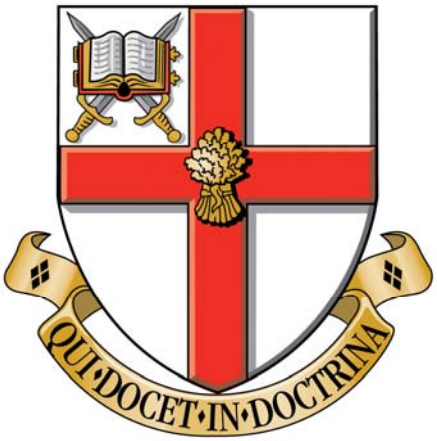

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Onset and phoneme awareness and its relationship to letter knowledge in German-speaking preschool children

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Abstract

Objectives: The aim was to explore whether word initial onset awareness is acquired before phoneme awareness and whether onset complexity influences performance on identification tasks. In addition, the relationship between onset and phoneme awareness and letter knowledge was investigated.

Method: In this study 22 monolingual German-speaking preschool children aged 5;00 – 5;11 were tested. Onset, phoneme identification, and letter knowledge tasks were administered. The children were presented with pictures of word pairs. Both words in each pair shared a single consonant onset, a two consonant onset cluster or the first consonant of a consonant cluster. The children were asked to pronounce the shared sound(s). Additionally, they were asked to name all 26 upper-case letters.

Results: Onset awareness tasks were significantly easier to complete than phoneme awareness tasks. However, no influence of onset complexity on onset awareness performance was found. Moreover, letter knowledge correlated with all phonological awareness tasks.

Conclusions: The results corroborate that phoneme awareness develops already at preschool age irrespective of explicit literacy tuition. Nevertheless, letter knowledge is closely related and should be linked to onset/phoneme awareness tasks.

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INTRODUCTION

An important aspect of spoken and written language therapy is phonological awareness (PA), i.e. the ability to reflect on and manipulate a word's sound structure independent of its meaning [1]. There are a variety of diagnostic tools and intervention materials, in clinical and educational settings alike, which aim to test and facilitate aspects of PA. Generally, the tasks presented either focus on syllables, onset-rhymes or phonemes. In order to precisely explore PA skills and to select appropriate intervention material, a strict control of these three linguistic units is important.

Onset structure in German

In English and German the onset of a syllable can comprise a maximum of three consonants (e.g. in English <string>, /strɪŋ/ or in German <Sprung>, /ʃprʊŋ/, i.e. <jump>). However, the onset can also be omitted (e.g. in English <egg>, /ɛg/ or in German <Eis>, /ais/, i.e. <ice cream>). Alternatively, the onset can comprise one or two consonants (e.g. in English <ball>, /bɔːl/ or <blood>, /blʌd/ or in German <Fuß>, /fuːs/, i.e. <foot>, or <Blatt>, /blat/, i.e. <leaf>).

Onset and phoneme awareness development

Previous studies provided evidence that syllable awareness develops first, followed by onset-rhyme, and phoneme awareness [e.g., 2, 3]. This developmental progression could be confirmed for German-speaking children [e.g., 4, 5]. There is consensus that preschool children can already successfully complete syllable- and onset-rhyme tasks [3, 6]. However, it is still debated whether phoneme awareness can be acquired in the absence of formal literacy instruction [7-9]. Carroll [10] found in her study of 56 pre-literate 4-year olds that no child successfully completed any of the phoneme awareness tasks unless they knew at least one letter [see also 9].

However, other studies have shown that children are able to complete phoneme tasks before they start school. For example, in a study by Hulme and colleagues [7] 16 monolingual English- and 24 monolingual Czech-speaking children (mean age 4;11 and 6;00 respectively) were tested. They were able to successfully complete a phoneme isolation task despite their lack of letter knowledge. For German-speaking children there is also evidence that different phoneme tasks can already be mastered by a considerable number of children before they enter school and are formally taught reading and writing [5]. In a longitudinal study on phonological awareness development, Schaefer and colleagues showed that a sound identification task which required 95 children to name the onsets of words was successfully completed by 80% of all children at the age of 5;00 – 5;11.

Onset complexity and differentiation of linguistic units

Word onset-identification tasks are chosen frequently to assess children's phoneme awareness [e.g., 2, 3, 6, 11, 12]. When designing such a task it is important to control

onset complexity and to differentiate between different linguistic units (i.e. the onset as a consonant cluster vs. individual phonemes of an onset cluster).

When comparing different levels of onset complexity, it can be hypothesised that children perform better on items with single consonants, as these are easier to identify and produce in comparison to consonant clusters. In contrast, one might argue that consonant clusters provide more phonological information which might facilitate identification [13]. In order to explore whether the number of consonants in onset position has a crucial impact on test performance, tasks should include pairs of words in which both words share either a single consonant onset (e.g. <Kuh> /kuː/ (cow) – <Kamm> /kam/ (comb)) or a two consonant onset cluster sharing both consonants (<Fliege> /ˈfliːgə/ (fly) – <Flöte> /ˈfløːtə/ (flute)). If the number of consonants has an impact on onset-identification by providing more phonological information, item pairs with consonant clusters should be easier to identify compared to words with a single consonant onset.

In order to differentiate different linguistic units and to explore whether children find it easier to complete onset-identification tasks in comparison to phoneme-identification, a third category of word pairs needs to be included. In this category items share the first consonant of a two consonant cluster (e.g. <Blatt> /blat/ (leaf) – <Brot> /broːt/ (bread)). In order to identify and pronounce the shared sound, children must break up the onset (i.e. identify /b/ and /l/ in <Blatt> and /b/ and /r/ in <Brot> and name [b] as the shared first sound). Such an operation requires phoneme awareness and, according to the assumed order of acquisition, this should be a harder task to complete.

A key study with English-speaking children showed that the linguistic unit rather than the number of consonants plays a significant role. Treiman and Zukowski [13] showed in a study with 28 monolingual English-speaking children (15 boys, 13 girls) aged between 4;04 – 5;09 and 31 children (17 boys and 14 girls) aged 5;04 – 7;02 that both groups performed better when they had to identify words only starting with one consonant (e.g. pacts – peel) in comparison to words starting with different consonant clusters (e.g. plan – prow). In a study with 32 Spanish-speaking children aged between 4;06 – 6;04 Jiménez Gonzáles und Haro García [14] found comparable results. Hence, both studies contributed to the assumption that it is not the onset complexity but the linguistic unit targeted that plays an important role in completing alliteration tasks. The current study aimed to explore whether this relationship could be found in German-speaking preschool children as well.

Letter knowledge

Letter knowledge (LK) is one important early literacy skill. It is assumed that LK development starts during preschool and that it does not evolve without explicit instruction. LK varies considerably [15] and is highly influenced by environmental factors, e.g. by the exposure to books [e.g., 16, 17]. It has been proven to be a

significant predictor of PA development [18-21]. Burgess and Lonigan [22] assessed PA and LK in four- to five-year old preschool children. Their data suggested a relationship between LK and PA. Multiple regression analyses showed that both factors significantly predicted each other [see also 23, 24]. As argued by Johnston, Anderson & Holligan [25] learning letters allows a child to gain insight into the segmental structure of a word. In their study they tested 51 children (aged 4;0 to 5;2 years) and found that phoneme awareness did not develop before the children also showed alphabetic knowledge. Bowey [26], for example, assessed the relationship between PA and LK in 96 preschool children (mean age 5;3 years). Children with high LK showed significantly better PA skills than children with intermediate or low LK on all phoneme tasks. No differences were found for the onset-rhyme tasks, which suggested a specific relationship between LK and phoneme awareness tasks. Moreover, Carroll [10] found in her study of 56 pre-literate children that no child successfully completed any of the phoneme tasks unless they knew at least one letter. Although the link between PA and LK has often been addressed in earlier research, we still do not fully understand the nature of this relationship [9].

An investigation of LK can contribute to the discussion about possible factors which facilitate PA and the question to which extend LK should be included in PA training and intervention.

The following research questions were addressed:

1. Does word onset complexity influence performance on sound-identification tasks?
2. Can preschool children complete sound-identification tasks on the word onset level more successfully in comparison to sound-identification tasks on the phoneme level?
3. Is there a relationship between onset and phoneme awareness and letter knowledge in German-speaking preschool children?

METHODS

Participants

Children were selected on the basis of the following selection criteria:

- German as their first language
- No history of speech and language difficulties
- No significant hearing loss
- No learning difficulties or noticeable medical or neurological problems
- No previous systematic literacy or letter instruction at nursery

Consent from the parents/carers was obtained for twelve girls and ten boys aged 5;00 – 5;10 (mean age 5;04). Participants from different regional locations (rural

versus urban) were recruited from nurseries in different catchment areas of Hamburg and Schleswig-Holstein (North of Germany).

Material

Prior to testing, the pictures included in the tasks summarised below were shown to the children to ensure that they knew the words and identified the pictures correctly. Subsequently, the children were introduced to the task: it was explained that they would be shown two pictures at a time and that they would be asked to pronounce the shared sound(s) ("What sound do these two pictures have in common at the beginning of the word?").

Onset and phoneme identification task

The design and administration was based on the *Sound-identification-output* task which is one of eleven subtests of a German PA test battery [27]. This subtest comprises all three categories; i.e. word pairs sharing either a single consonant (C_1), a two consonant cluster (C_1C_2), or the first consonant of a two consonant cluster ($\underline{C}_1C_2$). Since the original subtest only includes four test items (i.e. word pairs) per category, additional test items were added. For the current study each subcategory included nine test items, all supported by pictures. Children started with the single onset condition, followed by the two shared consonant clusters, and the two consonant clusters sharing the first consonant. All test items were balanced regarding their phonetic makeup, i.e. including sounds from all manner of articulation categories such as plosives, nasals, fricatives, and approximants (see Table 1 for an overview of test items). Each response was scored as correct (1) or incorrect (0). Non-responses were also scored as incorrect (0). In the second category items were scored as correct when children either identified the first sound or the consonant cluster of the word pair (i.e. [f] or [fl] in /ˈfliːgə/ and /ˈfløːtə/). All test items were pre-recorded and played back during the session to ensure consistent test administration [28].

C	C_1C_2	$\underline{C}_1C_2$
/bʊs/ – /bal/	/ˈʃlʏsl̩/ – /ˈʃlaŋə/	/flɛk/ – /frɔʃ/
/ˈlampə/ – /ˈlaitɐ/	/ˈtrɛpə/ – /ˈtrɔml̩/	/ˈʃnaːbl̩/ – /ˈʃlaŋə/
/kuː/ – /kam/	/ˈfløːtə/ – /ˈfluːk͡tsɔyk/	/knɔ͡pf/ – /klaun/
/vaːl/ – /vʊrst/	/krais/ – /krɔy͡ts/	/graːs/ – /ˈglɔkə/
/fuːs/ – /fɪʃ/	/blat/ – /bluːt/	/bl͡ɪts/ – /broːt/
/ˈnaːzə/ – /ˈnuːdl̩/	/glaːs/ – /ˈglɔkə/	/klait/ – /ˈkroːnə/
/ˈtɛlɐ/ – /ˈteːləfoːn/	/klaun/ – /klait/	/ˈʃnɛkə/ – /ʃtɔk/
/rɔk – /reː/	/broːt/ – /ˈbrɪlə/	/ˈbluːmə/ – /ˈbrɪlə/
/ˈdoːzə/ – /dax/	/ˈfliːgə/ - /ˈflaʃə/	/blat/ – /briːf/

Table 1: Test items for the all onset and phoneme identification subcategories. Note, the phonemic transcriptions follow the conventions outlined in [28].

Letter knowledge

Each child was presented with all 26 upper-case letters in a randomised order. The examiner encouraged the children to name them, even if they did not feel confident that they knew the correct name or sound. Both letter names and letter sounds were accepted as correct responses.

Procedure

Only nurseries that had given their written consent were included in the study and only children were tested for whom consent had been granted by their parents. The assessments were carried out in a quiet room within the nursery. Parents or another carer were allowed to attend the test sessions which lasted approximately 30 minutes. All sessions were scored online and audio recorded for later checking.

RESULTS

Nonparametric independent group comparisons between boys and girls were carried out (Mann-Whitney-U tests, based on raw scores). Gender differences were small and statistically not significant (all *p*s >.05). Internal consistency (using Cronbach's Alpha) was computed as a measure of reliability, exploring the relationship between individual items and the remaining group of items. Internal consistency was very satisfactory for the test (value of .94). The different Cronbach's Alpha scores for the three subcategories were as follows: C_1-items (.856), C_1C_2-items (.932), and $\underline{C}_1C_2$ items (.782)

The first research question aimed to explore whether word onset complexity influences performance on sound-identification tasks. The descriptive results for the individual subtasks are summarised in Table 2.

Variable	Mean (SD)	Median	Range
Onset with single consonant (C_1)	5.14 (2.98)	5	0 – 9
Onset cluster sharing both consonants (C_1C_2)	5.50 (3.76)	7	0 – 9
Onset cluster sharing first consonant ($\underline{C}_1C_2$)	3.32 (2.32)	4	0 – 9
Overall score (all 3 subcategories)	13.91 (8.20)	16	0 – 27
Letter knowledge	8.91 (7.55)	7	0 – 24

Table 2: Descriptive statistics for all onset and phoneme identification subcategories.

For the C_1-items (i.e. word pairs with single consonants) and the C_1C_2-items (i.e. word pairs with 2 shared consonants), the mean score was comparable, indicating a similar level of difficulty. To explore task difficulty across all three categories, non-parametric analyses were computed, based on the raw scores of all three subtests. Friedman's tests showed significant differences [X^2 (2) = 13.12, p < .001]. Hence,

Wilcoxon tests were used to explore pairwise relationships between different subtasks. The difference between the C_1- and C_1C_2-condition was not significant [z = -0.516, p = .636, r = -.078].

The second research question explored whether preschool children could complete sound-identification tasks on onset level more successfully in comparison to sound-identification tasks on phoneme level. Descriptive results exhibited the lowest mean score for the $\underline{C_1}C_2$-items (i.e. word pairs with 1 shared consonant). Wilcoxon tests showed significant group differences between $\underline{C_1}C_2$-items and C-items [z = -3.098, p < .001, r = -.467] and $\underline{C_1}C_2$-items and C_1C_2-items [z = -2.848, p < .005, r = -.429]. Bonferroni corrections for the significance criterion were used to control for the Type I error rate (p-value required for significance was .025). The reported group differences remained statistically significant suggesting better performance on the onset awareness tasks in comparison to the phoneme awareness subtest.

The third research question addressed the relationship between onset and phoneme awareness and LK. Nonparametric correlations were computed, using Spearman's ρ. The correlation between the C items and LK was strong and statistically significant [r_S = .693, p < .001], and so was the correlation between the C_1C_2 items and LK [r_S = .693, p < .001]. The data also showed a strong correlation between $\underline{C_1}C_2$ items and LK which was statistically significant [r_S = .602, p < .005]. Figure 1 shows the individual differences in the LK and the overall onset identification scores. The distribution of the individual data along the linear regression line suggests a strong relationship between these scores.

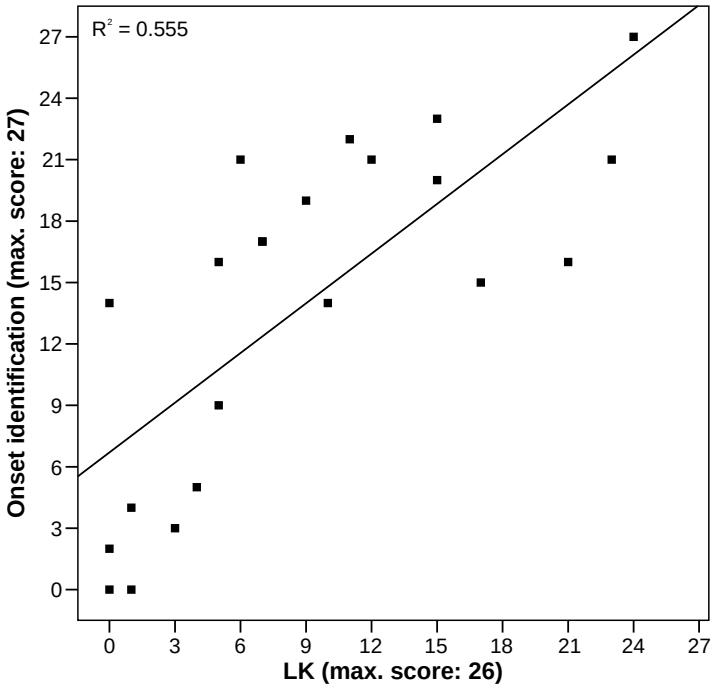

Figure 1: Scatterplot depicting the individual differences and the correlation between the Onset identification (across all tasks) and Letter Knowledge scores.

Because of the small sample size and study design causal relationships could not be explored. In order to investigate whether children with no LK scored worse on the PA tasks, the group was divided. Children were defined as having no LK if they knew three letters or fewer. Based on this criterion 6 children (3 boys and 3 girls) were defined as children with no LK and 16 children (9 girls, 7 boys) showed some LK.

A score of nine was defined as minimum performance, because this would suggest that children showed some understanding of the metaphonological operation in the tasks. Nine items represent 33% of the total score, allowing a firmer assumption that the child had some understanding of the subtask. Cross-tabulations were computed (including Fisher's Exact Test) which showed that children with no LK scored significantly poorer on the PA tasks than children with some LK [$p < .001$].

DISCUSSION

The current study aimed to explore 1) whether word onset complexity has an impact on onset awareness, 2) whether preschool children score higher on sound-identification tasks requiring onset awareness in comparison to phoneme awareness, and 3) whether LK is related to PA.

The results revealed that word onset complexity did not impact on children's task performance. Two consonant clusters (sharing both consonants in the onset of word pairs) were as easily identified as single consonants. This suggests that once children have acquired onset awareness, i.e. have learnt the function of this linguistic unit, they are also able to process more complex onsets. The added phonological information of the second consonant does not seem to improve onset identification [13].

Regarding research question two, children showed better performance on onset awareness items in comparison to items testing phoneme awareness. The results support the assumed developmental order from onset-rhyme to phoneme awareness. Moreover, they are in line with Treiman & Zukowski [13] and Jiménez Gonzáles & Haro García [14], revealing cross-linguistic similarities of languages which show similar onset structures. The data also support the notion of language-independent developmental trajectories and linguistic competencies. In contrast to findings from English-speaking children, which suggest that phoneme awareness does not develop in the absence of formal literacy instruction [9, 25], on group level the participants of this study were able to complete items on phoneme level.

The last aspect addressed in this study showed that LK and PA were correlated. Strong and significant correlations were found for all subtests and the scatterplot for all test items combined showed a strong relationship between PA and LK, which supports earlier research [21, 29]. Cross-tabulations confirmed that children with some LK have an advantage in completing PA tasks which is in line with findings

from other studies [e.g., 30]. LK supports children in breaking down the auditory input into abstract segments and enables them to establish sound categories and segmental phonological representations which in turn allow metaphonological manipulation on a fine-grained level [31]. Hence, it is not surprising that children with LK showed significantly better PA.

In sum, the presented findings support the assumption that it is the level of the linguistic unit (here: onset versus phoneme level) and not the onset complexity that impact PA performance. Phoneme tasks can be successfully completed before formal schooling starts. However, LK seems to be linked to PA performance. Clinical implications include that C_1- and C_1C_2-items can be used concurrently to train PA skills. Onset awareness should be practiced in PA intervention or training before phoneme awareness. The link between PA and LK suggests that it may be beneficial to include letters when training PA skills. This warrants further exploration in an intervention study.

REFERENCES

1. Stackhouse J, Wells B: Children's Speech and Literacy Difficulties 1: A Psycholinguistic Framework. 1997, London, Whurr Publishers.
2. Lonigan CJ, Burgess SR, Anthony JL, Barker TA: Development of phonological sensitivity in 2- to 5-year-old children. J of Educ Psychol 1998; 90(2): 294-311.
3. Carroll JM, Snowling MJ, Hulme C, Stevenson J: The development of phonological awareness in preschool children. Dev Psychol 2003; 39(5): 913-923.
4. Schaefer B, Fricke S, Szczerbinski M, Fox AV, Stackhouse J, Wells B: Development of a test battery for assessing phonological awareness in German-speaking children. Clin Linguist & Phon, 2009; 23(6): 404-30.
5. Schaefer B., Stackhouse J, Well B: The development of phonological awareness in German-speaking preschool children: A longitudinal study. in preparation.
6. Burt L, Holm H, Dodd B: Phonological awareness skills of 4-year-old British children: An assessment and developmental data. Int J Lang Commun Disord 1999; 34(3): 311-335.
7. Hulme C, Caravolas M, Malkova M, Birgstocke S: Phoneme isolation ability is not simply a consequence of letter-sound knowledge. Cognition 2005; 97(1): B1-B11.
8. Ziegler JC, Goswami U: Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. Psychol Bull 2005; 131(1): 3-29.
9. Castles A, Coltheart M: Is there a causal link from phonological awareness to success in learning to read? Cognition 2004; 91(1): 77-111.
10. Carroll JM: Letter knowledge precipitates phoneme segmentation, but not phoneme invariance. J Res Read 2004; 27(3): 212-225.
11. Chen X, Ku Y-M, Koyama E, Anderson R, Li W: Development of phonological awareness in bilingual Chinese children. J Psycholinguist Res 2008; 37(6): 405-418.
12. Rvachew S: Phonological processing and reading in children with speech sound disorders. Am J Speech Lang Pathol 2007; 16(3): 260-270.
13. Treiman R, Zukowski A: Children´s sensitivity to syllables, onsets, rimes, and phonemes. J Exp Child Psychol 1996; 61: 193-215.
14. Jimenez Gonzalez JE, Haro Garcia CR: Effects of word linguistic properties on phonological awareness in Spanish children. J of Educ Psychol 1995; 87(2): 193-201.
15. McBride-Chang C.: What is phonological awareness? J of Educ Psychol 1995; 87(2): 179-192.

16. Levy BA, Gong Z, Hessels S, Evans MA, Jared D: Understanding print: Early reading development and the contributions of home literacy experiences. J Exp Child Psychol 2006; 93(1): 63-93.
17. Senechal M, LeFevre JA, Daley KE: Differential effects of home literacy experiences on the development of oral and written language. Read Res Quart 1998; 33(1): 96-116.
18. Savage R, Blair R, Rvachew S: Rimes are not necessarily favored by prereaders: Evidence from meta- and epilinguistic phonological tasks. J Exp Child Psychol, 2006; 94(3): 183-205.
19. Hogan TP, Catts HW, Little T: The relationship between phonological awareness and reading: Implications for the assessment of phonological awareness. Lang Speech Hear Serv Sch 2005; 36(4): 285-295.
20. Wagner RK, Torgesen JK, Rashotte CA, Hecht SA, Barker TA, Burgess SR, Donahue J, Garon, T: Changing relations between phonological processing abilities and word level reading as children develop from beginning to skilled readers: A 5-year longitudinal study. Dev Psychol 1997; 33(3): 468-479.
21. Blair R, Savage R: Name writing but not environmental print recognition is related to letter-sound knowledge and phonological awareness in pre-readers. Read and Writ 2006; 19(9): 991-1016.
22. Burgess S, Lonigan CF: Bidirectional relations of phonological sensitivity and prereading abilities: Evidence from a preschool sample. J Exp Child Psychol 1998; 70(2): 117-141.
23. Foy JG, Mann V: Changes in letter sound knowledge are associated with development of phonological awareness in pre-school children. J Res Read 2006; 29(2): 143-161.
24. Mann VA, Foy JG: Phonological awareness, speech development, and letter knowledge in preschool children. Ann Dyslexia 2003; 53: 149-173.
25. Johnston RS, Anderson M, Holligan C: Knowledge of the alphabet and explicit awareness of phonemes in pre-readers: The nature of the relationship. Read and Writ 1996; 8(3): 217-234.
26. Bowey JA: Phonological sensitivity in novice readers and nonreaders. J Exp Child Psychol 1994; 58(1): 134-159.
27. Fricke S, Schäfer B: Test für Phonologische Bewusstheitsfähigkeiten (TPB), ed 2, revised. Idstein, Schulz Kirchner Verlag, 2011.
28. Mangold M.: DUDEN - Das Aussprachewörterbuch, Mannheim, Dudenverlag, 2005.
29. Foy JG, Mann VA: Effects of onset density in preschool children: Implications for development of phonological awareness and phonological representation. Appl Psycholinguist 2009; 30(02): 339-361.
30. Schneider W, Näslund JC: The early prediction of reading and spelling: Evidence from the Munich Longitudinal Study on Genesis of Individual Competencies; Leong CK, Joshi RM (eds): Cross-language Studies of Learning to Read and Spell. Amsterdam, Klüwer Academic Publishers, 1997, 139-159.
31. Treiman R, Zukowski A: Levels of phonological awareness; Brady S, Shankweiler DP (eds): Phonological Processes in Literacy: A Tribute to Isabelle Y. Liberman. Hillsdale NY, Lawrence Erlbaum Associates, 1991, 55-64.