHm[Verb+Pres+A1sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-YHm[Verb+Pres+A1sg]
40	üzerindeyiz	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YHz[Verb+Pres+A1pl]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-YHz[Verb+Pres+A1pl]
41	Üzerindeyken	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-[Verb]-Yken[Adv+While]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-[Verb]-Yken[Adv+While]
42	üzerindeymiş	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YmHş[Verb+Narr]+[A3sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-YmHş[Verb+Narr]+[A3sg]
43	üzerindeymi-şim	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YmHş[Verb+Narr]+YHm[A1sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-YmHş[Verb+Narr]+YHm[A1sg]
44	üzerindeyse	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NDA[Loc]-YsA[Verb+Cond]+[A3sg]	üzeri[Noun]+[A3sg]+[P3sg]+NDA[Loc]-YsA[Verb+Cond]+[A3sg]
45	üzerine	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NA[Dat]	üzeri[Noun]+[A3sg]+[Pnon]+NA[Dat]
46	üzerinedir	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NA[Dat]-DHr[Verb+Pres+Cop]+[A3sg]	üzeri[Noun]+[A3sg]+[P3sg]+NA[Dat]-DHr[Verb+Pres+Cop]+[A3sg]
47	üzerini	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NH[Acc]	üzeri[Noun]+[A3sg]+[P3sg]+NH[Acc]
48	üzerinin	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg] +NHn[Gen]	üzeri[Noun]+[A3sg]+[P3sg]+NHn[Gen]
49	üzerinizde	Üzer[Noun]+[Prop]+[A3sg]+HnHz[P2pl] +NDA[Loc]	üzeri[Noun]+[A3sg]+HnHz[P2pl]+NDA[Loc]

	Word	False parse	Replacement
50	üzerinizden	Üzer[Noun]+[Prop]+[A3sg]+HnHz[P2pl]+NDAn[Abl]	üzeri[Noun]+[A3sg]+HnHz[P2pl]+NDAn[Abl]
51	üzerinize	Üzer[Noun]+[Prop]+[A3sg]+HnHz[P2pl]+NA[Dat]	üzeri[Noun]+[A3sg]+HnHz[P2pl]+NA[Dat]
52	Üzerinizi	Üzer[Noun]+[Prop]+[A3sg]+HnHz[P2pl]+NH[Acc]	üzeri[Noun]+[A3sg]+HnHz[P2pl]+NH[Acc]
53	üzeriydi	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg]+[Nom]-YDH[Verb+Past]+[A3sg]	üzeri[Noun]+[A3sg]+[P3sg]+[Nom]-YDH[Verb+Past]+[A3sg]
54	üzeriyim	Üzer[Noun]+[Prop]+[A3sg]+SH[P3sg]+[Nom]-YHm[Verb+Pres+A1sg]	üzeri[Noun]+[A3sg]+[P3sg]+[Nom]-YHm[Verb+Pres+A1sg]
55	üzerleri	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+[Nom]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+[Nom]
56	Üzerlerinde	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+NDA[Loc]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+NDA[Loc]
57	üzerlerindeki	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+NDA[Loc]-ki[Adj+Rel]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+NDA[Loc]-ki[Adj+Rel]
58	üzerlerinden	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+NDAn[Abl]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+NDAn[Abl]
59	üzerlerindeydi	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+NDA[Loc]-YDH[Verb+Past]+[A3sg]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+NDA[Loc]-YDH[Verb+Past]+[A3sg]
60	üzerlerine	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+NA[Dat]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+NA[Dat]
61	Üzerlerini	Üzer[Noun]+[Prop]+lAr[A3pl]+SH[P3sg]+NH[Acc]	üzeri[Noun]+lAr[A3pl]+SH[P3pl]+NH[Acc]

APPENDIX C: LIST OF BOOKS USED IN SILVER STANDARD DATA AND THEIR AGE-GROUPS

	Book Title	Author	Age-group
1	Balık	Ayla Çınaroğlu	3 – 5
2	Kümes	Ayla Çınaroğlu	3 – 5
3	Kuş	Ayla Çınaroğlu	3 – 5
4	Kuzu	Ayla Çınaroğlu	3 – 5
5	Kırmızı Elma	Feridun Oral	3 – 5
6	Küçük Ayı ile Ahlat Ağacı	Yalvaç Ural	3 – 5
7	Can Arkadaşımın Doğumgünü	Aytül Akal	5 – 8
8	Canım Annemin Doğumgünü	Aytül Akal	5 – 8
9	Güzel Ablamın Doğumgünü	Aytül Akal	5 – 8
10	Pamuk Büyükannemin Doğumgünü	Aytül Akal	5 – 8
11	Tatlı Kardeşimin Doğumgünü	Aytül Akal	5 – 8
12	Tonton Dedemin Doğumgünü	Aytül Akal	5 – 8
13	Dilek Ağacı	Aytül Akal	5 – 8
14	Bilgisayardaki Saklambaç	Mehmet Atilla	8 – 10
15	Bilmeceler	Ömer Lütfü Şadoğlu	8 – 10
16	Cankuş	Ekrem Güneş	8 – 10
17	Çiçek Dürbünü	Kemal Özer	8 – 10
18	Çalı Çiçeği	A. Alper Akçam	10 – 12
19	Çanakkale Destanı	Bilgin Adalı	10 – 12
20	Çöp Plaza	Miyase Sertbarut	10 – 12
21	Kapiland'ın Karanlık Yüzü	Miyase Sertbarut	Above 12
22	Kent Düşleri	Hamdullah Köseoğlu	Above 12
23	Yaz Çırakları	Hamdullah Köseoğlu	Above 12
24	Ben Bir Ağacım	Orhan Pamuk	Unavailable
25	Benekli	Bilgin Adalı	Unavailable
26	Bodurcuk	Şebnem Kartal	Unavailable

APPENDIX D: CONSENT FORM

Gönüllü Katılım Formu

Bu çalışma, Orta Doğu Teknik Üniversitesi Bilişsel Bilimler Yüksek Lisans Programı kapsamında, Prof. Dr. Deniz Zeyrek danışmanlığında Elif Ahsen Tolgay tarafından yürütülen yüksek lisans tezi araştırmasının bir parçasıdır. Çalışmanın amacı, Türkçe dili için oluşturulması plânlanan psikodilbilimsel veritabanına eklenmek üzere anadili Türkçe olan katılımcılardan veri toplamaktır. Bu veritabanı, ileride yapılacak psikolojik ve dilbilimsel çalışmalar için temel oluşturacağından, katılımınız ileriye dönük araştırmalar için de faydalı olacaktır.

Çalışmaya katılım tamamen gönüllülük esasındadır. Katılım için anadilinizin Türkçe olması yeterlidir. Sorular, kişisel rahatsızlık verebilecek herhangi bir ayrıntı içermemektedir. Çalışmada sizden beklenen, belirli sayıda Türkçe kelimeyi anket başında belirtilen kıstaslara göre değerlendirmenizdir. Sorular, kişiye göre değişmekle beraber, ortalama 20 dakikanızı alacaktır. Anket süresince, çevrenizde dikkat dağıtıcı görüntü/ses olmamasına özen göstermenizi, soruları rahat ve sakin bir ortamda cevaplandırmanızı rica ediyoruz. Anket sırasında ara verip daha sonra ankete geri dönmenizde bir sakınca yoktur.

Çalışmada, sizden kimlik belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecek; elde edilecek bilgiler yalnızca bilimsel yayımlarda kullanılacaktır. Çalışma hakkında daha fazla bilgi almak için tezi yürüten Elif Ahsen Tolgay ile ahsen.tolgay@metu.edu.tr adresinden iletişime geçebilirsiniz.

Katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakmakta serbestsiniz. Çalışmadan ayrılmak için internet tarayıcınızın penceresini kapatmanız yeterli olacaktır. Çalışmamıza katılmayı kabul ediyorsanız, lütfen aşağıdaki cümleyi okuyup "Evet" kutucuğunu işaretleyerek "İleri" düğmesine basınız. Bu şekilde sayfa sizi ankete yönlendirecektir.

Değerli vaktinizi bu çalışmaya ayırdığınız için şimdiden teşekkür ederiz.

Bu çalışmaya tamamen gönüllü olarak katılıyorum ve istediğim zaman yarıda kesip çıkabileceğimi biliyorum. Vereceğim bilgilerin kimliğimle eşleştirilmeyeceğini biliyor ve bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum.

- Evet

APPENDIX E: AoA QUESTIONNAIRE INSTRUCTIONS

Bu anket, belirli sayıda Türkçe isim için 'kelime edinim yaşı' değerlerini elde etmek amacıyla hazırlanmıştır.Kelime edinim yaşı, bir kelimenin kişi tarafından hangi yaşta öğrenildiğini ölçen değerdir. Bir kelimenin öğrenilmiş olması için o kelimeyle karşılaştığımızda onu anlıyor olmamız yeterlidir; yani kelimeyi günlük hayatımızda etkin olarak kullanmıyor olsak dahi kelimenin ne ifade ettiğini anlıyorsak o kelimeyi öğrenmiş sayılırız.

Örnek olması açısından çeşitli kelimeler için kelime edinim yaşı aralıkları;

piyano	7-9	sandviç	4-6
balon	0-3	göz	0-3
palyaço	4-6	çekiç	7-9
gramofon	10-12	kask	10-12

Aşağıdaki kelimeleri, hangi yaşta öğrendiğinizi düşünüyorsanız altlarındaki kutuya o sayıyı girerek değerlendirmenizi rica ediyoruz.

Bilmediğiniz bir kelimeyle karşılaşırsanız lütfen kutuya "0" rakamını giriniz.

Kelime sıralaması rastgele olduğundan benzer cevaplar vereceğiniz kelimeler art arda sıralanmış olabilir; bunun sonuçlar açısından bir önemi yoktur, lütfen değerlendirmenizi önceki cevaplara göre değil okuduğunuz kelimeye göre yapmaya devam edin.

Anketi tek oturumda tamamlamak istemezseniz değerlendirme esnasında ankete ara verip geri dönmenizde bir sakınca yoktur.

APPENDIX F: POST-SURVEY DEMOGRAPHIC INFORMATION FORM

Anketi tamamlamak üzeresiniz, vaktinizi ayırdığınız için teşekkür ederim.Son olarak aşağıda sizden demografik bir takım bilgiler sorulmuştur. Kişisel hiçbir bilgi girmeniz gerekmemektedir.Tamamladıktan sonra cevaplarınızın kaydedilmesi için diğer sayfaya geçmeyi unutmayınız.

Yaş : _____

Cinsiyet :
- ❍ Kadın
- ❍ Erkek
- ❍ Diğer

Eğitim durumu :
(Tamamladığınız en yüksek derece)
- ❍ İlköğretim
- ❍ Lise
- ❍ Önlisans
- ❍ Lisans
- ❍ Yüksek Lisans
- ❍ Doktora

1-12 yaşlarınız arasında bulunduğunuz yer :
(Birden fazla yerde bulunduysanız lütfen bulunduğunuz yaşlar ile beraber belirtiniz)

_____

_____

APPENDIX G: IMAGEABILITY QUESTIONNAIRE INSTRUCTIONS

Bu anket, belirli sayıda Türkçe isim için 'imgelem' değerlerini elde etmek amacıyla hazırlanmıştır.

İmgelem; kelimelerin zihninizde uyandırdığı görsel veya işitsel çağrışımlar olarak tanımlanabilir. Örneğin; çiçek kelimesini okuduğunuzda zihninizde belirebilen görüntü, veya rüzgâr kelimesini okuduğunuzda belirebilen ses gibi. Bazı kelimeler, örneğin çiçek, zihnimizde kolayca bir imgelem uyandırırken bazıları, örneğin gerçek, o kadar kolay imgelem uyandırmaz. Aşağıdaki ankette, okuduğunuz kelimelerin zihninizde ne kadar kolay veya zor imgelem oluşturduğunu değerlendirmenizi rica ediyoruz. Lütfen en zor imgelem uyandıran veya hiç imgelem uyandırmayan kelimeler için 1'i; en kolay imgelem uyandıran kelimeler için 7'yi; arada bir değer alması gerektiğini düşündüğünüz kelimeler için ise uygun sayıyı işaretleyiniz.

Değerlendirme yaparken okuduğunuz kelime başka kelimeleri çağrıştırabilir; sizden ricamız çağrışım yapan diğer kelimeleri değil yalnızca okuduğunuz kelimeyi düşünerek imgelem değerini işaretlemenizdir.

Kelime sıralaması rastgele olduğundan benzer cevaplar vereceğiniz kelimeler art arda sıralanmış olabilir; bunun sonuçlar açısından bir önemi yoktur, lütfen değerlendirmenizi önceki cevaplara göre değil okuduğunuz kelimeye göre yapmaya devam edin.

Anketi tek oturumda tamamlamak istemezseniz değerlendirme esnasında ankete ara verip geri dönmenizde bir sakınca yoktur.

APPENDIX H: SAMPLE FROM IMAGEABILITY QUESTIONNAIRE

şut

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	7

eko

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	7

şike

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	7

kıskaç

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	7

hain

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	7

zencefil

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	7

parite

(İmgelemi en zor)						(İmgelemi en kolay)
1	2	3	4	5	6	

TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : .....
Adı : .....
Bölümü : .....

TEZİN ADI (İngilizce) :.....
.....
.....

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ☐

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. ☐
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullancılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐

Yazarın imzası ..... Tarih ….....