universität wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„English monosyllables and syllable weight: a diachronic overview"

verfasst von / submitted by

Vanja Vuković, BA

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Arts (MA)

Wien, 2018 / Vienna, 2018

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	A 066 812
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium English Language and Linguistics
Betreut von / Supervisor:	Univ.-Prof. Mag. Dr. Nikolaus Ritt

Preface

This master's thesis was produced with the purpose of providing a descriptive account of the phonology of a fairly underexplored, but widespread element of the English language, namely English monosyllables. While several authors have noticed the existence of a relatively large proportion of monosyllabic to polysyllabic words in English, no scholar has studied their phonological, and, in particular, phonotactic properties in great detail thus far. The present thesis attempts to fill this research gap by looking not only at phonotactics of monosyllables from a synchronic perspective, but also by studying English monosyllables throughout the time, i.e. diachronically. Specifically, this thesis will look at possible changes in syllable weight which monosyllabic words might have undergone during the development of the English language and the implications which these changes might have for the utterance rhythm.

The present thesis could not have seen the light of the day without unconditional emotional, professional, and practical support of several people. Therefore, I would like to thank them all most sincerely for all the kind and inspiring conversations we have led during the process of writing: my brother, father, aunt, my friends, and my partner. Last but not the least, I will be infinitely thankful to the person whose vast knowledge and fascination of linguistics stimulated my interest in the amazing science of language, namely my thesis supervisor Prof. Nikolaus Ritt. Finally, I would like to emphasise that I am extremely honoured that Prof. Ritt agreed to supervise my thesis.

Table of Contents

List of abbreviations

A-……Zero segments in the onset
A……One segment in the onset
AB……...Two segments in the onset
ABC……..Three segments in the onset
BTC……....Bible Texts Corpus
C……Consonant
*C……Constraint banning codas
*COMPLEXCOD……Constraint banning complex codas
D……..Diphthong
EME……..Early Modern English
EPD……..*English Pronouncing Dictionary*
F……Function word
FTBIN……...Constraint which requires feet to be binary
G……Voiced consonant (following Everett & Everett 1984: 76)
G (in the Appendix)……..Germanic word
GCat……..Grammatical category
GRAMWD……..Grammatical word
H……..Heavy monosyllable
H_n……..…..Hypothesis
IPA……..…International Phonetic Association
L……Long vowel
L (in OT)……Left
M……..Morphologically complex words
M-……...….Morphologically simple words
ME……..……Middle English
MED……..….*Middle English Dictionary*
MINWD……...…Constraint governing minimal prosodic words
ModE…….…….Modern English
OE…….……Old English
OT……...Optimality Theory
P……Period
PCat……Prosodic Category
pword……Prosodic word
PrWd…….……Prosodic word
PDE……..……Present Day English
PPCME2……...…The Penn-Helsinki Parsed Corpus of Middle English
R (in the data set)……...…Romance
RP……...……Received Pronunciation
S……...……..Short vowel
SH……Superheavy monosyllable
SSH……...……Super-superheavy monosyllable
SPE……...….*Sound Pattern of English*
SSP…….……..Sonority Sequencing Principle
V……....Vowel
VNC…….……Variability-based Neighbour Clustering
VV……Long vowel or diphthong

List of figures

List of tables

Part 1 - Introduction

1.1. Introduction

One of the most profound morphological changes in the history of English was the gradual disappearance of inflectional suffixes. This development can be traced back to late Old and Middle English, when the majority of the processes which resulted in the loss of inflections were at play (Lass 2008: 138). Inflectional endings were gradually becoming weaker and were eventually reduced to schwas, which, in turn, ceased to be pronounced by the second half of the fifteenth century (Minkova 1991: 2). Thus, by Late Middle English, almost all inflections had disappeared except noun plurals, the genitive, and a few verbal inflectional suffixes (Wełna 2017: 51). These processes produced the morphology of the English language as we know it today and contributed to the typological shift of English from a highly synthetic language to an analytic language.

Obviously, when English word forms lost their inflectional suffixes, their phonological shapes were altered as well, and the word classes most affected by this were content words, such as nouns, verbs, and adjectives, as they were the principal carriers of the entire inflection system. When this system collapsed, nominal, verbal, and adjectival word forms not only lost suffixes but unstressed syllables at the same time. In many cases, they wound up as monosyllables, whose number increased significantly during the period.

The observation was first made by Jespersen (1928: 3-4), who provides an extensive account of monosyllabism in English and compares the language to Mandarin Chinese in that both languages have undergone the process which he terms ‘monosyllabicisation’, albeit for different reasons. Monosyllables, as Jespersen further explains, have thus become an “indispensable part of the English vocabulary” (1928: 5). According to a brief quantitative analysis of the proportion of monosyllables in the English lexicon (Jespersen 1928: 15), there are approximately 4,700 monosyllabic words in English. This high number is not only due to the disappearance of inflectional suffixes, however, but also to the influx of monosyllabic loan words and to the increasing productivity of clipping (Jespersen 1928: 5-7).

In his discussion of monosyllables, Jespersen (1928: 9-10) also briefly describes their phonotactic characteristics. He does so primarily from a synchronic perspective, as he looks at the structure of onsets, nuclei, and codas in Modern English, but also approaches the question diachronically and compares the structure of Modern English monosyllables to the syllable structure found in Old English (henceforth: OE) ones.

A similar survey of the structure of English monosyllabic words was done by Kisaka (1940). Kisaka also emphasises the importance of monosyllables for the English lexicon and essentially agrees with Jespersen (1928) that monosyllables are a specific feature of the English lexicon. At the same time, he discusses their phonotactic characteristics in Old and Present-Day English (henceforth: PDE) in greater detail than Jespersen.

Both Jespersen and Kisaka emphasise the importance of monosyllables in the English language and describe their structures in some detail, but neither of them deals – explicitly and systematically – with the issue of their 'weight'[1], although some information is of course implicit to their descriptions. Since the times of Jespersen and Kisaka, of course, the property of 'syllable weight' has come to be studied extensively within the area of phonotactics (see e.g. Hyman 1985: 5), and the basic distinction between light syllables (such as the final CV syllable in *happy*) and heavy ones (such as CVV in *tea*, or CVC in *bit*) has proved to be crucial for understanding properties such as stress placement (cf. already Chomsky and Halle 1968), or restrictions that different languages impose on possible word form shapes. It is interesting, therefore, that the historical development of English monosyllables in terms of their weight has not come to be described, or accounted for, in the more recent literature either.

This thesis attempts to fill this gap. It will look at English monosyllables and their weight in each of the major stages in the evolution of the English language. In the present thesis, syllable weight[1] is defined as the property of syllable which predominantly depends on the elements in the rhyme of a syllable. Based on this characteristic, syllables can be light if they contain a non-branching rhyme, heavy, if they contain a branching rhyme, superheavy if one of the elements in the rhyme, i.e. nucleus or coda, branch, and super-superheavy if both elements in the rhyme branch.

Thus, this thesis will predominantly be concerned with the area of suprasegmental phonology, in which the syllable is a central constituent. At the same time, this study will also deal with potential areas of interaction between syllable weight and English speech rhythm. In other words, phonological levels above the syllable will be discussed as well. The diachronic analysis of English monosyllables and their weight will address a number of specific research questions, which are outlined in the following section.

[1] This notion is discussed in more detail in section 2.2.3 below.

1.2. Research questions

Generally speaking, most of the research questions addressed in this thesis are empirical and quantitative in nature. My study intends to provide a descriptive account of changes that English monosyllables have undergone in terms of their frequency and in terms of their weight. It is based on a corpus specifically constructed for the purpose and derived from English translations of the Bible from different stages in the history of English. The corpus is described in more detail in section 4.1. below. Although the main agenda of this study is descriptive, an attempt will also be made to explain the observable developments. These explanations will be grounded in naturalness theory and Optimality Theory (OT), as well as an evolutionary conceptualisation of language and language change. More on these theories, or approaches, will be said below (see section 3).

More specifically speaking, the present thesis will address the following research questions:

1. What is the proportion of monosyllabic words in the data set and has it changed over time?

   Although it was already noted by Jespersen (1928: 3-4) and Kisaka (1940: 536) that the proportion of monosyllables has come to be high in English, their observations deserve quantitative verification.
2. Has the (average) weight of monosyllables changed throughout the history of English, especially after the loss of inflectional suffixes in content words?
3. During different phases in the history of English, have the monosyllables become heavier or lighter?
4. Can any observable changes be described as (relatively) gradual or (relatively) abrupt?

The rationale behind questions 2-4 lies in the possibility that certain content words may have gained weight in order for English speech rhythm, which is usually described as stress-timed (Roach 2009: 107-8), to be maintained. For instance, a disyllabic word that became monosyllabic might see its syllable weight increased by compensatory lengthening (Kavitskaya 2002), so that it could continue to play the same rhythmic role that its disyllabic predecessor had played. By another rationale, the weight of monosyllables may have decreased, if they came to occur in sequences in which some of them were rhythmically demoted, so that a sequence of two monosyllables would come to occupy a rhythmic slot that had previously been occupied by a single disyllable.

5. In which parts of monosyllables (onset, nucleus, or coda) are changes most prominent?
6. Are there significant weight differences between morphologically simple and morphologically complex monosyllables, and have there been changes in that relation?

This question is interesting, because high weight might have become indicative or morphological complexity at one point, and simple monosyllables might have lost weight in response, so as to be more easily recognizable as simple.

7. Have restrictions on the minimal and the maximal weight of monosyllables remained constant over time, or have they changed? If there has been no change in absolute constraints, have there been statistically observable changes in preferences?

Although the question is primarily empirical, it could potentially provide insights on the relationship between syllable weight at different points in the evolution of English and rhythmic characteristics of hierarchically higher phonological constituents which the language exhibited at that point. – Thus, like questions 1 to 5, it may turn out to be relevant for testing hypotheses that have been made in the literature, and some of the predictions they imply. Some other hypotheses and predictions for which my data may hopefully turn out to be relevant are listed in the following.

1.3. Introducing hypotheses

- H_1: The gradual loss of inflectional endings in content words which were disyllabic in Old English, such as *scip-scipu* (ship, nominative singular-ships, nominative plural) which was most likely completed by the second half of the 15th century (Minkova 1991: 2) influenced the proportion of monosyllabic words to polysyllabic words in the English lexicon. More specifically, monosyllabic words probably became the prototypical word shape, which contributed to the increase in the proportion of monosyllables to polysyllables in English.

  This hypothesis is informed by the remarks made by Jespersen (1928: 3-4) and Kisaka (1940: 536), which were discussed in the introduction to this paper.
- H_2: After the loss of schwas, which were the remnants of the complex inflectional system of Old English, the frequency of monosyllabic words in English significantly increased. Moreover, monosyllables were most likely heavier on average prior to the loss of schwa because their frequency was lower and they were under pressure to be able to constitute

minimal rhythmic units, such as the Minimal Word. Minimal Words need to fulfil two key requirements; in particular, they must have at least one foot, which needs to be binary, so Minimal Words have to be at least bimoraic[2] (McCarthy & Prince 1995: 321). This might imply that monosyllables had to be able to constitute one foot, which had to be bimoraic or heavy. However, after the increase of the frequency of monosyllables in English, this pressure became lower, as the average length of strings of monosyllables probably became higher. This also means that monosyllabic words could now afford to be lighter on average, because they could join with a preceding or subsequent monosyllable in order to create a well-formed Minimal Word, which, in this case, might perhaps have to consist of two monosyllables. Therefore, the average syllable weight of English monosyllables has gradually changed. In particular, monosyllables have most likely become lighter on average.

- H_3: It has been widely recognised (e.g. Jakobson 2002: 377) that syllables cross-linguistically tend to have the CV (consonant-vowel) structure. Therefore, syllable coda has been identified as a phonotactically weak position (Lutz 1991), which has also been corroborated from a psycholinguistic perspective by Wedel (2017), who claims that "phonetic cues early in the signal for a word are more informative about word-identity". Based on these suggestions, it is assumed that codas of English monosyllables, being the final parts of monosyllabic words, will most likely behave similarly to syllable codas in general. This means that codas of monosyllabic words are probably less informative that its onsets or nuclei, and that they have undergone more changes diachronically.
- H_4: As the number of morphologically complex – and most probably heavy or superheavy – monosyllables increased, simple monosyllables will have lost weight, which would have made weight differences statistically more indicative of morphological simplicity vs. complexity. It is expected, therefore, that morphologically complex monosyllables will tend to be significantly heavier than morphologically simple ones.

As pointed out above, these hypotheses will be empirically examined by adopting a corpus-based approach. The corpus which will be used in the project was also created for the purpose of the project by the author, and will be discussed in more detail in the section on methodology.

[2] For a definition of morae, see section 2.2.3.

1.4. Organisation of the thesis

The present thesis is divided into two four main parts. After the introduction provided above, the second part provides the theoretical background to the thesis. In Chapter 1, notions such as the syllable in general and monosyllables in particular, syllable weight, as well as speech rhythm, will be discussed. After discussing the key concepts needed for the empirical part of the project, the linguistic theories which have informed this thesis to a large extent, namely naturalness theories, optimality theory, and evolutionary linguistics, will be introduced in Part 3. In the fourth part of the thesis, which outlines the empirical part of the project, first, the data used for the purposes of the project will be presented and the methodology adopted in the study will be explained in detail. Then, the results will be presented and briefly examined. Finally, they will be discussed in more detail in different subsections, each of which will look at a separate research question. The final section of the thesis will provide a conclusion and make suggestions for future research.

Part 2 – Theoretical concepts

In this chapter, different theoretical concepts necessary for the understanding of the topic of this thesis, as well as its empirical part, will be introduced and discussed.

2.1. The syllable

Although the primary concern of this thesis is not the notion of syllable as such, but rather monosyllables as they represent words which consist of one syllable, it is deemed useful to discuss the concept of syllable first as it might be able to enhance the understanding of any diachronic changes which monosyllables have undergone. For this purpose, the definitions of the theoretical concept of syllable and its treatment in different phonological theories will be discussed. Moreover, criticisms of the syllable will be briefly examined.

2.1.1. Defining the syllable

Although the notion of syllable may seem rather straightforward even from a non-specialist's perspective, the abundance of ideas about its nature as well as various, sometimes even contradicting, views on this concept from different phonological theories render the task of defining the syllable rather challenging. At the same time, however, providing a definition of the syllable is a necessity as this thesis will make extensive use of this concept. For that purpose, a definition of the syllable will be presented, which should, of course, be understood as an intentional simplification made due to the limited scope of the study.

This study approaches the concept of syllable considering three types of processes which are believed to play a significant role in production and perception of syllables as phonological units, namely articulatory or physiological processes, phonological processes, and psycholinguistic processes. From the point of view of the physiology of human articulation, it seems that "syllables might be associated with characteristic patterns of articulatory organization" (Krakow 1989, cited in Krakow 1999: 25). In particular, the patterns of syllable organisation based on physiological requirements seem to suggest that the articulatory movements exhibit differences in syllable onsets and syllable offsets (Krakow 1999: 47). A similar idea has already been proposed earlier, and it was suggested that the "ideal" syllable consists of an alternation of "stop and vowel, or in other words, closed vocal tract and open vocal tract" (Jakobson 2002: 377, my translation).

Regarding the evidence for the existence of syllables as psycholinguistic units, it has been suggested that they are necessary in several crucial language-related operations, such as speech production, language storage and access, as well as speech perception (Cholin 2011: 248). These findings qualify syllables as functional psychologically real units. The necessity for syllables as articulatory and psycholinguistic supports their status in phonological theory. In particular, syllables seem to be one of the key domains where phonological processes and constrains are applied (Blevins 1995: 207). As Blevins (1995: 207) explains, "[s]uch rules and constraints are sensitive to a domain that is larger than the segment, smaller than the word, and contains exactly one sonority peak". An example of a phonological rule which is sensitive to syllable structure is the so called "l-darkening" in English. More precisely, an allophone of the English phoneme /l/ becomes "dark" in coda positions. The quality described as "dark" actually refers to the quality of the phone produced when the back of the tongue is raised, which occurs only in syllable-final positions. Therefore, in this case, the phonological rule which is responsible for the production of dark /l/ is sensitive to its position in the syllable rather than in the word[3] and the rule affects it only when it is present in the coda (Lutz 1991: 166).

While this conception is present in most phonological theories, it is by no means the only way to define the concept of a syllable. In the following section, the status of the syllable in various phonological theories will be briefly reviewed.

2.1.2. The syllable in phonological theory: a brief overview

As Mott (2017: 229) states, "the syllable has generally been recognized as a fundamental unit in phonological analysis among all the major schools of thought in the field". Even the father of modern linguistics, Ferdinand de Saussure, concerned himself with the notion of syllable within a structuralist framework, thereby noting that the production of a syllable, due to the peculiarities of human speech organs, is based on the sonority scale (Marotta 2015: 57). His account was rendered more comprehensive by another structuralist, namely Roman Jakobson (2002: 377), who claims that syllables consist of "stop and vowel, or in other words, closed vocal tract and open vocal tract" (my translation). Thereby, he identified what is sometimes termed the "universal syllable" (Marotta 2015: 57). In connection with the present study, it might be significant to keep this notion in mind, as certain tendencies towards this "universal" structure might be revealed in the changes of the syllable weight in English monosyllables.

[3] Of course, in monosyllabic words, word-final position is equal to syllable final position.

Jakobson was not the only proponent of linguistic structuralism across the ocean. Leonard Bloomfield and the circle of scholars around him were equally working towards a better understanding of various aspects of human language. More specifically, the advent of Bloomfieldian linguistics and his notion of syntactic constituents gradually penetrated other areas of linguistics, including phonology (Goldsmith 2011: 168). This development was also relevant for the study of syllables as linguists such as Pike and Pike (1947) argued that syllables, too, can be treated as a type of constituent. Furthermore, new models of syllable structure appeared, including hierarchical and non-hierarchical ones, each of which came with a slightly different conceptualisation of the syllable. The major similarity between these models which is certainly noteworthy is reflected in the fact that each of them essentially employs the CV model already introduced by Jakobson (2002).

After Bloomfieldian structuralism, the next major linguistic theory within which phonology was also extensively studied was the generative theory, which proposed the existence of underlying representations of phonemes and their surface realisations. In addition, this theory involves the so called distinguishing features which can be used to describe phonemic inventories of languages as well as the application of phonological rules. Perhaps one of the most significant publications within the framework of generative phonology was the work by Chomsky and Halle, *The Sound Pattern of English* (henceforth: *SPE*), published in 1968. Significantly, the notion of syllable is practically excluded from the understanding of phonology as presented in the *SPE* (Goldsmith 2011: 172). More precisely, although Chomsky and Halle (1968: 354) clearly demonstrate their awareness of the existence of the syllable, which is evident as they include the feature "syllabic" in their system of phonological features, they do not necessarily conceive of syllables as important units of phonological organisation (Clements & Keyser 1985: 1).

Their approach was later modified by other generative phonologists, such as Pulgram (1970), who discussed the relationship between the syllable as a language universal and its status in individual languages, as well as Kahn (1976), who proposed new formalisations of syllable representation, the so called tiers (Goldsmith 2011: 174). Tiers are additional levels of representation of syllable structure which are built on strings of segments and are placed between the syllable and its components (Jensen 1993: 59). The tiers, as Clements and Keyser (1985: 3) explain, "involv[e] strings [which] represent[…] the node". The hierarchically highest node is the syllable level, which consists of the sounds which together comprise the syllable. The following figure shows an example of a syllable tier for the word *carry*.

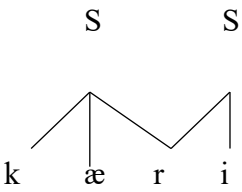


Figure 1. A representation of syllable tier (adapted from Clements & Keyser 1985: 3)

This representation is convenient as it clearly demonstrates the number of syllables in a word, as well as the segments which are included in the respective syllables (Clements & Keyser 1985: 3). In addition to that, this contribution of Kahn's was significant as it "made ambisyllabicity a natural notion" (Goldsmith 2011: 174). Ambisyllabicity, or the characteristic of certain segments to be part of two successive syllable, is also visible in the figure above, and is represented by the phoneme /r/. Kahn's (1976) theory was further extended by Clements and Keyser (1985), who also discuss the notion of syllable tiers, and, particularly, CV-tiers. The already established notion of the CV structure as the most preferred combination of sounds within the syllable was also considered by another phonologist who approaches the syllable from the perspective of natural generative phonology, namely Theo Vennemann (1988). Vennemann (1988: 13-21) argues that the preferred structure of a syllable, according to the 'Head Law' and 'Coda Law', consists of one sound in the head, and zero sounds in the coda.

As can be seen from this brief overview of the status of the syllable in various phonological theories, the syllable as a notion has been employed in different descriptions of phonology. While all of them certainly have their merits, the phonological aspect of the present thesis will be grounded in naturalness theories, evolutionary linguistics, and Optimality Theory, which will be explained in more detail in section 3.2. Before that, however, important characteristics of syllables, namely their structure and weight, will be discussed in the section to follow.

2.2. Syllable structure and syllable weight

Having defined the notion of syllable and briefly explained its status in various phonological theories, in this chapter, the focus will turn to two other concepts, namely the structure of syllables and their weight. Both of them are deemed significant for the present study as it particularly attempts to describe diachronic changes in English monosyllables by looking at the changes in their structure and weight.

2.2.1 Syllable structure: the basics

Although the syllable was widely recognised as a unit of phonological organisation and its preferred CV structure was established even before American structuralists, these scholars, as mentioned in the previous section, were the first to propose different models of syllable structure. These models include both hierarchical and non-hierarchical conceptualisations of the syllable. To exemplify these, some of them are demonstrated in Figure 2 below.

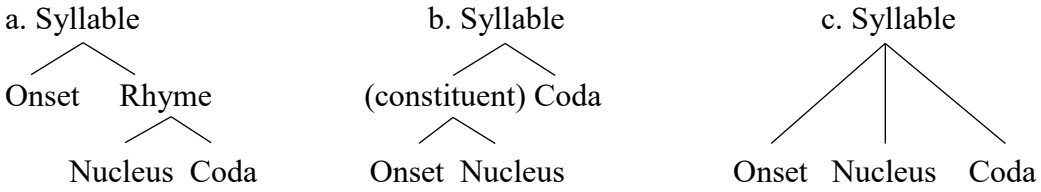


Figure 2. Hierarchical models of the syllable (Goldsmith 2011: 170)

As Figure 2 shows, three main hierarchical models of the syllable can be identified. Models *a* and *b* suggest that, at the highest level, syllables typically have two constituents, one of which further branches into two further constituents. As Goldsmith (2011: 170) explains, model *a* is most frequently used in current phonological theories, while model *b* was proposed with the underlying assumption that the universal syllable structure can be represented as CV structure, with coda being an additional element. While the CV-structure is typically seen as the preferred one, the relationship between onset and nucleus as represented in model *b* is not necessarily plausible from the perspective of stress assignment, because it seems that it is nucleus and coda which constitute one unit, thereby governing the placement of stress (see e.g. Ryan 2014). The same disadvantage can be identified in model *c*, also called flat model of syllable structure (Kressler & Treiman 1997: 297).

A further important consideration about syllable structure is related to the question of how syllable constituents should be filled. This question seems to be settled in different phonological theories, as the majority of them agree on the pronounced tendency of syllables to have, as it is frequently captured, the CV-structure. As discussed in the previous section, the suggestion regarding the CV-structure was put forward by numerous authors, including Jakobson (2002: 377), Pike (1947: 236), Vennemann (1988: 13-21), as well as Prince and Smolensky in their Optimality Theory[4] (Féry & Vijver 2003: 6).

[4] See section 3.2. for further explanation as to how syllable slots are filled according to OT.

The preferences for syllable structure are also frequently explained in terms of certain phonological principles which seem to govern the structure. Some of these principles will be outlined in the following section.

2.2.2. Syllable structure: the principles

Apart from the tendency of syllables to contain the CV-structure, several other principles of syllable-internal organisation can be discerned. As an extensive discussion of all principles of syllable structure would most likely exceed the scope of this paper, in this section, only two of them, which are most frequently found in different phonological theories, will be outlined.

The first of them is the so called Sonority Sequencing Principle (henceforth: SSP). The influence of this principle on the organisation of the segments in a syllable was, as previously mentioned, already noted by Saussure (Marotta 2015: 57). This principle is based on the realisation that speech sounds of a language have different levels of sonority, which is an acoustic effect based on the degree of resonance of a sound; "the more sonorous a sound, the more it resonates" (Carr 2013: 58). Different ranking scales of sound classes according to their relative sonority have been proposed, some of which provide a more general classification, whereas others are more refined. A sonority scale which will be used in this paper was produced by Hogg and McCully (1987: 33), and it contains the following classes:

Low vowels
Mid vowels
High vowels
Flaps
Laterals
Nasals
Voiced fricatives
Voiceless fricatives
Voiced Stops
Voiceless stops

All of these sonority classes are involved in the application of the SSP as they are assigned different positions in the syllable structure based on their relative sonority. The SSP affects the organisation of sounds in a syllable in that it requires the nucleus to contain a prosodic peak, and, by implication, to contain the most sonorous sound, while the sonority of sounds is supposed to decline with their distance from the nucleus (Carr 2013: 59). For instance, in the

word /kəʊld/, the diphthong /əʊ/ is the most sonorous element, the lateral approximant /l/ is less sonorous, and the voiced alveolar plosive /d/ is least sonorous. This principle should be seen as a tendency rather than a strict rule, as there are examples which seem to violate it, such as '/s/+stop' onsets in English and some other languages (e.g. Norwegian, Croatian, and Italian) (Yavaș 2010: 171) . For example, in the word /stɒp/, the sonority in the onset does not decline with the increased distance from the nucleus. Nevertheless, the SSP still successfully accounts for numerous examples of syllable structure, which is why it will not be rejected in the paper at hand.

Another principle which has been identified as one of the governing principles of syllable structure is the principle of Maximum Onset. As the term implies, this principle requires that onset, rather than coda, should be filled in cases of ambiguity (Carr 2013: 59). This principle emphasises once again the significance of the CV-structure mentioned several times in the paper so far. This type of syllables, which has a full onset and a nucleus, is also termed "core syllable" by Jensen (1993: 47), and it seems to be the preferred type for several reasons, including considerations on language acquisition and processing, language change, and cross-linguistic typological tendencies. Regarding the language acquisition tendencies, it has been noted that children first acquire those syllables which have the CV-structure, such as /ma/ and /ba/ (Carr 2013: 60). Carr (2013: 60) further explains that, historically, consonants in the coda are more likely to undergo the processes of weakening and ultimately completely disappear than the consonants in the onsets. One example of such a weakening process is the vocalisation of /l/ in syllable-final positions in some varieties of English (for a detailed account see e.g. Laurer (2008)). Furthermore, it has been demonstrated that virtually all languages which have VC-syllables also have CV-syllables, while languages which have CV-syllables do not necessarily have VC-syllables (Carr 2013). These arguments clearly support the understanding of CV-structures as the most fundamental structures of a syllable.

The principles described above are highly useful for the interpretation of the synchronic status of the structure of a syllable. Moreover, there is a possibility that these principles might be used for explaining diachronic tendencies in the changes of the individual constituents of the syllable.

Having described the basic principles which regulate the placement of segments in different parts of the syllables, we will now look at syllable weight, another concept which can be used to describe syllable structure, and which will be one of the principal foci of the present thesis.

2.2.3. Syllable weight

Syllable weight is another important structural characteristic of syllables. As this paper will be chiefly concerned with this particular property and its changes in English monosyllables, a brief account of the notion of syllable weight is in order.

The notion of syllable weight has its origins in classical Greek and Latin poetry, which heavily relied on the existence of a specific type of meter, mostly the epic dactylic hexameter[5]. More specifically, in order to create a certain metrical pattern, one would need to arrange syllables which have specific properties in a particular order. These properties would mostly involve the structure of the syllable, or, more precisely, its weight. According to their weight, syllables were divided into two classes, namely long and short. A long syllable would contain a long vowel or a diphthong, or, alternatively, a short vowel followed by a coda, while a short syllable would consist of a short vowel without a coda. (Bennett 1918 [2005])

In modern phonological theory, based on the length distinctions made in classical poetry, syllables with branching rhymes are described as heavy, whereas syllables whose rhyme does not branch are described as light (Hyman 1985: 5). In addition, in modern terminology, a third type of syllable based on the concept of syllable weight is identified, namely superheavy syllables, which have branching in both nucleus and coda (Hyman 1985: 10). Examples of superheavy syllables in Modern English include monosyllabic words such as /streɪt/, which has a branching nucleus, and /kept[6]/, as it has branching in the coda position. Recent studies have indicated the existence of an even heavier type of syllables, which can be described as super-superheavy syllable. This type of syllables has been discussed with a particular reference to English monosyllables by, for instance, Ritt and Kaźmierski (2015), who mention words such as *gold*, *false*, and *bind* as examples of super-superheavy syllables. As the authors (2015: 12) explain, despite the preference for CV syllables, one of the preconditions which enabled these super-superheavy rhymes to establish themselves through generations is "the existence of morphotactic patterns of the same shape". These patterns most likely make it possible for phonotactically suboptimal structures to enter the lexicon by the mechanism of analogy.

[5] Dactylic verse is also termed heroic verse, and it is based on dactyls, feet which consist of one long syllable and two short syllables. Dactylic hexameter typically has six dactyls (Bennett 1918 [2005]).

[6] It should be noted here that the consonant cluster /pt/ is produced by the morphological operation of inflection. However, it has implications for the phonological aspect of the word as well, which qualifies it is a morphonotactic consonant cluster. For a detailed discussion on morphonotactic consonant clusters and morphonotactics in general, consult e.g. Dressler and Dziubalska-Kołaczyk (2006) (see section 3.1.3).

A notion which is closely related to syllable weight is the so called mora. Mora can be defined as "a unit of metrical weight of length" (Pierrehumbert & Nair 1995: 78).When measuring in morae, light syllables are typically described as monomoraic because they contain only one mora, while heavy syllables are bimoraic (Hayes 1989: 254; Tranel 1991: 291-292). By implication, superheavy syllables, such as CVVC, are trimoraic (Hall 2002: 377), whereas super-superheavy syllables, such as CVVCC, could be described as 'quatrimoraic', as they contain four morae. In the present study, the notion of mora will be used frequently when measuring not only the weight of syllables but also the weight of higher suprasegmental units, such as feet. This classification of syllables according to their weight is based on the idea that syllable weight is a stable property.

This view is challenged by Ryan (2011), who argues that syllable weight should be understood as a gradient feature of syllables. More precisely, the author (Ryan 2011: 414) asserts that certain languages exhibit what he terms gradient weight, because, in these languages, weight is not only dependent on whether the rhyme is branching or not, but also on the specific elements in the syllable structure. For example, CVC syllables are lighter than CVV syllables even though they would both be classified as heavy (Ryan 2011: 414). This has been suggested for languages such as Finnish and Tamil, and not (yet) for English, which is why this view will not be adopted in the present thesis.

Therefore, it is traditionally assumed that the key elements of the syllable which contribute to its weight are its nucleus, as the most sonorous syllable component, and the coda. This view is most likely based on the model *a* from Figure 2, according to which these elements should be understood as a single constituent. This view will be adopted in the present thesis, but the alternative to this definition will also be considered below.

More specifically, while the majority of studies interpret the notion of weight as a characteristic of the rhyme slot, there are studies which include onsets in their accounts on syllable weight and argue that onsets, too, can contribute to the overall weight of syllables. This clearly contradicts the very definition of syllable weight as given in the introduction to this paper. However, it might be worth to present the arguments which support this view in order to be able to estimate whether, and, if so, to what extent, onsets are capable of exerting an influence on syllable weight.

One of the first studies which supports this view was presented by Everett and Everett (1984), who, based on their findings about Pirahã[7], argue that onsets are sensitive to stress in this language. More specifically, in Pirahã, stress placement is sensitive on the hierarchy of syllable weight, which is defined in the following way by Everett and Everett (1984: 706):

(1) "CVV > GVV > VV > CV > GV

(read > as 'is heavier than')", where C stands for a voiceless consonant, and G for a voiced consonant.

Everett and Everett (1984) were thus among the first scholars to challenge the view of syllable weight being absolutely dependent on the rhyme based on empirical findings. Their findings were extended by more recent studies, each of which emphasises the importance of onsets for syllable weight from the perceptual perspective. For example, Gordon (2005: 597) identifies 13 languages in which stress assignment is sensitive to the weight of onsets. As he further explains (2005: 597), syllables with an onset are treated as heavier than onsetless syllables, and stress placement in the languages he discusses, such as Alyawarra and Bislama[8], but also English, seems to be correlated with the weight of onsets in certain cases. For example, already Nanni (1977: 757) has suggested that the quality of the segments in the onset can influence stress placement in certain polysyllabic adjectives in English which contain the suffix *–ative*. In these adjectives, the first vowel is secondary stressed only if it has an onset with an obstruent, such as in *quantitative*; however, if the onset contains a single sonorant, such as in *imaginative*, the suffix will not carry secondary stress.

Although this proposal may seem neat in that it accounts for secondary stress assignment in the suffix under consideration, there are several problems with this view. First of all, while it does imply a certain relationship between onset and stress (which is only by implication connected to the relationship between onset and weight), this view actually suggests a connection between the quality of the segment in the onset and stress assignment. This is clearly more specific than the standard approach to syllable weight which focuses only on the number of segments in the rhyme, without providing any specifications as to the quality of these rhymes, and it is questionable whether phonological processes are sensitive to such highly specific constraints. Second, while the stress placement indeed seems to be dependent on the

[7] Pirahã is an Amazonian language which was extensively studied by Daniel and Keren Everett.
[8] Alyawarra is an Australian language (Gordon 2005), while Bislama is a Pacific creole based on English (Crowley 2004: 1).

quality of the elements in the onset in *–ative*, the rule can hardly be extended to other suffixes in English, let alone onsets in English in general.

Furthermore, as Nanni (1977: 759) proposes, the morpheme *–ive* in *–ative* can be seen as extrametrical, i.e. it is not relevant when metrical structure is assigned (Hogg & McCully 1987: 109). Extrametricality has also been identified in other morphologically conditioned allomorphs, such as in the suffix *–ate*, which can be pronounced in different ways (e.g. *separate* /ˈsepərət/ as an adjective vs. *separate* /ˈsepəreɪt/ as a verb) (Gaşiorowski 2011: 176). If it is assumed that *–ive* is not a part of the metrical structure, it seems that secondary stress assignment in words with the suffix *–ative* can be explained by referring to the metrical structure of the feet in which the first syllable, i.e. *–at*, of the suffix is present. Nanni (1977: 760) eventually explains that the placement of secondary stress on the *–at* part of the suffix depends on the Foot Formation rule (FF), which adjusts the structure of metrical trees and can stress or destress the *–at* in *–ative*. Therefore, it seems to be the case that stress assignment in these suffixes can be explained by the constraints of higher phonological domains, and that this cannot be taken as evidence that English onsets significantly contribute to stress assignment and syllable weight.

In more recent studies which focus on the influence of onsets on syllable weight it has been suggested that there exists a positive correlation between onset weight and perceptual energy (Gordon 2005: 597). More precisely, "[s]yllables with greater perceptual energy are heavier than those with lesser energy", where perceptual energy is calculated as the integration of loudness over time (Gordon 2005: 602). Similarly, Ryan (2014), who also looks at the syllable from the point of view of perception, proposes a treatment of the syllable in which syllable weight does not start with the rhyme, as it is typically claimed. Rather, it starts with the so called "p-center (perceptual center) [which signals] the perceived downbeat of the syllable", and most frequently occurs earlier in a word in the case of a heavier onset (Ryan 2014: 310). This proposal is to a large extent based on Ryan's findings for languages with complex stress systems and gradient weight systems such as English, in which there is a correlation between the size of an onset (i.e. its duration or weight) and the frequency of occurrence of word-initial stress (Ryan 2014: 311). Furthermore, Mai (2017) also finds that "pitch and amplitude maxima" within the syllable are also closely related to the number of segments in the onset. Specifically, the maximal pitch height will be placed earlier in a syllable which has more phonemes in the onset (Mai 2017).

However, the observed effects of onset weight on the acoustic perception of the syllable seem to be considerably smaller than those of the rhyme, which is why a proposal is put forward to continue excluding onsets from the categorisation of syllables based on their weight (Ryan 2014: 330). Specifically, Ryan (2014: 335) states that the effect of the rhyme, which is "parsed fully into the domain of weight" is clearly superordinate to the contribution of the onset. Although this proposal is conceptually accepted in the present thesis, an attempt will be made to include onsets in the description of possible changes in English monosyllables. This will be done with the aim of capturing subtle differences between monosyllables at different stages of the history of English.

Another aspect of syllables which is frequently included in descriptions of syllable structures in general and syllable weight in particular is syllable typology. In studies on syllable typology, syllable structure is compared cross-linguistically and syllable types are described in terms of the segments which they contain. More precisely, each of the syllable types is identified on the basis of the number of segments it contains, as well as the distribution of these segments. Although a cross-linguistic comparison of syllable types would be extremely interesting to look at, in this study, due to the fact that its primary focus is syllable weight in the English language, only syllable types which are attested in this language will be outlined. Providing an overview of different syllable types in Modern English is deemed helpful as it can be used as a basis for the discussion of the diachronic phonotactic tendencies which will hopefully be reflected in the results of the present study. Therefore, permissible phonotactic structures found in Modern English monosyllabic words will be presented in Table 1 on the following page.

Table 1 Possible phonotactic patterns of monosyllables in Modern English

Number	Syllable type	Example
1	VV	are /ɑː/
2	CVV	bar /bɑː/; no /nəʊ/
3	CCVV	blow /bləʊ/; claw /klɔː/
4	CCCVV	spray /spreɪ/; straw /strɔː/
5	VC	in /ɪn/
6	VVC	/ark /ɑːk/; ache /eɪk/
7	VCC	apt /æpt/
8	VVCC	arts /ɑːts/; aids /eɪdz/
9	VCCC	elves /elvz/
10	VVCCC	asked /ɑːskt/; ousts /aʊsts/
11	VVCCCC	angst /ɑːŋkst/
12	CVC	dog /dɒg/
13	CVVC	half /hɑːf/; vague /veɪg/
14	CCVC	slip /slɪp/
15	CCVVC	blouse /blaʊz/; fleece /fliːs/
16	CCCVC	strip /strɪp/
17	CCCVVC	spleen /spliːn/; strays /streɪz/
18	CVCC	fix /fɪks/
19	CVVCC	vast /vɑːst/; veils /veɪlz/
20	CVCCC	text /tekst/
21	CVVCCC	casts /kɑːsts/; wastes /weɪsts/
22	CVCCCC	lengths /leŋkθs/
23	CCVCC	slips /slɪps/
24	CCVVCC	branch /brɑːnʧ/; breaks /breɪks/
25	CCCVCC	script /skrɪpt/
26	CCCVVCC	splurged /splɜːʤd/; strives /straɪvz/
27	CCVCCC	twelfth /twelfθ/
28	CCVVCCC	grasps /grɑːsps/
29	CCVCCCC	twelfths /twelfθs/
30	CCCVCCC	scripts /skrɪpts/

31	CCCVCCCC	strengths /streŋkθs/

Table 1 is based on a similar, but slightly less comprehensive, table by Blevins (1995: 217), which includes 10 possibilities of structure of syllables in English and other languages. Further data was supplemented by adding author's own examples, as well as on the basis of a detailed overview of English phonotactics provided by Bauer (2015), who, in turn, bases her study on Jones (2003). The transcription conventions used for the transcription of the words in the table are based on the standards of International Phonetic Association (IPA), and particularly on the transcription of these words as provided by Wells (2008) in the *Longman Pronunciation Dictionary*. Additionally, the words in the table are transcribed taking Received Pronunciation (RP) as the model. The standards briefly outlined here will also be adopted in the rest of this thesis.

As can be seen from the table, 31 different phonotactic patterns of monosyllabic words can be identified in Modern English. Maximal number of segments in the onset position is three, while codas can contain maximally four segments. This difference can be explained by the fact that the majority of complex codas, *angst* being the only exception, are, in fact morphonotactic clusters, i.e. they are created as a result of adding different inflectional suffixes[9]. The key distinction between lexical coda clusters and coda clusters which are formed due to the operation of morphological processes is accurately captured by Bauer (2015: 455), who describes the latter as having "grammatical uses". This system will also be maintained throughout the paper, and any morphonotactic clusters which emerge in the findings will be appropriately discussed.

Apart from their weight and phonotactic characteristics, another noteworthy characteristic of syllables is that they are traditionally used for the description of hierarchically higher phonological sequences, particularly for the timing of speech rhythm. As rhythmic tendencies might be of assistance in the explanation of the results of the present study, the following section will provide a brief description of different types of speech rhythm.

[9] For a more detailed description of morphonotactic clusters, see section 3.1.3.

2.2.4. Syllables in connected speech: timing and rhythm

Similarly to the existence of different views regarding the internal structure of the syllable, different conceptions of the ordering of syllables in hierarchically higher phonological units can be identified. In this section, first, two principal views of the interaction of syllables and speech rhythm will be presented. It should be noted, however, that the theories to be discussed are only some of the theories, albeit the most frequently cited ones, and, in reality, there are other views as to how syllables are organised to create speech rhythm. Second, the interaction of rhythmic units with other phonological as well as morpho-syntactic units will be discussed.

The origins of the discussion on the relationship between the syllable and timing in speech can be traced back to the experiment conducted by Classé (1939), who analysed recordings of prose texts in English, and found that the temporal distance between successive stressed syllables is approximately equal in the recordings (Cummins 2015: 160). This was one of the first empirical demonstrations of the type of rhythm which Pike (1947: 13) later termed "stress-timed" (Goldsmith 2011: 171). In stress-timed languages, such as English, "stressed syllables will tend to occur at relatively regular intervals" (Roach 2009: 107). Therefore, regardless of the existence of any unstressed syllables, in languages such as English, stressed syllables which appear one after another will be separated by approximately equal amount of time. Furthermore, Pike (1947: 13) suggested that, beside stress-timed languages, there are languages, such as Spanish, in which the intervals between any successive syllables are approximately equal. He called those languages "syllable-timed" languages (Goldsmith 2011: 171). A phenomenon which is present in both syllable-timed and stress-timed languages is described by Abercrombie (1967: 97) as "isochrony". Isochrony is defined as "a common temporal interval between syllables" (Goldsmith 2011: 166). Of course, as the definitions above suggest, isochrony can be realised in different ways, depending on the rhythm of a specific language.

The clear-cut distinction between syllable-timed and stress-timed languages has not been accepted by the entire scientific community. For example, Roach (1982: 78) argues that the two extremes, namely syllable-timed and stress-timed languages, should not be seen as binary oppositions but rather as endpoints of a continuum as "all languages display both sorts of timing [and they only] differ in which type of timing predominates". Moreover, the differences in timing can even be based on individual speech styles and other speech habits of speakers (Roach 1982: 78). Another reason why the rigid separation between syllable-timed and stress-timed languages seems to be less than accurate is that there seems to be no difference between the regularity of intervals between two stressed syllables in syllable-timed languages and

stress-timed languages, as experimental evidence suggests (Fletcher 2010: 553). Findings which cast a doubt on the usefulness of the distinction of rhythmic classes based on timing are also reported in studies from the field of speech perception. For instance, an experiment conducted by Arvaniti (2010), suggests that participants were unable to distinguish between rhythmic classes of different languages if timing was used indirectly as the basis for distinction. More precisely, languages which have traditionally been described as being rhythmically more similar were perceived as having different types of rhythm.

As an alternative to the traditional rhythm classes described above, new theories about rhythmic organisation of speech which do not exclusively focus on isochrony as the organisational principle of rhythmic structure have been put forward. The most prominent of these were proposed by authors such as Couper-Kuhlen (1986: 60) and Schlüter (2005: 18), and they are based on the so called Principle of Rhythmic Alternation. As Hofmann (2018: 1) put it, the Principle of Rhythmic Alternation is "a rhythmic constraint that translates into a preference for sequences of stressed and unstressed syllables. [It] surface[es] in the form of a tendency rather than a strict rule in English, [and its] most visible effect […] consists in the avoidance, in numeric terms, of sequences of adjacent stressed syllables ([…] clashes), as well as adjacent unstressed syllables ([…] lapses)". Therefore, in this model, timing seems to be of minor importance; rather, the focus is placed on the alternation between stressed and unstressed syllables.

Although isochrony and the Principle of Rhythmic Alternation are not mutually exclusive, it seems that the inclusion of the latter principle could potentially explain diachronic changes in a language. The origin of this assumption lies in the idea that phonology and syntax interact with each other, as well as in the rejection of the argument that syntactic operations precede phonological ones, as it is often claimed, especially in the framework of generative grammar (Schlüter 2005: 3). Rather, there is a syntax-phonology interface, which implies that it is quite plausible to claim that phonological preferences may shape syntactic choices, thereby causing not only syntactic variation in order to conform to the Principle of Rhythmic Alternation, but also long-term language change. Examples of changes during the history of English which can be explained by this principle include, for instance, the position and semantic scope of different attributive structures in pre- and post-determiner positions (Schlüter 2005: 60-149), as well as the annihilation of the formal distinction between adjectives and adverbs in cases such as *scarce*/*scarcely* (Schlüter 2005: 235).

As can be concluded from the brief overview of different approaches to the relationship between syllables and rhythm, both classical approaches which employ rhythmic classes and the approaches which are based on rhythmic alternation assume the significance of stress. The former allow for the possibility of stress-timing, whereas the latter suggest an alternation of successive syllables based on stress and the absence thereof.

Speech rhythm can also be analysed by looking at other suprasegmental units. One of the basic units of rhythm is the so called foot. Feet are rhythmic units which include a stressed syllable and all the syllables before the next stressed syllable (Roach 2009: 108). In English, feet tend to be binary as they predominantly contain two morae (Hayes 1980); in other words, feet must be at least heavy. When it comes to the distribution of stressed and unstressed syllables, ideal English feet are trochaic (Carr 2013: 90), which means that they consist of a stressed syllable followed by an unstressed syllable. An ideal English foot will also tend to have two morae in the stressed position, or be at least heavy (Lahiri & Van der Hulst 1988; Dresher & Lahiri 1991: 272). English feet are, therefore, predominantly left-headed, as their first syllable tends to be prominent (Dresher & Lahiri 1991: 270).

Individual feet can also join to form hierarchically higher units, such as phonological or prosodic words (pwords or PrWd in OT (Kager 1999: 118). These units are higher than feet, but lower than, for example, phonological phrases or utterances, and their existence has been demonstrated by the reference to various phonological rules, phonotactic generalisations, and minimality constraints which apply precisely at this level (Hall 1999: 3). These suggestions are also accepted in OT, where PrWd is deemed relevant not only because of the above mentioned reasons, but also because it is believed to interact with other prosodic and morpho-syntactic constituents. This suggestion, put forth already by Nespor and Vogel (1986: 107), was further developed within the framework of OT.

One of the key assumptions of OT when it comes to the relationship between phonological and morpho-syntactic units is reflected in the constraint, or set of constraints, termed ‘Generalized Alignment’. This well-formedness constraint requires that the edges of various phonological units as well as phonological and morpho-syntactic constituents be aligned (McCarthy & Prince 2004: 73). For example, in the constraint which governs the assignment of English stress, the alignment of the edges of two prosodic constituents, namely foot and prosodic word, will occur, as shown below:

Align (PrWd, L, Ft, L),

which means that left edges of prosodic words tend to be aligned with left edges of feet (McCarthy and Prince 2004: 74).

As mentioned above, this constraint also applies to morpho-syntactic constituents, and it requires that "the edge on any instance of the morphological constituent GCat align with the corresponding edge of some prosodic constituent PCat" (McCarthy & Prince 2004: 451). This is represented in the following way:

Align (GCat, Edge, PCat, Edge),

whereby GCat represents morphological constituents, while PCat represents prosodic constituent (McCarthy & Prince 2004: 451).

These ideas, developed within the OT, are similar to the suggestions about the relationship between speech rhythm and morpho-syntax proposed by Schlüter (2005), as in both approaches the phonology and syntax are not conceptualised as isolated components, but rather as components which co-exist and interact. The alignment between phonological and morpho-syntactic constituents might also be useful from the perspective of cognitive processing as it might be easier to process a word whose phonological and morpho-syntactic edges are aligned. This approach will also be adopted in the present thesis, and it might even prove useful in explaining potential diachronic changes in syllable weight. In fact, as Donegan and Stampe (1983: 1) suggest, prosodic features not only interact with other levels of linguistic description, but that they can also be the driving force behind language change.

Before moving to the second theoretical component of the thesis, the following section will provide a discussion of the phenomenon of monosyllabism in general as well as of the status of monosyllabic words in English in particular.

2.3. Monosyllables: at the intersection of syllable and word

"*[M]onosyllables form the smallest kind of independent words human languages attest.*"

(Stolz, Hauser & Stamer 2012: 197)

One of the most striking characteristics of monosyllabic words is reflected in their capability to simultaneously function as syllables, phonological units which undergo different phonological operations, and words, which can be affected by morpho-syntactic and semantic processes. Despite this property, monosyllables have not received sufficient attention in the relevant literature outside of the field of language typology, although they seem to be important ingredients of numerous languages for reasons which exceed typological considerations. A

notable exception to this omission is a fairly recent edited volume by Stolz, Nau and Stroh (2012) which is exclusively devoted to the phenomenon of monosyllabism. As monosyllables are the primary focus of the present study, in this section, properties of monosyllables in general will be outlined before providing an account of monosyllabism in English.

2.3.1. The phenomenon of monosyllabism

As mentioned in the introduction to this chapter, monosyllables were predominantly studied in an attempt to divide various languages of the world into different types. These endeavours were most frequently pursued in Germany in the 19th and early 20th centuries, and the majority of these studies focused on the assignment of languages to different language types based on their mechanisms to express grammatical information (Nau, Stolz & Stroh 2012: 7). Languages which primarily relied on function words and word order for the creation of grammatical categories, and which are termed "isolating" in modern terminology, were described as monosyllabic. They were, moreover, also conceptualised as being less complex in terms of their structure, and hence less worthy than inflectional languages (Nau, Stolz & Stroh 2012: 7). This idea can be discerned in the thoughts by August Wilhelm Schlegel (1818: 14), who argues that "[l]anguages of this kind should present great obstacles to the development of the intellectual capacities" (translation by Nau, Stolz & Stroh 2012: 7). This implies that inflectionally complex languages were perceived as more elaborate, and they perhaps represented a seemingly greater challenge to foreign learners than isolating languages, which is why the latter were dismissed as inferior.

The ideas outlined above are clearly incompatible with the perspective of contemporary linguistic science. While they do have some merits, in that they paved the way for further studies in language typology, the view about the different statuses of language types which they advocate is not based on scientific enquiry, but rather on highly subjective, almost prescriptive, attitudes towards different phenomena. These views have been largely abandoned in the modern studies on language typology; moreover, monosyllables have started to attract attention not only because of the typological consequences which a high number of monosyllables in a language can have, but also because of their phonological and morphological properties.

In terms of their phonology, monosyllables, as well as syllables in general, can be studied, for example, by looking at their structure. One interesting point of discussion in that respect could involve looking at the possible difference in the organisational principles behind syllables in general and monosyllables, which might have different structure due to their function as a word. For example, they could have more segments in their codas than syllables which are included in polysyllabic words due to various morphological operations which can be applied to monosyllabic words (Basbøl (2012).

The relationship between morphology and monosyllables is important for various reasons. One of the questions which can be raised in this regard concerns the level of morphonotactics as proposed by Dressler and Dziubalska-Kołaczyk (2006). More precisely, morphological processes in monosyllables can result in the formation of morphonotactic consonant clusters. These clusters can sometimes be marked as they are not purely phonotactic (Dressler, Dziubalska- Kołaczyk & Pestal 2010: 51). In addition, it has been demonstrated that there is a correlation between highly complex consonant clusters (such as English triples) and morphological motivation for the emergence of these clusters (Orzechowska 2012: 110).

Another important point in connection with the interaction between the levels of phonology and morphology can be discussed with regard to language acquisition processes (Basbøl 2012: 37). In particular, it would be useful to study the questions such as: Is there a difference in the acquisition of monosyllables with and without phonotactically marked structures? Which of the levels of monosyllables, i.e. their phonological or morphonotactic properties, is acquired faster? Finally, the monosyllables can be studied so as to identify the criteria of phonological and morphological minimality cross-linguistically, but also language-internally, which has been done for some languages, for instance, by Zerbian (2012). Again, these endeavours involve considerations about the levels of phonological and morphological processes and their interrelatedness.

The brief overview of the variety of possible properties of monosyllabic words which can constitute highly interesting study questions clearly indicates that the significance of monosyllables exceeds their use in studies on language typology. Another aspect which has been relatively neglected in such studies, with the exception of a few minor studies published in the second half of the 20th century, such as Arlotto (1968), is the emergence of monosyllabic words in languages which are frequently described as predominantly monosyllabic. Those languages include, for instance, certain Asian languages, such as Chinese, which was described

as monosyllabic already by Friedrich Schlegel (1808: 44-46). One of the studies which fairly successfully bridges this research gap was presented by Michaud (2012), who provides a comprehensive account of the evolutionary development of monosyllabicisation in Asian languages. The author (2012: 118) states that monosyllabicisation in Asian languages, such as the languages which belong to the Sino-Tibetan family, was a gradual process which resulted in the establishment of certain regular patterns of monosyllabicisation. This process involved processes such as "(i) loss of the presyllable without any traces [and] (ii) loss of the presyllable after it has resulted in the spirantization of the medial consonant" (Michaud 2012: 118). These patterns suggest that Asian languages seem to have become fairly monosyllabic due to the loss of onsets.

A marked tendency towards monosyllabicisation has been noted in other languages as well, including English. Monosyllabism seems to be a significant component of the English language, and there are various reasons for the fairly high proportion of monosyllables to polysyllables in Modern English. As mentioned in the introduction, English monosyllables will be one of the main foci of this paper, which is why the history of the studies which looked at them will be briefly reviewed in the following section.

2.3.2. Monosyllabism in English

As Jespersen (1928: 5) noted, "[m]onosyllables constitute the most indispensable part of the English vocabulary and are with few exceptions those words which the small children learn first". This statement strongly emphasises the importance of monosyllabic words in English, both in terms of their proportion to polysyllables and from the perspective of language acquisition. When it comes to the former, Jespersen (1928: 15), based on Loring's *Rhymer's Lexicon* (1905) states that there are approximately 4,700 monosyllabic words in English, and this number could, as the author suggests, be even higher. Similarly, the analysis of words found in the *English Pronouncing Dictionary* (*EPD*) (Jones 1928) provided by Kisaka (1940: 536) yields exactly the same number of monosyllabic words in English. While both Jespersen's (1928: 15) and Kisaka's (1940: 536) findings are useful starting points for a discussion on English monosyllabism, the latter proposal seems more reliable as the data set used for the analysis is a source which can be seen as relatively representative of the English lexicon[10].

[10] That is, more representative than the *Rhymer's Lexicon*.

However, despite the apparent prevalence of monosyllables in the lexicon of Modern English, the proportion of such words was not necessarily as high in earlier stages of English. For example, as mentioned in the introduction to this paper, in OE, the majority of the content words still had inflectional suffixes, and were disyllabic. The inflectional system was eroded, and the suffixes were first reduced to schwas, which, in turn, disappeared from the phonetic realisation of the words by the second half of the 15th century (Minkova 1991: 2). These changes, as Jespersen (1928: 5) argues, were one of the major sources of the increase in the proportion of monosyllables in English. The entire process was, of course, significantly more complex, and, in order to provide a better understanding of the change which caused English to become predominantly monosyllabic, a slightly more detailed account of schwa loss in the history of English is in order.

It is explained by Minkova (1991: 155) that schwa loss was a gradual process and it had several stages. One of the earliest stages of schwa loss seems to be obscured by the conservative spelling conventions; however, it apparently began already during the Late Old English period. The textual evidence for the change under consideration from this period in certain cases corroborates the theory of schwa loss in this period, especially in those instances when scribes would graphically omit word final <e>1, such as in *æt ham* ('at home') (Minkova 1991: 46). Furthermore, the change was first restricted to certain phonological environments, such as hiatus, or an uninterrupted sequence of two vowels (Luick 1921-1944: 452). Some pieces of evidence for schwa deletion in hiatus include examples such as *sægdic* instead of *sægde ic* (Minkova 1991: 62). As Luick (1921-1944: 452) proposes, the most likely source of schwa loss in such environments is "the acceleration of the speech tempo". This explanation seems plausible due to the fact that schwas, despite being frequently described as weak vowels, still have a certain duration, and, if this duration is eliminated, speech can become faster. The question is, of course, whether schwa loss caused the acceleration, or the other way around.

Further data from this period which can be used to support the theory of schwa loss includes evidence from poetry, and, more specifically, from the rhyming patterns. While the presumable pronunciation in some of the poems is, again, obscured by spelling conventions, there are verses in which word-final <e> was most likely not pronounced in order to maintain the rhyming pattern (Minkova 1991: 70). To exemplify this, the following lines from the poem *Genesis and Exodus* are provided:

Also he god adde ofte *bi-sogte* 519
Wislike was him in here *brogt* 520

The words *bi-sogte* and *brogt* most likely produce a rhyming pattern despite their different spellings, which seems to suggest that schwa was at least on its way to disappear, as indicated by the inconsistency in spelling.

The central stage of this process, also termed early schwa loss, started to unfold around 1200, and it lasted until approximately 1400 (Minkova 1991: 155). During this period, schwa deletion processes led to the disappearance of schwas from word-final positions, regardless of word class (Luick 1921-1940: 473). This is in accordance with the idea by Minkova (1991: 2) mentioned in the introduction to this paper that "the sound of muting" was not pronounced after the second half of the fifteenth century. This assumption will be maintained throughout this study, and it will be especially important for the empirical part of the thesis and data analysis.

Therefore, schwa loss is assumed to be the key factor behind the increase in monosyllabism in English. However, other circumstances contributed to this change as well, including loanwords from Scandinavian languages and French, clippings, the use of onomatopoeia, as well as aphesis, or "the loss of an initial syllable" (Jespersen 1928: 5-7). Concerning the loanwords, It is possible that the high number of monosyllabic words in native English lexicon "attracted" monosyllabic loanwords from other languages.

Another aspect of English monosyllables which is discussed by both Jespersen and Kisaka, but more extensively by the latter, includes the phonotactic properties of these words. Kisaka (1940: 537) provides a fairly extensive analysis of different types of monosyllables in Modern English according to the segments attested in their onsets, nuclei, and codas. He identifies 16 possible types of monosyllabic words, and marks the vowels as *a* and consonants as *b*. The author's (1940: 537) classification, together with the frequencies of different syllable types, is provided on the following page.

Table 2 Types of monosyllables described by Kisaka (1940: 537), adapted

Number	Syllable type	Frequency in the *EPD*
1	*a*	28
2	*ab*	118
3	*ba*	373
4	*bab*	2,102
5	*abb*	41
6	*bba*	167
7	*babb*	565
8	*bbab*	953
9	*abbb*	1
10	*bbba*	19
11	*babbb*	23
12	*bbabb*	194
13	*bbbab*	87
14	*bbabbb*	4
15	*bbbabb*	13
16	*bbbabbb*	0[11]

As Table 2 above shows, the most common type of monosyllables is the one annotated as *bab*, which translates as CVC. This is in line with other suggestions regarding the preferred structure of syllables in general, as mentioned in section 2. Furthermore, the author (Kisaka 1940: 537) explains that this syllable type, together with three other types, namely *bbab*, *babb*, and the open syllables in the form of *ba*, constitutes 85 % of all types of monosyllables found in Modern English. Kisaka's (1940: 537) analysis can be seen as a fairly successful attempt at describing the structure of English monosyllables. However, for the purposes of this paper, the description provided in Table 1 of this paper will be adopted as it is deemed to be more extensive.

[11] Since there are apparently virtually no syllables of this type attested in the version of the *EPD* which Kisaka uses, it is not quite clear why he includes this type of monosyllables. One of the possible reasons for that could be that he came up with some examples, but none of these examples appeared in the *EPD*. In that case, it should be noted that his intuition is correct because there are examples of this type, as can be seen in Table 1 (p. 18-19).

Another important point raised in the study by Kisaka (1940) concerns the changes in the structure of English monosyllables. More precisely, the author (1940: 540-543) discusses the phonotactic characteristics of monosyllables in Modern English and compares some of them to the structure of monosyllables as attested in Old English. As regards initial consonant clusters, he states that 47 different combinations can be identified in Modern English (Kisaka 1940: 540). In addition, he (Kisaka 1940: 543) performs a comparison between initial consonants found in Old English and Modern English, and reports various combinations of segments. When it comes to the final clusters, Kisaka (1940: 540) mentions that two of his sources, namely Trnka and Jespersen (1928), mention different numbers. Specifically, according to the former, 44 syllable-final consonant clusters can be identified in Modern English, while the latter mentions 100 possibilities of final consonant clusters in English. The reason for this discrepancy, as Kisaka (1940: 540) explains, is that Jespersen also includes what nowadays would be called morphonotactic clusters, i.e. combinations of consonants which emerged as a consequence of morphological operations (Dressler, Dziubalska- Kołaczyk & Pestal 2010: 52), such as plural formation (e.g. the cluster /bz/ in *herbs*).

Both Kisaka's (1940) and Jespersen's (1928) observations about English monosyllables are deemed highly useful and will be used as important starting points for the present study. The study will attempt, however, to provide more than synchronic descriptions of syllable weight of monosyllables at different stages of the evolution of the English language. This will be done by performing comparisons between monosyllables in different periods of the development of English using corpus data and statistical procedures to verify the significance of the findings.

Having provided the theoretical background of the key concepts which will be used in the present thesis, in the following, the theoretical framework of the study will be outlined.

Part 3 – Theoretical framework

As mentioned in the introduction, the present thesis is mainly grounded in three linguistic theories, namely naturalness theories, Optimality Theory, and evolutionary linguistics. In this section, these approaches will be discussed so as to provide a theoretical framework for discussing the results of the study.

3.1. Naturalness theories[12]

To begin with, the linguistic theories of naturalness will be presented. More specifically, theories known as natural phonology and natural morphology and their core principles will be described because these could contribute to the understanding of, for instance, potential changes in syllable weight of English monosyllables, as well as differences between morphologically simple and morphologically complex monosyllabic words.

3.1.1. Natural Phonology

The theories of naturalness which are considered in this thesis have their roots in the theory of Natural Phonology introduced in a dissertation by Stampe (1973). The author (1973) conceptualises phonology as a system of mental processes operating at the abstract level of the human mind which are sensitive to physical limitations of human speech apparatus. This suggests that the enhancement of the ease of articulation seems to be one of the key results of the phonological processes, the primary role of which is to substitute a sound or class of sounds which would represent physical difficulty for the vocal tract by sounds which can be realised with reduced physical effort. While ease of articulation seems to be the key factor for potential substitution of sound classes, it is important to mention that phonological processes incorporate not only physical, but also cognitive aspects of speech, which implies that one of the aims of phonological processes is also to maximise the perceptual strength of the class of sounds (Stampe 1973: 9). In sum, "[p]honological processes are mental operations performed on behalf of the physical system" and their primary aim is to translate our phonological intentions into phonetic units which are within our natural phonetic limitations (Stampe 1973: 9; Donegan & Stampe 1979: 126).

[12] It should be noted that the theories of naturalness which will be adopted for the purposes of the present study are considerably different from the natural approaches from the field of the generative theory, such as Natural Generative Phonology, which was developed, for instance, by Venneman in the 1970s, and was largely based on *The Sound Pattern of English* (Chomsky & Halle 1968).

A further noteworthy characteristic of phonological processes is reflected in their universality. Again, the term 'universal' should not be understood in the sense of Chomsky's Universal Grammar; rather, their universality stems from the universality of the human speech apparatus, which is more or less the same in all healthy individuals. Therefore, the phonological processes which are applied so as to avoid or reduce a certain physiological difficulty in pronunciation, such as assimilations of two neighbouring sounds, are not language-specific. One piece of evidence which speaks in favour of the universality assumption can be discerned if one focuses on the speech of little children. Children seem to apply phonological processes of substitution as they tend to use substitute sound classes in place of those classes which they find difficult to articulate (Stampe 1973: 2-3). For example, instead of producing the voiceless post-alveolar fricative /ʃ/ as in /ʃuː/, a child may use its alveolar counterpart /s/ because it requires less physical effort. These phonological processes occur during the so called language-innocent state, and they substitute numerous classes of sounds for other sounds for reasons which are purely phonetic, but they hardly display any morphological or other 'conventional' substitutions (Donegan & Stampe 1979: 30). The processes of substitution are, therefore, inborn and not acquired by listening to adult speakers of language (Donegan & Stampe 2009: 6).

Although the main target of the phonological processes are features, such as voicing, these processes are not limited to individual segments; rather, the domain of their application includes hierarchically higher phonological elements, such as syllables, as well. The processes are sensitive to the divisions of phonological domains, such as the peak of a foot, which enables their successful application (Donegan & Stampe 2009: 7). However, rather than influencing these phonological units at the representation level, the application of phonological processes to units such as syllables "arises in the phonological processing of ongoing speech" (Donegan & Stampe 1978: 25). Moreover, the existence of syllables as a mental category is challenged by the authors because they suggest that certain phonotactic constraints are more violable than it may seem, which brings into question the cognitive reality of syllables as units on which phonological processes are applied (Donegan & Stampe 1978: 26).

Nevertheless, it is accepted that certain versions of syllable structure, or syllabification, are more natural in comparison to others. For example, they suggest that every syllable consists of two slopes, namely "rise" and "fall". Rise includes all elements up to, and including the syllabic element (i.e. onset and nucleus in traditional terminology), while fall includes the syllabic component and everything else that follows it (i.e. nucleus and coda). In addition, Natural

Phonology includes the idea of sonority distribution across different segments of the syllable, whereby it is emphasised that syllables which follow the SSP[13] are more preferred, and, by implication, more natural. The increase in naturalness might, then, be an important principle which governs diachronic changes in syllables and their structure.

While the concept of syllable is essentially not rejected in the earliest versions of Natural Phonology, more recent approaches from this framework have criticised the existence of the syllable as a unit in phonological organisation of languages. Most notably, Dziubalska-Kołaczyk (2011) argues against the notion of a syllable on several grounds, merely some of which will be mentioned here as a detailed discussion of her theory would clearly exceed the scope of the paper. First, the author (Dziubalska-Kołaczyk 2011: 55) suggests that the syllable does not have clearly identifiable boundaries, which implies that it should be dismissed as a phonological unit, because, for reasons of production and perception, units in phonology should have unambiguous margins. While it is true that defining the outer boundaries of the syllable can be somewhat complex, this argument is not necessarily sufficient to automatically ignore the importance of syllables in phonology. More precisely, there are various arguments which suggest that syllables are interpreted as phonological domains. For example, Lutz (1991) suggests that numerous phonological changes in English seem to be sensitive to the phonotactic position of the sound in question. Similarly, psycholinguistic experiments have indicated that "listeners are sensitive to syllabically defined allophonic distributions" (Coetzee 2011: 296). Examples of phonotactically conditioned allophones include the various allophones of English phoneme /l/, as well as the distribution of aspirated and unaspirated stops in English (Coetzee 2011: 296). This might indicate that users of a language are aware of syllable boundaries when producing and analysing phonological aspects of a language.

Second, Dziubalska-Kołaczyk (2011: 56) mentions that, despite the claims about the existence of Sonority Sequencing Principle in the syllable, this principle is "often violated by the languages of the world". This piece of criticism seems to be more directed towards the SSP than towards the notion of syllable itself, which, again, implies that the argument under consideration at least does not appear to be sufficiently elaborate to instantly reject the syllable as a phonological unit because it has been demonstrated that certain phonological processes are apparently sensitive to a domain which corresponds to the syllable level. Therefore, in the

[13] For a definition of SSP, see section 2.2.2 of this thesis.

present thesis, the syllable, as mentioned in section 2.1.1. will be treated as a unit of phonological organisation and used as a heuristic.

Another crucial concept in Natural Phonology are phonological rules. As mentioned above, phonological processes which act on both segmental and suprasegmental domains are already active before children have acquired their first language or languages. The interaction with mature language users, of course, inevitably influences children's language use in the widest sense. One of the specific ways in which these interactions can enable the transformation from the state of complete language innocence to a state of language maturity consists in the acquisition of rules (Donegan and Stampe 2009: 6). As an example of a phonological rule, Stampe (1973: 46) mentions the change from /k/ to /s/ in words such as *electricity*. Once acquired, these and similar phonological rules become so ingrained in the human mind that they can only be disobeyed with a considerable amount of difficulty.

Phonological rules are different from phonological processes in at least three ways. First, as mentioned above, unlike phonological processes, with which individuals are endowed at birth, phonological rules need to be learnt during the process of first language acquisition (Donegan & Stampe 2009: 6). Second, they are language-specific rather than universal. Third, it is possible for rules to interact with other aspects of a language, such as morphology or syntax (Donegan & Stampe 2009: 5). As the phonology-morphology interaction might exert an influence on syllable structure, and therefore be relevant for the present study, it will be briefly discussed in the following subsections.

3.1.2. Natural Morphology

The aspects of interaction between phonological and morphological rules, an area also known as morphonology, have been extensively studied within the fields of natural morphology and morphonology founded by Dressler, Wurzel, and Mayerthaler, to name a few, in the late 1970s. Before focusing on the phonology-morphology interface and elaborating on its potential relevance for the present study, a brief account of the theory of morphological naturalness is in order. It should be noted at the outset that, whenever the term 'morphology' is used in this chapter, it implies both inflectional and derivational morphology, as it is done within the theory itself (see e.g. Dressler 1987: 4).

Natural Morphology, being largely based on Natural Phonology, shares a fairly similar set of assumptions as to what it means for a linguistic unit or feature to be described as natural. However, since morphological naturalness can hardly be explained in terms of ease of articulation only, other principles need to be identified which would enable speakers to unconsciously label a certain morph as more natural than its competitors. The principles which have been proposed for defining morphological naturalness include bi-uniqueness, iconicity, and stability of morphological classes (Dressler 1987: 7). Bi-uniqueness and iconicity refer to the relationship between signifier and signified. The former requires a one-to-one relationship between the two, which is sometimes not possible due to the conflict between morphology and lexicon (cf. the polysemy of the suffix –er) (Dressler 1987: 8). Similarly, iconicity postulates that the signifier and signified resemble each other. Clearly, complete iconicity is virtually impossible in language, because it always inevitably contains a certain degree of symbolism (Dressler 1995: 23). Moreover, the degree of iconicity seems to vary across different levels of linguistic description, and it seems to be least obvious in morphology. As Berretta (1995: 198) put it, in morphology, "the conceptual and linguistic mediation is much stronger and the connection between sign and external reality is much less direct".

Some of the alternative proposals which have been made in an attempt to describe the naturalness and iconicity of morphological units include notions such as markedness [14] proposed by Jakobson (1932) and Greenberg (1966). In naturalness theories, markedness is conceived as a property which is the direct opposite of naturalness. As the notion of markedness is extensively used in theories of language universals, it can be stated that "marked means universally dispreferred on a given parameter" (Dressler, Dziubalska-Kołaczyk & Spina 2001: 103). Examples of marked classes include, for example, strong verbs in Germanic languages (Dressler, Dziubalska-Kołaczyk & Spina 2001: 124), such as *swim* and *ride* in English, or *schwimmen* and *reiten* in German, whereas all other weak (or 'regular') verbs would be described as unmarked.

While the theory of markedness seems adequate for explaining the difference between morphologically natural and unnatural structures, it has, nevertheless, not escaped criticism. One of the most significant contributions in which the notion of markedness is challenged was made by Haspelmath (2006). The author (2006: 26) states that markedness is used in twelve different senses and there is no unified view of what this notion actually signifies, which can

[14] For an overview of the development of the notion of markedness in different linguistic theories, see e.g. Battistella (1996).

cause confusion. Moreover, he believes that some of these senses are redundant and their role could be fulfilled equally well, if not better, by using the notions such as frequency of use and phonetic and conceptual difficulty of explanation (Haspelmath 2006: 64). Haspelmath's suggestion certainly makes sense in that replacing the general and sometimes vague notion of markedness could help to avoid potential confusion between different definitions of markedness. However, his alternative proposals seem to provide a description of the different sources of markedness, rather than markedness itself, which renders them suboptimal as solutions which could completely replace the notion of markedness. Therefore, in this paper, the definition given in the previous paragraph will be adopted[15].

As mentioned in the previous section, it is possible for interaction between morphological processes and phonological rules, which can be sensitive to these processes, to take place. This could be of particular significance for the present study, as it will also look at possible differences between morphologically simple and complex monosyllables. Therefore, in what follows, the relationships between phonology and morphology and their relevance for syllable structure will be discussed.

3.1.3. Morphonology and morphonotactics

As already pointed out, phonological rules, unlike phonological processes, can interact with morpho-syntactic properties of a language. This interaction takes place at the level of morphonology, which is essentially derived from the areas of phonology and morphology and does not exist independently (Zwicky 1985: vii; Dressler 1985: 4). The dependence on the modules of phonology and morphology renders this area of language particularly interesting because it indicates that human cognition seems to be capable of grasping a complex input and producing a (possibly even more) complex output while simultaneously taking into account various rules and limitations.

As its name suggests, morphonology assumes the existence of both phonological and morphological rules. Morphological rules govern, for example, the existence of morphological alternations, such as plural formation, which can be represented in the following way:

"Ø ~ /z/ [e.g. dog-dogs]" (Dressler 1985: 12).

[15] Admittedly, this definition does not account for rarity in texts, which is also one of the definitions of markedness discussed by Haspelmath. However, this criterion is not relevant for the present study, which is why this is not considered problematic.

Morphological and morphonological rules are, like phonological rules, language-specific and need to be acquired, but, unlike phonological processes, morphological and morphonological rules need to be specifically learnt (Dressler 1984: 29) because they involve an additional level. All these types of rules are learnable because they follow some of the key requirements of naturalness, such as bi-uniqueness. Moreover, when applied together, the effects of different naturalness requirements, such as phonological one-to-one mapping and morphotactic transparency, can work together to enhance the naturalness of a particular feature (Dressler 1985: 318). This is taken as one of the pieces of evidence which corroborates the theory of natural morphonology, as well as its convergence with natural phonology and natural morphology.

Morphonological operations are also noteworthy because they can produce specific phonotactic combinations which seem to deviate from the preferred syllable structure, i.e. CV or CVC. The relationship between morphonological processes and the effect which they exert on phonotactic structures is studied within the area of morphonotactics, introduced by Dressler and Dziubalska-Kołaczyk in 2006. One of the key foci of this approach lies on the "shapes of morpheme combinations, particularly when they differ from the phonotactics of lexical roots and thus signal morpheme boundaries" (Dressler & Dziubalska-Kołaczyk 2006: 2). This approach has proven helpful in explaining certain diachronic changes of sound combinations, which is why a morphonotactic theory could be highly useful for the present study.

A particular point of interest in morphonotactic research are word-final consonant clusters, i.e. groups which consist of more than one consonant and which typically include morpheme boundaries, such as /gz/ in *dogs*. These clusters are called purely morphonotactic clusters because they are a result of the application of a morphological process (Dressler, Dziubalska-Kołaczyk & Pestal 2010: 52). Other types of consonant clusters which are not purely morphonotactic, but "morphonotactic by default" are consonant clusters which most frequently occur in morphologically complex words, but they may occur in morphologically simple words as well (Dressler, Dziubalska-Kołaczyk & Pestal 2010: 52). These clusters include examples such as /ps/, which may signify plural, as in *capes*, but it is also attested in singular word forms, such as *lapse*.

Morphonotactic clusters are, as the theory suggests, more likely to be phonotactically marked, or dispreferred in the sense of phonetic limitations of human vocal tract. This is of considerable importance for diachrony, because it can help explain the emergence of phonotactic markedness in numerous consonant clusters. Examples of phonotactically marked consonant clusters in English include codas of the past simple tense of weak verbs, such as *screamed* /skriːmd/, and *robbed* /rɒbd/ (Dressler, Dziubalska-Kołaczyk & Pestal 2010: 52). As these examples indicate, phonotactically marked consonant clusters which are produced by morphological rules are most active at the end of words (at least in English, see the source above for a discussion on some other European languages). This tendency has led the authors to conclude that "inflection […] is signalled by marked consonant clusters" (Dressler, Dziubalska-Kołaczyk & Pestal 2010: 61). While all clusters can be seen as marked in a sense because, given the preferred syllable structure, they seem to be typologically rare, morphonotactic consonant clusters are 'even more' marked because no similar lexical clusters are typically attested in the language which has such clusters. For instance, in English, /md/ and /bd/ from the example above cannot be found in morphonotactically simple words.

However, English does have a certain number of phonotactically marked consonant clusters which are not always a direct consequence of the application of morphonological rules. Consider, for example, lexemes such as *gold* /gəʊld/, *false* /fɔːls/, and *ounce* /aʊns/. These rhymes, as Ritt and Kaźmierski (2015: 5) argue, represent a rarity in the languages of the world because they considerably deviate from the preferred CV structure. Nevertheless, they do occur in English, and, since they are predominantly morphologically simple, one needs to look elsewhere for a possible theory which would explain the emergence of such rhymes. Ritt and Kaźmierski (2015: 25) propose several factors for the establishment of these rhymes, namely lexicalisation of Old English present participles, such as *freond*, Homorganic Lengthening, which, as discussed above, occurred in Late Old English, as well as the creation of seemingly dispreferred rhymes which, in turn, enabled the establishment of their more preferred counterparts.

While such rhymes have not emerged due to the application of morphonological rules, the existence of phonotactically marked morphonotactic consonant clusters seems to have contributed to their establishment. More specifically, the frequency of morphonotactic consonant clusters first enabled language users to form expectations about the formation of similarly marked clusters which are not necessarily morphonotactic. Then, the existence of morphonontactic consonant clusters increased speaker's ability to perceive all phonotactically

marked clusters, and, finally, "such word forms were then interpreted as faithful reflections of lexically underlying structures" (Ritt & Kaźmierski 2015: 11).

Marked syllable rhymes in general and morphonotactic consonant clusters in particular are relevant for the present study because one of its aims is to find out whether there are statistically significant weight differences between morphologically simple and morphologically complex monosyllables, and whether their weight has changed over time. As predicted by H_5, morphologically complex monosyllables are significantly heavier than morphologically simple ones. Moreover, the weight of the former has most likely increased more than the weight of the latter in order to enhance the signalling function of marked syllable rhymes. In other words, it might be perceived as more natural to associate morphological complexity with higher syllable weight.

Having briefly outlined the basic assumptions of the naturalness theory, it becomes clear that one of its major advantages, as aptly summed up by Singh (2011: 4), is that it takes into account not only the biological limitations of humans, but also the fact that they are capable of "creative confrontations […] with [the] language". In addition, it is believed that both Natural Phonology and Natural Morphology can offer valuable insights into the motivation behind certain tendencies in language change, which is clearly useful for the present study, as it will attempt to provide possible explanations for the observed patterns.

According to the assumptions made within the framework of Natural Phonology, it can be expected that sound change would presumably tend to render sound patterns more natural considering the limitations of human speech apparatus. An example of a sound change which seems to be in accordance with the hypotheses of Natural Phonology is a sound change in the Tswana language. This change involved "a process of changing away from the unnatural Tswana system (with post-nasal devoicing) to a more natural system (with post-nasal voicing)" (Coetzee & Pretorius 2010: 416). Therefore, it seems that the Tswana language moved towards a system in which sounds which follow nasals assimilate to nasals in voicing, as this might be more natural when it comes to articulation. In other words, the driving force behind the change seems to lie in the need for an increased ease of articulation. Such explanations are clearly not applicable to all sound changes in all languages, but they are not completely without merit either because they take into account the universal human preference for phonetic sound patterns which require less energy from the vocal tract.

The potential relevance of Natural Morphology and morphonotactics for studies in diachronic linguistics was already pointed out above. Two points seem to be most important for explanations of language change with reference to Natural Morphology. First, if it is assumed that morphological change is supposed to increase naturalness of a morph, it should increase its bi-uniqueness and iconicity so as to render the morphological structure in question as transparent as possible. Second, while the existence of morphonotactic consonant clusters may perhaps seem somewhat less natural due to their phonotactic markedness, such clusters which are created by application of morphonological rules simultaneously "facilitate[…] morphological processing in perception" (Dressler, Dziubalska-Kołaczyk & Pestal 2010: 52). This suggests that an increased ease of perception could also be understood as possible motivation for morphological change.

In order to complete the theoretical background of the thesis, in what follows, the Optimality Theory, which will also be used as a part of the theoretical background of the present thesis, will be briefly outlined.

3.2. Optimality Theory

Optimality Theory (henceforth: OT) is a relatively recent phonological theory, first introduced by Prince and Smolensky in 1993. Their approach is essentially grounded in the framework of generative theory in that it considers, for example, the relationship between underlying representations of sound patterns and their surface realisations (Prince & Smolensky 2004: 2). Nevertheless, it goes beyond the classical generative approaches as its principal aim is "to ratify and […] extend the results of modern research on the role of constraints in phonological grammar" (Prince & Smolensky 2004: 2). The advent of OT stimulated the interest in phonological constraints based on the considerations of the nature of articulation of different speech sounds and their combinations (Féry & Vijver 2003: 5).

The specific phonological constrains considered in OT include markedness constraints and faithfulness constraints, both of which govern the output form. The former refers to the idea that every aspect of language, or a specific structure, can have two values: it can be either unmarked, or cross-linguistically preferred, or marked, i.e. universally dispreferred (Kager 1999: 2). For instance, open syllables are unmarked, while closed syllables are marked (Kager 1999: 3). Markedness constraints[16], therefore, assess the output on the basis of cross-linguistic

[16] But see e.g. Haspelmath (2006) on the arguments against the notion of markedness and the alternatives to this concept.

tendencies, and the ideal output candidate will be unmarked. Faithfulness constraints, by contrast, assess the output on the basis of the input, whereby the output which follows faithfulness constraint will preserve the input structure as faithfully as possible (Prince & Smolensky 2004: 3).

The descriptions of the two types of constraints in OT suggest that these constraints may be in conflict. In fact, as Kager (1999: 6), explains, they are "inherently conflicting", which is perhaps one of the crucial characteristics of the relationships between constraints in OT. This is the case because contrasts in the lexicon will tend to be preserved, which means that some of the structures will tend to be marked so as to be distinguished from other structures. For instance, although front rounded vowels are cross-linguistically marked, they increase the potential of signalling lexical contrasts. In such cases, the fulfilment of faithfulness constraints may inhibit the application of markedness constraints (Kager 1999: 6). If the constrains exhibit intrinsically opposing tendencies, the natural question would be how is the output then governed, i.e. which constraints are followed when a sound pattern is produced?

The answer to this can be found in the mechanism of the constraint interaction as postulated in OT. More precisely, constraints are violable, and they enter priority relationships in the sense that, each time an output is generated, the fulfilment of one constraint has the priority over another (McCarthy 2007: 262). OT, therefore, assumes a hierarchical ranking of conflicting constraints which is based on a strict domination of constraints (Kager 1999: 13). This also explains why constraints must be violable: if all of them were satisfied, it would be virtually impossible to generate an output form because they are in conflict. The optimal candidate will satisfy the higher-ranked constraints, while it will most likely violate the lower-ranked ones. This suggests that even optimal candidates are not ideal as they incur a violation against a certain constraint; still, there is no candidate that performs better when it comes to the requirements of higher-ranked constraints (Kager 1999: 13).

The optimal candidate is selected on the basis of the constraint ranking by following several steps. The entire process starts in the lexicon, which provides "the richness of base", and contains the input which is free from any constraints (Kager 1999: 19). Then, the component of the grammar called generator (abbreviated GEN) devises a set of candidates, which are then forwarded to the so called evaluator (EVAL), which chooses the optimal candidate. This candidate satisfies the requirements of the constraint which is ranked highest in the hierarchy (McCarthy 2007: 265). The selection procedure is shown on the following page:

/input/ ⟶ GEN ⟶ {*cand*$_1$, *cand*$_2$, …} ⟶ EVAL ⟶ [output]

(McCarthy 2008: 19)

When it comes to graphical representations of the selection process, OT uses the so called *tableau* to demonstrate how the procedure is conducted. An example of such a *tableau* can be seen in Table 3 below.

Table 3 A tableau for simple domination (Kager 1999: 13)

	C_1	C_2
a. ☞ *candidate a*		*
b. *candidate b*	*!	

As the *tableau* above suggests, both candidates *a* and *b* violate some constraints, as marked by the asterisk symbols. Candidate *b* violates constraint C_1, which is ranked higher than constraint C_2, which is violated by candidate *a*. Since the former incurs a violation of a constraint which has higher priority, the latter is selected as the optimal candidate, as marked by the index symbol.

The set of constraints put forth in OT not only describes the characteristics of optimal segments, such as in the example with front round vowels, but it also provides a description as to which features should be present in suprasegmental phonological domains in order for these to qualify as optimal. To exemplify this, the level of syllable can be taken as an example.

Similarly to other phonological theories (see section 2.1.2), OT conceives of the syllable as the main unit of phonological organisation, which also means that markedness and faithfulness constraints are applied to syllable structure. In addition to that, the proposals by earlier phonologists, such as Jakobson (2002: 377), that the 'ideal' syllable has the CV structure, are taken into account and it is assumed that the preferred syllable structure begins with a consonant, which is in the onset, and ends in a vowel, which is the nucleus (Kager 1999: 93). A CV-syllable, therefore, completely satisfies the markedness constraint, and any other structure would represent a violation of this constraint. Using the terminology of OT, these constraints can be expressed in the following ways:

ONS

A syllable must have an onset.

NUC

Syllables must have nuclei.

-COD

A syllable must *not* have a coda [original emphasis].

(Prince & Smolensky 2004: 106-108).

This demonstrates the importance of articulation and perception in OT; more specifically, the onset position needs to be filled because a consonant is "the best starting point" for a following vowel (Kager 1999: 94).

Of course, although the CV-syllable seems to be the ideal syllable type, the majority of the world's languages have other syllable types as well, such as CVC, CVCC, and so on. OT also includes constraints which prescribe how the optimal candidates for syllables which deviate from the ideal structure should look like. Again, it is required that syllables nevertheless remain as simple as possible in terms of the number of segments contained in the onset and coda respectively. More precisely, as Prince and Smolensky (2004: 108) assert,

*COMPLEX

No more than one C or V may associate to any syllable position node.

This constraint postulates that the ideal structure of a syllable includes one consonant in the onset and coda respectively, and a short vowel in the nucleus. Thereby, complex constituents are conceptualised as marked, and the markedness constraints will tend to prevent them from appearing in the output.

The brief account of OT above inevitably omitted the details of this theory; however, its aim was to provide the gist of the explanation of the phonological processes as conceived in OT. While it is clearly a generative theory, the constraints which it postulates seem to encompass the aspects of human articulation and perception. For example, markedness constraints require that marked forms are not present in the lexicon. This idea is similar to the ideas proposed in naturalness theories, which is why it is believed that the two theories together could potentially be used for the explanations to be proposed in the present thesis. Moreover, it is believed that these constraints may also be able to explain diachronic changes not only in syllables in general, but also in monosyllabic words, which are the focus of the present study.

In the final section of the theoretical part, the evolutionary approach to language and language change will be discussed in order to offer an insight into the understanding of language and language change as conceived in the present thesis.

3.3. The evolutionary approach to language

As its name suggests, the evolutionary approach to language which is established within the field known as evolutionary linguistics, can be understood as an application of Darwinian approach to the development of biological species to language change. The pioneer of evolutionary linguistics was August Schleicher, whose fascination with Darwin's ideas about inheritance and selection made him to think about the ways in which he could apply the same logic to language change. As Schleicher (1983: 15) himself put it, "Darwin's […] theory struck me on a much higher degree, when I applied [it] to the science of language". Schleicher's views reflect a more general conceptualisation of languages which was present in his era, according to which linguistic forms are fairly similar to natural organisms in that they emerge, develop (i.e. evolve) and, ultimately, decay and decease. Moreover, this understanding of language was supported by the tendency to transfer methods used in natural sciences, such as biology, to linguistics. As Schleicher (1983: 18) states, "[i]t is my earnest desire that the natural history method should find more and more favour with those who investigate the subject of language in general". Perhaps one of the best examples of Schleicher's ideas is represented in his family tree of languages (see Schleicher 1983).

The evolutionary approach to linguistics has not been abandoned; on the contrary, more recently, more elaborate theories have emerged which approach various linguistic phenomena from the perspective of the evolutionary model. These theories essentially propose the existence of two levels of language evolution: biological and socio-cultural. While some of them argue that language evolution is purely biologically-motivated, the majority of more recent views have modified such understanding to include social aspects of human beings such as learning and culture (McMahon & McMahon 2013: 236). A prime example of the former theories would be the suggestion by Chomsky, who believes that language and its development was created by the biological evolution of the human language faculty. However, this definition seems to be too narrow because humans exist in social communities and extensively use language for purposes of communication, which suggests that it is plausible that human social interactions in the widest sense could likewise shape the direction of language evolution. As Croft (2008: 220) argues, "[w]hat is required is a generalized theory of evolutionary change

that subsumes biological evolution, language change, and other phenomena of evolutionary change such as cultural evolution".

The approach to language evolution which will be adopted in the present thesis reflects this prevailing view. More specifically, following Dawkins (1976; 1989), Christiansen and Kirby (2003), and Ritt (2004), it is assumed that cultural evolution plays a significant role in language evolution in general. According to their theories, the key transmitters of cultural characteristics are replicators. Replicators in cultural transmission perform the same function as genes in the transmission of hereditary characteristics, as they are copied from one generation to another, whereby most of their structure is left intact (Croft 2008: 221). Dawkins (1976) terms these cultural replicators 'memes'. In comparison to genes, memes may seem slightly more abstract and difficult to grasp because they are essentially mental categories. Moreover, using the concept of cultural memes in the widest sense might not be sufficiently specific to account for the replication of linguistic characteristics, which is why more specialised linguistic replicators seem to be necessary.

These replicators are termed 'linguemes' (Croft 2000: 28). Due to the existence of various linguistic units at virtually all levels, it may not be immediately clear what could constitute a lingueme, i.e. whether it can be any linguistic utterance, or a hierarchically lower unit, such as lexeme, or phoneme. As Ritt (2004: 133) explains, linguistic replicators need to be small competence constituents, which are capable of a faithful transmission of information. Therefore, the best candidates for linguistic replication are phonemes, because "they are hard to get rid of even if one tries" (Ritt 2004: 135). However, it is also possible to have a sequence of phonemes or a morpheme as linguistic replicators because they satisfy the criteria such as copying fidelity and longevity, which are necessary for replication. Linguistic replicators are responsible for human linguistic behaviour, one of the principal purposes of which is to ensure further replication processes rather than communication (Ritt 2004: 231). This view reflects Dawkins's selfish gene theory applied to the evolution of language.

Having described the linguistic counterparts of genes, the question which naturally arises is how does the selection procedure work in linguistic replication? Selection, according to Hull (1988: 408-9), is a process which brings about "differential perpetuation of the relevant replicators". Various criteria have been proposed which govern the procedure of selection of linguistic replicators. For example, Ritt (2004: 222-227) discusses what seem to be the most important selectional pressures in language evolution, namely genetic, memetic, and social

pressures. The interplay of these pressures ensures an evolutionary process which is constrained by human biogenetic endowment and social interactions, whereby the memes which participate in the process interact with other memes. This implies that, within speech communities, processes such as evolution, adaptation or learning constantly take place (Ritt 2004: 105), which enables the adaptation of linguistic replicators to the needs of other replicators. This process is often called "meme-meme adaptation" (Ritt 2004: 291).

In the evolutionary approach to language, it is also assumed that living organisms are interactors who interact with the environment, which, consequently, brings about selection (Croft 2008: 221). This is reflected in the models proposed by Hull (1988), Ritt (2004), and Croft (2008). Nevertheless, Hull and Croft do not share the view of the selfish gene/meme theory that replicators exist in order to enable further replication, but assume a more substantial influence of social factors, such as social networks, on the selection of variants of a linguistic unit.

A particularly relevant area for the present thesis in which the evolutionary theory of language has been applied is phonological change. In her work on evolutionary phonology, Blevins (2004: 17) describes evolutionary phonology as "the general study of [synchronic] sound patterns in relation to language change". According to the author (2004: 32) phonological change is phonetically motivated and it can originate, for instance, in misperceptions of phones if they are either phonetically similar or phonologically ambiguous. The change can, then, influence the shape of the sound pattern of languages. As Blevins (2006: 157) further explains, evolutionary phonology is not interested in describing only specific languages, but also cross-linguistic phonological tendencies. For the purposes of the present thesis, one of the most relevant aspects of her theory includes the discussion on syllable-related changes. Blevins (2004: 132) argues that the explanations for synchronic syllable structures need to build on explanations of segmental changes which brought about this structure. This approach will be adopted in the present thesis as well.

Having outlined the theoretical framework of the present study, in the following section, the methodological approach adopted in the thesis will be described.

Part 4 – Method and results

4.1. Methodology

This chapter contains an outline of the methodological conventions followed during the course of the project. As already mentioned in the introduction, the present study can be described as a corpus-based study in the sense that corpus data was used to test the hypotheses formulated prior to the data analysis stage. In what follows, the specific steps taken to select, retrieve and analyse the data will be outlined.

In order to be able to pursue a diachronic study of English monosyllables, first, an appropriate corpus had to be selected. However, finding a historical corpus which would serve the purpose of the study proved fairly difficult for several reasons. First, there seem to be virtually no ready-made corpora which are phonologically tagged so as to enable the researcher to retrieve the words based on the number of syllables they contain. Second, even if such corpora were available, the degree of comparability of the texts which they would include would most likely not be sufficient for the purposes of the present study. The reason for this lies in the fact that, in order to be able to detect frequencies of monosyllables in texts from different periods, one needs to have highly comparable texts at their disposal. The majority of the available historical corpora, such as The Penn-Helsinki Parsed Corpus of Middle English (PPCME2) (Kroch & Taylor 2000), despite their careful design and numerous advantages, do not meet the criteria of high comparability and balance needed for the present study.

In order to tackle these issues, it was decided to compile a corpus which is tailored to fulfil the requirements mentioned above. The corpus, preliminary entitled Bible Texts Corpus (henceforth: BTC), as the title suggests, consists of eight extracts from different English translations of the Bible, ranging from Old English to Present-Day English. This is a clear advantage as the translations into each of the major stages of English can offer a valuable insight into the changes which might have occurred between these periods, which simultaneously fulfils the aforementioned comparability criterion. Moreover, this approach allows for a high degree of control over aspects such as potential lexico-grammatical and stylistic differences between the texts, as these are reduced to a minimum. This, of course, does not necessarily imply that the texts are identical, as the translations do exhibit minor differences, but these differences are not deemed sufficiently large to potentially skew the results. A list of the Bible translations used for the purposes of the present study is shown in Table 4 on the following page. The table only contains the basic information about the texts, while complete citations of the texts can be found in the list of references at the end of this thesis.

Table 4 A list of primary sources used for the thesis

Title	Year (period)
Ða Halgan Godspel on Englisc *(The Anglo-Saxon Version of the Holy Gospels)*	c. 990 (OE)
The Wycliffe Bible	1395 (ME)
Tyndale Bible	1534 (EME)
King James Bible	1611 (EME)
Douay-Rheims Bible (Challoner Revision)	1752 (ModE)
Joseph Smith Translation of the Bible	1844 (ModE)
The Phillips New Testament in Modern English	1958 (ModE)
The World English Bible (WEB)	2001 (ModE)

As can be seen in Table 4, the distribution of texts across the periods is unfortunately somewhat uneven. While in the first two periods a fairly low number of texts per period is attested in the corpus, it was possible to find more texts from the later periods.

The reason for the low number of texts in the first two periods is the limited number of Bible translations into Old English which existed back then. The text from 990, together with Lindisfarne Gospels from the beginning of the 8th century, represents a rare example of Old English translations of the Bible. Similarly, in the Middle English period, despite the existence of Bible-related texts such as *The Ormulum*, which essentially contains paraphrases of Biblical texts, no more than one complete translation of the Bible can be found. In the modern period, from the 16th century onwards, the number of Bible translations has been increasing for reasons such as the invention of the printing press, the emergence of national state in England, and standardisation of written language. Due to the higher number of texts in the modern period, it is expected that the language development which occurred during this period is more accurately reflected in the data.

The issue of unequal distribution of texts across the periods adds to other problems which can be frequently encountered in studies on historical linguistics conducted by means of corpora, such as representativeness and balance which. As Claridge (2008: 245) explains, while these criteria are sufficiently difficult to meet when producing contemporary corpora, it is even more challenging to compile a representative and balanced corpus which aims at illustrating earlier language stages. Of course, this does not imply that using historical corpora is entirely useless;

what it does imply is that the results obtained by means of historical corpora should be treated with a certain degree of caution. In an attempt to tackle the issue of the limited representativeness, several statistical procedures were conducted. The setup of the statistical computations will be described in more detail in section 4.1.

Due to the limited scope of the project, an analysis of entire Bible translations was unfortunately not possible. Rather, it was necessary to adopt a sampling strategy which would result in a manageable set of data. The sampling strategy can be described as stratified convenience sampling (for a comprehensive definition of this type of sampling, consult e.g. Dörnyei 2007) as it took the division of the historical language stages as the basis for stratification. The convenience aspect of the strategy is reflected in the fact that only the texts which are readily available were used for the purposes of the thesis. The specific passages from the Bible which meet the availability criterion are the gospels, because, as Table 4 shows, these texts were translated into English already during the OE period. The section of gospels which was extracted for the present project consists of the first three chapters of the Gospel of Mark. These were assembled into an integrated Word document, which represents the basis for the BTC corpus. The total number of words in the corpus amounts to 19,645 words. The limited size of the corpus enables the author to look at every instance of monosyllables, which clearly contributes to the reliability of the findings. Furthermore, although such a size of the corpus may seemingly reduce its representativeness, it is believed that the number of monosyllabic words it contains is sufficiently high, which increases the likelihood that the corpus will be representative of the genre. Moreover, as mentioned above, an attempt will be made to overcome this obstacle by applying methods of inferential statistics, as explained in section 4 below.

Once the document was produced, each of the texts was analysed separately in an Excel file using the Filter function in order to identify the number and phonotactic characteristics of monosyllabic words. The monosyllables were subjected to both qualitative and quantitative analysis, which suggests that the present study can be qualified as a mixed-methods study. First, for each of the periods, the ratio of monosyllables to polysyllables[17] was determined in order to quantitatively verify the claims by Jespersen (1928) and Kisaka (1940) introduced in Chapter 1 of the thesis.

[17] The ratio was determined for word form tokens.

After the completion of this first quantitative stage of data analysis, the qualitative stage commenced. During this stage, each of the monosyllabic words was annotated for the following properties: syllable structure (where C stands for a consonant and V for a vowel), word class (i.e. content (C) or function (F)), syllable weight, length of the nucleus, the number of segments in the onset, morphological complexity, as well as its origin. In order to prepare the data for quantitative analysis, instead of using descriptors such as "heavy", syllable weight was annotated using the following numerical symbols: 0 (light syllable), 1 (heavy syllable), 2 (superheavy syllable), and 3 (super-superheavy syllable, such as the ones described by Ritt and Kaźmierski (2015)). The length of the nucleus was marked with symbols "S" for short, "L" for long, and "D" for diphthong. The number of elements in the onset was annotated using the following descriptors: "A-" (zero elements in the onset), "A" (one element in the onset), "AB" (two elements in the onset), and "ABC" (three elements in the onset). The morphological complexity was described by using "M" for morphologically complex words (such as *cats*), and "M-" for morphologically simple words. Finally, the words were annotated for their origin using the symbols 'G' for Germanic and 'R' for Romance. The following figure illustrates an excerpt of an Excel sheet in which the analysis was conducted.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1		CV	CCV	VC	VCC	CVC	CCVC	CCCVC	CVCC	CCVCC	CCVCC(	Conten	Functic						A-	A	AB
210	bead					CVC						C				2		D		A	
212	béc					CVC						C			1			L		A	
213	bed					CVC						C			1			S		A	
214	bed					CVC						C			1			S		A	
215	bed					CVC						C			1			S		A	
217	beoð					CVC							F			2		D		A	
218	beoð					CVC							F			2		D		A	
219	beon					CVC							F			2		D		A	
220	beon					CVC							F			2		D		A	
221	bið					CVC							F		1			S		A	
222	bið					CVC							F		1			S		A	
223	bið					CVC							F		1			S		A	
224	bið					CVC							F		1			S		A	
225	bið					CVC							F		1			S		A	
227	byð					CVC							F		1			S		A	
228	byð					CVC							F		1			S		A	
230	com					CVC						C			1			L		A	
231	com					CVC						C			1			L		A	
232	com					CVC						C			1			L		A	
233	com					CVC						C			1			L		A	

Figure 3. Example of qualitative analyses conducted in Excel (from the OE data set)

Once all monosyllables were annotated as described above, they were analysed using methods of both descriptive and inferential statistics. The former consists of univariate analysis, i.e. analysis of the statistical properties of a single variable, including calculations such as percentages, measures of central tendency, such as mean, median, and mode, measures of spread such as standard deviation, as well as significance testing. In addition to that, due to the fact that the data set under analysis contains data points from various temporal periods, the type

of neighbour clustering called Variability-based Neighbour Clustering (see Gries & Hilpert 2008) was applied so as to identify the periods which should be used as referent points for data analysis. When it comes to the methods which belong to the area of inferential statistics, it should be noted that these were employed with the aim of estimating whether the findings about the sample can be generalised to the entire population. One of the key methodological tools used to achieve this purpose includes the chi-squared test, which is essentially a means of significance testing which can indicate the existence of a statistically significant difference between, for example, two data sets. The basis for the chi-squared tests are absolute (raw) frequencies, whereas the direction of any observable changes is measured based on normalised frequencies. Counting and percentages were conducted automatically in Excel, while all other statistical computations were conducted using R software, version 3.4.0, and R Studio, version 1.0.143. The results of these calculations will be reported in the following section.

Before that, however, it seems necessary to briefly mention the major difficulties encountered during the data analysis so as to offer a direct insight into the process of data analysis, thereby hopefully increasing the transparency of the study. It should be noted at the outset that these issues predominantly pertain to the first two texts from Table 4 above, i.e. texts from Old and Middle English.

One of the major difficulties experienced during the analysis of texts from these periods involves the lack of a direct correspondence between spelling and sounds. Because of this, in certain cases, it was not entirely clear whether certain phonological changes such as Homorganic Lengthening (for a description and discussion of the phenomenon, see, for example, Ritt 1994) affected all vowels which preceded homorganic consonant clusters or merely high vowels, as suggested by Minkova and Stockwell (1992). Although certain scribes, as Mokrowiecki (2015: 429) claims, seem to have indicated vowel length by using acute accents more or less systematically in manuscripts such as *Homilies of Ælfric*, it has not been sufficiently researched whether this tendency of scribes was displayed in other manuscripts as well. For the purposes of the present study, despite the apparent lack of a general consensus in the field, the theory by Minkova and Stockwell (1992) will be followed.

Additionally, the texts from Old and Middle English exhibit a high degree of spelling variation, which is indicative of a lack of standard language. Since spelling is one of the key pieces of evidence of earlier pronunciation, this clearly adds another dimension to the complexity of approaching sound patterns of earlier stages of English. A prime example of this difficulty is

reflected in the existence of different spelling variants of one and the same lexeme. This problem is even more prominent in the Middle English text because Old English had more stable spelling due to the conventions from the scriptorias in Wessex (for a detailed discussion of Old English standard, see e.g. Gretsch 2009). For instance, word-final letter <e>, which in most cases represented the schwa vowel, is not always attested in one and the same lexeme (e.g. both spellings *laye* and *lay* for PDE *lay* are attested in ME). Although spelling variation can be a valuable source of evidence as it can indicate a change which was ongoing in the period in which the text was produced, the lack of standard clearly poses a difficulty when trying to determine the pronunciation of a specific word. However, the standardisation has not solved the issue of discrepancy between spelling and pronunciation. For example, in Modern English, there are numerous words which end in <e>, which is silent in pronunciation, such as *robe*.

Finally, due to the lack of standardised language in earlier language stages, and the amount of regional variation in PDE, the question which needs to be posed is related to the variety which is described in the present thesis. Providing an answer to this question is clearly more difficult with respect to earlier stages of the language because we most likely do not have the access to the evidence for all regional varieties which existed in the past. When it comes to PDE, the situation is significantly clearer, as it is possible to describe varieties such as British English, American English, Indian English, etc. The present thesis will aim at providing a description of monosyllables in British English, and, more specifically, in the variety known as Received Pronunciation (RP).

The issues briefly touched upon clearly indicate why studying phonological patterns in the earlier stages of English can be fairly challenging. Nevertheless, English historical phonology is not only possible, but also highly successful due to a bulk of literature in which the most likely paths of diachronic sound changes have been described in detail. These sources can be understood as guidelines which can be followed when mapping out the territory of new, linguistically underexplored data.

Having briefly described the methods adopted for the purposes of the present study, in the next chapter, the results of the empirical part of the project will be reported and interpreted in the light of relevant theoretical approaches.

5. Results and interpretation

In this chapter, the results of quantitative data analysis will be reported and interpreted. After demonstrating the calculations conducted for the purposes of preparing the data for further analysis, the hypotheses outlined in the introductory section of the paper will be restated before presenting the empirical findings used to test the hypotheses in question.

5.1. Data preparation: normalisation and clustering

As mentioned in the previous section, the BTC corpus used to empirically test the hypotheses consists of eight texts. Although these texts display a high degree of similarity, they typically differ in their size, i.e. word count. The differences are not major; however, the different numbers might potentially misrepresent the frequencies of different types of monosyllables, which would, clearly, skew the results. In order to avoid this issue and obtain results which represents the distributions faithfully, first, the raw numbers of words in the texts from different years were normalised per 1,000 words using the following formula:

$$Relative\ frequency\ of\ monosyllables = \frac{Absolute\ frequency\ of\ monosyllables * 1000}{Total\ number\ of\ words\ in\ the\ text}$$

Of course, this procedure was adopted only when it was appropriate for the description of the tendency, and the relative frequencies were not used for statistical tests.

The normalised word counts for each of the texts are shown in Table 5 below.

Table 5 Absolute and relative frequencies of monosyllables in texts from different periods

Text number	Period (year)	Absolute frequency	Relative frequency (normalised per 1,000)
1	c. 990	1080	562.5
2	1395	1462	642.35
3	1534	1784	751.79
4	1611	1732	745.9
5	1752	1788	762.14
6	1844	2002	765.58
7	1958	1845	757.38
8	2001	1639	755.29

Table 5 seems to indicate a moderate increase in the relative frequency of monosyllabic words and a stabilisation in the trend after the year 1534. However, it is not quite clear whether the observed change is statistically significant. Therefore, a strategy needed to be employed which would reflect the tendency of change more faithfully. The selected method involved two statistical procedures, both of which were conducted using the R workspace and R Studio. The first procedure consisted in computing a correlation coefficient known as Kendall's τ. Kendall's τ is a coefficient which constitutes the basis for the non-parametric tau-test of statistical significance. More specifically, when applied to corpus data, it "[c]orrelates the sequence of corpus sub-periods with the relative frequencies of data" (Hilpert & Gries 2009: 390). The results of the tau-test can be seen in Table 6 and Figure 4 below.

Table 6 Results of Kendall's τ for relative frequencies of monosyllables over the periods

Kendall's τ	**2-sided *p*-value**
0.571	0.063487

The τ coefficient which is almost exactly between 0 and 1, albeit closer to 1, suggests the existence of a moderate trend in the data set (Hilpert & Gries 2009: 390). This conclusion is supported by the *p*-value, which would, as the authors (Hilpert & Gries 2009: 390) explain, in such cases count as marginally significant.

A clearer visualisation of the apparent tendency in the data set above can be obtained by looking at the following graph:

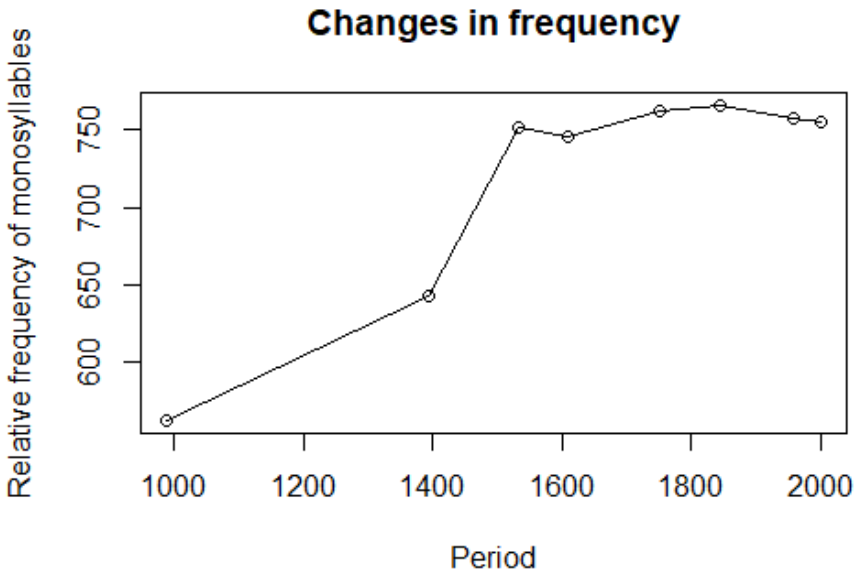


Figure 4. Chart produced using Kendall's τ for relative frequencies of monosyllables

Figure 4 seems to corroborate the increasing tendency which reaches the point of stabilisation probably somewhere around the year 1534, which can also be observed in Table 5 above. Although Kendall's coefficient is clearly useful as it provides a better understanding of the trend in a data set, this coefficient alone is not sufficient for making more detailed statements about the internal structure of the data and about the linearity of the trend. In order to obtain more information about the data and prepare it for the analysis, the statistical method known as Variability-based Neighbour Clustering (henceforth: VNC) (Gries & Hilpert 2008) was employed. VNC was specifically developed for linguistics, and it has been predominantly used in psycholinguistic studies on language acquisition and in diachronic corpus linguistics to identify clusters, or stages, in diachronic data. VNC was also employed for the purposes of the present study in order to identify the individual periods which should be clustered together so as to obtain a more detailed depiction of the dynamics of the change.

The VNC groups the individual data points together on the basis of their similarity, which is inversely proportional to the variation coefficient. For two successive data points (e.g. frequencies), the coefficient of variation can be obtained by dividing "the mean of their joint […] frequencies by the standard deviation of their joint frequencies" (Gries & Stoll 2009: 237). This procedure is repeated until the variation coefficient for every two successive values is computed and stored, whereby the smallest coefficient of variation is determined and the values which are most similar to each other are clustered together (Hilpert & Gries 2009: 390). The entire procedure is fully automatic and can be done in both R workspace and R Studio, although the former seems to be more reliable for this method, which is why the VNC was conducted there. The iterative algorithm behind the operation in pseudocode as well as the code used for the function can be found in Appendix 8.2. The calculations based on the VNC algorithm resulted in two figures, namely a dendrogram and a "scree" plot, both of which are shown on the following page.

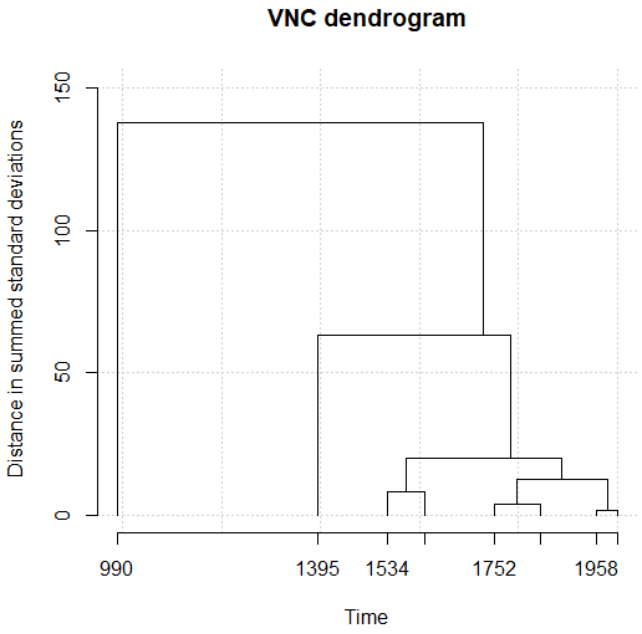


Figure 5. VNC dendrogram for relative frequencies of monosyllables

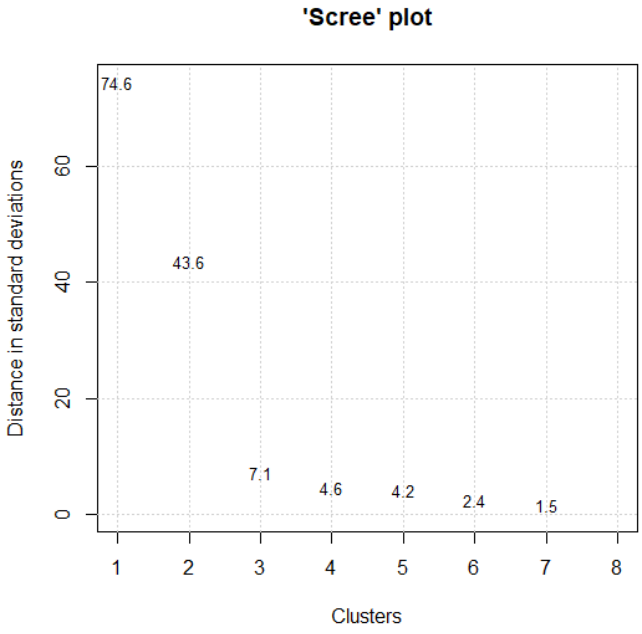


Figure 6. 'Scree' plot for relative frequencies of monosyllables

The VNC dendrogram in Figure 5 above demonstrates how the clusters are gradually formed based on their similarity. It also shows which data points are least similar, and therefore should be considered as separate clusters. The algorithm also automatically produces a "scree" plot which accompanies the dendrogram and which is highly useful for interpreting the results of the clustering. More specifically, when looking at the "scree plot", the number of the clusters

which should be taken into consideration can be identified. As the plot shows, the slopes between the data points 74.6 and 43.6 and 43.6 and 7.1 respectively are fairly steep, while the steepness of the slope considerably decreases after 7.1 and becomes nearly horizontal. This suggests that VNC has produced the following three main clusters: the first one consists of data point 74.6, the second one of data point 43.6, and the third one includes data points from 7.1 to 1.5. When looking at the dendrogram, the specific years which should be included in each of the clusters are identifiable: cluster 1 includes only the year 990, cluster 2 includes only the year 1395, while cluster 3 groups the rest of the years together.

This result is interesting because the generated clusters seem to coincide with the periods between which important linguistic changes occurred. For example, Old English (cluster 1) and Middle English (cluster 2) are different clusters, which coincides with a decrease in the number of inflections, and might, by implication, correspond to an increase in monosyllabism. Perhaps even more significant is the fact that all periods after schwa loss were clustered together. Again, this might correspond to a significant increase in the relative frequency of monosyllabic words between clusters 2 and 3.

5.2. Increase in the relative frequency of monosyllables

Having identified the three clusters between which the changes in the relative frequency of monosyllabic words seem to be the most significant, a new periodisation schema was established which represents the basis for all further analyses. This periodisation is shown in Table 7 below.

Table 7 Frequency of monosyllables with the periodisation based on the VNC

Period	Period code	Absolute frequency of monosyllables	Relative frequency of monosyllables
c. 990	1	1080	562.5
1395	2	1462	642.35
1534-2001	3	10,790	758.41

As can be seen from the table above, it is now clear that the trend under investigation is indeed linear and that the relative frequency of monosyllabic words has increased in the corpus. The following plot represents the tendency graphically.

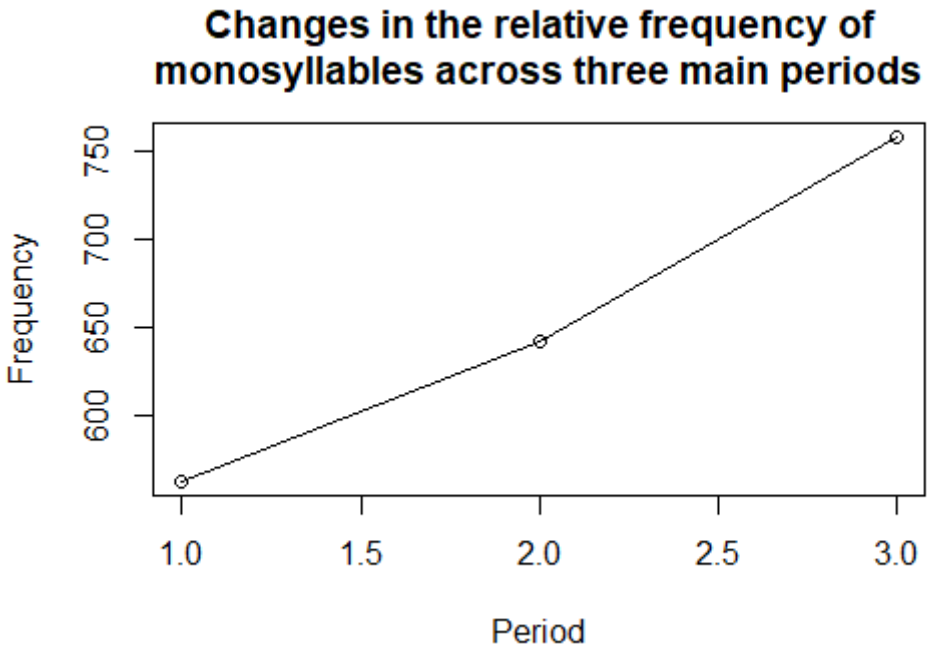


Figure 7. Changes in the relative frequency of monosyllables (based on VNC)

Figure 7 indicates a pronounced increase in the relative frequency of monosyllables. In order to statistically verify its statistical significance, chi-squared tests[18] were performed in RStudio, yielding the following results:

Table 8 Results of the chi-squared test for changes in the frequency of monosyllables

Periods	X^2	df	*p*-value
Between Periods 1 and 2	57.405	1	3.547e-14
Between Periods 2 and 3	7101.8	1	< 2.2e-16

As *p*-values in Table 8 suggest, there is a statistically significant difference between periods 1 and 2 as well as between periods 2 and 3 with respect to the frequency of monosyllables in each of the periods. The *p*-value is considerably lower for the difference between the latter periods, which indicates an even bigger difference between these periods. As Period 3 is the first period in which the inflectional suffixes and hence the schwas almost entirely ceased to exist, it was expected that the relative frequency of monosyllabic words markedly increased between periods 2 and 3.

[18] For all chi-squared tests conducted for the purposes of the present study, absolute (raw) frequencies were used.

5.3. Increase in the proportion of monosyllables

Although the increase in the relative frequency of monosyllabic words was most likely gradual, it seems to have triggered significant consequences. Perhaps the most immediate of these is also a quantitative one as it pertains to the change in the proportion of monosyllabic words to polysyllabic words in the English lexicon, which was also predicted by the first hypothesis (H_1) introduced in Chapter 1 of the present paper. The hypothesis proposes the following:

H_1: The gradual loss of inflectional endings in content words which were disyllabic in Old English, which was most likely completed by the second half of the 15th century (Minkova 1991: 2), influenced the proportion of monosyllabic words to polysyllabic words in the English lexicon. More specifically, this might have rendered monosyllabic words the prototypical word shape in English, which led to the increase in the proportion of monosyllables to polysyllables.

This hypothesis was quantitatively tested, and the results of the calculations are summarised in the following table.

Table 9 Proportions of monosyllabic to polysyllabic words

Period	MS	PS	Results of the chi-squared test		
1	1080 (56.25 %)	840 (43.75 %)	**X^2** = 30	**df** = 1	***p*-value** = 4.32e-08
2	1462 (62.65 %)	814 (35.76 %)	**X^2** = 184.49	**df** = 1	***p*-value** < 2.2e-16
3	10790 (75.84 %)	3,437 (24.15 %)	**X^2** = 3800.3	**df** = 1	***p*-value** < 2.2e-16

The data from Table 9 suggests that the proportion of monosyllabic words has been significantly higher in comparison to the proportion of polysyllabic words in all three periods under consideration. Moreover, it seems that in Period 2, and especially in Period 3, the proportion of monosyllables has considerably increased, while the proportion (i.e. percentage) of polysyllables decreased. The decreasing trend of the frequency of polysyllables is also evident in Table 10 on the following page.

Table 10 Frequencies of polysyllables with the periodisation based on the VNC

Period	Period code	Absolute frequency of polysyllables	Relative frequency of polysyllables
c. 990	1	840	437.50
1395	2	814	357.64
1534-2001	3	3437	241.58

It seems, therefore, that the proportion of polysyllables has significantly decreased overall. Furthermore, in the case of polysyllabic words, the rate of change seems to be somewhat higher in comparison to the overall rate of increase of monosyllabic words. The slightly bigger change between Periods 2 and 3 coincides with the period in which the frequency of monosyllables substantially rose. The changes in the proportions are graphically summarised in Figure 8 below.

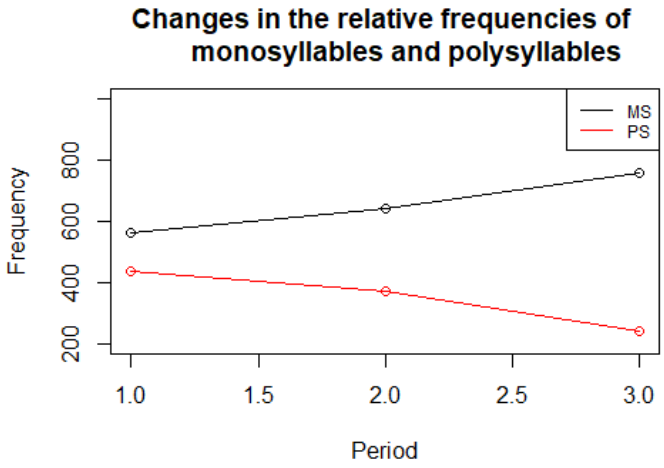


Figure 8. Changes in the relative frequencies of monosyllables and polysyllables

The lines in Figure 8 show the opposing tendencies of monosyllabic and polysyllabic words in the corpus across the three periods under analysis. The observed trend is clearly suggestive of a significant increase in the proportion of monosyllables to polysyllables. Therefore, the part of the hypothesis which proposes the increase in the proportion of monosyllables is quantitatively corroborated. In order to check whether the increase in frequency can be attributed to the increase in the frequency of monosyllabic content words and thereby completely verify hypothesis 1, calculations were conducted to obtain the results about the

changes in the frequencies of monosyllabic content and function words respectively. These results are reported in the following section.

5.4. Changes in the relative frequencies of monosyllabic content and function words

If the increase in the proportion of monosyllables to polysyllables is indeed caused by the increase of monosyllabic content words as a consequence of schwa loss, it is expected that the proportion of monosyllabic content words should have considerably increased, while the frequency of monosyllabic function words should have remained fairly stable throughout the periods under analysis.

In order to examine and identify the trends in the data, first, the proportions of monosyllabic content words to monosyllabic function words were calculated. It was expected that the proportion of function words would be significantly higher in all periods simply because function words are used with a considerably higher frequency due to their role as devices which establish various relationships within a clause and between two or more clauses. Table 11 below summarises the results of this calculation.

Table 11 Changes in the proportion of monosyllabic content words to monosyllabic function words

Period	**Content**	**Function**	**Results of the chi-squared test**		
1	148 (13.70 %)	932 (86.29 %)	$X^2 = 569.13$	**df** = 1	***p*-value** < 2.2e-16
2	212 (14.50 %)	1250 (85.49 %)	$X^2 = 736.97$	**df** = 1	***p*-value** < 2.2e-16
3	3127 (28.88 %)	7663 (71.00 %)	$X^2 = 1906.9$	**df** = 1	***p*-value** < 2.2e-16

As predicted, the proportion of monosyllabic function words to monosyllabic content words has remained significantly higher in all three periods. This is also shown graphically in figures 9-11 on the following page.

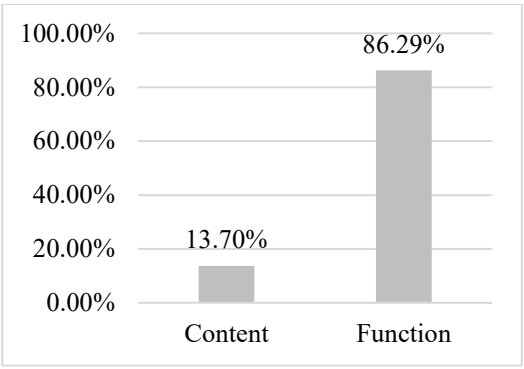


Figure 9. Proportion of monosyllabic content words to monosyllabic function words in Period 1

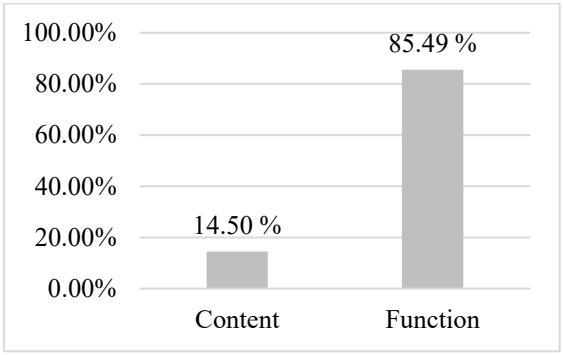


Figure 10. Proportion of monosyllabic content words to monosyllabic function words in Period 2

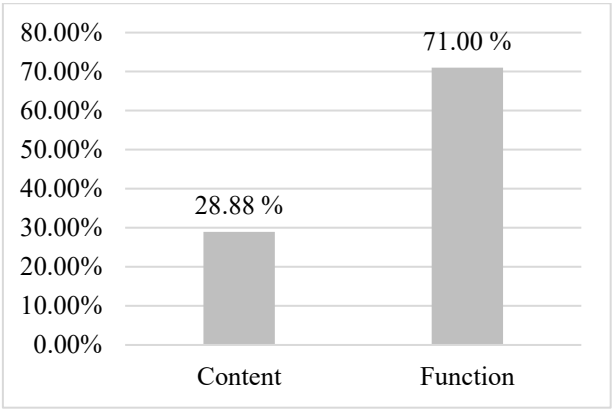


Figure 11. Proportion of monosyllabic content words to monosyllabic function words in Period 3

A particularly noteworthy trend which can be observed from the graphs on the previous page is a certain increase in the proportion of monosyllabic content words throughout the periods, despite the fact that the proportion of function words has been significantly higher in all periods. An increase in the proportion of monosyllabic content words could have been caused by the disappearance of schwas in the final syllables of disyllabic words, which is especially evident

between Periods 2 and 3. The apparently bigger difference between periods 2 and 3 indicates that the timing of the change, again, corresponds to the post-schwa loss period, when the number of monosyllables increased.

When it comes to the changes in the proportion of monosyllabic function words, an opposing tendency can be observed. More precisely, their frequency has somewhat decreased during the periods under consideration. Nevertheless, the rate of decrease seems to be somewhat lower in comparison to the changes observed in the subset of monosyllabic content words, which could indicate that the change in the frequency of function words was slightly slower than the change in the frequency of monosyllabic content words. This might, in turn, indicate that the change in content words is more substantial, which could, of course, be a consequence of schwa loss which predominantly affected content words.

Having determined the direction of the observed change based on the relative frequencies, the next step in the analysis was to determine the statistical significance of the change using contingency tables.

Table 12 Changes in the proportions of monosyllabic content and function words – the chi-squared test

	Word class and frequency		
Period	**C**	**F**	**Total**
P1	148 *282.48*[19]	932 *797.52*	**1080**
P2	212 *382.38*	1250 *1079.61*	**1462**
P3	3127 *2822.13*	7663 *7967.86*	**10790**
Total	**9301**	**3585**	**13332**
Statistical significance	X^2 = 234.1	**df** = 1	***p*-value** < 2.2e-16

Table 12 above suggests that the changes under consideration are statistically significant, based on the fairly low *p*-value. The statistical significance could be attributed to the change in the proportion of monosyllabic content words, which, as the figures above have suggested, seems to be fairly substantial in comparison to the change in the proportion of function words.

[19] Expected values are displayed in italics.

5.5. English as an increasingly monosyllabic language

According to the first hypothesis of the present study, the gradual loss of inflectional endings in content words which were disyllabic in Old English, which was most likely completed by the second half of the 15th century (Minkova 1991: 2), influenced the proportion of monosyllabic words to polysyllabic words in the English lexicon. More specifically, the proportion of monosyllables to polysyllables increased, which might have rendered monosyllabic words the prototypical word shape in English. Based on the empirical findings presented in sections 5.2-5.4, it can be concluded that the hypothesis was quantitatively corroborated by statistical results in several ways.

First, it was shown that the relative frequency of monosyllabic words in English as well as its proportion to polysyllabic words has apparently considerably increased. This important finding is also in line with the argument put forth by Jespersen (1928: 3-4) and later Kisaka (1940), who suggest that the English language has undergone the process of monosyllabicisation, similarly to certain Asian languages, such as Chinese. This process, as Jespersen (1928: 5-7) claims, is to a large extent caused by the loss of inflectional suffixes, which were first reduced to schwas before completely disappearing in the second half of the 15th century (Minkova 1991: 2). The timing of this change seems to be reflected in the results presented in the previous sections; more specifically, the frequency and the proportion of monosyllables increased more substantially between periods 2 (end of the 14th century) and 3 (second half of the 16th century onwards). As it is estimated that schwas were completely lost between these periods, it seems reasonable to assume that schwa loss was the main trigger for the change under consideration. Therefore, the first set of results seems to indicate that the increase of monosyllabism in English lexicon correlates with the increase in their relative frequency in language use.

In order to exclude the possibility that the increase in monosyllabic words in English should be attributed to the high frequency of function words only, and in order to demonstrate that it is not only the timing of the change which seems to support the hypothesis that the increase in monosyllabism can be attributed to the loss of inflectional endings, the changes in the proportions of monosyllabic content and functions words were also measured. The results of these calculations indicated that, while the majority of all monosyllabic words in the corpus are still function words, the proportion of monosyllabic content words has significantly increased between Periods 2 and 3. This change also seems to support Jespersen's (1928: 3-4) idea that the loss of inflectional suffixes, which affected exclusively content words, is

responsible for the change under consideration, as well as Minkova's (1991: 2) argument about the period in which the endings were lost.

The dramatic increase in monosyllabism in English might also indicate that monosyllables have become the prototypical word shape in English. This tendency was apparently identifiable already in Old English, as the proportion of monosyllables was higher back then as well, but with the loss of inflectional suffixes, the tendency became considerably more pronounced. It is possible that their low length renders them more natural in the sense that they are relatively easy to produce and process. This quality of theirs might even make them more adequate for replication and thus evolutionary stable.

The tendency of monosyllables to be something relatively close to the prototype in English can lead to important consequences not only within the English language, but also when it comes to the language contact which English has had with other languages throughout its history, and, in particular, for loanwords. More specifically, Jespersen (1928: 5-7) believes that the influx of monosyllabic loanwords also contributed to the increase in monosyllabism in English. It might be the case, therefore, that, because monosyllables became the most frequent word shape in English, English was more susceptible to borrowings which were likewise monosyllabic. While this hypothesis is difficult to test in the present study not only due to its limited scope, but also due to the corpus which is perhaps not ideally reflective of the borrowings from, for instance, Romance languages such as French and Latin, the corpus data does indicate certain possible tendencies.

For instance, the analysis has shown that the relative frequency of monosyllabic Romance words in general has significantly increased between Periods[20] 2 and 3. Specifically, in the text from Period 2, i.e. from Middle English, a certain number of monosyllabic words of Romance origin was identified as well, but it is not particularly high (0.47 %). This fairly low percentage may be slightly surprising, given the fact that *Middle English Dictionary* (*MED)* had around 48 % headwords which were of either Latin or French origin (Durkin 2014: 256). However, these words probably did not emerge in the text from Period 2 because of the nature of the genre. In Period 3, despite the conservativeness of religious texts, the influence of Romance languages and the use of monosyllabic words from these languages seems to be more evident. What this might suggest, then, is that the monosyllabicisation of English has rendered the

[20] Period 1 is excluded from this comparison because the relevant text contains only one word of Romance origin, namely *Christ*.

language more susceptible to loanwords which are more similar to its prototypical word shape, which seems to have become the monosyllable. In other words, the likelihood that English will borrow a word from a foreign language might be higher if that particular word is monosyllabic (Ritt 2017, personal communication). Although this suggestion is in line with Jespersen's (1928: 5-7) argument proposed above, it is immediately clear that the corroboration of this claim would require a considerably more detailed study and that this idea should only be understood as a speculation.

This section has explained why the results from previous sections corroborate hypothesis 1. In the following sections, the results concerning hypothesis 2 will be discussed, thereby providing a more detailed insight into the changes which the increase in monosyllabism might have caused.

5.6. Changes in the average weight of monosyllables

The second set of research questions investigated in the present thesis pertains to the changes in the average weight of monosyllabic words in English throughout the three periods. Hypothesis 2 proposes the following:

H_2: Monosyllables were most likely heavier on average prior to the loss of schwa because their frequency was lower and they were under higher pressure to constitute minimal rhythmic units, such as the Minimal Word (see McCarthy & Prince 1995: 321). However, after the increase of the frequency of monosyllables in English, this pressure became lower, as the average length of strings of monosyllables probably became higher. This also means that monosyllabic words could now afford to be lighter on average, because now they could join with the preceding or subsequent monosyllable in order to create a well-formed Minimal Word. Therefore, the average syllable weight of English monosyllables has gradually changed. In particular, monosyllables have most likely become lighter.

In order to verify the hypothesis above, several statistical analyses were conducted. First, for each of the periods, the proportions of heavy, superheavy, and super-superheavy monosyllables were determined. Then, the statistical significance of the changes for each of the types of monosyllables was determined. Finally, the same procedure was repeated for monosyllabic content and function words respectively.

The proportions of heavy, superheavy, and super-superheavy monosyllables in Period 1 can be seen in Figure 12 and Table 13 on the following page.

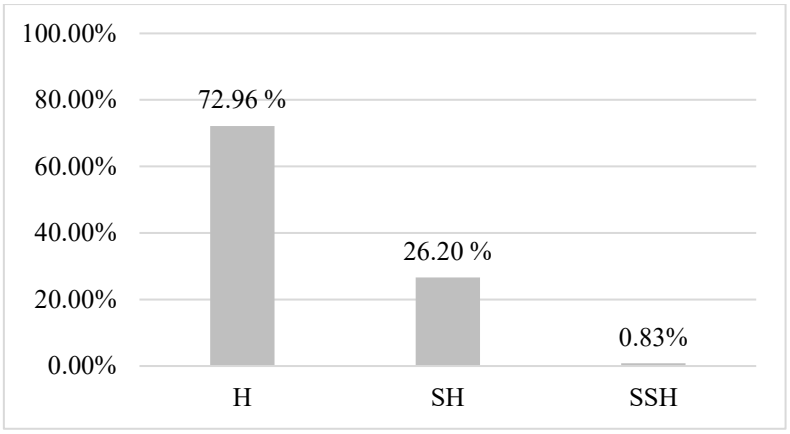


Figure 12. Proportions of different types of monosyllables in Period 1

Table 13 Proportions of different types of monosyllables in Period 1

Type	**Heavy**	**Superheavy**	**Super-superheavy**
Frequency	788 (72.96 %)	283 (26.20 %)	9 (0.83 %)
Results of chi-squared tests	**Between H and SH:**		
	X^2 = 238.12	**df** = 1	***p*-value** < $2.2e^{-16}$
	Between SH and SSH:		
	X^2 = 257.11	**df** = 1	***p*-value** < $2.2e^{-16}$

The data above suggests that, in Period 1, heavy monosyllables seem to have been the dominant type of monosyllables as they constitute more than two thirds of all monosyllabic words in the text from the Old English period. Super-superheavy monosyllables, by contrast, were apparently exceedingly rare, while the frequency of superheavy monosyllables is significantly higher than that of super-superheavy syllables, and significantly lower than the frequency of superheavy monosyllables. The following figures and tables show the developments in Periods 2 and 3.

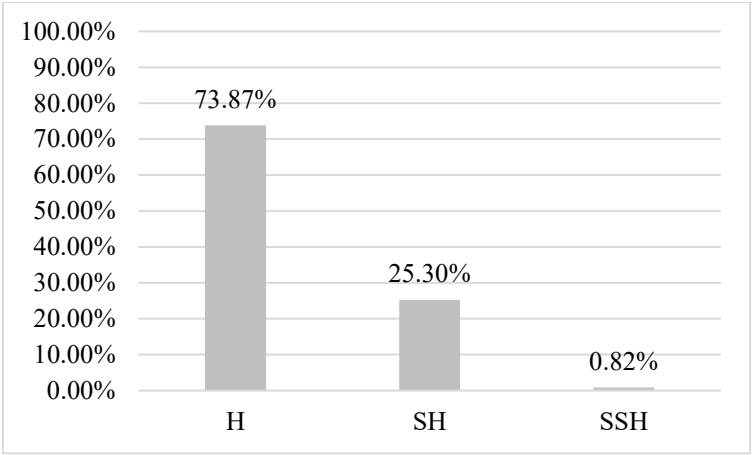


Figure 13. Proportions of different types of monosyllables in Period 2

Table 14 Proportions of different types of monosyllables in Period 2

Type	**Heavy**	**Superheavy**	**Super-superheavy**
Frequency	1080 (73.87 %)	370 (25.30 %)	12 (0.82 %)
Results of chi-squared tests	**Between H and SH:**		
	X^2 = 347.66	**df** = 1	***p*-value** < $2.2e^{-16}$
	Between SH and SSH:		
	X^2 = 335.51	**df** = 1	***p*-value** < $2.2e^{-16}$

In Period 2, a similar tendency can be observed. Specifically, the majority of monosyllabic words seem to have remained heavy on average, and the proportions of superheavy and super-superheavy monosyllables have not changed considerably.

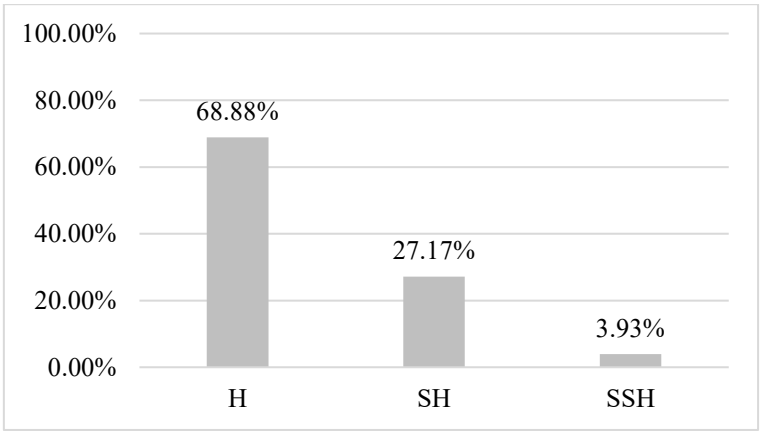


Figure 14. Proportions of different types of monosyllables in Period 3

Table 15 Proportions of different types of monosyllables in Period 3

Type	Heavy	Superheavy	Super-superheavy
Frequency	7433 (68.88 %)	2932 (27.17 %)	425 (3.93 %)
Results of chi-squared tests	**Between H and SH:**		
	X^2 = 1954.6	**df** = 1	***p*-value** < $2.2e^{-16}$
	Between SH and SSH:		
	X^2 = 1872.2	**df** = 1	***p*-value** < $2.2e^{-16}$

Similarly to Period 2, heavy monosyllables prevail in Period 3. In addition to that, the frequency of superheavy syllables seems to have slightly decreased, while the proportion of super-superheavy syllables moderately increased.

Therefore, the frequency of heavy monosyllables in the corpus has remained more or less stable, whereby they seem to have remained the most frequent type of English monosyllables. Similarly, the frequency of superheavy monosyllables has also remained stable, with a fairly low overall increase which, of course, is not sufficient to change to overall distribution. When looking at the changes in the frequency of super-superheavy monosyllables, it becomes evident that their frequency has undergone a relatively big change during the three periods. Nevertheless, super-superheavy monosyllables have remained the minority in comparison to heavy and superheavy monosyllables.

The verification of the significance of the changes in frequencies of the individual types of monosyllables required statistical tests, the results of which are presented in the following tables.

Table 16 Changes in the proportions of different types of monosyllables

	Syllable weight and frequency			
Period	**H**	**SH**	**SSH**	**Total**
P1	788 *743.45*	283 *290.41*	9 *36.12*	**1080**
P2	1080 *1019.95*	370 *393.13*	12 *48.90*	**1462**
P3	7433 *7527.58*	2932 *2901.45*	425 *360.96*	**10790**
Total	**9301**	**3585**	**446**	**13332**
Statistical significance	X^2 = 67.765	**df** = 4	***p*-value** = 6.724e-14	

According to the results from the table above, the observed changes in the proportions of different types of monosyllables with respect to their weight are statistically significant. In order to detect in which part of the contingency table the significance might be higher, the results were obtained separately for differences between heavy and superheavy and superheavy and super-superheavy monosyllables respectively.

Table 17 Changes in the proportions of heavy and superheavy monosyllables

	Syllable weight and frequency		
Period	**H**	**SH**	**Total**
P1	788 *773.03*	283 *297.96*	**1071**
P2	1080 *1046.59*	370 *403.40*	**1450**
P3	7433 *7481.36*	2932 2883.63	**10365**
Total	9301	3585	**12886**
Statistical significance	X^2 = 5.9966	**df** = 2	***p*-value** = 0.04987

Table 18 Changes in the proportions of superheavy and super-superheavy monosyllables

	Syllable weight and frequency		
Period	**SH**	**SSH**	**Total**
P1	283 *295.69*	9 *32.30*	**292**
P2	370 *339.73*	12 *42.26*	**382**
P3	2932 *2985.57*	425 *371.42*	**3357**
Total	3585	446	**4031**
Statistical significance	X^2 = 51.964	**df** = 2	***p*-value** = 5.202e-12

As the tables above suggest, the difference between the proportion of superheavy and super-superheavy monosyllables seems to be more significant than the difference between heavy and superheavy monosyllables, albeit both of them are statistically significant. This difference might also be responsible for the overall statistical significance of contingency table 16.

Despite the statistical significance of the change in the proportions of different types of monosyllables, the average weight of monosyllables seems to have remained fairly stable over the periods in the BTC corpus. Although the proportion of superheavy and super-superheavy monosyllables increased, these increases are not sufficiently large to influence the domination of heavy monosyllables.

Before providing a more detailed interpretation of the results above in the light of the second hypothesis, it might be useful to compare the changes in the proportions of different types of monosyllabic content and function words. This is done with the aim of verifying whether schwa loss, which predominantly affected content words, might have exerted an influence on syllable weight in content words.

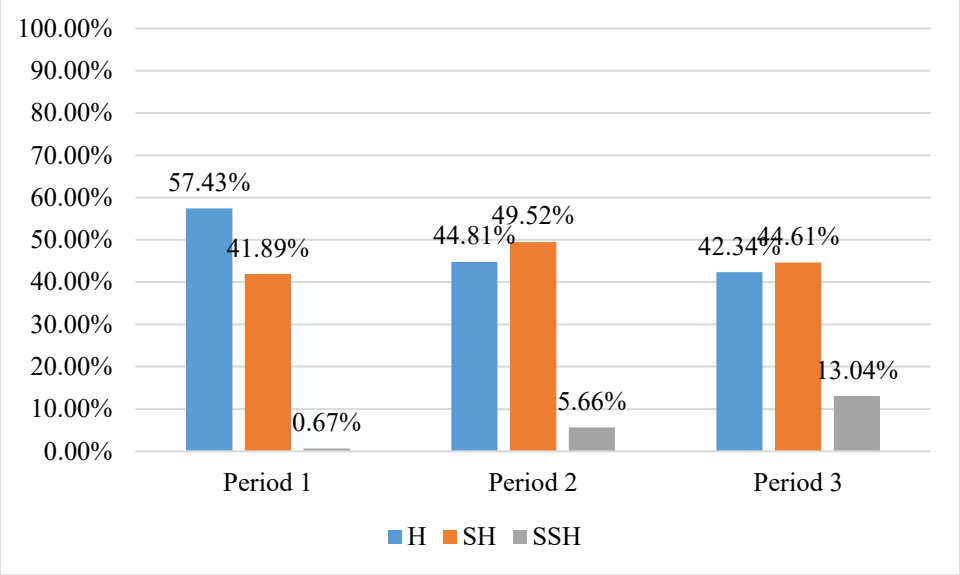


Figure 15. Distribution of different types of monosyllabic content words across periods

As the figure above suggests, in Period 1, the majority of monosyllabic content words in the corpus were heavy. In Periods 2 and 3, this trend has slightly changed, and it seems that superheavy monosyllables became the dominant type in the subset of monosyllabic content words. Furthermore, the percentage of super-superheavy monosyllabic content words gradually increased, and it reached 13.04 per cent in Period 3. The biggest difference can, therefore, be observed between Periods 1 and 2, while the distributions in Periods 2 and 3 are approximately equal. However, it seems that one significant change occurred between Periods 2 and 3; more specifically, the proportion of super-superheavy monosyllables considerably increased.

Thus, it is interesting to note that the subset of monosyllabic content words slightly deviates from the trend which is observable in the complete set of monosyllabic words. More specifically, in the last two periods, an average monosyllabic content word has apparently been either heavy or superheavy. This might suggest that the loss of schwas indeed influenced certain content words, and that they gained an additional mora in certain cases so as to compensate for it and preserve the rhythmic structure of higher phonological units. Alternatively, it could be the case that the slightly higher weight of certain monosyllabic words is caused by the existence of morphonotactic clusters in some of them.

In order to verify whether this trend holds only for content words, the differences between syllable weight of function words were compared as well. The results of these calculations are shown below.

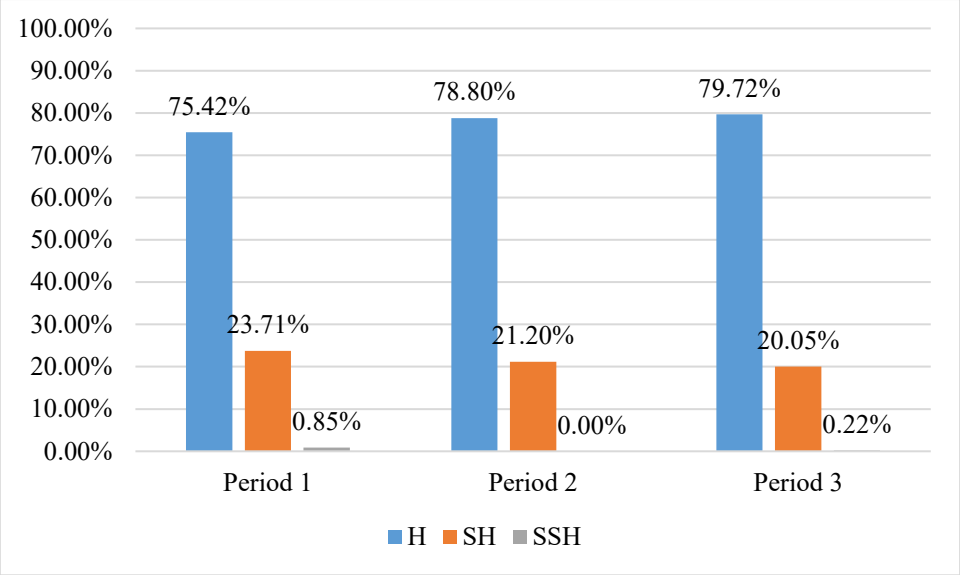


Figure 16. Distribution of different types of monosyllabic function words across periods

Figure 16 indicates that the distribution of different types of syllables in monosyllabic function words has remained more or less constant during the periods under investigation. Similarly to the proportions in the overall set of monosyllabic words, heavy monosyllables seem to be the dominant ones in all periods under investigation, whereas superheavy and especially super-superheavy monosyllables are attested with a lower frequency. Moreover, the proportion of super-superheavy monosyllables has remained extremely low in all periods under investigation, and in Period 2, no super-superheavy monosyllabic function words can be identified. This result indicates that monosyllabic function words seem to have had lower weight on average, and it could suggest that these words were not considerably affected by schwa loss. It could also indicate that the lower weight serves as a signal for their status as words without a specific content meaning.

The following tables summarise the results of the calculations with reference to the relevant statistical test.

Table 19 Frequencies of monosyllabic content and function words in Period 1

Type	Content	Function	Results of the chi-squared test		
H	85	703	$X^2 = 484.68$	**df** = 1	*p*-value < 2.2e-16
SH	62	221	$X^2 = 89.332$	**df** = 1	*p*-value < 2.2e-16
SSH	1	8	$X^2 = 5.4444$	**df** = 1	*p*-value = 0.01963

As Table 19 suggests, in Period 1, function words seem to have been heavier on average, as there is a statistically significant difference between heavy monosyllabic content and function words. Monosyllabic content words were seemingly lighter on average, as can be seen from the fairly low *p*-values when it comes to the statistical differences between the values of superheavy and super-superheavy monosyllables (i.e. 2.2e-16 and 0.01963 respectively).

Table 20 Frequencies of monosyllabic content and function words in Period 2

Type	Content	Function	Results of the chi-squared test		
H	95	985	$X^2 = 733.43$	**df** = 1	***p***-value < 2.2e-16
SH	105	265	$X^2 = 69.189$	**df** = 1	***p***-value < 2.2e-16
SSH	12	0	$X^2 = 12$	**df** = 1	***p***-value = 0.000532

In Period 2, a slightly different trend can be observed. Specifically, while there are still more function words which are heavy and superheavy, there are virtually no super-superheavy function words. In addition to that, although there are significantly more monosyllabic function words with heavy and superheavy monosyllables, the largest number of monosyllabic content words seems to have been superheavy, while the largest number of monosyllabic function words was apparently heavy. This difference might point towards a tendency of content words to be somewhat heavier on average.

Table 21 Frequencies of monosyllabic content and function words in Period 3

Type	Content	Function	Results of the chi-squared test		
H	1324	6109	$X^2 = 3080.3$	**df** = 1	***p***-value < 2.2e-16
SH	1395	1537	$X^2 = 6.8772$	**df** = 1	***p***-value = 0.00873
SSH	408	17	$X^2 = 395.72$	**df** = 1	***p***-value < 2.2e-16

The table above indicates a distribution which is fairly similar to the ones found in periods 2 and 3. More precisely, in the Modern English period in the BTC corpus, there are significantly more heavy monosyllables which are function words than the ones which are content words. A similar conclusion can be drawn for superheavy monosyllables, although the *p*-value is considerably lower. However, when it comes to super-superheavy monosyllables, content words seem to be heavier on average. Again, the prototypical weight of monosyllabic content

words seems to be somewhere between heavy and superheavy, while monosyllabic function words seem to be heavy on average, based on the distribution from the table above.

The apparent tendency of monosyllabic content words to be slightly heavier on average in all periods might be attributed to the fact that it is predominantly content words in which morphonotactic consonant clusters can be formed. Still, it should be noted that a large proportion of content words, namely nearly half of them, has also remained heavy throughout the periods, which suggests that they also adequately reflect the overall tendency of monosyllabic words to remain heavy on average.

5.7. Changes in the average weight of monosyllables: possible explanations

Hypothesis two, restated at the beginning of this chapter, can now be evaluated by looking at the results provided above. The first part of the hypothesis predicted a decrease in the average weight of monosyllables across the three main periods. In other words, it was expected that the proportions of superheavy and super-superheavy monosyllables would decrease, while the proportion of heavy monosyllables would increase. However, the data above does not suggest this tendency. More precisely, the average weight of monosyllabic words has remained heavy on average in all periods under analysis. Therefore, it has not decreased, which, strictly speaking, refutes hypothesis two.

It is interesting to note, however, that, despite the absence of an overall decreasing trend in the average syllable weight, the weight of monosyllables has apparently not increased either, and monosyllabic words seem to have preserved what seems to be their prototypical shape despite the loss of schwas. The stable weight is probably also made possible by the increase in the relative frequency of monosyllables, because it is likely that the average length of strings of monosyllables increased, so, despite schwa loss, each of the monosyllables in a row is capable of constituting a minimal prosodic word, but there is no need for them to be heavier on average as the following rhythmic slot will probably be filled by another monosyllable. Thus, although the findings do not corroborate the hypothesis, they do not confirm its opposite either, i.e. they merely suggest a *status quo*. Such findings also imply that monosyllables, despite the increase in their relative frequency, tend to remain bimoraic on average, whereby they are capable of constituting minimal prosodic words (*MINWD*). This means that the pressure on monosyllables to constitute such prosodic units has not decreased.

Some of the reasons for this might include the numerous advantages of heavy, i.e. bimoraic, monosyllables from the perspective of prosodic units. As mentioned above, by retaining their average bimoraic weight, English monosyllables will be able to follow the *MINWD* constraint (McCarthy & Prince 1995: 321), which requires minimal words to be binary. Moreover, as minimal feet are binary as well, the constraint represented as FTBIN (Hammond 1999: 170), stating that feet need to be binary, will also be satisfied. In addition to that, the alignment of these two prosodic units, as specified by one of the constraints of Generalized Alignment, i.e.

Align (PrWd, L, Ft, L) (McCarthy and Prince 2004: 74),

is also made possible.

Being binary, heavy monosyllables are also suitable for the alignment of prosodic and grammatical words in cases of morphonotactically simple words, which is another aspect of the Generalized Alignment constraint, Align (GCat, Edge, PCat, Edge) (McCarthy & Prince 2004: 451), also expressed as *GRAMWD=PRWD* (grammatical word equals prosodic word) in Prince and Smolensky (1993). For instance, words like *play*, *catch*, *like* etc. should be able to be prosodic and grammatical simultaneously without the need to attach to another grammatical word in order to form a prosodic word. Although this constraint is ranked below the constraints such as FTBIN, it is still interesting to see how the preservation of the average weight of monosyllables enabled the fulfilment of constraints which are purely prosodic as well as the alignment of phonological and syntactic domains. This also suggests that rhythm indeed seems to play a highly significant role when it comes to the preservation and change of linguistic structures, as already proposed by Donegan and Stampe (1983).

However, although heavy monosyllables indeed fulfil the constraint which requires feet to be binary, their average weight could be seen as suboptimal from the perspective of English feet. More precisely, English feet tend to be trochaic, and the ideal weight of good trochees seems to be somewhere between 2 and a half and 3 and a half morae (Ritt 2004: 292). This suggests that heavy monosyllables may be too light to form well-formed trochees on their own and that more of them might be necessary so as to create such trochees, under the assumption that the average weight of monosyllabic words has remained heavy. Nevertheless, as suggested in the second part of hypothesis two, after schwa loss, the likelihood of individual monosyllables to stand next to each other in an utterance increased. Thereby, if need be, several successive monosyllables can join so as to form a trochee which is, for instance, trimoraic. This process is called prosodic fusion, and it combines several grammatical words (grammatical in the sense

that they are not prosodic words, but individual lexemes on which grammatical, i.e. morpho-syntactic operations can be applied), and results in the creation of a well-formed prosodic word (Gordon & Applebaum 2010: 52).

The process of prosodic fusion has already been described in detail in connection with monosyllabic function words which have the tendency to attach to a content word which immediately precedes of follows (e.g. *a book* is one prosodic word), and is called cliticisation (see e.g. Zwicky 1977; Selkirk 1984: 340-341). Cliticisation aptly shows that it is possible for monosyllabic function words to prosodically attach to the neighbouring polysyllabic words. During this process, they tend to be destressed, which is required if they attach to a neighbouring content word, for instance, so as to avoid stress clashes.

By analogy, it may be possible that two or more successive monosyllabic content words adjoin each other in order to form prosodic units of different length, depending on the specific rhythmic requirements of the phonological environment. In fact, the tendency of monosyllabic words to become destressed and attach to a preceding or subsequent word seems to be fairly pronounced and it has been even captured as a phonological rule called "*Monosyllabic Destressing*" by Selkirk (1984: 119). This rule consists of destressing either CVC syllables or heavy CV syllables if both primary and secondary stress is absent (Selkirk 1984: 120). This tendency, again, suggests that the constant average weight of monosyllables has not caused any major problems for the maintenance of stress-timed rhythm because of the increase in their relative frequency, as argued above. Similarly, this property of monosyllabic content and function words is also expected from the perspective of the Principle of Rhythmic Alternation because it can prevent stress clashes and lapses.

Therefore, English monosyllables seem to have had at least two morae in each of the periods. This is also corroborated by the examination of corpus data, as the apparent restriction on their minimal weight has always required them to contain at least a short vowel followed by a coda. In other words, English has never had phonologically light syllables, such as some Romance languages (e.g. *no* in Italian) or Slavic languages (e.g. *da* (yes) in numerous Slavic languages.

Another possible reason why heavy monosyllables seem to have remained something close to the prototype in English might be that this type of monosyllables is perceived as more natural in the sense that they are not overly complex, as is the case with superheavy monosyllables, in order to require a considerable articulation effort. As Stampe (1973) argues, this is one of the key principles of naturalness from the perspective of speech production. Heavy syllables are,

furthermore, also not overly light, so they can form well-formed prosodic words alone, which can also be aligned with other prosodic and morphological categories. Thereby, they satisfy the criterion of perceptual strength, also mentioned by Stampe (1973: 9). Heavy monosyllables will, therefore, be typically interpreted as units in which the domains of prosody and morphology are aligned. The alignment between prosodic and morpho-syntactic categories, which was expressed in the form of a constraint in the previous section, also seems to be more natural from the perceptual perspective as it makes it easier for the listener to conduct the word segmentation process (Steiner 2012: 180).

From the perspective of language acquisition, heavy monosyllables might also be easier to acquire, or more learnable (or, as Pullum (2016) suggests, "acquirable"). Although they are not light, which would, according to the traditional view of learnability, be the most simple and thus the ideal case for acquisition (Swarup & Gasser 2008: 299), they are, nevertheless, the lightest possible syllable type in English. Their weight also makes them functionally useful as they can constitute higher phonological units. Functional usefulness seems to be associated with different levels of complexity, especially with somewhat higher complexity because complex structures are more likely to carry information (Swarup & Gasser 2008: 300). Therefore, it seems that heavy monosyllables seem to be the balance between simplicity and functionality, which renders them highly learnable. Indeed, Swarup & Gasser (2008) argue that the features which are most learnable seem to have the ideal measure of simplicity and complexity, which can be described as "simple, but not too simple". This balance is visually represented in the figure below.

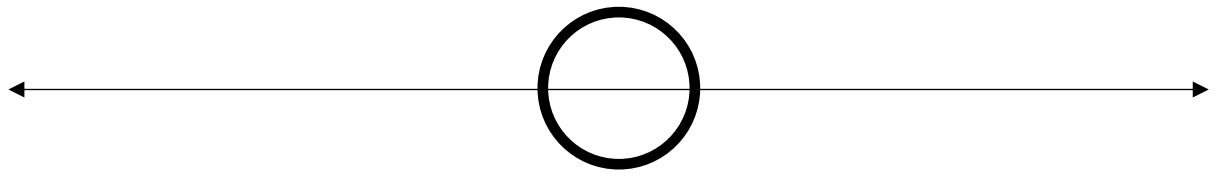


Figure 17. The complexity line for languages (Swarup & Gasser 2008: 300)

Although Figure 17 above is designed for entire languages and their levels of learnability and expressivity, it can also be conveniently used for the explanation about the status of heavy monosyllables discussed above. More precisely, these monosyllables seem to the balance between learnable (i.e. simple) from both articulatory and perceptual perspective as they are the lightest syllable type in English, and expressive because they can express a sufficient

amount of information, as evidenced by their ability to constitute prosodic words and feet, which the majority of them possesses. In other words, they are simple, but not too simple, which might also positively influence their stability in replication across generations as the pressures to become simpler or more complex are most likely not overly high.

Therefore, the stability of syllable weight of English monosyllables can be explained by the pressure for these words to be minimally bimoraic, which, as it seems, has not decreased despite the increase in the relative frequency of monosyllabic words. The balance between simplicity and expressivity which seems to be present in these monosyllables might have enhanced their replication across generations, whereby they proved "fitter" than, for instance, superheavy monosyllables.

5.8. Changes in the individual parts of monosyllables

Although the findings above suggest that the average weight of monosyllables remained more or less stable throughout the periods, it might be worth investigating whether there is a specific part of monosyllables (i.e. onset, nucleus, or coda) which underwent certain changes during the periods. In connection with that, hypothesis 3 predicts the following:

- H_3: It has been noted that syllables in general tend to have the CV (consonant-vowel) structure for reasons of language acquisition and cognitive processing (Carr 2013: 59). This, together with the fact that codas of English monosyllables are more likely to indicate morphological complexity than, for example, nuclei, suggests that it is possible that the increase in the number of morphonotactic consonant clusters after schwa loss might have affected the stability of average coda of English monosyllables, while the nuclei have remained more or less stable.

In this section, the hypothesis above will be tested. In order to obtain the relevant results, first, the structure of monosyllables was compared for each of the periods by looking at possible changes in nuclei and codas. The following figures and tables show the proportions of different types of vowels which can constitute the nucleus (i.e. short vowels, long vowels, and diphthongs) in the periods under analysis.

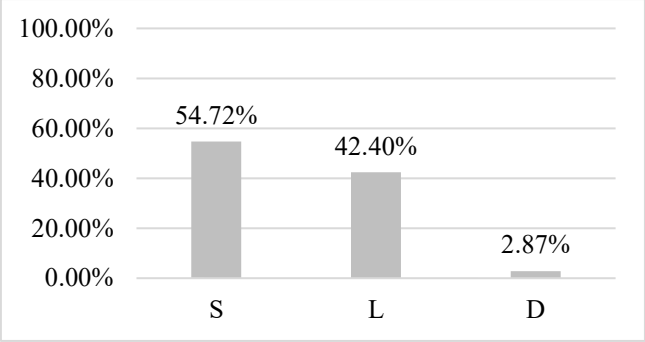


Figure 18. Proportions of short vowels, long vowels, and diphthongs as nuclei of monosyllabic words in Period 1

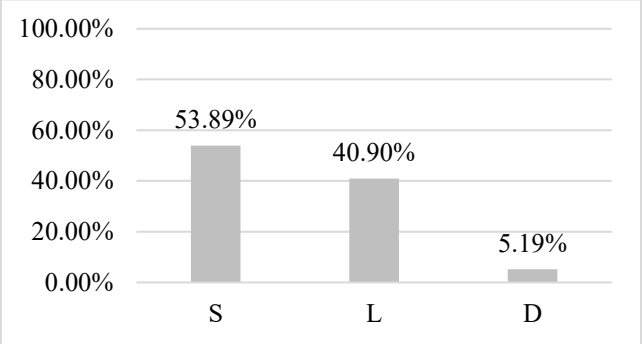


Figure 19. Proportions of short vowels, long vowels, and diphthongs as nuclei of monosyllabic words in Period 2

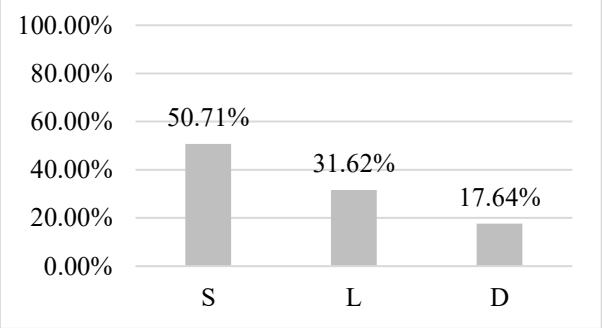


Figure 20. Proportions of short vowels, long vowels, and diphthongs as nuclei of monosyllabic words in Period 3

The figures above suggest a relative stability of the nuclei. More precisely, it seems that the dominant type of nucleus has been the one which consists of a short vowel. This is understandable from the perspective of naturalness theories, as such nuclei could require the least energy to be produced and perceived. In addition to that, short vowels follow the constraint of OT when it comes to the complexity of the individual constituents of the syllable, namely:

*COMPLEX

No more than one C or V may associate to any syllable position node (Prince & Smolensky (2004: 108).

Similarly, from the point of view of language evolution, it could be that these nuclei are the easiest ones to replicate. When it comes to the changes in the nuclei with long vowels, it seems that their proportion has slightly decreased. This decrease could have been caused by the significant increase in diphthongs as long vowels became diphthongs as a result of the Great Vowel Shift.

Indeed, the proportion of diphthongs as nuclei of monosyllables has increased, as the figures above suggest. Nevertheless, the average weight of the nuclei of monosyllabic words has remained monomoraic. The reason for this might be that they are the lightest nucleus type, and it may be relatively easy to integrate them into trochees because they are inherently light, and the weight of the monosyllable in which they constitute the nucleus can be adjusted by adding codas with different weight.

In order to statistically verify the changes observed above, the chi-squared test was conducted on the basis of a contingency table. The results are reported in the following table.

Table 22 Changes in the proportions of different types of nuclei

	Nucleus type and frequency			
Period	**S**	**L**	**D**	**Total**
P1	591 *554.98*	458 *361.94*	31 *163.06*	**1080**
P2	788 *751.28*	598 *489.96*	76 220.74	**1462**
P3	5472 *5544.72*	3412 *3616.09*	1906 *1629.18*	**10790**
Total	**6851**	**4468**	**2013**	**13332**
Statistical significance	X^2 = 314.83	**df** = 4	***p*-value** < 2.2e-16	

As the table suggests, there is a statistically significant difference in the proportions of different types of nuclei in English monosyllabic words over time in the BTC corpus. The biggest difference can most likely be observed when it comes to the proportion of diphthongs, because the difference between observed and expected values is the largest when it comes to the frequency of diphthongs. Furthermore, their proportion seems to have substantially increased, as indicated by the figures above. In order to further analyse which types of nuclei underwent most significant changes, separate tests of significance were conducted. The results are shown in the following tables.

Table 23 Changes in the proportions of nuclei with short and long vowels

	Nucleus type and frequency		
Period	**S**	**L**	**Total**
P1	591 *634.92*	458 *414.07*	**1049**
P2	788 *838.89*	598 *547.10*	**1386**
P3	5472 *5377.17*	3412 *3506.82*	**8884**
Total	**6851**	**4468**	**11319**
Statistical significance	X^2 = 19.757	**df** = 2	***p*-value** = 5.126e-06

Table 24 Changes in the proportions of nuclei with long vowels and diphthongs

	Nucleus type and frequency		
Period	**L**	**D**	**Total**
P1	458 *337.11*	31 *151.88*	**489**
P2	598 *464.65*	76 *209.34*	**674**
P3	3412 *3666.22*	1906 *1651.77*	**5318**
Total	**4468**	**2013**	**6481**
Statistical significance	X^2 = 319.52	**df** = 2	***p*-value** < 2.2e-16

Both *p*-values in the tables above are fairly low, which suggests a highly significant difference between the proportions of both short and long nuclei and long nuclei and diphthongs. The latter *p*-value is somewhat lower, however, which might point towards a bigger difference in the proportions of long vowels and diphthongs in the nuclei.

In order to further evaluate hypothesis 3, the same calculations were conducted to estimate the possible changes in codas. The results of these calculations are graphically represented in figures 21-23 below. The abbreviation "C-" stands for monosyllables without a coda, "C" for monosyllables with one consonant in the coda, "CC" for two consonants in the coda, and "CCC" for three consonants in the coda.

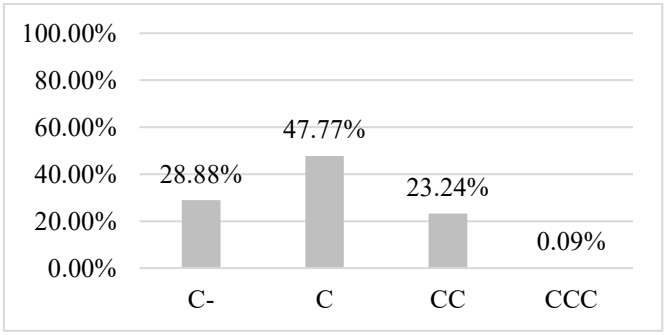


Figure 21. Proportions of monosyllables with different types of coda in Period 1

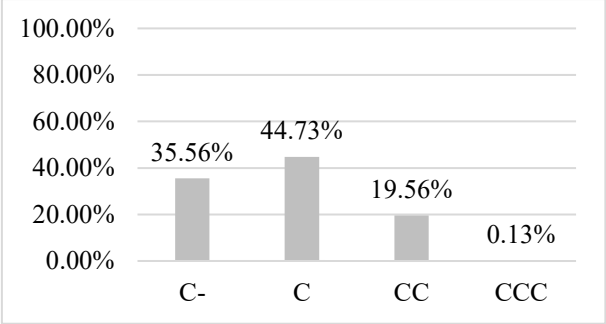


Figure 22. Proportions of monosyllables with different types of coda in Period 2

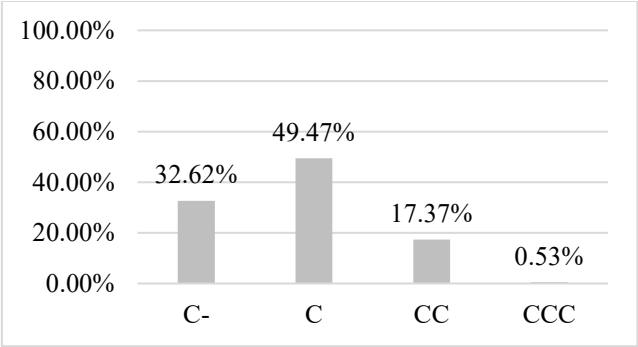


Figure 23. Proportions of monosyllables with different types of coda in Period 3

As the figures above indicate, in each of the periods, a clear preference towards codas with one consonant seems to be evident. Monosyllables without codas are also relatively frequent, while branching codas with consonant clusters seem to be slightly dispreferred, especially those which consist of three elements.

The frequency of empty codas seems to have increased between Periods 1 and 2, while between Periods 2 and 3, it has slightly decreased. The relatively high proportion of empty codas might be in line with the preference for the CV structure (Carr 2013: 59). This tendency has also been described, for example, by Lutz (1991), who claims that the coda is an example of a phonotactically weak position, and describes several phonotactic changes which have resulted in empty coda. By contrast, the frequency of monosyllables with one consonant in the coda has remained approximately constant, with no significant changes, and a minor increase overall. Although the CV syllable structure might be the preferred one when looking at isolated syllables cross-linguistically, it seems that in English the CVC structure of monosyllables seems to be beneficial because, even if such a syllable has a short vowel, the coda can add a mora to it which may be necessary for trochee formation. When looking at the changes in the frequency of codas with two consonants, it seems that this type of codas has somewhat decreased between Periods 1 and 2. Between Periods 2 and 3, however, the proportion of

complex codas has remained fairly stable, with only a minor decrease. As previously mentioned, the frequency of monosyllables with three consonants in the coda has been rather low in all three periods. However, in Periods 2 and 3, the proportion of these monosyllables considerably increased.

The following table shows the statistical significance of the observed changes

Table 25 Changes in the proportions of different types of coda

	Coda type and frequency				
Period	**C-**	**C**	**CC**	**CCC**	**Total**
P1	312 *352.54*	516 *527.11*	251 *195.39*	1 *4.94*	**1080**
P2	520 *477.24*	654 *713.56*	286 *264.50*	2 *6.68*	**1462**
P3	3520 *3522.20*	5337 *5266.31*	1875 *1952.10*	58 *49.36*	**10790**
Total	**4352**	**6507**	**2412**	**61**	**13332**
Statistical significance	X^2 = 43.21	**df** = 6	***p*-value** = 1.06e-07		

According to the values from the table above, the changes in the proportions of different types of coda in monosyllabic words are statistically significant, as the *p*-value is fairly low. In the following, an attempt will be made to determine which of the coda types exhibit the most significant difference concerning the change in the proportions.

Table 26 Changes in the proportions of C- and C codas

	Coda type and frequency		
Period	**C-**	**C**	**Total**
P1	312 *331.84*	516 *496.15*	**828**
P2	520 *470.50*	654 *703.49*	**1174**
P3	3520 *3549.65*	5337 *5307.34*	**8857**
Total	**4352**	**6507**	**10859**
Statistical significance	X^2 = 11.081	**df** = 2	***p*-value** = 0.003925

Table 27 Changes in the proportions of C and CC codas

	Coda type and frequency		
Period	**C**	**CC**	**Total**
P1	516 *559.57*	251 *207.42*	**489**
P2	654 *685.79*	286 *254.20*	**674**
P3	5337 *5261.63*	1875 *1950.36*	**5318**
Total	**4468**	**2013**	**6481**
Statistical significance	X^2 = 21.991	**df** = 2	***p*-value** = 1.678e-05

Table 28 Changes in the proportions of CC and CCC codas

	Coda type and frequency		
Period	**CC**	**CCC**	**Total**
P1	251 *245.78*	1 *6.21*	**252**
P2	286 *280.89*	2 *7.10*	**288**
P3	1875 *1885.31*	58 *47.68*	**1933**
Total	**2421**	**61**	**2473**
Statistical significance	X^2 = 10.537	**df** = 2	***p*-value** = 0.00515

In sum, according to the results of the chi-squared tests based on the tables above, it seems that the changes in the proportions between empty codas, codas with one consonant, as well as codas with two consonants are highly statistically significant, while the changes between complex codas with two and three consonants are also statistically significant, but considerably less so. This is understandable given the low frequency of codas with three elements in the dataset in all periods under analysis, and the seemingly smaller change in their frequency in comparison to other types of codas.

Finally, in order to consider the possibility that the complexity of onsets can potentially exert an influence on syllable weight, the possible changes in the onsets were also studied, although, as mentioned in the introduction, this is done for purely exploratory purposes, and onsets are not included in the definition of syllable weight as conceived in this thesis. Rather, onsets were studied in order to examine the phonotactic preferences of this part of the syllable. The results of these calculations are shown in figures and tables below. The symbol "A-" represents onsetless syllables, "A" represents syllables with one consonant in the onset, "AB" stands for syllables with an initial consonant cluster which consists of two consonants, while "ABC" stands for three consonants in the onset.

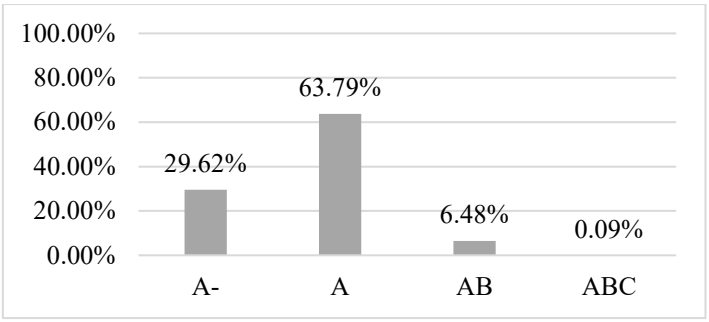


Figure 24. Proportions of monosyllables with different types of onset in Period 1

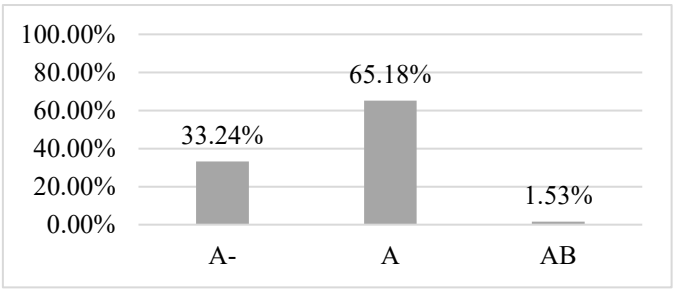


Figure 25. Proportions of monosyllables with different types of onset in Period 2

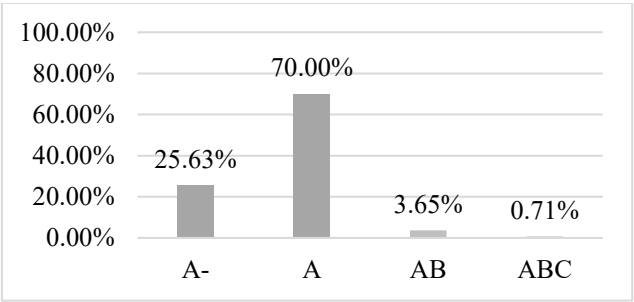


Figure 26. Proportions of monosyllables with different types of onset in Period 3

Figures 24-26 indicate a strong preference for the "A" onsets, i.e. onsets which consist of a single consonant, as in /dɔː/ (<door>), which has remained stable throughout the periods under investigation. The second most frequent syllable type with respect to the onset structure is the "A-" type, which represents monosyllables with zero elements in the onset. By contrast, complex consonant clusters in the onset seem to be dispreferred, as their frequency has been fairly low throughout the periods. Again, this is in line with what has been suggested about syllable structure in general in various phonological theories (e.g. Jakobson 2002: 377; Vennemann 1988: 13-21), according to which syllables cross-linguistically will tend to have the CV structure, i.e. which suggest that onsets tend to be found in the majority of the syllables in the world's languages.

From the findings presented above, it is not immediately clear how the onsets could potentially contribute to syllable weight. It could be argued, for example, that their tendency to remain more or less constant on average (i.e. "A") could be correlated with the stability of the average weight of monosyllables, which has remained heavy throughout. However, this cannot be convincingly demonstrated from the results above. Therefore, Ryan's (2014: 330) suggestion to continue excluding onsets from the definition of syllable weight despite their contribution to the overall acoustic energy of the syllable seems reasonable.

Thus, it seems that, in each of the periods, the preferred syllable structure has been CVC. While this structure is not exactly the one which has been described as the universal one (e.g. by Jensen 1993: 47), the CVC structure is also mentioned as highly frequent one in various languages by several authors, such as Jakobson (2002: 377). Moreover, the CVC structure was already identified by Kisaka (1940: 537), who particularly focuses on English monosyllables, as the most frequent one in English. The CVC structure of English monosyllables seems to be convenient for the creation of trochaic feet because it increases the chances of monosyllabic words to be trimoraic, and enables them to be at least bimoraic, which already fulfils the *MINWD* constraints.

As the findings also suggested, the V slot has been predominantly filled by a short vowel. At the same time, this is the slot which seems to have undergone most significant changes during the periods under investigation, as the frequency of diphthongs significantly increased. As mentioned above, this increase could be attributed to the Great Vowel Shift which occurred between periods 2 and 3.

When it comes to the restrictions on the minimal and maximal syllable weight of monosyllabic words, it has been found that the minimal possible structure of a monosyllable consists of a short vowel and a coda (e.g. *on*, *at*), while the maximal syllable structure can be observed in words such as *scribes* (CCCVVCC), which contain branching in both onset and the coda, and thereby qualify as examples of super-superheavy syllables. However, it seems that these extreme types of monosyllables are comparatively rare as the CVC monosyllables seem to be the majority in each of the periods. Therefore, no statistically observable changes in preferences can be identified. The apparent stability of the prototypical structure of monosyllables indicates that the suggestion proposed in hypothesis 3 cannot be corroborated on the basis of the present findings. Nevertheless, the hypothesis seems to be correct regarding the preferences of onsets and nuclei, although it fails to predict the preference of codas of English monosyllables.

In the following section, the possible differences in syllable weight between morphologically simple and complex monosyllables will be explored so as to examine hypothesis 4.

5.9. Differences in syllable weight between morphologically simple and complex monosyllables

Hypothesis 4 proposes that changes in syllable weight might also depend on the morphological complexity of monosyllables. More specifically, it predicts the following:

H_4: As the number of morphologically complex – and most likely heavy or superheavy – monosyllables increased, simple monosyllables will have lost weight, which would have made weight differences statistically more indicative of morphological simplicity vs. complexity.

In order to test this hypothesis, the data was divided into two subsets – one which included morphologically simple monosyllables, and the other with morphologically complex monosyllables only. For the purposes of the statistical analyses, morphological complexity is defined as morphonotactic complexity (Dressler, Dziubalska-Kołaczyk & Pestal 2010: 52). Therefore, even if a monosyllable was morphosemantically complex, such as in irregular plural forms, as in *men*, or past tenses of strong verbs, such as *thought*, it was not marked as morphologically complex.

The following graphs illustrate the differences between the proportions of morphologically simple and complex monosyllables in each of the periods.

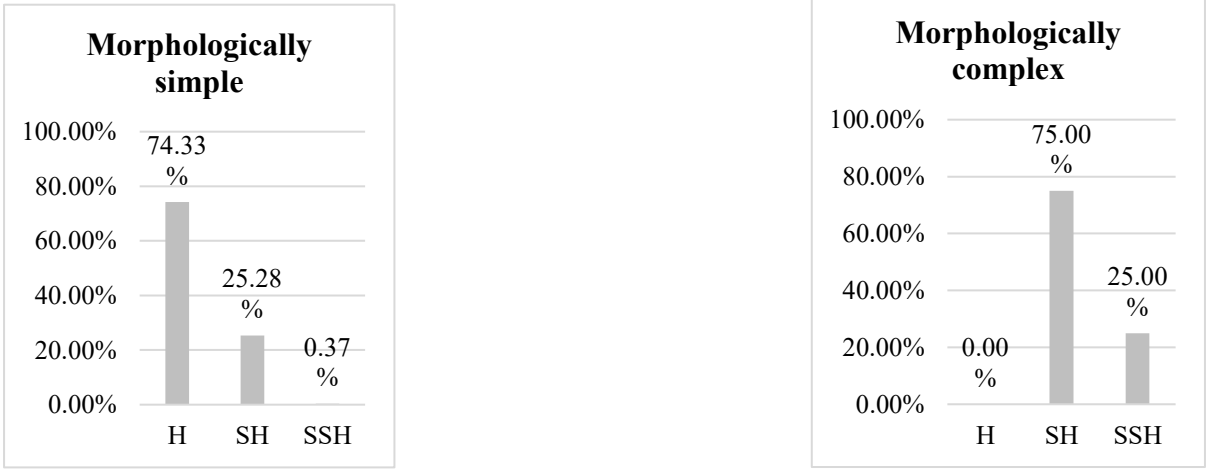
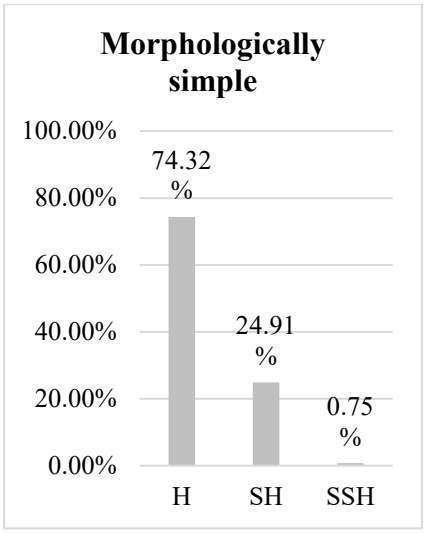


Figure 27. Distribution of different types of monosyllables in Period 1 with respect to their morphological complexity



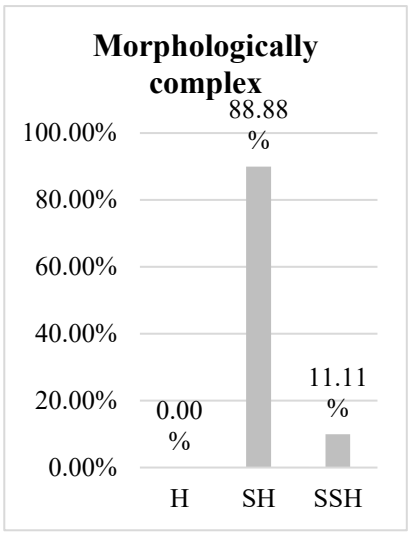
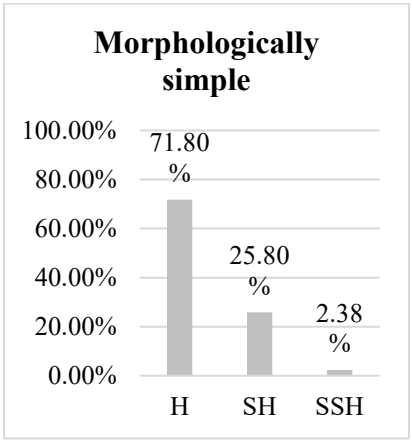


Figure 28. Distribution of different types of monosyllables in Period 2 with respect to their morphological complexity



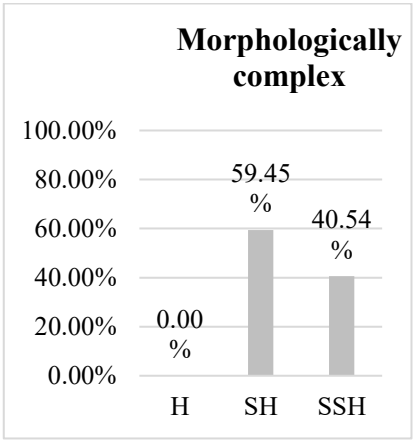


Figure 29. Distribution of different types of monosyllables in Period 3 with respect to their morphological complexity

As Figures 27-29 above suggest, it seems that morphologically simple monosyllables have predominantly tended to be heavy, while approximately one third of them has been superheavy, and an exceedingly low number of them has been super-superheavy in the periods under investigation. Morphologically complex monosyllables, by contrast, have apparently never been heavy; in fact, the vast majority of them seems to have been superheavy in each of the periods under investigation, while a certain number of these has been super-superheavy in Periods 1 and 2. In Period 3, approximately 40 per cent of all morphologically complex monosyllables were super-superheavy. These findings indicate that there has been a preference towards lower weight in morphologically, i.e. morphonotactically, simple monosyllables on average, whereas morphologically complex monosyllables have tended to be considerably heavier. The following tables show the relative frequencies of morphologically simple and

morphologically complex monosyllables, with the aim of detecting increasing or decreasing trends in their syllable weight.

Table 29 Changes in the relative frequencies of morphologically simple monosyllables

	Syllable weight and relative frequency		
Period	**H**	**SH**	**SSH**
P1	743.39	252.83	3.77
P2	743.28	249.13	7.57
P3	718.09	258.04	23.86

When it comes to morphologically simple monosyllables, the following can be discerned: the relative frequency of heavy and superheavy monosyllables has decreased, while the frequency of super-superheavy monosyllables substantially increased.

Table 30 Changes in the relative frequencies of morphologically complex monosyllables

	Syllable weight and relative frequency	
Period	**SH**	**SSH**
P1	750	250
P2	888.88	111.11
P3	594.53	405.46

As the table above indicates, the relative frequency of morphologically complex superheavy monosyllables oscillated during the periods, and it decreased between the last two periods. A similar tendency can be observed in the subset of morphologically complex super-superheavy monosyllables; nevertheless, in Modern English, their relative frequency considerably increased.

In order to detect potential statistically significant differences in the diachronic changes, further tests of statistical significance were conducted to compare the possible changes in the proportions of different types of monosyllables (i.e. heavy, superheavy, and super-superheavy) regarding their morphonotactic complexity. The results of these calculations are shown in the following tables.

Table 31 Changes in the proportions of different types of morphologically simple monosyllables

	Syllable weight and frequency			
Period	**H**	**SH**	**SSH**	**Total**
P1	788 *766.40*	268 *272.00*	4 *21.58*	**1060**
P2	1080 *1050.55*	362 *372.85*	11 *29.59*	**1453**
P3	7433 *7484.03*	2671 *2656.14*	247 *210.81*	**10351**
Total	**9301**	**3301**	**262**	**12864**
Statistical significance	X^2 = 34.461	**df** = 4	***p*-value** = 5933e-07	

From the table above it can be seen that the changes in the proportions of morphologically simple monosyllables with respect to their weight are statistically significant. The following tables show the results for the changes in the proportions of heavy and superheavy, and superheavy and super-superheavy monosyllables respectively.

Table 32 Changes in the proportions of morphologically simple heavy and superheavy monosyllables

	Syllable weight and frequency		
Period	**H**	**SH**	**Total**
P1	788 *779.38*	268 *276.61*	**1056**
P2	1080 *1064.27*	362 *377.72*	**1442**
P3	7433 *7457.33*	2671 *2646.66*	**10104**
Total	**9301**	**3301**	**12602**
Statistical significance	X^2 = 1.5529	**df** = 2	***p*-value** = 0.46

The difference between the proportions of morphologically simple heavy and superheavy monosyllables, according to the table above, is not statistically significant. Therefore, the frequencies of these two types of monosyllables have remained stable across the periods, as was also indicated in Figures 27-29. This might also suggest that the overall statistical significance of the change in the proportions of different types of morphologically simple monosyllables might actually lie in the proportions between superheavy and super-superheavy monosyllables. This possibility will be verified in the table below.

Table 33 Changes in the proportions of morphologically simple superheavy and super-superheavy monosyllables

	Syllable weight and frequency		
Period	**SH**	**SSH**	**Total**
P1	268 *251.99*	4 *20.00*	**272**
P2	362 *345.57*	11 *27.42*	**373**
P3	2671 *2703.42*	247 *214.57*	**2918**
Total	**3301**	**262**	**3563**
Statistical significance	X^2 = 29.728	**df** = 2	***p*-value** = 3.505e-07

The assumption above is corroborated by the results from the table. More precisely, the statistical significance found in the overall subset of morphologically simple monosyllables can be attributed to the changes in the proportions of superheavy and super-superheavy monosyllables. Indeed, despite the stability of the proportions of different types of morphologically simple monosyllables, Figures 26-28 also indicate a change in the proportion particularly between superheavy and super-superheavy monosyllables. However, despite the statistically significant increase in the proportion of morphologically simple super-superheavy monosyllables, the dominant type of simple monosyllables remains heavy across the periods under consideration.

Finally, similar calculations were conducted in order to evaluate the possible changes between morphologically complex monosyllables, the results of which are shown below.

Table 34 Changes in the proportions of morphologically complex monosyllables

	Syllable weight and frequency		
Period	**SH**	**SSH**	**Total**
P1	15 *12.13*	5 *7.86*	**20**
P2	8 *5.46*	1 *3.53*	**9**
P3	261 *266.40*	178 *172.59*	**439**
Total	**284**	**184**	**468**
Statistical significance	$X^2 = 4.9976$	**df** = 2	***p*-value** = 0.08218

The findings above suggest that the proportions of morphologically complex monosyllables have not changed significantly, as the *p*-value is higher than 0.05.

Therefore, in contrast to the prediction outlined in the introductory section of the thesis, the average weight of both morphologically simple and complex monosyllables has not substantially changed. More precisely, the average weight of morphologically simple monosyllables has not decreased overall. However, it has not increased either, which implies that syllable weight of these monosyllables has remained fairly stable, and predominantly heavy. Furthermore, the average weight of morphologically complex monosyllables has always tended to be higher on average, so it is possible that there was no need for a change as the two types of monosyllables have been associated with different weight throughout the periods in the corpus. This might suggest that there is a correlation between syllable weight and morphological complexity, i.e. that higher weight is associated with morphological complexity. This possibility will be further interpreted and explored in section 5.10.

The following figures summarise the findings concerning the differences between morphologically simple and morphologically complex monosyllables. Heavy monosyllables are not shown in the figures because no morphologically complex heavy monosyllables were identified, which makes them irrelevant for the comparison. The symbol “M-” represents morphologically simple monosyllables, while “M+” stands for morphologically complex monosyllables.

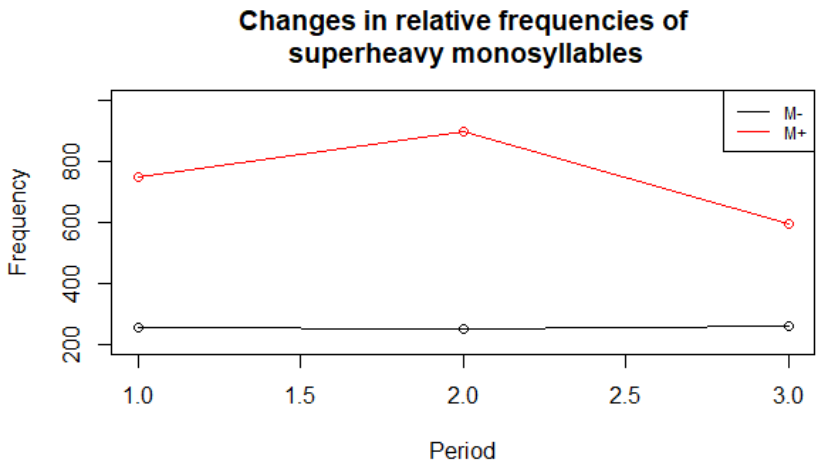


Figure 30. Relative frequencies of superheavy monosyllables with respect to their morphological complexity

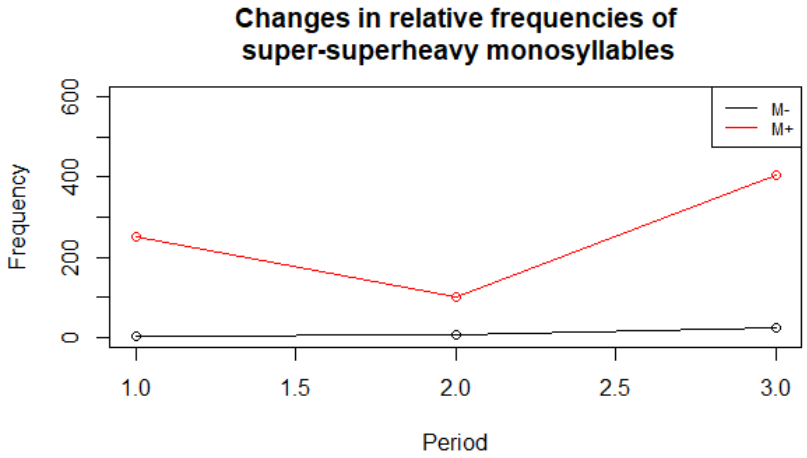


Figure 31. Relative frequencies of super-superheavy monosyllables with respect to their morphological complexity

As the figures above suggest, the relative frequency of morphologically simple superheavy monosyllables has remained fairly stable, while the frequency of morphologically complex superheavy monosyllables has increased, albeit apparently not significantly, as shown in Table 34 above. Furthermore, while the relative frequencies of both types of super-superheavy monosyllables increased, the increase of this type of monosyllables is significantly more pronounced in morphologically complex monosyllables.

In sum, the findings concerning morphologically simple and complex monosyllables do not strictly corroborate hypothesis 4, which predicts that morphologically simple monosyllables would have lost weight. Nevertheless, the tendency of morphologically complex monosyllables

to be considerably heavier on average in all periods under investigation may also be important for signalling morphological complexity. This possibility will be discussed in the following section.

5.10. Syllable weight as an indication of morphological complexity

As mentioned in section 5.7, heavy monosyllables seem to be balanced between simplicity and expressivity. In other words, they do not seem to impose a substantial burden on the processes of articulation and cognitive processes and they are functionally useful because their weight typically enables the alignment of prosodic and morpho-syntactic domains. When it comes to superheavy and super-superheavy syllables, however, they seem to be slightly more difficult to articulate and process. These factors might be responsible for their comparably low frequency. However, in Period 3 of the subset of morphologically complex words, their frequency is relatively high. Since they are not sufficiently simple from the perspective of naturalness, it might be the case that they have high functionality when it comes to signalling morphological complexity.

One of the ways in which the signalling function of superheavy and super-superheavy monosyllables can be fulfilled is by means of morphonotactic consonant clusters. Generally speaking, consonant clusters in the coda position seem to be dispreferred from the perspectives of different theoretical approaches. For example, they represent a deviation from the cross-linguistically preferred CV-syllable structure, which has been acknowledged, for instance, by Jakobson (2002: 377) and in the theory of Natural Phonology put forth by Stampe (1973). Similarly, within the framework of Optimality Theory, there are constraints according to which not only consonant clusters in coda (*COMPLEX^{COD}), but also codas in general (*C) are phonotactically dispreferred (Kager 1999: 97; 94). From the perspective of the evolutionary approach to language, it could be argued that, since coda clusters seem to be suboptimal when it comes to the ease of articulation and cognitive processing, these clusters may be more difficult to replicate and transmit across generations, particularly after long vowels or diphthongs (Ritt & Kaźmierski 2015: 6).

Nevertheless, superheavy monosyllables can contain a consonant cluster in the coda, and super-superheavy monosyllables consist of either a long vowel or a diphthong as their nucleus, followed by a consonant cluster which contains at least two segments (e.g. *found*, *priest*, or *scribes*), and sometimes even three (e.g. *bursts*, *minds* or *priests*), and still they managed to increase in Period 3, which actually spans across 6 centuries. The question which immediately

arises would be what makes such monosyllables and these clusters so useful that their complexity seems to be ignored in the processes of transmission, even after a bimoraic nucleus, as in super-superheavy monosyllables? One possible explanation for this development can be found in the capability of morphonotactic clusters to signal morpheme boundaries (Dressler & Dziubalska- Kołaczyk 2006: 250) and thereby increase the iconicity of the morph, which is also an important requirement in the theory of Natural Morphology (Dressler 1987: 7). More specifically, as the authors explain, the absence of certain sequences of segments which make up morphonotactic clusters, such as /bz/ in *scribes* above, in morphologically simple words can serve as an indication of morphological complexity, which seems to be beneficial for language processing. The tendency of consonant clusters such as /bz/ to end in a voiced consonant has been explored by Prömer (2015: 107), who argues that the morphonotactic clusters which end in a voiced consonant signal the morphological category, which is plural in this case, more clearly.

A possible counterargument to the explanation proposed could be that it is not only the case that morphologically complex monosyllables can contain consonant clusters; rather, instances of morphologically simple monosyllables, such as *hound*, can also not only contain a cluster in the coda, but also be super-superheavy. The conclusion of this argument might be that the fact that both types of monosyllables can have consonant clusters and even be super-superheavy can cause confusion, and actually undermine the signalling capacity of morphologically complex superheavy and super-superheavy monosyllables. Nevertheless, while it is certainly true that there are cases of morphonotactically simple superheavy and super-superheavy monosyllables, their relative frequency has been considerably lower than the relative frequency of morphologically complex monosyllables with three or four morae.

In fact, Ritt and Kaźmierski (2015: 1) explain that morphonotactically simple super-superheavy monosyllables are typologically rare despite their stability in languages such as English, while morphonotactically complex super-superheavy monosyllables seem to be more frequent. Moreover, one of the reasons why the rare types of morphologically simple monosyllables emerged in languages such as English in the first place, is the existence of morphologically complex monosyllables with similar patterns, i.e. CVVCC structures. First, these patterns "merely facilitate the […] recognisability" of similar patterns in morphologically simple words, before enabling the listeners to interpret morphologically simple super-superheavy monosyllables as reflections of their underlying structures (Ritt & Kaźmierski 2015: 25). Therefore, the higher frequency of morphologically complex CVVCC monosyllables renders

them not only more appropriate for signalling morphonotactic complexity, but also gives rise to similar, albeit rarer, structures in morphologically simple words. Thereby, the listeners are more likely to associate heavier monosyllables with morphological complexity, which enables them to identify morphonotactic complexity easier. In sum, higher syllable weight of monosyllables with morphonotactic clusters on average seems to be functionally useful as it increases the signalling capacity of these clusters, and creates conditions under which morphologically simple super-superheavy monosyllables can also be processed more easily.

Although higher average weight of morphologically complex monosyllables can enhance their signalling function, superheavy and super-superheavy monosyllables may be suboptimal from the perspective of English speech rhythm because they exceed the bimoraic minimum which is found in minimal prosodic words. Superheavy monosyllables are trimoraic, while super-superheavy monosyllables have even four morae, which suggests that they do not fit into minimal feet, which need to be binary, and prosodic words. However, their length in morae is actually optimal for the creation of ideal trochees. This was suggested in a specific theory from the framework of evolutionary linguistics, namely Ritt's (2004: 292ff) theory of Great Trochaic Conspiracy, which is also applied to morph-memes.

More precisely, Ritt (2004: 292) explains that the ideal weight of good trochees seems to be somewhere between 2 and a half and 3 and a half morae, if general maximal syllabification is assumed. Examples of monosyllables which would fit into this weight include syllables such as CVVC, or CVCC. This length closely corresponds to the length of superheavy syllables, as they are always trimoraic, which is exactly the median value between 2 and a half and three and a half. Therefore, they may be more suitable for trochee-formation than heavy syllables because these are maximally two morae heavy, which suggests that they cannot form an ideal trochee without the process of prosodic fusion with neighbouring words.

Superheavy monosyllables also seem to be the optimal candidates for trochee formation because they enable the alignment of ideal trochaic feet and and morpho-syntactic constituents, i.e. the Generalized Alignment, also in cases of morphologically complex monosyllables. While the requirement of Generalized Alignment can also be fulfilled by (morphologically simple) heavy monosyllables, this type of monosyllables would not enable the generalised alignment between prosodic words and trochaic feet which are heavier than two morae. Of course, these explanations cannot easily be applied to morphologically complex words with super-superheavy syllables, such as *teams*. However, even these words are not considerably

longer than ideal trochaic feet as the difference between them is only 0.5 morae in the case of a maximal trochaic foot, which could suggest that they are not exceedingly difficult to incorporate into the rhythmic structure.

The differences in weight between morphologically simple and complex monosyllables could also be useful for the replication of the respective types of monosyllables across generations. More specifically, in the process of language acquisition, it might be easier to learn that lower weight is associated with morphologically simple monosyllables, while morphologically complex monosyllables predominantly exhibit higher weight. In addition to that, if it is assumed that the generalized alignment between prosodic and morpho-syntactic constituents plays a role in language acquisition, it could be argued that language learners acquire the category of minimal prosodic word, which is minimally bimoraic, and learn to associate this weight with morphological simplicity. Furthermore, well-formed trochees, which tend to be longer than two morae, are perhaps linked with the alignment with morphologically complex monosyllables. These differences in weight and alignment with different constituents could have a relatively high signalling capacity, which might positively influence the stability of syllable weight of morphologically simple and complex monosyllables respectively in replication and language evolution. Of course, this is merely a speculation and it should be verified in a separate project.

To sum up, the findings from the present section have indicated a statistically significant preference for lower weight in morphonotactically simple monosyllabic words, while morphonotactically complex monosyllables tend to exhibit higher weight. It is believed that these differences might be functionally useful, because they might perform an important signalling function in language acquisition and processing.

6. Conclusion

In sum, this thesis has looked at the syllable weight of English monosyllables, which, as already noted by Jespersen in 1928, have become highly frequent in the English language after the loss of inflectional endings and schwas. This conclusion of Jespersen's (1928) was also taken as the basis for the first hypothesis tested in this paper, namely that the frequency and proportion of monosyllabic words increased in English, which was corroborated by the findings presented in the study. Due to the increase in the frequency of monosyllables, it was expected that the average weight of monosyllabic words might have become lower, because monosyllables are more likely to join with a neighbouring monosyllable to create a well-formed Minimal Word (see McCarthy & Prince 1995: 32). However, this hypothesis cannot be verified based on the results of the present study, which suggest that English monosyllables have tended to be heavy on average in all three periods under analysis. Being heavy on average is probably beneficial because this implies that such monosyllables can form higher prosodic units, such as feet, on their own, without the need for prosodic fusion with a preceding or subsequent word.

Furthermore, the study explored potential changes in the individual parts of the monosyllables, with a particular focus on their rhyme as this is the part of the syllable which contributes to the syllable weight. It was assumed that the coda might have undergone major changes, because onsets and nuclei are claimed to have a higher signalling function when it comes to the identification of words and are hence expected to more stable in the replication process. However, no changes were identified in this respect, and it was established that the majority of monosyllables has tended to have the CVC structure, with a short vowel as their nucleus, although the frequency of diphthongs substantially increased, albeit not substantially enough to affect the domination of short vowels.

Finally, hypothesis four predicted that syllable weight of morphologically complex monosyllables increased, and that of morphologically simple monosyllables decreased in order to enhance their signalling capacity. While these changes cannot be detected based on the data from the present study, it seems that morphologically simple monosyllables have tended to be predominantly heavy, while morphologically complex monosyllables have been at least superheavy, and sometimes super-superheavy. It seems, therefore, that morphological complexity has been associated with higher syllable weight, and it is believed that these differences in weight might participate in signalling the differences between morphological simplicity and complexity.

As mentioned above, these findings are obtained from a corpus which consists of eight Bible translations into English. The specific section of the Bible which was used for the purposes of the study is the first chapter of the Gospel of Mark. Clearly, this suggests that the size of the corpus is relatively small, and that the results should be treated with a certain degree of caution. However, an attempt was made to overcome this obstacle by conducting statistical tests of significance and thereby identify the trends in the data. Moreover, despite its limited size, the BTC corpus has numerous advantages, as it contains highly comparable texts from different periods and it was possible to analyse virtually every example of monosyllabic words.

The present thesis has hopefully demonstrated that English monosyllables, being fairly frequent in the language, can be approached from various perspectives, including their phonological and morphological aspects, as well as the interaction of these. Further areas of potential research include the psycholinguistic aspects of production and perception of monosyllables in isolation and in hierarchically higher units, such as feet, as well as their stability in the replication and evolution of language.

7. List of references

7.1. Primary sources

Vuković, Vanja (student). 2018. Bible Texts Corpus (BTC).

The corpus includes the following texts:

Challoner, Richard. 2011 [1752]. *The Holy Bible: Douay-Rheims Version, Challoner revision, the Old and New Testaments*. Auckland: Floating.

King James Bible. 2018 [1611]. King James Bible Online. https://www.kingjamesbibleonline.org/1611_Mark-Chapter-1/ (31 Jan. 2018).

Phillips, John Bertram. 1993 [1958]. *The New Testament in Modern English*. https://www.biblegateway.com/passage/?search=Mark+1&version=PHILLIPS (27 July 2018).

Smith, Joseph. 2006 [1844]. *The Community of Christ's inspired version of the Bible*. http://www.centerplace.org/hs/iv/iv-mar.htm (27 July 2018).

Thorpe, Benjamin (ed. and transl.). 1844. *The Homilies of the Anglo-Saxon Church. The First Part, Containing The Sermones Catholici, or Homilies of Ælfric. In the original Anglo-Saxon, with an English version. 2 volumes.* London: Taylor. Online version: Project Gutenberg. http://www.gutenberg.org/files/38334/38334-h/38334-h.htm (27 July 2018).

Tyndale, William. 2002 [1534]. *Tyndale Bible*. Studylight.org. https://www.studylight.org/desk/index.cgi?sr=0&old_q=Mark+1&search_form_type=g ene ral&q1=Mark+1&s=2&t1=en_tyn&ns=0 (27 July 2018).

Ward, Martin; Widger, David. 2013. *The Project Gutenberg EBook of The World English Bible (WEB), The Old Testament, Complete*. http://www.gutenberg.org/files/8294/8294-h/8294-h.htm (27 July 2018).

Wycliffe, John. 2002 [1395]. *The Wycliffe Bible*. Studylight.org. https://www.studylight.org/desk/?t1=en_wyc&q1=mr%201 (27 July 2018).

7.2. Secondary literature

Abercrombie, David. 1967. *Elements of general phonetics*. Edinburgh: Edinburgh University Press.

Arlotto, Anthony T. 1968. "On defining 'monosyllabism'". *Journal of the American Oriental Society* 88(3), 521-522.

Arvaniti, Amalia. 2010. "Can stress-timing and syllable-timing be perceived?". *The Journal of the Acoustical Society of America* 128, 2478-2478.

Basbøl, Hans. 2012. "Monosyllables and prosody: the Sonority Syllable Model meets the word". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 13-43.

Battistella, Edwin L. 1996. *The logic of markedness*. New York, NY: Oxford University Press.

Bauer, Laurie. 2015. "English phonotactics". *English Language and Linguistics* 19(3), 437-475.

Bennett, Charles Edwin. 2005 [1918]. *New Latin Grammar*. Project Gutenberg. http://www.gutenberg.org/files/15665/15665-h/15665-h.htm (24 July 2018)

Berretta, Monica. 1995. "Morphological markedness in L2 acquisition". In Simone, Raffaele (ed.). *Iconicity in Language*. Amsterdam: Benjamins, 197-235.

Blevins, Juliette. 1995. "The syllable in phonological theory". In Goldsmith, John (ed.). *Handbook of phonological theory.* London: Blackwell, 206-244.

Blevins, Juliette. 2004. *Evolutionary phonology: the emergence of sound patterns*. Cambridge: Cambridge University Press.

Blevins, Juliette. 2006. “A theoretical synopsis of evolutionary phonology”. *Theoretical Linguistics* 32(2), 117-166.
Carr, Philip. 2013. *English phonetics and phonology: an introduction*. (2nd edition). Oxford: Blackwell.
Cholin, Joanna. 2011. “Do syllables exist? Psycholinguistic evidence for the retrieval of syllabic units in speech production”. In Cairns, Charles E; Raimy, Eric (eds.). *Handbook of the syllable*. Leiden: Brill, 225-253.
Chomsky, Noam; Morris, Halle. 1968. *The sound pattern of English*. New York, NY: Harper & Row.
Christiansen, Morten H.; Kirby, Simon. 2003. “Language evolution: consensus and controversies”. *Trends in Cognitive Sciences* 7(7), 300-307.
Claridge, Claudia. 2008. “Historical corpora”. In Lüdeling, Anke; Kytö, Merja (eds.). *Corpus linguistics: an international handbook. Volume I.* Berlin: De Gruyter, 242-259.
Classé, André. 1939. *The Rhythm of English Prose*. Oxford: Blackwell.
Clements, George Nick; Keyser, Samuel Jay. 1985. *CV phonology: a generative theory of the syllable*. Cambridge, MA: MIT Press.
Coetzee, Andries W. 2011. “Syllables in speech processing: evidence from perceptual epenthesis”. In Cairns, Charles E; Raimy, Eric (eds.). *Handbook of the syllable*. Leiden: Brill, 295-328.
Coetzee, Andries W.; Pretorius, Rigardt. 2010. “Phonetically grounded phonology and sound change: the case of Tswana labial plosives”. *Journal of Phonetics* 38, 404-421.
Couper-Kuhlen, Elizabeth. 1986. *An introduction to English prosody*. Tübingen: Niemeyer.
Croft, William. 2000. *Explaining language change: an evolutionary approach.* Harlow: Longman.
Croft, William. 2008. “Evolutionary linguistics”. *Annual Review of Anthropology* 37, 219-234.
Crowley, Terry. 2004. *Bislama reference grammar.* Honolulu, HI: University of Hawaii Press.
Cummins, Fred. 2015. “Rhythm and speech”. In Redford, Melissa Annette (ed.). *The Handbook of speech production.* Chichester: Wiley Blackwell, 158-177.
Dawkins, Richard. 1976. *The selfish gene*. Oxford: Oxford University Press.
Dawkins, Richard. 1989. *The selfish gene*. (2nd edition). Oxford: Oxford University Press.
Donegan, Patricia Jane; Stampe, David L. 1978. “The syllable in phonological and prosodic structure”. In Bell, Alan; Bybee, Joan Hooper (eds.). *Syllables and segments*. Amsterdam: North-Holland, 25-34.
Donegan, Patricia Jane; Stampe, David L. 1979. “The study of natural phonology”. In Dinssen, Daniel A. (ed.). *Current approaches to phonological theory*. Bloomington, IN: Indiana University Press, 127-173.
Donegan, Patricia Jane; Stampe, David L. 1983. “Rhythm and the holistic organization of language structure”. In Richardson, John F; Marks, Mitchell; Chukerman, Amy (eds.). *Papers from the Parasession on the Interplay of Phonology, Morphology, and Syntax*. Chicago: Chicago Linguistic Society, 337–353. [corrected version].
Donegan, Patricia Jane; Stampe, David L. 2009. “Hypotheses of natural phonology”. *Poznan Studies in Contemporary Linguistics* 45(1), 1-31.
Dörnyei, Zoltan. 2007. *Research methods in applied linguistics: quantitative, qualitative, and mixed methodologies.* Oxford: Oxford University Press.
Dresher, Elan; Lahiri, Aditi. 1991. “The Germanic foot: metrical coherence in Old English”. *Linguistic Inquiry* 22, 251-286.
Dressler, Wolfgang Ulrich. 1984. “Explaining Natural Phonology”. *Phonology* 1, 29-51.
Dressler, Wolfgang Ulrich. 1985. *Morphonology: the dynamics of derivation*. Ann Arbor, MI: Karoma.
Dressler, Wolfgang Ulrich. 1987. *Leitmotifs in Natural Morphology*. Amsterdam: Benjamins.

Dressler, Wolfgang Ulrich. 1995. “Interactions between iconicity and other semiotic parameters in language”. In Simone, Raffaele (ed.). *Iconicity in language*. Amsterdam: Benjamins, 21-39.
Dressler, Wolfgang Ulrich; Dziubalska-Kołaczyk, Katarzyna; Spina, Rossella. 2001. “Sources of markedness in language structures”. *Folia Linguistica Historica* 22(1-2), 103-135.
Dressler, Wolfgang Ulrich; Dziubalska-Kołaczyk, Katarzyna. 2006. “Proposing morphonotactics”. *Rivista di Linguistica* 18(2), 249-266.
Dressler, Wolfgang Ulrich; Dziubalska-Kołaczyk, Katarzyna; Pestal, Lina. 2010. “Change and variation in morphonotactics”. *Folia Linguistica* 31, 51-67.
Durkin, Philip. 2014. *Borrowed words: a history of loanwords in English*. Oxford Scholarship Online.web.a.ebscohost.com.uaccess.univie.ac.at/ehost/detail/detail?vid=0&sid=bf852c4c-b3aa-46f3848fdb4b3b89a039%40sessionmgr4007&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=683840&db=nlebk (26 July 2018).
Dziubalska-Kołaczyk, Katarzyna. 2011. “Natural Phonology without the syllable”. In Hurch, Bernhard; Rhodes, Richard A. *Natural Phonology: the state of the art*. Berlin: Mouton de Gruyter, 53-72.
Everett, Dan; Everett, Keren. 1984. “On the relevance of syllable onset to stress placement”. *Linguistic Inquiry* 15(4), 705-711.
Féry, Caroline; Vijver, Ruben Florentius Hendricus Eduardus van de (eds.). 2003. *The syllable in optimality theory*. Cambridge: Cambridge University Press.
Fletcher, Janet. 2010. “The prosody of speech: timing and rhythm”. In Hardcastle, William J.; Laver, John; Gibbon, Fiona E. *The handbook of phonetic sciences*. (2nd edition). Oxford: Blackwell, 521-602.
Gaşiorowski, Piotr. 2011. “Words in *–ate* and the history of English stress”. In Fisiak, Jacek (ed.). *Studies in Middle English linguistics.* Berlin: Mouton de Gruyter, 157-180.
Goldsmith, John Anton. 2011. “The syllable”. In Goldsmith, John Anton; Riggle, Jason; Yu, Alan C.L (eds.). *The Handbook of phonological theory*. Chichester: Blackwell, 164-196.
Gordon, Matthew. 2005. “A perceptually-driven account of onset-sensitive stress”. *Natural Language & Linguistic Theory* 23(3), 595-653.
Gordon, Matthew; Applebaum, Ayla. 2010. “Prosodic fusion and minimality in Kabardian”. *Phonology* 27(1), 45-76.
Greenberg, Joseph Harold. 1966. *Language universals: with special reference to feature hierarchies*. The Hague: Mouton.
Gretsch, Mechthild. 2009. “Late Old English (899-1066)”. In Momma, Haruko; Matto, Michael (eds.). *A companion to the history of the English language*. Chichester: Wiley-Blackwell.
Gries, Stefan Thomas; Hilpert, Martin. 2008. “The identification of stages in diachronic data: variability-based neighbour clustering”. *Corpora* 3(1), 59-81.
Gries, Stefan Thomas; Hilpert, Martin. 2012. “Variability-based neighbour clustering: a bottom-up approach to periodization in historical linguistics”. In Nevalainen, Terttu; Traugott, Elizabeth Closs (eds.). *The Oxford handbook of the history of English*, 134-144. Oxford: Oxford University Press. An online companion. http://global.oup.com/us/companion.websites/fdscontent/uscompanion/us/static/companion.websites/nevalainen/Gries-Hilpert_web_final/vnc.individual.html (30 July 2018).
Gries, Stefan Thomas; Stoll, Sabine. 2009. “Finding developmental groups in acquisition data: variability-based neighbour clustering”. *Journal of Quantitative Linguistics* 16(3), 217-242.
Hall, Alan T. 1999. “The phonological word: a review”. In Kleinheinz, Ursula; Hall, Alan T. (eds.). *Studies on the phonological word*. Amsterdam: Benjamins, 1-23.

Hall, Alan T. 2002. “The distribution of superheavy syllables in Standard German”. *The Linguistic Review* 19, 377-420.
Hammond, Michael. 1999. *The phonology of English: a prosodic optimality-theoretic approach.* Oxford: Oxford University Press.
Haspelmath, Martin. 2006. “Against markedness (and what to replace it with)”. *Journal of Linguistics*, 42(1), 25-70.
Hayes, Bruce. 1980. “A metrical theory of stress rules”. PhD thesis, MIT.
Hayes, Bruce. 1989. “Compensatory lengthening in moraic phonology”. *Linguistic Inquiry* 20(2), 253-306.
Hilpert, Martin; Gries, Stefan Thomas. 2009. “Assessing frequency changes in multistage diachronic corpora: applications for historical corpus linguistics and the study of language acquisition”. *Literary and Linguistic Computing* 24(4), 385-401.
Hofmann, Klaus. 2018. “Reconstructing rhythmic relationships in Middle English”. Paper presented at *20. Studientag zum Englischen Mittelalter (SEM)*, University of Vienna, Vienna, 2-3 Mar. 2018.
Hogg, Richard Milne; McCully, Cris B. 1987. *Metrical phonology: a coursebook*. Cambridge: Cambridge University Press.
Hull, David Lee. 1988. *Science as a process: an evolutionary account of the social and conceptual development of science*. Chicago, IL: University of Chicago Press.
Hyman, Larry M. 1985. *A theory of phonological weight*. Dordrecht: Foris.
Jakobson, Roman. 1971. *Selected writings: I1: Word and language*. Berlin: Mouton de Gruyter.
Jakobson, Roman. 2002. *Selected writings: 1: Phonological studies*. (3rd edition, ed. by Linda R. Waugh and Monique Monville-Burston). Berlin: Mouton de Gruyter.
Jensen, John Thayer. 1993. *English phonology*. Amsterdam: Benjamins.
Jespersen, Otto. 1928. *Monosyllabism in English: biennial lecture on English philology, British Academy*. London: Milford
Jones, Daniel. 1928. *An English pronouncing dictionary : (showing the pronunciation of over 50.000 words in international phonetic transcription).* London: Dent.
Jones, Daniel. 2003. *Cambridge English pronouncing dictionary*. (16th edition, ed. by Peter Roach, James Hartman & Jane Setter). Cambridge: Cambridge University Press.
Kisaka, Tiaki. 1940. “English monosyllabism”. *Studies in English Literature* 20(4), 536-552.
Kager, René. 1999. *Optimality theory*. Cambridge: Cambridge University Press.
Kahn, Daniel. 1976. “Syllable-based generalizations in English phonology”. PhD thesis, MIT.
Kavitskaya, Darya. 2002. *Compensatory lengthening: phonetics, phonology, diachrony*. New York, NY: Routledge.
Krakow, Rena A. 1989. “The Articulatory Organization of Syllables: A Kinematic Analysis of Labial and Velar Gestures”. PhD thesis, Yale University.
Krakow, Rena A. 1999. “Physiological organization of syllables: a review”. *Journal of Phonetics* 27, 53-54.
Kressler, Brett; Treiman, Rebecca. 1997. “Syllable structure and the distribution of phonemes in English syllables”. *Journal of Memory and Language* 37, 295-311.
Kroch, Anthony, and Ann Taylor. 2000. The Penn-Helsinki Parsed Corpus of Middle English (PPCME2). Department of Linguistics, University of Pennsylvania. CD-ROM, second edition, release 4 (http://www.ling.upenn.edu/ppche-release-2016/PPCME2-RELEASE-4).
Lahiri, Aditi; Hulst, Harry van der. 1988. “On foot typology”. In Blevins, Juliette; Carter, Juli (eds.). *North East Linguistic Society Proceedings 18*. Somerville, MA: Cascadilla Press, 286-299.
Lass, Roger. 2008. “Phonology and morphology”. In Lass, Roger (ed.). *The Cambridge History of the English Language, III*. Cambridge: Cambridge University Press, 1476-1776.

https://www-cambridge-org.uaccess.univie.ac.at/core/books/cambridge-history-of-theenglish language/3C7F48434EE6B219DDAB7F4F333BFE39 (28 Jan. 2018).
Laurer, Christina. 2008. *Poor Paul: L vocalisation and the process of syllable coda weakening*. Frankfurt am Main: Lang.
Loring, Andrew. 1905. *The rhymers' lexicon*. (2nd edition). London: Routledge.
Luick, Karl. 1921-1940. *Historische Grammatik der englischen Sprache.* Stuttgart: Bernhard Tauchnitz.
Lutz, Angelika. 1991. *Phonotaktisch gesteuerte Konsonantenveränderungen in der Geschichte des Englischen*. Tübingen: Niemeyer.
Mai, Anna. 2017. "The phonetic effects of onset complexity on the English syllable". *The Journal of the Acoustical Society of America* 142(4), 2581-2581.
Marotta, Giovanna. 2015. "Syllable and prosody in Latin Grammarians". In Russo, Domenico (ed.). *The notion of syllable across history, theories and analysis*. Newcastle upon Tyne: Cambridge Scholars, 55-87.
McCarthy, John J. 2007. "What is Optimality Theory?". *Language and Linguistics Compass* 1(4), 260-291.
McCarthy, John J. 2008. *Doing Optimality Theory: applying theory to data*. Malden, MA: Blackwell.
McCarthy, John J.; Prince, Alan. 1995. "Faithfulness and reduplicative identity". In Beckmann, Jill N.; Dickey, Laura Walsh; Urbanczyk, Suzanne (eds.). *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory*, 249-384.
McCarthy, John J.; Prince, Alan. 2004. "Generalized Alignment: introduction and theory". In McCarthy, John J. (ed.). *Optimality Theory in phonology: a reader*. Malden, MA: Blackwell, 72-76.
McMahon, April M.S.; McMahon, Robert. 2013. *Evolutionary linguistics*. Cambridge: Cambridge University Press.
Michaud, Alexis. 2012. "Monosyllabicization: patterns of evolution in Asian languages". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 115-131.
Minkova, Donka. 1991. *The history of final vowels in English: the sound of muting*. Berlin: Mouton de Gruyter.
Mokrowiecki, Tomasz. 2015. "Acute accents as graphic markers of vowel quantity in two Late Old English manuscripts". *English Language and Linguistics* 19 (3), 407-436.
Mott, Brian. 2017. "Approaches to the syllable: an assessment". *Linguistica* 57, 229-241.
Nanni, Debbie L. "Stressing words in –ative". *Linguistic Inquiry* 8(4), 752-763.
Nau, Nicole; Stolz, Thomas; Stroh, Cornelia. 2012. "Preface". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 7-13.
Nespor, Marina; Vogel, Irene. 1986. "The phonological word in Greek and Italian". In Andersen, Henning (ed.). *Sandhi phenomena in the languages of Europe*. Berlin: Mouton, 65-74.
Orzechowska, Paula. 2012. "Effects of morphology on the syllable structure". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 91-113.
Pierrehumbert, Janet; Nair, Rami. 1995. "Word games and syllable structure". *Language and Speech* 38(1), 77-114.
Pike, Kenneth Lee. 1947. *Phonemics: a technique for reducing languages to writing*. Ann Arbor, MI: University of Michigan Press.
Pike, Kenneth Lee; Pike, Eunice V. 1947. "Immediate constituents of Mazatec syllables". *International Journal of American Linguistics* 13, 78-91.

Prince, Alan; Smolensky, Paul. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar.* Technical report RuCCS-TR-2. New Brunswick, NJ: Rutgers University Center for Cognitive Science.
Prince, Alan; Smolensky, Paul. 2004. *Optimality theory: constraint interaction in generative grammar*. Malden, MA: Blackwell.
Prömer, Christina. 2015. "Explaining final fricative voicing: morphonotactic factors in the establishment of the English {/z/} plural". MA thesis, Department of English and American Studies, University of Vienna.
Pulgram, Ernst. 1970. *Syllable, word, nexus, cursus*. The Hague: Mouton.
Pullum, Geoffrey K. 2016. "Learnability". *Oxford Bibliographies Online*. http://www.oxfordbibliographies.com/view/document/obo-9780199772810/obo 9780199772810-0077.xml (27 July 2018).
R workspace. (Version 3.4.0). [Computer Program].
R Studio. (Version 1.0.143). [Computer Program].
Ritt, Nikolaus. 1994. *Quantity adjustment: vowel lengthening and shortening in Early Middle English*. Cambridge: Cambridge University Press.
Ritt, Nikolaus. 2004. *Selfish sounds and linguistic evolution: a Darwinian approach to language change*. Cambridge: Cambridge University Press.
Ritt; Nikolaus; Kaźmierski, Kamil. 2015. "How rarities like *gold* came to exist: on co-evolutionary interactions between morphology and lexical phonotactics". *English Language and Linguistics* 20(1), 1-29.
Ritt, Nikolaus. 2017. Personal communication, May.
Roach, Peter. 1982. "On the distinction between 'stress-timed' and 'syllable-timed' languages". In Crystal, David (ed.). *Linguistic controversies: essays in linguistic theory and practice in honour of F. R. Palmer*. London: Arnold, 73-79.
Roach, Peter. 2009. *English phonetics and phonology: a practical course*. (4th edition). Cambridge: Cambridge University Press.
Ryan, Kevin M. 2014. "Onsets contribute to syllable weight: statistical evidence from stress and meter". *Language* 90(2), 543-545.
Schlegel, August Wilhelm. 1818. *Observation sur la langue et la literature provençales*. Paris: Librairie Grecque-Latine-Allemande.
Schlegel, Friedrich. 1808. *Über die Sprache und Weisheit der Indier. Ein Beitrag zur Begründung der Althertumskunde*. Heidelberg: Mohr und Zimmer.
Schleicher, August. 1983. "The Darwinian theory and the science of language". (transl. by Alexander V. M. Bikkers). In Koerner, Konrad Ernst Frideryk; Maher, Peter J. (eds.). 1983. *Linguistics and evolutionary theory: three essays*. Amsterdam: Benjamins, 1-73.
Schlüter, Julia. 2005. *Rhythmic grammar: the influence of rhythm on grammatical variation and change in English*. Berlin: Mouton de Gruyter.
Selkirk, Elizabeth O. 1984. *Phonology and syntax: the relation between sound and structure*. Cambridge, MA: MIT Press.
Singh, Rajendra. 2011. "Natural Phono(morpho)logy: a view from the outside". In Hurch, Bernhard; Rhodes, Richard A. *Natural Phonology: the state of the art*. Berlin: Mouton de Gruyter, 1-38.
Stampe, David L. 1973. *A dissertation on natural phonology*. PhD thesis, University of Chicago.
Steiner, Petra. 2012. "Relations with monosyllables: a view from Quantitative Linguistics". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 173-197.
Stockwell, Robert P.; Minkova, Donka. 1988. "The English vowel shift: problems of coherence and explanation". In Kastovsky, Dieter; Bauer, Gero (eds.), *Luick revisited: papers read*

at the Luick Symposium at Schloss Liechtenstein, 15. – 18.9.1985. Tübingen: Gunter Narr, 355-393.

Stolz, Thomas; Hauser, Sonja; Stamer, Heiko. 2012. "ω → σ → V: The first step towards the comparative grammar of monosyllables". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 173-197.

Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). 2012. *Monosyllables: from phonology to typology*. Berlin: Akademie.

Swarup, Samarth; Gasser, Les. 2008. "Simple, but not too simple: learnability vs. functionality in language evolution". In Smith, Andrew D.M.; Smith, Kenny; Ferrer i Rancho, Ramon (eds.). *Evolution of language, The Proceedings of the 7th International Conference (Evolang7)*. Barcelona, 12-15 March. Singapore: World Scientific.

Tranel, Bernard. 1991. "CVC light syllables, geminates and Moraic Theory". *Phonology* 8(2), 291-302.

Vennemann, Theo. 1988. *Preference laws for syllable structure and the explanation of sound change: with special reference to German, Germanic, Italian and Latin*. Berlin: Mouton de Gruyter.

Wedel, Andrew. 2017. *Signal evolution within the word.* Project presented at *Diachronic Phonotactics Workshop* (dpt17), University of Vienna, Vienna, 7-8 Sept. 2017.

Wells, John Christopher. 2008. *Longman pronunciation dictionary.* (3rd edition). Harlow: Pearson Education Longman.

Wełna, Jerzy. 2017. "Morphology". In Brinton, Laurel; Bergs, Alexander (eds.). *The history of English:: Volume 3, : Middle English*. Berlin: Mouton de Gruyter, 51-75.

Yavaş, Mehmet. 2010. "Sonority and the acquisition of /s/ clusters in children with phonological disorders". *Clinical Linguistics & Phonetics* 24(3), 169-176.

Zerbian, Sabine. 2012. "Morpho-phonological and morphological minimality in Tswana monosyllabic stems (southern Bantu)". In Stolz, Thomas; Nau, Nicole; Stroh, Cornelia (eds.). *Monosyllables: from phonology to typology*. Berlin: Akademie, 131-149.

Zwicky, Arnold M. 1977. *On clitics*. Bloomington, IN: Indiana University Linguistics Club.

Zwicky, Arnold M. 1985. "Preface". In Dressler, Wolfgang Ulrich. 1985. *Morphonology: the dynamics of derivation*. Ann Arbor, MI: Karoma, vi-ix.

8. Appendix

8.1. Data

This Appendix shows the counts for each of the relevant parameters in each of the periods separately.

8.1.1. Period 1 – Old English

Table 35 Frequencies of monosyllabic and polysyllabic words in Old English

	Raw frequency	Percentage	Relative frequency
Monosyllables	1080	56.25 %	562.5
Polysyllables	840	43.75 %	437.5
Total	1920	100 %	

Table 36 Frequencies of monosyllabic content and function words

	Raw frequency	Percentage	Relative frequency
Content	148	13.70 %	137.03
Function	932	86.28 %	862.86
Total	1080	100 %	

Table 37 Frequencies of monosyllabic content words with respect to their weight

	H	SH	SSH	Total
Raw frequency	85	62	1	148
Percentage	57.43 %	41.89 %	0.67 %	100 %
Relative frequency	574.32	418.91	6.75	

Table 38 Frequencies of monosyllabic function words with respect to their weight

	H	SH	SSH	Total
Raw frequency	703	221	8	932
Percentage	75.42 %	23.71 %	0.85 %	100 %
Relative frequency	754.29	237.12	8.58	

Table 39 Proportions of different types of monosyllables with respect to their weight

	H	SH	SSH	Total
Raw frequency	788	283	9	1080
Percentage	72.96 %	26.20 %	0.83 %	100 %
Relative frequency	729.62	262.03	8.33	

Table 40 Proportions of different types of onsets in monosyllabic words

	A-	A	AB	ABC	Total
Raw frequency	320	689	70	1	1080
Percentage	29.62 %	63.79 %	6.48 %	0.09 %	100 %
Relative frequency	296.29	637.96	64.81	0.92 %	

Table 41 Proportions of different types of nuclei in monosyllabic words

	S	L	D	Total
Raw frequency	591	458	31	1080
Percentage	24.72 %	42.40 %	2.87 %	100 %
Relative frequency	247.22	424.07	28.70	

Table 42 Proportions of different types of codas in monosyllabic words

	C-	C	CC	CCC	Total
Raw frequency	312	516	251	1	1080
Percentage	28.88 %	47.77 %	23.24 %	0.09 %	100 %
Relative frequency	288.88	477.77	232.40	0.92 %	

Table 43 Frequencies of morphologically simple and complex monosyllables

	Raw frequency	Percentage	Relative frequency
Simple	1060	98.14%	981.48
Complex	20	1.85 %	18.51
Total	1080	100 %	

Table 44 Proportions of morphologically simple monosyllables with respect to their weight

	H	SH	SSH	Total
Raw frequency	788	268	4	1060
Percentage	74.33 %	25.28 %	0.37 %	100 %
Relative frequency	743.39	252.83	3.77	

Table 45 Proportions of morphologically complex monosyllables with respect to their weight

	SH	SSH	Total
Raw frequency	15	5	20
Percentage	75.00 %	25.00 %	100 %
Relative frequency	750	250	

Table 46 Proportions of Germanic and Romance monosyllables

	G	R	Total
Raw frequency	1079	1	1080
Percentage	99.90 %	0.09 %	100 %
Relative frequency	999.07	0.92	

8.1.2. Period 2 – Middle English

Table 47 Frequencies of monosyllabic and polysyllabic words in Middle English

	Raw frequency	Percentage	Relative frequency
Monosyllables	1462	64.35 %	642.35
Polysyllables	814	35.76 %	357.64
Total	2276	100 %	

Table 48 Frequencies of monosyllabic content and function words

	Raw frequency	Percentage	Relative frequency
Content	212	14.50 %	145.00
Function	1250	85.49 %	854.99
Total	1462	100 %	

Table 49 Frequencies of monosyllabic content words with respect to their weight

	H	SH	SSH	Total
Raw frequency	95	105	12	212
Percentage	44.81 %	49.52 %	5.66 %	100 %
Relative frequency	448.11	495.28	56.60	

Table 50 Frequencies of monosyllabic function words with respect to their weight

	H	SH	Total
Raw frequency	985	265	1250
Percentage	78.8 %	21.2 %	100 %
Relative frequency	788	212	

Table 51 Proportions of different types of monosyllables with respect to their weight

	H	SH	SSH	Total
Raw frequency	1080	370	12	1462
Percentage	73.87 %	25.30 %	0.82 %	100 %
Relative frequency	738.71	253.07	8.20	

Table 52 Proportions of different types of onsets in monosyllabic words

	A-	A	AB	Total
Raw frequency	486	953	23	1462
Percentage	33.24 %	65.18 %	1.57 %	100 %
Relative frequency	332.42	651.84	15.73	

Table 53 Proportions of different types of nuclei in monosyllabic words

	S	L	D	Total
Raw frequency	788	598	76	1462
Percentage	53.89 %	40.90 %	5.19 %	100 %
Relative frequency	538.98	409.02	51.98	

Table 54 Proportions of different types of codas in monosyllabic words

	C-	C	CC	CCC	Total
Raw frequency	520	654	286	2	1462
Percentage	35.56 %	44.73 %	19.56 %	0.13 %	100 %
Relative frequency	355.67	447.33	195.62	1.36	

Table 55 Frequencies of morphologically simple and complex monosyllables

	Raw frequency	Percentage	Relative frequency
Simple	1453	99.38 %	993.84
Complex	9	0.61 %	6.15
Total	1462	100 %	

Table 56 Proportions of morphologically simple monosyllables with respect to their weight

	H	SH	SSH	Total
Raw frequency	1080	362	11	1453
Percentage	74.32 %	24.91 %	0.75 %	100 %
Relative frequency	743.28	249.13	7.57	

Table 57 Proportions of morphologically complex monosyllables with respect to their weight

	SH	SSH	Total
Raw frequency	8	1	9
Percentage	88.88 %	11.11 %	100 %
Relative frequency	888.88	111.11	

Table 58 Proportions of Germanic and Romance monosyllables

	G	R	Total
Raw frequency	1454	8	1462
Percentage	99.45 %	0.54 %	100 %
Relative frequency	994.52	5.47	

8.1.3. Period 3 – Modern English

Table 59 Frequencies of monosyllabic and polysyllabic words in Modern English

	Raw frequency	Percentage	Relative frequency
Monosyllables	10790	75.84 %	758.41
Polysyllables	3437	24.15 %	241.58
Total	14227	100 %	

Table 60 Frequencies of monosyllabic content and function words

	Raw frequency	Percentage	Relative frequency
Content	3127	29.88 %	298.80
Function	7663	71.01 %	710.19
Total	10790	100 %	

Table 61 Frequencies of monosyllabic content words with respect to their weight

	H	SH	SSH	Total
Raw frequency	1324	1395	408	3127
Percentage	42.34 %	44.61 %	1.30 %	100 %
Relative frequency	423.40	446.11	130.47	

Table 62 Frequencies of monosyllabic function words with respect to their weight

	H	SH	SSH	Total
Raw frequency	6109	1537	17	7663
Percentage	79.72 %	20.05 %	0.22 %	100 %
Relative frequency	797.20	200.57	2.21	

Table 63 Proportions of different types of monosyllables with respect to their weight

	H	SH	SSH	Total
Raw frequency	7433	2932	425	10790
Percentage	68.88 %	27.17 %	3.93 %	100 %
Relative frequency	688.87	271.73	39.38	

Table 64 Proportions of different types of onsets in monosyllabic words

	A-	A	AB	ABC	Total
Raw frequency	2766	7553	394	77	10790
Percentage	25.63 %	70.00 %	3.65 %	0.71 %	100 %
Relative frequency	256.34	700	36.51	7.13	

Table 65 Proportions of different types of nuclei in monosyllabic words

	S	L	D	Total
Raw frequency	5472	3412	1906	10790
Percentage	50.71 %	31.62 %	17.66 %	100 %
Relative frequency	507.13	316.21	176.64	

Table 66 Proportions of different types of codas in monosyllabic words

	C-	C	CC	CCC	Total
Raw frequency	3520	5337	1875	58	10790
Percentage	32.62 %	49.46 %	17.37 %	0.53 %	100 %
Relative frequency	326.22	494.62	173.77	5.37	

Table 67 Frequencies of morphologically simple and complex monosyllables

	Raw frequency	Percentage	Relative frequency
Simple	10351	95.93 %	959.31
Complex	439	4.06 %	40.68
Total	10790	100 %	

Table 68 Proportions of morphologically simple monosyllables with respect to their weight

	H	SH	SSH	Total
Raw frequency	7433	2671	247	10351
Percentage	71.80 %	25.80 %	2.38 %	100 %
Relative frequency	718.09	258.04	23.86	

Table 69 Proportions of morphologically complex monosyllables with respect to their weight

	SH	SSH	Total
Raw frequency	261	178	439
Percentage	59.45 %	40.54 %	100 %
Relative frequency	594.53	405.46	

Table 70 Proportions of Germanic and Romance monosyllables

	G	R	Total
Raw frequency	10411	379	10790
Percentage	96.48 %	3.51 %	100 %
Relative frequency	964.87	35.12	

8.2. R Code

This section of the Appendix shows the codes used for the purposes of the statistical calculations. Although the majority of the calculations were repeated more than once, the code is shown only once (i.e. with one example from the study) for space reasons.

a) Correlation coefficient Kendall's τ:

```
monos=(read.table(file="clipboard", sep="\t", header=TRUE))

View(monos)

a<-monos$INPUT

b<-monos$YEARS

Kendall(a,b)
```

tau = 0.571, 2-sided pvalue =0.063487

b) VNC dendrogram and scree plot (see Gries & Hilpert 2012)**:**

```
> load(file.choose())

> vnc.individual(file.choose())
```

0.1428571
0.2857143
0.4285714
0.5714286
0.7142857
0.8571429

Pseudo-code for VNC (Gries & Stoll 2009: 226):

1 compute a distance or a similarity matrix which provides the (dis-) similarity of all elements to each other on the basis of some distance measure

2 repeat

3 identify the two elements that are most similar to each other (in the case of ties, choose one pair randomly);

4 merge the two elements that are most similar to each other and compute new distances on the basis of this merger

5 until the number of elements is one

6 draw a dendrogram that summarizes the groupings arrived at in steps 1 to 5

c) Chi-squared test (for two-way tables):

monos_increase<-(read.table(file="clipboard", sep="\t", header=TRUE))

View(monos_increase)

a<-monos_increase$Freq

chisq.test(a)

Chi-squared test for given probabilities

data: a

X-squared = 57.405, df = 1, p-value = 3.547e-14

d) Chi-squared test (for multi-way contingency tables):

SyllableWeight_Freq <-matrix(c(788, 1080, 7433, 283, 370, 2932, 9, 12, 425), nrow=3)

SyllableWeight_Freq

```
  [,1] [,2] [,3]
[1,]  788  283    9
[2,] 1080  370   12
[3,] 7433 2932  425
```

chisq.test(SyllableWeight_Freq)

Pearson's Chi-squared test

data: SyllableWeight_Freq

X-squared = 67.765, df = 4, p-value = 6.724e-14

chisq<-chisq.test(SyllableWeight_Freq)

chisq$expected

```
        [,1]      [,2]      [,3]
[1,]  753.4563  290.4140  36.12961
[2,] 1019.9566  393.1346  48.90879
[3,] 7527.5870 2901.4514 360.96160
```

8.3. Abstract

The primary purpose of the present thesis is to provide a descriptive account of potential changes in the syllable weight of English monosyllabic words. Despite the tendency of the English language to become increasingly monosyllabic, especially after the loss of schwas in the second half of the 15th century (Minkova 1991), as already observed by Jespersen (1928) and Kisaka (1940), no study has been conducted which would explore possible changes in the weight of English monosyllables, and which could potentially explain the relationship between monosyllables and higher rhythmic units, such as feet. This thesis aims to fill this gap by focusing on English monosyllables throughout the time.

Based on the relevant literature, it was assumed that the increase in the frequency of monosyllables in English is statistically significant, which was corroborated on the basis of a corpus which consists of eight Bible translations into English from Old, Middle, and Modern English. Furthermore, following the principles of Natural Phonology (Stampe 1973), and the constraints for minimal prosodic words (McCarthy & Prince 1995), it was assumed that the average weight of monosyllables would decrease. The basis for this assumption was the idea that, due to the increased frequency of monosyllables, these words could now join together to form minimal prosodic words, or other rhythmic units, so the pressure on individual monosyllables to constitute prosodic words themselves decreased. However, this hypothesis has not been verified by the results of the analyses, and it was demonstrated that English monosyllabic words have tended to be heavy on average. This suggests a relative stability of the syllable weight of English monosyllables across periods, which can be understood as an example of evolutionary stable strategy which increases the possibility of replication.

Moreover, it was expected that any relevant changes would primarily affect the codas of English monosyllables, as this position is seen as phonotactically weak (Lutz 1991) and thus possibly most susceptible to changes. This hypothesis can also be rejected as the most frequent structure of monosyllables in English has also remained constant during the periods, with a pronounced preference towards the CVC structure. Finally, the fourth hypothesis predicted a possible decrease of syllable weight in morphologically simple words, and an increase of syllable weight in morphologically complex words. While this, again, cannot be corroborated by looking at the data, it has been demonstrated that morphologically simple monosyllables have been associated with lower weight, while morphologically complex monosyllables displayed considerably higher weight throughout the periods.

The results, therefore, indicate a substantial increase in the proportion of monosyllables in English, as well as their stable weight during the periods under consideration, with evident weight differences between morphologically simple and complex words.

8.4. Zusammenfassung

Die vorliegende Arbeit versucht einen Überblick über die möglichen Veränderungen im Silbengewicht der englischen einsilbigen Wörter zu vermitteln. Obwohl die englische Sprache dazu neigte, zunehmend monosyllabisch zu werden, besonders nach dem Schwa-Schwund in der zweiten Hälfte des fünfzehnten Jahrhunderts (Minkova 1991), wie bereits von Jespersen (1928) und Kisaka (1940) bemerkt, wurde bisher keine Studie, die mögliche Veränderungen im Silbengewicht der englischen einsilbigen Wörter, und die eventuell die Beziehung zwischen Einsilblern und höheren rhythmischen Einheiten erklären könnte, durchgeführt. Diese Arbeit versucht daher, diese Lücke durch eine diachrone Studie der englischen einsilbigen Wörter zu füllen.

Aufgrund der Erkenntnisse, die aus der relevanten Literatur hervorgehen, wurde in der vorliegenden Untersuchung davon ausgegangen, dass die zunehmende Anzahl der Einsilbler im Englischen statistisch signifikant ist, was auch mittels eines Korpuses, der aus acht Bibelübersetzungen ins Englische aus dem Altenglischen, Mittelenglischen und Modernen Englisch besteht, bestätigt wurde. Ferner, in Anlehnung an die Prinzipien der Natürlichen Phonologie (Stampe 1973) und die Beschränkungen der minimalen prosodischen Wörter (McCarthy & Prince 1995), wurde angenommen, dass das durchschnittliche Gewicht der Einsilbler sinken würde. Die Grundlage für diese Hypothese war die Idee, dass sich diese Wörter wegen ihrer zunehmenden Häufigkeit verbinden könnten, um minimale prosodische Wörter oder andere rhythmische Einheiten zu bilden, so dass der Druck auf die individuellen einsilbigen Wörter, selbst prosodische Wörter zu bilden, abgenommen haben könnte. Dennoch konnte diese Hypothese nicht durch die Ergebnisse der Analysen bestätigt werden. Stattdessen wurde bewiesen, dass englische Einsilbler im Durchschnitt dazu neigten, schwer zu sein. Dieses Resultat deutet eine relative Stabilität des Silbengewichts der englischen einsilbigen Wörter über die betrachteten Zeiträume hinweg an, was eventuell als ein Beispiel für die evolutionär stabile Strategie, die die Möglichkeit der Replikation erhöht, verstanden werden kann.

Zudem wurde erwartet, dass die potenziellen Veränderungen vorwiegend die Silbenkoda betreffen würden, weil diese Position als phonotaktisch schwach (Lutz 1991) angesehen wird und daher am ehesten Veränderungen unterliegen würde. Diese Hypothese kann jedoch auch verworfen werden, weil die häufigste Struktur der einsilbigen Wörter im Englischen ebenfalls unverändert geblieben ist, wobei eine starke Tendenz zur CVC-Silbenstruktur besteht. Schließlich sagte die vierte Hypothese eine mögliche Reduzierung des Silbengewichts der morphologisch einfachen Wörter, sowie eine Steigerung des Silbengewichts der morphologisch komplexen Einsilber voraus. Obwohl dies nicht direkt durch die Untersuchung bestätigt werden kann, konnte gezeigt werden, dass morphologisch einfache Einsilbler in Verbindung mit einem niedrigeren Gewicht stehen, während morphologisch komplexe Einsilbler ein wesentlich höheres Gewicht über die Zeitperioden hinweg aufgewiesen haben.

Zusammenfassend deuten die Ergebnisse also auf eine wesentliche Steigerung der Anzahl der einsilbigen Wörter im Englischen, sowie ihres stabilen Silbengewichts während der betrachteten Zeiträume, wobei offensichtliche Unterschiede im Gewicht zwischen morphologisch einfachen und komplexen Wörtern festgestellt werden konnten.