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ONLINE ASSESSMENT AND DEVELOPMENT OF MORPHOLOGICAL AWARENESS AND READING COMPREHENSION IN GRADES 2-4

Summary of Doctoral Dissertation

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Subject and Structure of the dissertation

This study aims to contribute to the linguistic aspects of reading acquisition by developing an online instrument for assessing morphological awareness in grades 2-4. Morphological awareness is the ability to reflect upon and manipulate morphemes and employ word formation rules in one's language (Kuo & Anderson, 2006). The significant contribution of morphological awareness to reading comprehension has been shown in studies conducted in languages with deep orthographies but there are only a few studies about this relationship and the development in an agglutinative language with a transparent orthography and a rich morphology, and there are no instruments for measuring morphological awareness in grades 2-4 in Hungarian children.

This topic is important because reliable assessment tools can facilitate identifying the factors which contribute to reading difficulties and they can also promote developing efficient reading intervention programmes in grades 2-4. International surveys show that Hungarian children's performance in reading comprehension must be improved. Morphological awareness contributes to the development of reading skills therefore, research efforts invested into the assessment and development of morphological skills especially in lower primary grades is essential for children to make progress in school subjects.

Theoretical background

Morphological awareness is considered to be a metalinguistic skill. It can be more widely interpreted as children's skill for understanding how the language works, the application of linguistic rules, the ability to comprehend words and sentences. Morphological awareness also applies to the ability to recognise, understand and use common morphological forms, and segment words into smaller units. Finally, it also includes the ability to understand the meaning of different affixes, and how they change the meaning of the word (Apel, 2014; Carlisle, 2000; Nagy et al., 2014).

Theories and models of word identification are closely associated with several aspects of reading acquisition. On the level of word form morphological knowledge is important for spelling and decoding as well as for understanding the lexical information. Morphological knowledge underpins the identification of morphologically complex words through nonlexical word processing, and in this way it has an impact on reading skills. Recognising words in a text paves the way for understanding sentences and texts (Rastle, 2019). Morphology refers to different processes of word-formation, for instance, inflection, derivation and compounding. All the words are comprised of at least one morpheme. For example, the word *erdők (forests)* can be broken down into two morphemes: *erdő+k, (*forest+s*)* each morpheme has a distinct meaning or indicates a grammatical function but the word *felhő (*cloud*)* cannot be broken down further because of its meaning

The theory of morphological awareness originates from the model created by Verhoeven & Perfetti (2011) the processing of morphologically complex words requires the non-lexical route of word recognition; the brain tries to decompose the words by separating the component morphemes. The dual route model propose that morphologically complex words are analysed regarding to their constituent parts. This phenomenon is termed as morpho-orthographic segmentation. Morphological analysis takes place on the orthographic level before the activation of the whole-word presentations (Rastle, 2019; Verhoeven & Perfetti, 2011).

Most theories of reading acquisition ignore the role of morphological awareness in reading acquisition. However, the acquisition of morphological knowledge plays an important

role in language acquisition; and there is a strong link between language acquisition and reading skills (Gósy, 2008; Blomert & Csépe, 2012). Ehri's model (1991) mentions morphological processing in the consolidated alphabetic phase, when children become able to decode the sequence of letters in a word (Ehri, 1991).

Verhoeven & Perfetti (2017) emphasised the role of morphology in learning to read across different writing systems. Morphological decomposition is essential to understand the systematic relationships among the surface forms of the words and their meaning. Morphology is an inter-level activation pattern that reflects the correlation among orthography, phonology and semantics (Verhoeven & Perfetti, 2017). The changes in theories and models of reading acquisition have demonstrated that learning to read have some general features which can be applied for all the alphabetic languages; however, some differences were found among languages with different writing systems (Verhoeven & Perfetti, 2017).

Reading acquisition is also influenced by the orthography of the language (Katz & Frost, 1992). In shallow orthographies, the spelling-sound correspondence is direct; from the rules of pronunciation one is able to pronounce the word correctly. Hungarian and Turkish children learn to read compound words even the non-words quite early and can read many types of word endings with different inflectional and derivational suffixes. Finnish children can read fluently after one month of reading instruction (Holopainen, 2002). Orthographic transparency enhances morphological segmentation, morphological parsing facilitates word identification even when the script is transparent (Haddad et al., 2018). Children acquire morphological structures easily since morphology marks the grammatical relationships locally, which makes it easier to recognise the typical patterns and use them to create new forms using analogies (Rastle, 2019). The major inflectional rules are acquired by the early elementary grades, but the awareness of compound and derivational morphology continues to evolve through elementary school years later (Kuo and Anderson, 2006).

Morphological awareness is comprised of the following subcomponents: orthographic awareness, graphosemantic awareness and graphomorphological awareness Morphological awareness has a strong relationship with reading comprehension because morphemes have semantic, phonological and syntactic properties. Additionally, morphological awareness is connected to other aspects of language knowledge, and may give a more general insight into metalinguistic skills than phonological awareness (Kuo & Anderson, 2006). Studies have found a positive correlation between morphological awareness and reading comprehension; it is supposed to have both a direct and indirect impact on reading comprehension. Children's morphological awareness shows growth throughout primary school years; and it becomes an increasingly strong factor of reading comprehension performances (Casalis et al, 2011). Gender differences in performances in reading are usually found in demographically representative samples. Girls significantly outperformed boys. Another finding was that the differences in achievements between boys and girls increased with age. (Reilly et al., 2019). Since gender differences appear in reading performances (Reilly et al., 2019), we supposed similar differences could be found in morphological awareness too.

Morphological awareness has different subskills. It includes inflectional, compound and derivational morphological subskills. Research studies classify the dimensions of morphological awareness differently. Carlisle (2000) identified two dimensions of morphological awareness: morphological structure awareness, morphological analysis. Kuo and Anderson (2006) added a third one, morphological decoding (Carlisle, 2000; Deacon, Tong & Francis, 2017; Kuo & Anderson, 2006). Measures for assessing morphological awareness have been discussed by several studies (Apel et al., 2013; Apel, 2014; Berko, 1958; Carlisle, 1995, 2000; Kuo & Anderson, 2006; Török & Hódi, 2015). Apel et al., (2013) gave a detailed analysis of the tasks for assessing morphological awareness. A variety of tasks has been used to assess this ability consisting of judgment tasks, production tasks and analogy

tasks including several subvarieties. The most common methods of measuring morphological structure awareness identified by Carisle (2000) include either sentence completion tasks; for example, “farm. My uncle is a ___”; (Carlisle, 2000, p.187), or analogy tasks, where children have to use the same morphological manipulation on a different word or sentence, for instance, “walk: walked: run: _ __”; (Nunes et al., 1997, p.649).

Several researchers propose that intervention in morphological awareness can develop reading comprehension after the initial phases of the reading acquisition. Carlisle (2010) summarized the results of 16 different morphological intervention programmes; besides morphological tasks some programmes included reading comprehension as well as explicit grammatical tasks. The tasks developing morphological awareness in pedagogical practice were found to be important because of their relevance and usefulness in education (Carlisle, 2010). The theoretical background for the intervention programmes was supported by content-based approach and metacognitive models of skill development (Csapó, 2003; Csíkos, & Steklács, 2010).

Reading proficiency is closely connected with reading motivation. Reading motivation was hypothesised to explain reading performances better than other variables (Guthrie et al., 2007) and it is also linked to success in learning and learning outside school. Motivation helps reduce differences in reading skills of different ability students and it can be a driving for reaching better results and reduces the possibility of developing a negative attitude towards reading. The lack of interest has a strong negative impact on reading proficiency (Klauda & Guthrie, 2015). Studies assessed how gender differences influence reading motivation. Girls and boys assessed themselves similarly for reading proficiency; however, girls valued reading higher than boys (Marinak & Gambrell, 2010).

Aims and relevance of the research

This research aimed to support reading instruction by finding efficient methods to measure morphological awareness, and shed the light on the importance of the morphological knowledge which might contribute to the development of more effective teaching programmes which would support the amelioration of literacy skills.

This study is original and novel in several ways: There are no instruments available for measuring morphological awareness and reading comprehension for Hungarian students in grades 2-4. Therefore, this research fills a research gap by developing an online instrument for assessing the construct. The development of morphological awareness and reading comprehension has been analysed in grades 2-4; and the relationship between morphological knowledge and reading comprehension has been investigated to see how the two constructs relate to each other in grades 2-4 in the Hungarian language. The relationship among morphological awareness, reading comprehension and reading attitudes has been explored as well.

Table 1 The time frame of the empirical research

Time	Research activity
March –May, 2019	The second pilot of the instrument (grades 2-4)
January- March, 2020	The large sample survey (grades 2-4)

In summary, this research consisted of two main parts. The primary aim of the empirical research was to develop an online instrument for assessing morphological awareness in grades 2-4. The aim of the pilot study was to prepare the planned large sample survey; to get preliminary results about the operation of the test, and gain preliminary data about the development of the morphological awareness in grades 2-4. The large sample survey

endeavoured to determine the reliability and the validity of the online instrument, yield more data about the construct and make more precise estimations about children' morphological awareness skills and its development in grades 2-4.

Research questions and hypotheses

The topics of this research encompass the basic questions of the assessment and the development of morphological awareness. On the one hand, they cover the questions which refer to the instrument, the structure, dimensions and operations of morphological awareness and its relationship with background variables, as well as the questions related to the development of the ability.

I. The questions related to the structure of the morphological awareness

Is the instrument suitable for measuring morphological awareness in the examined age group?

Are the psychometric properties of the test acceptable for the research?

Is the validity of the construct acceptable?

Can the subconstructs be differentiated within the morphological test?

What relationships can be found among the subconstructs?

II. Research questions related to morphological awareness, reading comprehension, background variables and the development of the ability

How does morphological awareness change in the examined grades?

What relationships can be found between the background variables?

What are the main differences between the boys' and girls' performances in morphological awareness and reading comprehension?

How does reading motivation influence performances in morphological awareness and reading comprehension?

What relationships can we find between morphological awareness and reading motivation among boys and girls?

What relationship can be found between basic reading skills and reading motivation in boys and girls?

The hypotheses are in agreement with the research questions

I. Hypotheses referring to the instrument

$H_{1:}$ Our instrument gives a reliable estimation about the development of the students' morphological awareness, and the psychometric features of the tests are acceptable.

H_2 There is a moderate correlation among the subtests.

II. Hypotheses about the development of the morphological awareness and its relationship to the background variables

Basic reading comprehension skills and reading motivation are also measured but only as background variables which assessed their relationship to morphological awareness.

H_3 There will be a difference in the levels of development of morphological awareness in the different grades (Carlisle, 2000).

H_4 Morphological awareness develops throughout grades 2-4 (Gabig & Zaretsky, 2013).

H_5 There will be moderate correlations between morphological awareness and reading comprehension (Kirby et al., 2012).

H_6 There will be gender differences between the performances in morphological awareness and in reading comprehension. Based on the findings which prove that there are differences between boys' and girls' achievements in reading and language skills (Reilly et al., 2019), we hypothesise that there must be gender differences in morphological awareness skills as well.

H_7 Reading motivation will be linked to both morphological awareness and reading comprehension. Studies prove that there is a positive relationship between reading motivation and reading comprehension (Marinak & Gambrell, 2010); therefore we suppose that

morphological awareness has a similar positive relationship with reading motivation since morphological awareness is a precursor of reading.

Pilot Study — An online instrument assessing the relationship between morphological structure awareness and reading comprehension in Hungarian 2-4 graders

The participants were second graders (N=124 age: M=8.7, SD=0.40 years), third graders (N=137 age: M=9.6, SD=0.45 years) and fourth graders (N=97 age: M=10.4, SD=0.63 years); altogether 356 children were tested (age: M=9.5, SD=0.81 years). Three children started, but did not finish the test. 171 girls and 169 boys completed the test, 16 children did not answer the gender question.

In the pilot test, various task types were implemented, for example, affix identification task, compounds, derivation and nonwords. The online test consisted of five sections: affix identification/real words (10 items), compound words (10 items), derivation (10 items), affix identification/nonwords (10 items), reading comprehension (10 items). The intention of the first four sections of the instrument was to test children's awareness of the basic grammatical structures and the ability to manipulate them. The fifth section assessed reading comprehension. Data collection was carried out in Hungary in spring, 2019. The tests were delivered through the eDia platform (Csapó & Molnár, 2019). Children were given an identification code to log-on to the test. The test was conducted in a group setting. The entire test took approximately 30 minutes to complete (second grade: M=27.3, SD=9.1 minutes; third grade: M=23.8, SD=6.3; fourth grade: M=25.4, SD=11.0) (Varga, Pásztor, & Steklács, 2020). The purpose of the pilot study was to get preliminary results about the operation of the test and prepare the large sample survey. It was also an important aim to follow how the two skills develop during the second grade through fourth grade and, to examine the relationship between morphological awareness and reading comprehension skills.

Results, discussion and limitations

The overall psychometric properties of the tests were acceptable. The Morphological Structure Awareness and the Reading Comprehension tests had good reliabilities in all grades; however, the Derivation and Affix Identification/Nonwords subtests should be further improved. Standard deviations showed that almost every subtest could differentiate students' abilities especially, among children who had a lower skill level. The analysis of the performances of the three age groups showed that there was a significant improvement between grade 2 and grade 3. An improvement tendency was observed between grade 3 and 4 as well; however, the differences were not statistically significant except in the case of the Affix Identification/Nonwords subtest. Nevertheless, the results suggest that morphological awareness skills are changing parallel with reading comprehension skills in grade 2 to 4. One reason for the lack of a larger developmental gap between grade 3 and 4 could be the high mean scores, especially in the achievements of the Affix Identification/Real words subtest. The inclusion of more difficult items will help further investigate this phenomenon. An interesting result was that the largest performance differences were between the two subtests assessing affix identification: the mean scores were the lowest with nonwords and highest with real words. The reason for that might be that in tasks using nonwords children cannot rely on the meaning of the words; and therefore; they must rely on their morphological awareness skills.

The correlations in the second, third and fourth grades showed a significant positive relationship between Morphological Structure Awareness and Reading Comprehension subtest performances. The Affix Identification with Nonwords subtest had the strongest

correlation with reading comprehension. This strong relationship gives evidence that these nonwords tasks are representing an important factor of children's reading comprehension performances. These tasks expect a more complex cognitive effort from children to understand the rules of forming singular and plural nouns and verbs using suffixes compatible with nouns. Students had to rely only on the structure without knowing the meaning of the word.

These results are in line with international research findings (Carlisle, 2000; Kuo & Anderson, 2006; Levesque et al., 2017) and support that morphological awareness helps learners decompose unknown morphologically complex words into their constituent morphemes and apply morphological rules to derive meanings of unknown words (Apel et al., 2013; Carlisle, 1995, 2000; Casalis et al., 2011; Kirby et al., 2012). The study has two limitations; the first is related to the psychometric properties of the test and the second to a small sample size. The future test development could contribute to a more precise and reliable assessment tool as well as the developmental tendencies could be further investigated. In addition, some other dimensions of the constructs could also be included in test development as a means to better understand how awareness of morphological structure influences reading comprehension. Although the overall sample size was not small (N=356), the number of participants in each grade level significantly reduced the generalizability of the findings) (Varga, Pásztor, & Steklács, 2020).

The large sample survey — Relationship among morphological awareness and reading comprehension and reading motivation

The sample, the procedures and data analysis

The aim of this research was to analyse how the online instrument for assessing morphological awareness and reading comprehension worked on a large sample, and to get an insight into how reading motivation contributes to reading performances. 4,134 children were examined in 94 Hungarian schools. The number of students in grades 2-4 was 1,310, 1,291, and 1,533 respectively. The survey included 2,026 boys; 637(grade 2), 629 (grade 3) and 760 (grade 4). The sample consisted of 1,877 girls; 597 (grade 2), 602 (grade 3) and 678 (grade 4). 231 students did not give the gender information.

The final version of the test contained 59 items all together. It included a morphological structure awareness test covering a wide selection of subskills related to morphological awareness, and two dimensions were added to the previous version of the instrument: morpheme segmentation (Apel et al., 2013; Apel, 2014; Carlisle, 2000). The task types of the pilot study were kept since they worked well. However, two items were added to each subtest; the number of items increased from 10 to 12 in the subtests: identification of affixes/real words (12 items), compound words (12 items), derivation (12 items) and identification of affixes in nonwords (12 items). In addition, 12 items were included for morpheme segmentation to assess how children could identify relational relationships within the word (Carlisle, 2000). The instrument contained a short reading comprehension test which was the same which was used in the pilot test (10 items). It measured basic reading skills, it worked well in the pilot study; therefore, it was kept. It was used as a sort of background variable to see how the relationship between morphological awareness and reading develops.

In addition, a self made reading motivation questionnaire consisting of ten items was implemented. The questionnaire measured reading motivation (7 items), self efficacy (1 item), the motivation for printed texts (1 item) and the motivation for digital media (1 item). The reason for including only a short questionnaire was that this way children could complete the

whole test and the questionnaire within a 45-minute lesson. The psychometric features of the instrument, the students' performances in morphological awareness and reading comprehension were analysed. The development in morphological awareness and its relationship to basic reading comprehension skills and reading motivation were explored. For data analysis CFA analysis, descriptive statistics, one way ANOVAs, Tukey Post hoc and independent samples T-tests were conducted.

Discussion of the results of the large sample survey

The psychometric features of the instrument in grades 2-4, and the investigations revealed that the online test was an appropriate instrument for assessing morphological awareness and reading comprehension in the whole sample and in grades 2-4. The reliabilities and validity of the morphological awareness test and the subtests were good and acceptable except for the morpheme segmentation subtest; however, this subtest assessed an essential aspect of the construct; therefore, the results of this subtest was also discussed.

Confirmatory factor analyses (CFA) were conducted to test the underlying measurement model for morphological awareness. The 5-dimensional model based on the subtests showed good model fit in all grades.).Thus, the five latent factors of morphological structure awareness can be empirically distinguished. The magnitudes of correlations among the subtests (range between .26-.55) indicate that all dimensions represent important and distinguishable aspects of morphological awareness. The reliability of the reading comprehension subtest and the instrument for reading motivation were also acceptable.

Growth was found in the performances in morphological awareness throughout grades 2-4. The performances both in the morphological awareness test and in the subtests improved from grade 2 through grade 4. The analyses confirmed that morphological awareness and reading comprehension skills improved significantly in all the grades examined. ANOVA and Tukey tests demonstrated that the differences were statistically significant in the morphological awareness test and in the subtests.

The analysis of the means and standard deviations shed the light on the differences in students' performances regarding the subtests in grades 2-4. Children had a difficulty in identifying morphemes in multimorphemic words especially when they could not rely on the meaning of the words. Consequently, the tasks including nonwords seemed to be the most difficult for the children. These tasks reflected children's morphological awareness skills the most efficiently. The results related to the nonwords tasks imply that the children's derivational morphological skills improved more slowly than inflectional morphological skills throughout grades 2-4 (Kuo & Anderson, 2006; Tyler & Nagy, 1989). However, this tendency could not be observed in the subtests where real word items were implemented, the increasing performances in morphological awareness as well as the statistical differences among the grades seem to justify my hypothesis that children's morphological skills develop rapidly in grades 2-4.

This research also aimed to analyse the relationship between morphological awareness and reading comprehension. Besides the subtests which included nonwords the lowest means and relatively high standard deviations were found in the Reading Comprehension subtest. The results in reading Comprehension subtest and the Affix Identification /Nonword subtest seemed to show the most similar values. The comparable values might imply that there must be a strong possibly bidirectional relationship between the constructs. Children come across an extensive amount of written language input during the first years of primary school and it impacts their morphological awareness skills, and morphological awareness skills support their reading comprehension skills to an increasing extent.

A significant positive correlations ($p<.01$) were found between the Morphological Structure Awareness test and the subtests which demonstrated that the subtests were important dimensions of the construct. These correlations in most cases seemed to show a slight decrease, however, there are three important correlations which seem to be increasing throughout the three grades: (1) the relationship between the Morphological Structure Awareness Test and the Affix Identification Nonwords subtest, (2) the relationship between morphological awareness and reading comprehension (3) the relationship between the Affix Identification Nonwords and reading comprehension. The findings are in line with the research studies (Berko, 1958) which suggest, on the one hand, nonwords tasks demonstrate morphological skills the most efficaciously, and on the other hand, that morphological awareness has an important role in word reading which affects reading comprehension (Kirby et al., 2012). The developmental patterns confirm morphological awareness and reading comprehension are interdependent.

The differences between boys' and girls' results in Morphological Structure Awareness test and in the subtests showed that the girls performed slightly better than boys. Although both the boys' and girls' performances improved throughout the three years the differences between the two genders were noticeable even in the fourth grade. The differences seemed to increase or remain on the same level in the Affix Identification/Nonwords, in the Morpheme Segmentation subtests. In all the other subtests, the boys seemed to catch up with the girls. The subtests where the girls kept their advantage were the ones which required a higher level of morphological awareness, for example, identifying inflectional and derivational suffixes in nonwords tasks or identifying relationships within a word (Relational task).

The relationship among reading motivation, performances in morphological awareness and reading in grades 2-4 has been analysed. Statistically significant growth in reading motivation throughout grades 2-4 was observed. Quartile groups were created based on the test results; then the relationship between the quartile groups and reading motivation was investigated. Reading motivation, morphological awareness and reading comprehension were found to be interdependent in grades 2-4. The children who were more engaged in reading activities performed better in both tests.

Reading self-concept and motivation for the printed media positively influenced morphological awareness and reading comprehension test results. However, the motivation for the digital media negatively affected the test performances. The statistical analysis showed that there were significant differences among the test results related to self-concept, motivation for printed media and motivation. Students' beliefs about their capabilities corresponded to their reading achievements ($p<0.05$). It implies that their views must have been shaped by their experiences with reading activities (Solheim, 2011). The correlations analysis showed that reading motivation had a weak positive significant relationship with both morphological awareness and reading comprehension. The correlations between reading motivation and reading comprehension were slightly increasing throughout the three grades.

Girls showed slightly higher values in reading motivation throughout the three grades. The boys showed almost the same values in reading motivation in grades 2-4. The girls' reading motivation showed a significant difference between grades 2 and 3 ($p<.01$). The differences were not statistically significant between grades 3 and 4 for the girls either.

Reading self-concept had a weak positive correlation with reading comprehension and morphological awareness. Motivation for the printed media also revealed a weak positive significant relationship with both test results; the correlation was the strongest in grade 3; however, in grade 4 it seemed to be decreasing. Motivation for digital media showed a significant weak negative correlation with morphological awareness and reading comprehension.

General Discussion

This research covered the questions which referred to the novel online instrument; the structure, dimensions and operations of morphological awareness and its relationship with the background variables, as well as the questions related to the development of the ability. The hypotheses regarding the instrument have been justified by this research. This instrument seemed to give a reliable estimation about the development of the students' morphological awareness and the psychometric features of the tests were acceptable. Moderate correlations were found among the subtests. Both morphological awareness and reading comprehension showed growth throughout grades 2-4; this finding was supported by the statistical differences among the performances throughout grades 2-4 (Carlisle, 2000; Casalis et al, 2011; Deacon et al., 2017)

The statistical analyses demonstrated that there was a positive relationship between morphological awareness and reading comprehension. Morphological awareness supports the development of reading skills, however, further examinations are needed to explore how exactly morphological awareness or other skills might contribute to the development of reading skills. Morphological awareness and reading comprehension seemed to be interdependent since morphological skills were linked to word identification, which supported reading skills. The relationship was supported by the moderate significant correlations between morphological awareness and reading comprehension (Levesque et al., 2017). The performances in morphological awareness and reading comprehension showed a weak significant relationship with reading attitudes (Klauda & Guthrie, 2015).

The hypothesis about the differences between girls' and boys' performances was partly justified. Growth was found in both boys' and girls' performances throughout grades 2-4. The differences seemed to decrease, for example, in reading comprehension; however, in the most difficult morphological tasks the differences increased or remained on the same level.

The hypothesis about the impact of reading motivation on the performances in both morphological awareness and reading comprehension was partly justified since there was a significant positive relationship between reading motivation, morphological awareness and reading performances. However, it seemed that the two constructs were interdependent; the relationship between reading motivation and reading comprehension was also found to be bidirectional.

Summary

The Main Findings of the Literature Review

This research concentrated on morphological awareness, a precursor of reading and a component of metalinguistic awareness. The literature review consists of an extensive exploration of theories of morphological awareness; studies prove that morphological awareness is an important factor in word recognition especially in the case of multimorphemic words. Theoretical and empirical studies confirm that cognitive linguistic skills, e.g. morphological awareness, support the acquisition of basic reading skills. The theoretical chapters review some important reading models, word recognition models in order to discuss how they relate to the importance of morphology. Although studies prove that word recognition lays the groundwork for attaining basic reading skills reading theorists have paid little attention to morphological awareness. Mostly bottom-up and interactive reading models claim that the development of cognitive linguistic skills support the acquisition of basic reading skills. Although there are several definitions of morphological awareness research literature falls short of creating a unified definition of the construct. I agree with Kuo &

Anderson (2006) that morphological awareness is "The ability to reflect upon and manipulate morphemes and employ word formation rules in one's language..." (Kuo & Anderson, 2006, p. 161). Though recent research has found that morphological awareness works across different writing systems; both in deep and shallow orthographies (Verhoeven & Perfetti, 2017); it is a relatively new approach to conduct research on morphological awareness in an agglutinative language with a transparent orthography. The theoretical chapters discuss the main dimensions (inflectional, compound and derivational morphology), the main cognitive linguistic basics (relational, syntactic and distributional) and measures of this construct. Its relationship to reading comprehension was reviewed and all the pedagogical implications were explored. The cognitive foundation of the developmental patterns of morphological awareness was built around the standards, and curricula for grades 2-4. As far as Hungarian National Core Curriculum (2020) and the new framework curricula are concerned; morphological skills are given little attention.

Several gaps were found in the research literature which gave me inspiration to start my research. First, although theoretical models of reading mostly tend to ignore the role of morphological awareness, a great number of empirical studies prove that morphological processing influences word identification which is the basis of reading acquisition. Morphological awareness got little research interest in shallow orthographies. Thus, we do not know much about how morphological awareness works in languages with a shallow orthography. Since there is no consensus about the definition of morphological awareness and researchers used different measures for assessing the construct, it is difficult to compare the results. Second, morphological awareness has been measured orally or with written paper-based methods. An entirely online instrument has not been developed yet. Third, morphological skills are underrepresented in Hungarian reading research. Fourth, the further analysis of the literature allows for the conclusion that the development of morphological awareness in boys and girls has not been researched extensively in deep orthography languages either. Fifth, Non-cognitive skills have an impact on achievements in various subject areas, however, there are no research studies investigating the relationship between morphological awareness and reading motivation. Since morphological awareness is a precursor of reading skills I supposed that there might be relationship between morphological awareness and reading motivation.

I decided that the main focus of my research would be developing an online instrument for measuring morphological awareness in grades 2-4; however, I also wanted to examine how morphological skills relate to basic reading comprehension skills and reading motivation.

The Pilot Test

The aim of the pilot study was to empirically test the online instrument assessing morphological awareness in the second, third and fourth grades of primary school. It was also an important aim to get preliminary information about the operation of the instrument and to tap into different dimensions of morphological awareness. The instrument tested inflectional and derivational and compound morphology. It consisted of four subtests (affix identification for real words, affix identification for nonwords, derivation and compound words). A short reading comprehension test for assessing basic comprehension skills was also included. The aim of including the reading test evaluating literary reading skills was to investigate the relationships between morphological awareness and reading comprehension. Another reason for including only a short reading comprehension test was that this way children could complete both morphological and the reading comprehension test within a 45 minute lesson. The pilot study attempted to follow how morphological skills and reading comprehension

skills develop throughout grades 2-4 and to tap into the relationship between morphological awareness and reading comprehension skills in the Hungarian language.

The psychometric properties of the tests were acceptable. The Morphological Structure Awareness and the Reading Comprehension subtests showed good reliabilities in all grades. The Derivation and Affix Identification for Nonwords subtests had to be further improved. In Affix Identification for Real Words subtest, a ceiling effect was observed. Thus, it was planned to include more difficult tasks in the Affix Identification/Real Words subtests. The first version of the online test was suitable for the assessment of different aspects of morphological awareness. An important finding was that there was a significant improvement in performance in morphological awareness between grade 2 and grade 3. An increase in performances was conspicuous between grades 3 and 4 as well; however, the differences were not statistically significant except in the case of the Affix Identification for Nonwords subtest. The results of the pilot study indicated that morphological awareness skills and reading comprehension skills show similar increase in grade 2 to 4.

The examination of the correlations in second, third and fourth grade revealed that the participants' performance showed a significant positive correlation between morphological awareness and reading comprehension tests. The Affix Identification with Nonwords subtest had the strongest correlation with reading comprehension. This strong relationship gives a proof that these nonwords tasks show morphological skills which are related to reading comprehension skills. (Varga, 2020; Varga, Pásztor & Steklács, 2020). The results of the pilot study were in line with international research findings (Carlisle, 2000; Kuo & Anderson, 2006; Levesque et al., 2017) and support that morphological awareness helps learners decompose unknown morphologically complex words into their constituent morphemes and apply morphological rules to derive meanings of unknown words (Apel et al., 2013; Carlisle, 1995, 2000; Casalis et al., 2011). The correlations between students' morphological structure awareness and their reading comprehension suggest that reading comprehension skills are influenced by their morphological structure awareness skills (Apel, et al., 2013; Casalis et al., 2011). This relationship supports the approach that teaching the structure of the language is essential for the effective reading instruction and developing reading skills (Kuo & Anderson, 2006). The research results of the pilot study also suggested that morphological awareness develops similarly in a language with a shallow orthography and a rich morphological system that is morphological knowledge has an impact on reading skills (Verhoeven & Perfetti, 2017, Varga, 2020).

The Main Findings of the Large Sample Survey

The main objective of the large sample survey was to examine how the instrument works in a large sample and to get more reliable data about how different aspects of morphological awareness change in the second, third and fourth grades. It also attempted to follow how morphological awareness develops in the Hungarian language and what relationship it has with basic reading comprehension skills and reading motivation as well as how these relationships change in grades 2-4.

The reliabilities and validity of the morphological awareness test and the subtests were good and acceptable except one subtest (morpheme segmentation); however, this subtest was essential because it evaluated important aspects of morphological awareness; therefore, it was kept for the analyses. This instrument is suitable for assessing morphological awareness in a reasonable timeframe. Therefore, it is a useful tool for teachers to get information about the development of the morphological skills.

Growth was found in the performances in all the examined constructs, which implies that there is a gradual development in morphological awareness throughout grades 2-4.

Despite the growth in morphological skills children had difficulty in identifying morphemes in multimorphemic words especially when they could not rely on the meaning of the words. The increasing performances in morphological structure awareness and reading comprehension as well as the statistical differences among the grades support the hypothesis that children's morphological skills develop in grades 2-4.

Significant positive correlations ($p<.01$) were found between the morphological awareness test and the subtests throughout the three grades which indicates that the subtests were important dimensions of the construct. The findings propose that morphological awareness has an important role in word reading which affects reading comprehension (Kirby et al., 2011.) The developmental patterns confirm there is a reciprocal link between morphological awareness and reading comprehension. The relationship between morphological awareness and reading comprehension seem to get stronger in grades 2-4.

The differences between boys' and girls' results indicate that girls performed slightly better than boys. In some subtests the boys seemed to catch up with the girls. The subtests where the girls kept their advantage were the ones which required a higher level of morphological awareness, for example, identifying inflectional and derivational suffixes in nonwords tasks or identifying relationships within a word (relational task).

This research attempted to inspect how different achievements in morphological awareness and reading comprehension were linked to reading motivation. Reading motivation, morphological awareness and reading comprehension were interdependent in grades 2-4. The children who were more engaged in reading activities performed better morphological awareness and in reading comprehension. The different achievement levels for morphological awareness and reading comprehension had a statistically significant effect on reading motivation in each grade, which implied that reading motivation and morphological awareness were interdependent. The same is true for the relationship between reading motivation and reading comprehension; it was proposed to be bidirectional. It is a novel finding that gender differences were found in morphological awareness similarly to the gender differences found in reading comprehension

Gender differences were found in reading motivation too. Girls showed higher motivation values than boys. The girls' reading motivation increased between grades 2 and 3; nevertheless, no significant differences were found between grades 3 and 4 for the girls. The boys showed the same values in reading motivation throughout the three grades. The results concerning reading motivation and reading comprehension are in line with international findings. (McGeown et al., 2012; Marinak & Gambrell, 2010). The relationship between morphological awareness and reading motivation has never been explored; this is certainly a new research result. It can also support the hypothesis that morphological awareness is linked to reading skills, and therefore, it is also linked to reading motivation as well.

Different aspects of reading motivation, e.g., reading self-concept and motivation for printed media had a positive relationship with both morphological awareness and reading comprehension. A possible explanation for this might be that children who believe that are better readers have more developed morphological skills. The relationship between achievements in morphological awareness, reading performances and self-concept indicated that the students' beliefs about their capabilities corresponded to their achievements. There was a weak, positive correlation among reading motivation and morphological awareness; reading motivation and reading comprehension. The correlations were slightly increasing throughout the three grades. However, it is true only for the girls. They showed slightly higher values in motivation than boys.

A novel feature of this research is that morphological awareness has not been measured with an entirely online instrument before; however, some research used partly online instruments. I chose to create an online instrument because eDia surface offered a number of

advantages to the students and teachers as well (Csapó & Molnár, 2019). This online instrument is suitable for diagnostic assessment of morphological awareness in everyday teaching practice. The eDia online surface is attractive and child-friendly. Children can listen to the instructions which make the assessment more acceptable for them. Children can see their results when they complete the test. Thanks to the automatic scoring students and teachers get automatic feedback about the students' performances which reduces the time and energy which are required to assess students and obtain the information about children's skill levels (Csapó & Molnár, 2019). Teachers can follow the children's skill development and plan interventions in the light of the achievements in the test (Csapó & Molnár, 2019).

This instrument employed a new approach to assessing for morphological awareness; at the same time it implemented the task types which were commonly used for assessing morphological awareness. The results revealed that the online instrument efficiently distinguished between the children's performances in morphological structure awareness in grades 2-4. Growth found in morphological awareness throughout all the three grades examined which follows the pattern described in literature (Gabig & Zaretsky, 2013). Moderate correlations between morphological awareness and reading comprehension are in line with the international research findings (Apel et al., 2013; Deacon et al, 2017). The relationship between the constructs got stronger throughout the three grades which also corresponded to other research results, which claim that the role of morphological awareness increases throughout primary school years (Carlisle, 2000; Levesque et al, 2017).

The significance of this research is that it enriched the empirical research connected to the linguistic aspects of reading acquisition giving evidence about the link between morphological awareness and reading comprehension. It shed the light on the importance of morphological skills which might help teachers and students to identify challenges in reading comprehension. This research investigated the relationship between the performances in morphological awareness, reading comprehension and reading motivation. It is a novel finding of this research that reading motivation has a positive relationship with morphological awareness.

In sum, the final version of the online instrument seemed to give a reliable estimation about the development of the students' morphological awareness. These findings suggest that morphological awareness is linked to the development of reading skills. However, further examinations are needed to explore how exactly morphological awareness or other skills might contribute to the development of reading skills (Carlisle, 2000; Casalis et al., 2011; Deacon et al., 2017; Levesque et al., 2017). Growth was discovered in students' performances in morphological awareness throughout grades 2-4. Inflectional morphological skills develop earlier than compound and derivational morphological skills. These findings are in line with the developmental patterns found in deep orthography languages (Gabig & Zaretsky, 2013). Therefore, I assume that morphological awareness develops similarly in shallow orthography languages as in deep orthography languages.

Limitations, Practical Implications and Future Plans

Although this work provides contribution to the literature of morphological awareness it has certain limitations. The first limitation of this research is the generalisability of my findings. Despite the great number of the students tested I could not declare that these results represent Hungarian children in grades 2-4. The second limitation concerns the instrument. This test contains judgement tasks with multiple choice questions. Using open-ended questions would have allowed examining the skill from a different angle. The third limitation of the research is that I used only quantitative methods. However, using qualitative methods; for example, oral examinations would have provided further information.

The practical implications of this research include calling the attention to the importance of morphology instruction. This online instrument gives information about inflectional, derivational and compound morphological skills; relational, syntactic and distributional knowledge. It can be a useful tool for teachers to identify children's strengths and weaknesses in morphological awareness and determine which subskills should be improved. It is also a great advantage of the test that the whole testing procedure can fit into a 45-minute lesson, and the results are displayed immediately after the child finishes the test. The results can be downloaded from eDia system and an assessment scale helps to interpret the results.

I believe that morphological instruction is beneficial since it supports understanding word structures. I agree with the opinion that the rules of the language should be taught in a playful way rather than making children repeat grammatical rules. These tasks could also develop their metalinguistic awareness which is important when they start learning a foreign language. Tasks with nonsense words encourage children to think about language as an object and use their morphological skills. Segmentation tasks improve children's morphological skills and it would be beneficial using them as early as in grade 2.

I am finishing this thesis with the description of further research plans. This online instrument could be further improved. More items could be added to the morphological segmentation subtest to get more information about the students' morpheme segmentation skills. Open ended questions could be inserted to test conscious morphological awareness. Also, longitudinal research could follow the developmental tendencies. It would give a detailed picture about how morphological awareness contributes to reading comprehension. Qualitative research methods; for example, eye tracking examinations could also be conducted to see how children solve morphological tasks and what additional information is revealed by the heat maps.

It is also a plan to develop a morphological intervention programme. The reliable and valid instrument for the assessment of morphological awareness is essential for the fulfilment of the intervention. As described in the previous chapter this online instrument was developed and tested and seemed to be reliable; therefore, it will be possible to follow the students' development and the effects of the intervention programme. The eDia system has the possibilities to offer customised interventions to the students. Thus, students can receive different intervention assignments according to their skills and their results in the pretest. During the intervention the programme will offer different options according to the students' correct and incorrect answers. Such intervention programmes can be beneficial in everyday teaching practice because students can receive interventions in the skills which are the most challenging for them. The planned morphological intervention programme aims to improve language skills in general, inspire children to think about the language and teach explicit grammatical rules. This research might contribute to the enhancement of the efficiency of school education by providing a reliable and valid assessment tool to evaluate morphological skills and the fulfilment of these plans will facilitate the transfer of the skills taught during the intervention (Csapó & Molnár, 2019).

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