MUTUAL RELATIONSHIP BETWEEN PHONOLOGICAL AWARENESS AND READING ACQUISITION

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Abstract: The following article focuses on the subject of phonological awareness. Phonological awareness is an ability to identify and analyze the sound structure of speech flow and operate the various phones. Awareness of the sound structure of a word is a basic condition for breaking the alphabetical code and for acquisition of written language skills. Recognition of relation between phonological awareness and acquisition of reading and spelling is described as one of the biggest successes of developmental psychology.

Key words: phonological awareness, reading acquisition, the alphabetical principle, phoneme, graphic phonemic conversion, phones, compiling phonology, Analysis, synthesis, meta-linguistic ability, alphabetical code, spelling, rhyming skills

Preface. Phonological awareness has been studied extensively in relation to acquisition of reading and spelling. There is a debate between two groups of researchers regarding the essence of relation and character of reciprocity between phonological awareness and reading. Representatives of the first group claim that phonological skills precede and dictate the extent of success of a child in academic skills. According to supporters of the second approach, phonological awareness awakens as a direct result of learning of reading and spelling. Beyond the academic argument which has a theoretical importance, these approaches have practical implications as well, on ways of teaching, therapeutic involvement, its timing and contents.

Methods that teach the alphabetical principle teach recognition of a single letter and connecting it to a suitable phoneme. The process of mapping letters on phonemes is called “graphic phonemic conversion”. This is not a simple conversion process between a letter and a sound, but rather, letters are mapped on phonemes, which the sounds of speech (phones) are mapped on, as well. The excitement is made by compiling of units

out of the phonemes that are aroused by letters in a graphic-phonemic conversion process. This phonological excitement is called “compiling phonology”. The recognizable phonology is more direct, simple and fast, but as it requires learning of the full orthographic structure and a strong associative relation. It mainly serves skilled readers for identification of common words or words without diacritics, in which the phonological structure is not represented in an injective manner by the orthographic structure. The fact that children read words better than not-words indicates that as early as in the beginning, they make use of recognizable phonology, but as this method requires an early familiarity with the word, this cannot be the only method they use. Therefore, it is likely to assume that children learn how to turn letters into phonemes.

As all phonemes have also sounds, exciting of a word occurs upon completion of the graphic-phonemic process by the articulatory loop. Furthermore, from the first moment children use lexical knowledge for supporting conversion processes. According to the modern approaches, exciting of phonemes and exciting of words in a lexicon occur in parallel and support each other. According to the phonological approach, decoding of script obligates internalization of the alphabetical principle and an ability to operate it in a process of graphic-phonemic conversion. As the amount of attentiveness at the disposal of the cognitive system is limited, and as decoding of scrip and reading comprehension occur in parallel, investing attentiveness in the decoding process detracts from the amount of attentiveness invested in the understanding process. It is particularly difficult while reading sentences or whole sections; attentiveness is then required for identification of relations between words. Therefore, the more excitation of words would require less attentiveness, the better would be reading comprehension. Apparently, it should have been easier to identify script than sound, as letters are separated from one another while sounds are integrated one in the other, but it is quite the opposite. It might be that the reason for this is the interdependency – being of the phonic-phonemic conversion process an automatic one, that does not require directed cognitive activity, makes children unaware of the phonemic structure of a word (for example – children would say that the word “girl” and the word “boy” begin differently and couldn’t recognize that it is the same phoneme). The ability to identify phonetic differences exists from birth, but awareness of it arrives at a later stage and necessitates an explicit learning or meta-

linguistic experience. This awareness of basic units words are comprised of and their phonological structure is called **"phonological awareness"** [1].

Phonological awareness is the awareness of word composition, and the ability to control its parts. The phonological alertness is correlated with several factors; age of the subject, his vocabulary, recognition and comprehension of reading, the language environment of the child.

Phonological analysis of the orthographic structure of a written word is a central process in recognition of written words.

A person uses the phonetic system for purposes of speech, and the phonological system for creation of meanings. In animals, each sound has a meaning, which makes communication into simple but limited. Man's language, on the other hand, cannot be based on vocal units that represent meanings directly, as studies show that distinction between voices performed by one dimension only (for example volume) is limited to about 7 categories, and even if several dimensions are tested together, we reach several dozens of categories only, and this is still less than the number of concepts in a semantic system [1].

Phonological awareness means the ability to address just the tone aspect of the language separately from its semantic/morphemic aspect. Acquisition of phonological awareness is a developmental meta-linguistic process which appears in a very young age [3].

Analysis, synthesis, syllables and phonemes counting in a word, replacement and omitting of phonemes and rhyming are phonological alertness skills. Yet, researchers are not unanimous regarding the location of the best skill for measurement of phonological alertness, as each assignment entails a different linguistic and cognitive requirement.

One can notice in the phonological awareness development, the sub-conscious control phase and later on, conscious control.

As early as in infancy, an ability has been observed in babies to identify the voice of their mother in midst of other voices [5]. The basic voice unit, the phone, does not represent meaning but it is an abstract lingual unit termed phoneme. Combination of phonemes creates a phonological unit, and each unit with a meaning is a word. Thus, with use of just several dozens of voice units, limitless number of concepts can be created. The shortcoming of such a phonological lingual system is forfeiting a direct and simple

representation of meaning, as the relation between a word and a meaning is arbitrary. Thus, learning of words requires attentiveness and effort, and in addition, reception of speech requires decoding of phones out of listening stimulation, the mapping thereof to the phonemes they represent through a process of phone-to-phoneme transition, exciting of phonological units in a lexicon and exciting the related semantic concepts. The reason this process is still a fast and simple one is that phonetic decoding, the phonetic-phonemic translation and also the excitement of phonological units in a lexicon are done through designated mechanisms. The phonetic system operates automatically since the moment of birth and analyses any hearing information in order to detect phonetic information within it. A child stores phonological units in the vocabulary (lexicon) and over time, a relation is created between a phonological unit in the lexicon and a concept in the semantic memory. Thus, meaning is created and the unit turns into a word. According to this perception, words are a sub-department of all the phonological units possible in a language [1].

As he develops, the child preserves and refines the ability to grasp phonetic differences existing in his mother's tongue. This process of discerning sounds, which is acquired in an early age is automatic-functional and does not entail meta-linguistic awareness. Words acquisition begins with the acquisition of distinctive features and with the first acquired words is phonological processing developed.

At the age of about 4, children begin to be able to divide the stream of sounds into syllables [17]. Thus, for example the word "window" will be divided into two syllables "win-dow". The ability to divide a word into separate speech segments is called phonemic awareness, and it appears at later age, around 5 or 6. Then the child is able to divide the word on a phonemic level – for example: "dog" – d-o-g [12], [20], [17].

The later ability of grasping the word as an object composed of separable segments, meaning syllables and phonemes, is defined as "phonemic alertness" which is a field of phonological alertness that is required later as mentioned above [5], [12]. The process of exciting of phonological units that are operated for understanding of a word is automatic, meaning, that a person has no control over it and it operates each time phonetic information reaches the perception space of a person. Therefore, its operation does not require cognitive resources. The mechanism that relates between a phonological unit and

meaning, on the other hand, is one being studied and therefore requires attentiveness. Over time, when the relation is reinforced through frequent exciting of the association between them, less attentiveness is required and the process is almost completely automatic, of the type that is called “controlled but screened”. The meaning is that usually, exciting of a phonological unit would be sufficient enough for operating an associative relation without effort, but in rare or unclear instances, or upon learning of new words, it would not be sufficient and then, attentiveness is requires as well. Understanding of words in a sentence requires much attentiveness, amongst other things, as the phonological structure of a word can change according to the syntax context (which is called “morphic-syntax rule”, for example rule of inflection. Additionally, attentiveness is required for understanding, meaning, the semantic processing, required for many actions such as memory, analysis of meaning of each word, analysis of context between words, etc. These actions require, amongst other things, an effective distribution of attentiveness and a burden on the attentiveness system, through “inner speech” and making it into a phonological-verbal message, and the child retains that information actively, and accessible through memorization. The advantage of such a mechanism is that the cognitive system does not need to invest attentiveness on phonetic decoding and in exciting of phonological units, and thus it is capable to invest all the resources in syntax and semantic processing of the message, which means, its understanding [1].

A.R. Nesdale, M.L. Herriman and W.E. Tunmer [13], also include in phonological awareness the ability to divide a spoken word into separate phonological units which comprise it, do a synthesis of those units and produce a word. This skill has been examined mostly in school age children in structured assignments of sound recognition, omission of syllables and rhyming. It was found higher in the developmental hierarchy and existent in a later phase in most children including Hebrew speaking ones [9].

S. Bentin [1] concludes that phonological awareness is a meta-linguistic ability which comprises many diverse skills that appear in different developmental phases. Thus, the appraisement of phonological awareness level depends upon the examined phonological ability.

Children focus their attention at early stages of acquisition of spoken language, upon contents and ways of using a language rather than upon the sound structure of speech. In

reception of a spoken language, there is no relation to the sequence of sounds that create a word. In the process of lingual development children learn to distinguish in the structural plain as well – sentences are comprised of separate words, words are comprised of syllables and syllable of phones. Combination of several phones while heeding the rules of a language creates a word anew. In order to receive a written word awareness of each phone that comprises it is required. Only after a child has received the sound structure of a word, can he be taught the graphic representations of phones.

The written language is built upon an alphabetical code in which a limited number of letters allows for endless composition of words. Words of a written language are sound compositions constructed according to rules of the alphabetical system. In order to acquire reading, writing and spelling, a child must break the alphabetical code, understand the relation between a graphic symbol and the sound it represents – the graphic-phonemic relation – and deduce from the graphic symbols the sounds that create a spoken word. Such decoding requires various skills: distinction between various graphic stimulations, turning them into sounds according to rules of the alphabetical code, remembering them according to the sequence of their appearance and combining them together into a word that has meaning.

Phonological awareness in general and phonemic alertness in particular in complex mutual relationship is related with the reading ability [1]. This is an important factor in forecasting the reading ability in young readers [16]. Additionally, it was found that practicing phonological awareness assists also the reading comprehension [11]. The argument of precedence of phonological awareness is based on study of rhyming. The idea that rhyming skills are heralds of phonological awareness – which paves the way to written language skills – has arisen by the initiative of P. Bryant and L. Bradley [2], first on the basis of impression and then, according to many studies, they have proven that children exhibit sensitivity and awareness of rhyming words long before the age of school. Three and four year old children are capable of judging when words rhyme and when they begin with the same sound. This proves, according to the researchers, that children exhibit not only sensitivity to sounds but also to the phone units included in a word. Regarding phonological structure, the sounds of a rhyme are positioned intermediately between a syllable and a phone. Alphabetical letters are usually

represented by a single sound – phoneme. A rhyme is a bigger sound unit than a phone, and that is the reason, the researchers admit, awareness of a rhyme is not necessarily awareness of a phoneme. Many studies have been conducted on the subject of importance of rhyming ability and its implications on learning. In one of them, it has been found that nearly all dyslectic children reveal lack of sensitivity of rhyming. Another way, adopted for confirmation of the causal hypothesis, has been in the early training of children in rhyming ability and a several years of following up on their progress in written language skills (reading and spelling) and in arithmetic. 400 children at the ages of four and five have been tested in rhyming skills. Upon their reaching the age of six, one groups of children has received an intensive training for two years in study of rhyming, another group in rhyming and writing of alphabetical letters and a third group received – in similar dosage – a training in perceptual content but not in the category of rhyming. The study has yielded findings that confirm unequivocally the relation between awareness of rhyming and success in acquisition of reading and spelling – but not in arithmetic. The impact of rhyming awareness has been found to be consistent and even has been positioned above variables such as IQ and vocabulary. Another question which has occupied the researchers as to whether the effect of awareness of rhymes upon speed and quality of reception of a written language is direct or does it go through phonological awareness, meaning, indirect. Their studies have led them to the conclusion that both ways are existent. Rhyming creates a foundation for effective functioning in recognition and isolation of phones that guarantees the ability of a child to understand the relation between a letter and a sound. Rhyming awards as well, a unique and independent contribution to acquisition of reading probably in that it helps a child to create spelling categories – sequences of letters, words with similar sounds – both in reading and writing. The question is whether children indeed make an analogy between a rhyme – segments of sounds and between segments of letters, in reading and writing. U. Goswami [6] has found that children indeed recognize the relation between the sound similarity – rhyme – and a segment of spelling – grapheme representation, at the stage of acquisition of reading and spelling and even later. The extent of exposure of a child to an environment that encourages and supplies an abundance of rhyming would determine, to a large extent, his skills in this field. Rhyming is delivered to a child through child songs,

games with an accompanying song or recitation, TV commercials, word games and more. Children have a mastery of an impressive collection of rhymes – which has surprised all the researchers – and they often create, like in, name-calling for instance, rhymes of their own. The findings that awareness is required for learning of reading, emphasize that without such learning, awareness does not develop at all. Nonetheless, studies show that children who have undergone training in a kindergarten, through which they have improved their ability to isolate phonemes within words, have better succeeded in reading over the years. Other studies as well have shown that explicit teaching of phonological awareness, parallel to reading, facilitates the acquisition of reading and speeds it up. In an experiment conducted in Israel, 4 groups of children in kindergarten have been taken with a very low phonological awareness, and taught by various methods. One group has undergone training of isolation of phonemes within words, the second group has undergone same training and in addition has studied the forms of letters but without learning how to read, the third group has studied whole words and played games of improvement of understanding of sentences and the fourth group has not studied anything at all. In tests delivered to those children in middle and end of 1st grade, it has been found that the two first groups managed to read words and non-words (but no effect has been found on learning of letters, meaning no difference between the two groups) while the last two groups have failed [1].

The different perception of phonological awareness in general and in rhyming in particular, claims, as mentioned earlier, that phonological awareness, awakens following the learning of reading and not before that. Experiencing in learning of reading, arouses phonological awareness and it, its turn, enhances the progress in reading. Followers of this approach accept the fact that children have many rhyming skills prior to the advent of reading, but a rhyme is a larger unit than a phone, and therefore its perception is not related to the foundation of reading skills. According to the phonological approach, a child must learn the rules of mapping between groups of letters and groups of phonemes in order to decode a script, and in order to do so he needs to first be familiar with the two groups and understand what is different and what is the same. Studies that have examined the relation between phonological awareness and reading have found a high positive correlation between awareness of success in reading tests and between prediction of such

a success. Such a prediction implies that phonological awareness precedes reading ability, but the causality cannot be concluded out of the correlation. Indeed, studies of illiterate adults have revealed the same phenomena as in children, while illiterate adults who have undergone literacy courses for adults have succeeded. These data testify to the fact that development of phonological awareness is not a spontaneous maturation process but rather is an outcome of exposure to the alphabetical principle. A reinforcement of this argument lies in the fact that children who have studied reading of whole words succeed less in tests of phonological awareness, same as children who study logographic script. A study in Israel has further reinforced the argument, and showed that transition from a kindergarten to 1st and 2nd grade affect 4 times more than an increase in age, and the second half of 1st grade is the key factor of development of phonological awareness. The conclusion is that being exposed to system of alphabetic script, children internalize the alphabetical principle, and by this they become aware as well of the phonemic structure of a spoken language, meaning – learning of reading arouses the awareness of phonological structure of words [1].

According to J. Morias [12], in the first phase the child uses phonemic awareness in order to study the grapheme-phonemic relation, at first as an injective relation of grapheme to phoneme and later on acquires the more complex grapheme-phoneme relations that change according to different contexts. The more the reader practices the more automatically he learns to apply the grapheme-phonemic rules, and the phonemic awareness turns into sub-conscious. But this influence of phonemic awareness on reading acquisition is as mentioned before, a reciprocal influence, meaning, the phonemic awareness does not develop spontaneously without the acquisition of reading fundamentals and mainly the alphabet [1].

Researchers A.R. Nesdale, M.L. Herriman and W.E. Tunmer [13], conclude that by knowing the phonemic units of the spoken word, a child is capable, when encounters a written word, to map it upon a spoken word. Most children require a formal study in order to acquire skills related to phonemic awareness, but children who arrive in schools with some phonological awareness will acquire reading much easier [21]. J.A. Norris [14] also claims that this acquired phonemic awareness is considered an important pre-reading skill, which constitutes an index of forecasting future success in reading

acquisition. Phonological awareness in a kindergarten age is one of the most prominent and important factors of literary development [4].

R. Hummer, S. Bentin and S. Kahn [9] have examined the development of phonological awareness and the phoneme alertness in Hebrew speaking children. In their research, the effects of age were compared to the effect of reading acquisition on these skills, and it was found that the school experience of formal learning to read is the main factor in phonemic awareness development, meaning the recognition of separate phonemes in speech. S. Bentin [1], states that for most children the exposure to the alphabet and reading acquisition evokes recognition of the phonemic structure of words, nonetheless, there are children to whom this exposure is not enough, and who might have difficulties in reading acquisition due to improper phonemic awareness. Those children require phonological training – especially in phonemic recognition.

Most children with language impairment, have problems in using the phonetic channel on levels of functioning of: awareness, recognition and decoding of words, encoding, storing of lingual information, use of codes in work memory, extraction of lingual information and its execution.

According to K.E. Stanovich [18] reading impairment is caused by absence of phonological sensitivity which causes difficulties in recognition of sound-letter context and thus the inability of decoding of written material. Stanovich has proven in his studies the importance of components of phonological awareness – in assignments such as omitting of phones, recognition of missing sound, similar sound and more – for reading skills. K.E. Stanovich [18] emphasizes the importance of phonological awareness in the process of learning of reading. Not all components of phonological awareness develop in the process of maturation and therefore children – prior to their entering of the study framework – are to be instilled with these very important skills, and if this is not done, children who are skilled in the field of phonological awareness would advance faster in reading and the rest would lag behind. To his opinion, phonological awareness precedes the development of reading but it is also an outcome of experience in reading.

An important index for evaluation of phonemic awareness is the recognition of opening and closing sounds of the word. U. Goswami and P. Bryant [8], and also U. Goswami [7], term this sounds as critical phonological units for young children in the beginning of

reading and spelling process. Good phonemic skills make it easier on the beginner reader to acquire the alphabet, but the ability to divide a word into its phonological compartments such as the recognition of the opening and closing sound is a higher skill in the meta-phonological hierarchy and apparently is developed in conjunction with reading acquisition and gaining command over reading [10]. R. Rosenbaum [15], in the process of his seminaries have examined phonologic skill in the "Heder" (Jewish religious pre-school) pupils in kindergarten age of 5-6. In the "Heder' the children learn how to read by the phonetic method of teaching. A significant advantage was found in those children in recognition of rhyming words or opening sound, but not in the closing sound and in the omission of first and last phoneme assignment.

This is additional field in which home and kindergarten can contribute to children in their literacy development and in encouragement of phonological awareness. Various actions done with language, not for a purpose of immediate communication, but those that analyze and observe sounds, in words and sentences are termed meta-linguistic actions. The better is lingual awareness of children, the more would reading assignment facilitate them later on. Kindergarten teachers, can play with children games that develop the awareness of vocabulary, grammar and even rules of discourse. For example, different children in a group can describe an object with different words while using adjectives or other sentence structures. Children can offer another word to a given word, such as “sky” – “heaven”, additionally they can describe emotions with words, such as: “happy”, “glad”, “enjoying”, “feel good”.

One of most important meta-linguistic fields in literacy development is the field of phonological awareness (meta-phonology). Phonological awareness is the ability to distinguish between the complex sounds that comprise words. This is an important ability for development of reading that, as is well known, is based on the relation between the sounds of words (phonemes) and their graphic representations (graphemes). Many studies indicate that children with good phonological awareness at the age of kindergarten manage to read easily in 1st and 2nd grades of Primary school [19]

When children with deficient phonological awareness – regular children with normal abilities – enter a study framework, they have difficulties in understanding the alphabetic principle and delay in breaking the symbol-sound code. As a result, they are exposed to a

small amount of reading, and all this implies – flawed vocabulary, poor syntax knowledge and poor worldly knowledge.

A specific problem in phonological awareness might develop into a serious failure in instilling of reading**. The separation into sounds** as opposed to division of a word into syllables which is a rather easy task for kindergarten children, separation of a word to the basic components – phones – is a complex action which is not acquired in a spontaneous process. Children with reading difficulties lack the phonological skills required in the critical stage of acquisition of a lingual task. She has found that children who have not managed to pass the alphabetic barrier reveal impairment in ability to separate words into phones, in naming and short-term verbal memory. In studies which have examined the importance of training of children in production of sounds towards their training for reading, it has been found that those trained in this skill have reached higher achievements in reading than children who have not undergone a similar training. Thus, practice and mediation of a kindergarten teacher and of parents for phonological awareness can promote a literate child. At the disposal of a kindergarten teacher, there are diverse ways to enrich the phonological awareness of children at the ages of 3 to 6. They use various games that deal in separation of sounds or combining them and also, in recognition of sounds of a language. For example, children are asked to divide their first name into syllables while clapping hands according to the number of syllables, or they are asked to find private names in their group that begin with a certain sound. Another example for the activity is separation of familiar words into their syllables, or finding a words that is a combination of syllables. The kindergarten can read songs with rhymes, and even encourage children to invent new rhymes. There are children writers that often use catchy rhymes, like E. Hilel, D. Ben-Dor, E. Sidon and many others. Reading of songs that include rhymes and games of sounds encourage children to pay attention to the sound structure of a language they use. It appears that although finding show that without reading there is not spontaneous development of awareness of single phonemes that words are comprised of, and the opposite is correct as well – without phonological ability reading is not acquired at all. How can these reciprocal relationships can be explained? It might be that the phonological awareness is not a single ability but a combination of different abilities, such as operation of single phonemes and awareness of super-

phonemic units (such as syllables). Studies have shown that for example, children can identify an opening unit – the consonant or consonants that precede a vowel in a syllable, for example "s" in the beginning of the word "sitting" and recognition of a closing unit, for example "n" in the word "balloon" which are super-phonemic units, even prior to their capability of handling single phonemes.

In conclusion. the assumption is that awareness of such super-phonemic units develops as a result of rhyming games, children's songs and various lingual games that take place in a kindergarten, while awareness of single phonemes requires study and exposure to the alphabetical letters. It might be that super-phonemic awareness is a necessary condition for proper development of phonemic awareness. Children who do not experience enough in lingual games or who have slow development of the lingual cognitive mechanism, arrive to school without a stable phonological foundation, and therefore would have difficulties in internalizing the alphabetical principle. Additionally, it might be that exposure to script would not be enough for development of sufficient phonemic awareness. There is a concern that due to this difficulty a cumulative lagging would be created in them, and they would develop a negative attitude to reading and would not succeed in various assignments. This difficulty can be prevented by a direct teaching of the phonemic structure of a spoken language, prior to learning of reading or parallel to it [1].

Bibliography

1. Bentin S. Phonological awareness, reading, and reading acquisition, A survey and appraisal of current knowledge. Advances in psychology, In: Frost R., Katz L. (Eds.). Orthography Phonology, Morphology, and Meaning. Amsterdam, W. Holland. 1992, 94, pp. 193-210.
2. Bradley, L., Bryant, P. Rhyme and reason in reading and spelling. Ann Arbor, University of Michigan Press, 1985, 125 p.
3. Elli, A. W. Reading, Writing and Dyslexia, A Cognitive Analysis, Hillsdale, N. J. Erlbaum, 1984, pp. 1-35.
4. Falach R. The Effect of Educational E-book Activity on Emergent Literacy of Kindergarten Children at Risk of Study Impairment, As Compared to Mutual Reading from a Printed Book. Bar-Ilan University, 2008, pp. 7-8.
5. Gombert, J.E. Metalinguistic development. University of Chicago Press, 1992, 238 p.

6. Goswami U. Children's use of analogy in learning to spell. British Journal of Developmental Psychology, 1988, 6.1, pp. 21-33.
7. Goswami U. Phonological and lexical processes, 2000. In Pearson P, D., et al. Handbook of Reading Research. Longman Inc, 1560 Broadway, New York, NY 10036, Mahwah, NJ, Erlbaum, 1984, pp. 151-267.
8. Goswami U., Bryant P. Phonological skills and learning to read. London, Lawrence Erlbaum, 1990, 32, pp. 1173-1176.
9. Hammer R., Bentin S., Kahan S. The Effects of Learning How to Read in the First Grade on the Development of Phonologic Awareness of Children. Orientations, H.D, 1992, pp. 442-455.
10. Hodson B.W. Helping individuals become intelligible, literate, and articulate, The role of phonology. Topics in Language Disorders, 1994, 14.2, pp. 1-16.
11. Levi-Shimon S. The Effects of Thinking Abilities, Phonologic Awareness and Morphologic Awareness upon Reading Abilities of First Grade Children. Master's thesis, Bar-Ilan University, Ramat-Gan, 2006, pp 9-13.
12. Morais J. Metaphonological abilities and literacy. Dyslexia, Integrating theory and practice. Whurr Pub. London and New Jersey, 1991, pp. 93-107.
13. Nesdale A.R., Herriman M.L., Tunmer W.E. Phonological awareness in children. In: Metalinguistic awareness in children. Springer Berlin Heidelberg, 1984, pp. 56-72 .
14. Norris J.A. From frog to prince, Using written language as a context for language learning. Topics in Language Disorders, 1991, 12.1, pp. 66-81.
15. Rosenbaum R. The Effects of Early Reading on Phonological Alertness. Seminary paper, Communication Disorders Faculty, Tel-Aviv University, 1990, 140 p.
16. Shif R., Adi Yafe A. Teaching of Reading and Writing. From Research to Practice in Pre-school Education, Jerusalem, National Science Academy publication, 2008, pp. 119-151.
17. Snoling M. Dyslexia a Perspective for Developmental Concept of Reading Comprehension and the Ability to Spell. From English, Amos Lewin, Goma, Cherikover Publication, Tel-Aviv, 1992, 141 p.
18. Stanovich K.E. Matthew effects in reading, Some consequences of individual differences in the acquisition of literacy. Reading research quarterly, 1986, pp. 360-407.
19. Tubul G. Phonological Awareness Exam as a Prediction Tool for Acquisition of Reading. Master's thesis, Department of Communication Disorders, Tel-Aviv University, 1993, 40 p.
20. Tunmer W.E., Nesdale A.R. Phonemic segmentation skill and beginning reading. Journal of Educational Psychology, 1985, 77.4, pp. 417-427.
21. Van Kleeck A., Schuele C.M. Precursors to literacy, Normal development. Topics in Language Disorders, 1987, 7.2, pp. 13-31.