

Research Paper: Investigating the Relationship Between Morphological Awareness and Reading Skills in the Third and Fourth Grade Dyslexia and Normal Developing Readers



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ABSTRACT

Introduction: Reading is defined as the ability to understand and use written language which is done via conversion of grapheme to phoneme. Morphological Awareness (MA) is the ability of conscious manipulation of morpheme which is the smallest meaningful language unit. The relationship between reading ability and MA is bidirectional. Many aspects of reading are predicted by MA. In Iran, one study has been conducted on this relationship. Regarding this issue, the main aim of the current study is to investigate the relationship between reading and MA. Because, the explicit MA (conscious use of morphemes) appears in the third and fourth graders, we studied the relationship between dyslexia and normal readers in these two graders.

Materials and Methods: In this cross-sectional study, 34 normally developed readers (22 boys and 12 girls) and 20 dyslexic students participated. Teacher questionnaire and NAMA test were used for dyslexia diagnosis. In addition, NAMA test for reading evaluation and MA test for assessment of morphological knowledge were used. Normal distribution of the data was examined by 1-sample Kolmogorov Smirnov test, while the data were analyzed by Pearson and Spearman Correlation Coefficient.

Results: In normal students, there is a relationship between word comprehension task and total score of morphological awareness test (Correlation Coefficient=0.70), between word reading and construct formation task (CC=0.46), between text comprehension and dynamic morpheme production task (CC=0.57), and between phoneme deletion and total score of morphological awareness test (CC=0.63). In dyslexic children, the relationships exist between word comprehension and construct formation (CC=0.60), between dynamic morpheme production (CC=0.78), and total score of morphological awareness test (CC=0.67), between text comprehension and morphological awareness task (CC=0.64), and between word chain and morpheme identification task (CC=0.78).

Conclusion: According to statistical analyses, some tasks of MA were correlated with some reading tasks; we believe the tasks used for reading skills could have influenced these results. The tasks of the present study for reading skills assessment were different from the tasks of other studies.

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1. Introduction

Reading is defined as the ability to understand and use written language which is done via converting grapheme [1] to phoneme [2]. Metalinguistic awareness such as Phonological Awareness (PA) [3, 4], orthographic awareness [5], and Morphological Awareness (MA) [6] are necessary to learn reading. The focus of the current study is to investigate the relationship between MA and reading skill. MA refers to the ability of conscious manipulation of morpheme which is the smallest meaningful unit of language [7]. There are three kinds of morphemes in English, including, inflectional, derivational [8], and compounding process [9]. In the initial learning phase of word reading, students use grapheme to phoneme or letter to phoneme conversion. In this stage, MA lacks a crucial role in learning how to read, because students learn monomorphemic word [10]. However with higher educational level and considering time and memory load, these rules are not enough. In lieu of grapheme to phoneme conversion, the students learn how to read the whole morpheme, instead of phoneme representation [11]. Thus, MA training has a faster effect on word reading than phonological awareness [7].

There is a substantial body of evidence which proves MA association with reading ability. According to Carlisle and Goodwin (2013), the relationship between MA and reading is not clear [12], many studies emphasize this relationship though. Berninger et al. (2008) reported that MA through morpheme recognition contributes to learning how to read, via word decoding and word reading [13]. In Carlisle (2000) study on third and fifth grade students, results showed a relationship between the words with several or complex morphemes and word reading. According to the results, this contribution was stronger in fifth graders than third graders, however, there is much evidence indicating the contribution of MA and reading in the initial stage of elementary school, too [14].

Deacon and Kirby (2004) study on 2-5 graders, showed a meaningful relationship between MA and pseudo-word reading but no relationship between MA and word reading. Also, MA contribution with reading accuracy is bi-directional [15]. Considering the results, the relationship between MA and reading, depending on the tasks, is related to reading such as, word reading, reading comprehension, text reading and reading accuracy and this contribution changes during time [16]. Regarding the above mentioned studies, MA and reading comprehension are correlated, too [13-15, 17, 18].

Aside from many studies on the correlation between MA and reading in English, several studies were performed in the other languages [19-24] that showed a relationship between MA and reading in the all languages. For instance, Lau et al. (2017) concluded a strong association between MA in compound words and Chinese reading ability.

Many studies focus on MA deficit in the reading ability of children with dyslexia. The results of several studies show that performance of dyslexic students in MA are weaker than good readers [25, 26]. Elbro and Arnbak (1996) studied and compared the process of reading compounds in Danish dyslexics and normally developing peers; they proved that dyslexic children read according to morphological structures, but their normal peers used automatic recognition of whole words [27]. Guimaraes et al. (2015) investigated derivational and inflectional morphology in Brazilian learners with the surface and phonological dyslexia in 9 students in grades 4, 5, and 6. They concluded that students with different reading patterns perform differently in MA tests [21].

Shu et al. (2006) reported that dyslexic students in Chinese were best distinguished from normal peers in MA tasks. However, their performance in visual skill tasks and PA was indistinguishable. Therefore, MA in Chinese is a strong predictor for literacy skills in both groups [28]. In a study conducted on Arabic speakers, between two groups of readers; Learning Disability (LD) and normal readers, the results showed that morphological awareness was a predictor of reading in the normal group but not in the LD group. LD students performed similar to normal readers in MA tasks [23].

Ghaemi et al. (2011) in Persian, considered the role of MA in accuracy, speed, and comprehension of reading in the second grade students (27 dyslexic children and 57 normal peers). The results showed that in the early phase of learning how to read, MA does not have any effect on their reading abilities [29]. There is one study in Iran that investigated the relationship between MA and reading. Because Persian is morphologically rich language, the major aim of the current study is to investigate the correlation between MA and reading abilities in dyslexic and normally developing students. We focused on this question in the current study that whether there is a relationship between MA and reading (the correlation coefficient between reading and MA will answer this question). Theoretical assumption to perform the present study is that, there is a correlation between MA and reading skills.

2. Materials and Methods

Participants

The study participants comprised 54 children with dyslexia and normally developed readers. The students were selected from the third and fourth grades: twenty students in grades 3 and 4 as dyslexia group and 34 students (19 third and 15 fourth grade students) participated as normal control group. All participants were native Persian speakers. The schools were located in mid-level socioeconomic neighborhoods in Tehran. The considered criteria for normal group included being monolingual, having normal IQ, studying at the third and fourth grade without running out in normal grade, having normal reading development according to NAMA reading and dyslexia test, lacking non-compensated visual and auditory deficit or defect in sensory, neurologic, speech, language and communication aspects, and lacking educational deprivation.

Considered criteria for dyslexia group included having nonverbal IQ higher than 80 (to exclude them from children with mental retardation), deficit existence in teacher questionnaire and NAMA test, lack of non-compensated auditory and visual deficit and defect in sensory, neurologic and speech, language and communication aspects, no co-morbid deficit such as ADHD, being monolingual and mental age coincide mental age is the index of developmental level and age equivalent score that obtained from standard measurement from cognitive ability [30] (because there is a possibility that dyslexic children run out from one or several grades, therefore we utilized from mental age not from chronological age).

Methods

NAMA reading and dyslexia test and MA tasks were used in the present study [31]. MA tasks were adopted from other studies and were translated according to morphological features of Persian language and their validity and reliability were examined. Subtests of NAMA test included word reading, non-word reading, word chain, rhyme, phone deletion, reading comprehension, word comprehension, naming, letter sign, and category sign. MA tasks consisted of the morphological awareness task [32] ($\alpha=0.49$), dynamic morpheme production task [33] ($\alpha=0.89$), comes from task [33-36] ($\alpha=0.59$), sentence analogy task [37] ($\alpha=0.86$), relative task [14] ($\alpha=0.37$), morpheme identification ($\alpha=0.52$), morphological construction tasks [38] ($\alpha=0.47$), morphological spelling test (because responses of students were similar in both times of test execution, reliability was

not obtained) [39], test of morphological decomposition [14, 40] ($\alpha=0.01$), and construct formation task [24] ($\alpha=0.46$). Test validity was found as 0.94.

Procedure

This cross-sectional study was performed in Tehran during 4 months. Dyslexia participants and normal readers (matched with them in age and educational level) were selected by simple sampling method. At the beginning, the consent form was given to the teachers. To select study participants, teacher questionnaires were distributed among the teachers. If lower than 3 questions were marked positive for any student in the teacher questionnaire, the student was considered as a normally developing reader, and upper than 3 positive questions points to a suspected dyslexic student [41].

The reading and MA tests were administered to both groups in the students' houses by the researcher. First, the reading diagnostic NAMA reading test and then MA tasks were administered. The instructions as part of each task sheet were read out loud by the evaluator. Examples were presented to each participant before the test. The tests were executed for each student individually. The scores of correct answers were calculated for each test separately. Administering the tests took about 30 min for the control group and 45 min for dyslexic students. SPSS (23 version) was used for data analyses. At first, for checking the normal distribution of data, 1-sample Kolmogorov-Smirnov test was used. In case of normal distribution of the data, the Pearson correlation and Spearman correlation tests were implemented ($P\leq 0.05$).

3. Results

The present study aimed to study the relationship between morphological awareness and reading in normally developed and dyslexic children at elementary school (third and fourth grade). Pearson and Spearman correlation coefficients showed that there were diversity patterns between morphological awareness and reading tasks. Ten tasks were used for the assessment of morphological awareness and reading separately. We found a few related tasks. The following results are for normally developing children. At third grade, we found a relationship between rhyme and word comprehension tasks with total score of morphological awareness test ($PC=0.63$)**, ($PC=0.70$)** respectively; word reading with construct formation task ($SC=0.46$)*; naming pictures with morphological decomposition ($SC=0.54$)* and relative tasks ($SC=0.56$)*; and finally text comprehension with dynamic morpheme production

(SC=0.57)* and comes from tasks (SC=0.47)*. At fourth grade, the relationship was found between phoneme deletion with total score of morphological awareness test (PC=0.63)**, naming pictures with construct formation (SC=0.62)* and comes from tasks (SC=0.55)*; and rhyme with the sentence analogy task (SC=0.52)*.

The relationships between reading and morphological awareness were different for dyslexic children. At third grade, the relationships were observed between word comprehension and construct formation (PC=0.60)*, dynamic morpheme production (PC=0.78)**, and total score of morphological awareness test (PC=0.67)*, and text comprehension with morphological awareness (PC=0.64)*, construct formation (PC=0.66)*, and total score of morphological awareness test (PC=0.68)*. At fourth grade, the relationship were found between word chain with morpheme identification task (PC=0.78)*, and category signs with morpheme identification task (PC=0.79)* with dynamic morpheme production task (PC=0.86)*.

4. Discussion

The study results confirmed the findings of Spencer et al. (2015) and Berninger et al. (2009). Spencer et al. studied the relationship between word comprehension and morphological awareness [42]. Berninger et al. found that, “comes from” task and “morphological decomposition” task are related to reading [43]. Nunes and Pittas also showed the relationships between the sentence analogy and the morphological relatedness with reading in Greek language [39], but at this study the relationship was just shown for the sentence analogy task. Farsi, like Greek, is a semitransparent language that most sounds are written with one or two letters that is fixed in different context.

Guimarães et al. (2015) found that the relationship between reading and morphological awareness depends on the type of dyslexia in dyslexic children. Phonological dyslexic children outperform on derivational morphemes in morphological awareness test compared to surface dyslexic children. Although these two groups of children perform similar on inflectional morphemes, phonological dyslexic children are unable to decode words by grapheme to phoneme conversion. Therefore, they decode the units larger than phoneme such as words and derivational morphemes [21].

Several studies have shown the relationship between reading and morphological awareness among different languages, such as Hebrew [24], English [11, 14, 42,

44], Greek [39], Chinese [20, 45], Arabic [23], Spanish [22], Brazilian [21], and Farsi [29]. Based on the Frost Model, the morphological awareness influences reading. This model has shown that phonological and semantic factors are both important for converting written form to phonemic output during reading process. Presumably phonological representation plays an important role at early stages of learning to read but children gradually recognize morphemes as the units that construct words. Since morphemes have fixed orthographic forms, children recognize them by analogy between words to recognize them faster [46].

In the present study, we administered 10 tasks from different studies [14, 21, 24, 32-39, 47] to assess morphological awareness and translated the tasks and adopted them based on Farsi language features. For the assessment of reading, we used the only standardized reading test in Iran. The tasks that used for reading assessment were different from the tasks that other studies had used. The main reason for difference between the results of this study and other studies might be because of different tasks that have been used. Other studies have assessed text comprehension [24, 39, 44], reading accuracy [48], and reading speed [11], but Nama reading test does not include these items for assessment.

Written language in Farsi is different from other languages which is another reason for the difference between the results of our study and that of the others. Despite transparent/alphabetic writing systems, Farsi is semitransparent and has specific orthographic rules [49, 50]. There is not one-to-one correspondence between phoneme and grapheme in most written words. The study result showed that children decode morphemes to read words at later stages of learning how to read (third and fourth grade). Ghaemi et al. (2010) also proved no relationship between morphological awareness and reading at early stages of learning to read (first grade) because at this stage they rely on phonological awareness for recognizing written words.

This study has two important limitations. First there is just one standardized reading test in Farsi. There are not enough tasks related to decoding word in text, reading accuracy and speed. Therefore, the relationship between these tasks and morphological awareness was not assessed. Another limitation is related to sample size. It is recommended that the relationship be investigated in larger samples in different elementary grades. It is also suggested that the relationship between MA and several aspects of reading such as speed, accuracy, and comprehension should be considered in future studies.

Results of the current study showed inconsistency between tasks of MA and NAMA dyslexia and reading test in the both dyslexia and normal developing readers groups, that is, some of tasks were correlated with themselves but other tasks didn't show this correlation.

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Conflict of Interest

The authors declared no conflicts of interest.

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