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Comparison of lexical-semantic processing in children with developmental language disorder and typically developing peers

Summary

Recent studies indicate that lexical and semantic deficits in children with developmental language disorder (DLD) are not caused only by reduced vocabulary and retrieval difficulties but also by sparse lexical-semantic network and deficits in semantic organization. This paper investigates qualitative differences in the lexical processing between children with DLD and typically developing peers, as well as developmental trends in the lexical-semantic processing in preschool and early school-age children with DLD. The sample consisted of 115 participants (5–8 yr.), 60 children with DLD and 55 typically developing (TD) children. The sample was also divided in two age groups, preschool (5 and 6 yr.) and school-aged groups (7 and 8 yr.). Word association task was used for the assessment of lexical-semantic processing. The responses were coded either as mature associations (paradigmatic and syntagmatic), immature associations (phonological, unrelated and echolalic) or omissions. The results show that DLD children have significantly less mature associations and more immature associations. Also, the performance of children with DLD was significantly poorer at early school age compared to their TD peers. Sparse lexical-semantic network and deficits of semantic organization in DLD children are caused by poor semantic fields and semantic categories, as well as difficulties in the activation of lexicon. However, developmental trends analysis showed that DLD children, although significantly delayed in lexical processing, have similar developmental pattern like TD children.

Key words: developmental language disorder, lexical-semantic processing, developmental trend

1. INTRODUCTION

1.1. Lexical-semantic deficits in children with developmental language disorder

Delays in early word acquisition are one of the first symptoms of lexical-semantic deficits in children with developmental language disorder (DLD) (La Paro, Justice, Skibbe, & Pianta, 2004; Rice, Taylor, & Zubrick, 2008). Some authors consider this to be the key symptom of delay in the speech and language development in children who are later diagnosed with DLD (Bishop, 2014; Watkins, Kelly, Harbers, & Hollis, 1995). Studies have repeatedly shown that DLD children have significant deficits in lexical semantics. These children have been reported to have reduced receptive and expressive vocabularies compared to their typically developing peers (Gray, Plante, Vance, & Henrichsen, 1999; Vuković, I., & Vuković, M., 2007), as well as word finding difficulties in naming tasks and during spontaneous speech (Messer & Dockrell, 2006). Furthermore, novel words learning studies indicate that children with DLD have poorer performance than age-matched controls (Gray, 2005; Nash & Donaldson, 2005). However, naming deficits in children with DLD are not only due to difficulties with long-term lexical memory retrieval, but these children also have underdeveloped semantic representations and deficits in lexical-semantic organization and processing (Dockrell, Messer, George, & Ralli, 2003; McGregor & Apel, 2002; Sheng & McGregor 2010).

In terms of lexical processing abilities, a developmental delay in children with DLD is well documented, where lexical processing can be adequate to child's vocabulary but not to the child's age (Pizzioli & Schelstraete, 2011). In addition, children with DLD give significantly poorer word definitions compared to typically developing peers (McGregor, Newman, Reilly, & Capone, 2002), and generally demonstrate significantly lower conceptual knowledge of words (Alt, M., Meyers, & Alt, P., 2013). Word association studies also gave insight into sparse semantic representations in DLD children. Sheng and McGregor (2010) found that more immature types of word associations are linked to poor lexical-semantic organization in children with DLD. In this study, DLD children also provided less semantic responses and more errors comparing to both, age-matched and vocabulary matched children. These data showed that children with DLD had deficits in lexical processing that exceeded their overall vocabulary delays. In addition, the results of some studies showed that deficits in lexical processing continued through school-age period in children with DLD (Mainela-Arnold, Evans, & Coady, 2010).

1.2. Lexical-semantic network

The term "lexical-semantic network" refers to a theoretical concept which includes person's vocabulary, the way words are stored in semantic memory and how they are organized, as well as processes that allow access to semantic memory (Collins & Loftus, 1975). According to Spreading-activation theory described by Collins and Loftus, the semantic system consists of conceptual nodes. The conceptual nodes that share semantic information are connected to each other, therefore, the activation of one node triggers the activation of whole network of semantically connected nodes. For example, the word *leg* may readily activate words such as *arm*, *head*, *shoulder*, *leg* or other, all of which belong to the same semantic category as *leg*. Words that share some semantic features with *leg*, such as *shoes*, *walk*, *kick*, can also be activated. Which word will be activated by stimulation of conceptual node depends on the strength of activation. Growing number of semantic features provides wider and more stable activation of the lexical-semantic network (Patterson, Nestor, & Rogers, 2007). Accordingly, poor lexical concepts (small number of semantic information) and poor semantic categories (small number of words in semantic category) can lead to weaker activation of lexical-semantic network.

In term of evaluation lexical-semantic knowledge, lexicon is often described in the context of "breadth" and "depth." Although it is difficult to isolate the assessment of these two lexicon dimensions (Vermeer, 2001), lexicon "breadth" is often measured by the number of words that a person has, for example, with confrontational naming tasks (picture naming) (McGregor et al., 2012). On the other hand, the lexicon "depth" is more difficult to evaluate, and is usually assessed with word definitions, lexical ambiguity resolution, synonyms or word associations tasks (Boucher, Bigham, Mayes, & Muskett, 2008; McGregor et al., 2012; Norbury, 2005). Thus, these types of tasks measure richness with which a given word is represented and how words are organized among each other in one's lexicon (McGregor et al., 2012).

1.3. Current study

Guided by semantic network model (Collins & Loftus, 1975), the current study is set to investigate qualitative differences in the lexical processing between children with DLD and typically developing peers. Preschool and early school period is characterized by dynamic development of lexical skills. Furthermore, in this short period of time a child has to master a high number of skills necessary for acquiring the curriculum. Thus, linguistic deficits in DLD children can increase during this

period of development. Accordingly, the aim of this study was to investigate the developmental trends in the lexical-semantic processing in preschool and early school children with DLD.

Relating to linguistic profile of DLD children, there is debate among researchers whether DLD is a disorder which is manifesting as delayed versus deviant development of language abilities. Although the unusual linguistic patterns are sometimes seen in children with DLD, specifically in area of phonological and morphosyntactic abilities, it is shown that the observed "deviant" patterns are not typical for these children (Leonard, 2000). Regarding this delay – deviance dichotomy, we also wanted to investigate whether children with DLD, aged five to eight, show any atypical pattern in the development of lexical-semantic abilities. Further, immature association types were neither investigated nor explained in detail in previous studies. Studies in this research field were mostly focused on mature type of associations (paradigmatic and syntagmatic) in a context of semantic abilities (Sheng & McGregor, 2010), but also in a context of syntactic abilities (McGregor et al., 2012). Considering that, we also wanted to investigate the hierarchy of immature types of associations in DLD children compared to TD children to gain full insight of developmental pattern.

2. METHODS

2.1. Participants

The sample consisted of 115 participants aged between five to eight years comprised in two groups: a group of children with DLD and a group of typically developing (TD) children. The children with DLD were recruited from the local speech and language therapy services in Belgrade, Serbia. The control children were recruited from local preschools and schools in Belgrade as well.

The DLD group included 60 children aged between 58 and 100 months, mean age 73 months. There were 38 boys and 22 girls in this group. *Wechsler intelligence scale for children revised* that has been normed on the Serbian population (Biro, 1997) was administered to all children. Inclusion criterion was IQ above 85. All 60 children were diagnosed with expressive type of DLD. Type of speech and language disorders was diagnosed by qualified speech and language therapist who administered the following series of test tasks: 1. Global articulation test (Kostić & Vladisavljević, 1983) (below 75% of age expected performance); 2. Phoneme discrimination test (Kostić,

Vladisavljević, & Popović, 1983) (below 75% of age expected performance); 3. Children's grammar (Vladisavljević, 1983a) (below 50% of age expected performance); 4. Semantic test (Vladisavljević, 1983b) (below 50% of age expected performance) and 5. Understanding and comprehension of speech test (Vladisavljević, 1997) (min 75% of age expected performance). The assessment tasks 1 to 5 are not standardized.

The control group included 55 TD children aged between 60 and 100 months, mean age 73 months. There were 27 boys and 28 girls. All 55 children passed preschool speech and language screening in referential institutions in Belgrade. TD group was age matched to DLD group and there were no statistically significant differences between the two groups regarding age ($F_{(1)} = 0.665$; $p = 0.416$), sex ($\chi^2_{(1)} = 2.369$; $p = 0.124$) and mother's education ($\chi^2_{(1)} = 0.81$; $p = 0,783$).

Furthermore, the sample was divided into two age sub-groups: 1. preschool children (5 and 6 yr.) including 33 DLD and 25 TD children; 2. School-aged children (7 and 8 yr.) including 27 DLD and 30 TD children.

2.2. Materials

Word association task (WAT) was used to examine the lexical processing skills in children. For the purposes of this study we took 80 words from Kent-Rosanof list (Kent & Rosanoff, 1910) and added 10 verbs. The final list of words consisted of 90 items (50 nouns, 14 verbs and 26 adjectives). All words selected were early acquired, highly imaginable, of course depending on the word class, with either high or medium frequency, according to *Children's frequency dictionary* (Lukić, 1983).

Association responses were coded into six categories: paradigmatic, syntagmatic, phonological, unrelated, echolalic and omissions (no response). *Paradigmatic* responses were those that had a clear semantic relation to a stimulus word, for example, synonyms, antonyms, hypernyms or words from same semantic category. *Syntagmatic* responses were those that had a clear sequential connection with the stimulus words (book – reading) or words derived from stimulus word. *Phonological* responses were those words that are phonologically similar but bare no semantic relation to the stimulus word, for example, *crn – trn* (black – thorn). *Unrelated* responses were those that show neither one of above mentioned relationship with the stimulus word. *Echolalic* responses were repetitions of the stimulus word.

Code reliability. To check for reliability of coding, a second coder independently coded 20% of samples from each group, not familiar to the identity of the children.

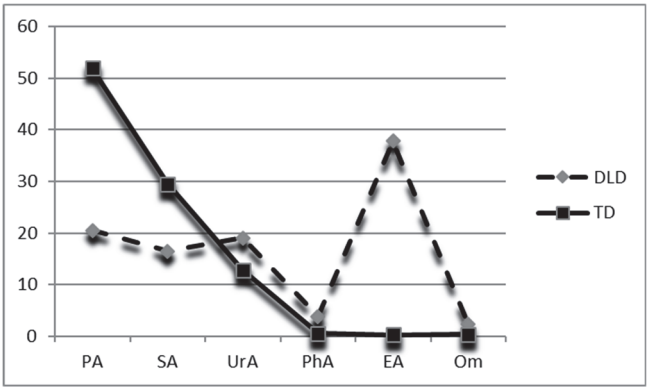
Point-to-point agreement averaged 93%. The remaining responses were coded by the author after the agreement was established.

Statistical analysis. Chi-square test and analysis of variance (ANOVA) were used for comparing two groups of children on age, sex and mother's education. Differences between two groups regarding their lexical processing skills were investigated using an ANOVA. When the assumption of homogeneity of variances has been violated, Welch ANOVA was used. Furthermore, Pearson's correlations were used in order to examine the correlation pattern of associations in the two groups of children. Two-way ANOVA was used to investigate the developmental trends in lexical processing in the two groups.

3. RESULTS

3.1. Mature and immature associations in DLD and TD children

The distribution of WAT answers is shown in Figure 1.



Legend / Legenda: DLD – developmental language disorder / razvojni jezični poremećaj; TD – typically developing children / djeca urednog razvoja; PA – paradigmatic associations / paradigmatske asocijacije; SA – syntagmatic associations / sintagmatske asocijacije; UrA – unrelated associations / nepovezane asocijacije; PhA – phonological associations / fonološke asocijacije; EA – echolalic responses / eholalije; Om – omissions / omisije

Figure 1. Associations in DLD and TD children
Slika 1. Asocijacije kod djece s razvojnim jezičnim poremećajem i djece urednog razvoja

Regarding the between groups differences in number of mature associations (paradigmatic and syntagmatic), children with DLD showed significantly poorer performance compared to their TD peers. On the other hand, children with DLD produced significantly more echolalic responses. Also, DLD children did not give any response to a stimulus word significantly more. Children with DLD and TD children did not differ significantly regarding the number of unrelated and phonological responses (Table 1).

Table 1. ANOVA test for comparison of two groups regarding WAT responses
Tablica 1. ANOVA test usporedbe dviju skupina na Testu asocijacija riječi

		Mean / Aritmetička sredina	SD	*F*	*p*
Paradigmatic / Paradigmatski	DLD	20.518	23.295	65.229	**0.000**
	TD	51.940	18.305		
Syntagmatic / Sintagmatski	DLD	16.482	15.491	20.236	**0.000**
	TD	29.516	15.554		
Unrelated / Nepovezani	DLD	19.055	19.986	0.323	0.571
	TD	17.292	12.779		
Phonological / Fonološki	DLD	3.814	14.643	2.981	0.089
	TD	0.545	0.824		
Echolalic / Eholalije	DLD	37.833	44.721	42.238	**0.000**
	TD	0.303	0.918		
Omission / Omisije	DLD	2.277	4.924	7.685	**0.007**
	TD	0.404	1.702		

Statistically significant differences are bolded. / Statistički značajne razlike su podebljane.

3.2. Intercorrelations of WAT responses in DLD and TD children

Correlation analyses were run separately for the two groups. The results were different for the groups. In the TD group the results for unrelated and syntagmatic associations seem to be significantly opposite to the most mature, paradigmatic associations (Table 2). This means that the participants who had more paradigmatic responses also had fewer syntagmatic responses, as well as fewer unrelated associations. Further, the TD children who had less phonological associations also had less echolalic responses and children who had fewer omissions also gave less echolalic responses.

Table 2. Correlations between associations types in the TD group
Tablica 2. Korelacije između vrsta asocijacija kod djece urednog razvoja

		Omission / Omisije	Echolalic / Eholalije	Phonological / Fonološki	Unrelated / Nepovezani	Syntagmatic / Sintagmatski
Paradigmatic /	*r*	-0.145	-0.136	-0.023	-0.525	-0.720
Paradigmatski	*p*	0.290	0.321	0.868	**0.000****	**0.000****
Syntagmatic /	*r*	-0.012	0.068	0.058	-0.193	
Sintagmatski	*p*	0.929	0.622	0.672	0.159	
Unrelated /	*r*	0.032	-0.075	-0.183		
Nepovezani	*p*	0.814	0.587	0.182		
Phonological /	*r*	0.263	0.623			
Fonološki	*p*	0.052	**0.000****			
Echolalic /	*r*	0.563				
Eholalije	*p*	**0.000****				

** $p < 0.01$; * $p < 0.05$

Table 3. Correlations between associations in the DLD group
Tablica 3. Korelacije između vrsta asocijacija kod djece s razvojnim jezičnim poremećajem

		Omission / Omisije	Echolalic / Eholalije	Phonological / Fonološki	Unrelated / Nepovezani	Syntagmatic / Sintagmatski
Paradigmatic /	*r*	0.189	-0.691	-0.136	0.128	0.396
Paradigmatski	*p*	0.148	**0.000****	0.301	0.330	**0.002****
Syntagmatic /	*r*	0.123	-0.717	-0.100	0.411	
Sintagmatski	*p*	0.350	**0.000****	0.448	**0.001****	
Unrelated /	*r*	0.198	-0.661	-0.051		
Nepovezani	*p*	0.128	**0.000****	0.701		
Phonological /	*r*	-0.080	-0.191			
Fonološki	*p*	0.541	0.145			
Echolalic /	*r*	-0.313				
Eholalije	*p*	**0.015****				

** $p < 0.01$; * $p < 0.05$

Correlation analysis indicates a different pattern of associations in DLD children (Table 3). The results for the echolalic responses show opposite values to the most mature ones – the paradigmatic associations, and they have reached statistical significance. The correlation is negative and very high. The same type of correlation was found between syntagmatic and echolalic responses as well. This means that the DLD children who had more paradigmatic and syntagmatic associations had fewer echolalic responses. Furthermore, the positive correlation was observed between syntagmatic and unrelated responses. Unlike the results from the control group, there was no significant correlation between paradigmatic and syntagmatic associations in the DLD group.

Correlation analysis between immature types of associations (phonological, unrelated, omissions and echolalic) showed a high negative correlation between unrelated and echolalic responses, as well as a moderate negative correlation between the echolalic responses and omissions. These results indicate that DLD children who had more unrelated associations and more omissions had significantly less echolalic responses.

3.3. Developmental trend of association skills in DLD and TD children

Further analysis was performed in order to compare the developmental trends of associations in two groups. Using two-way ANOVA, the interaction of language status and age was not determined regarding the number of the paradigmatic associations ($F_{(1;111)} = 0.674$; $p = 0.414$). This means that the number of paradigmatic associations increases with age and the increase was statistically significant in both groups (DLD: Welch $F_{(1;39.870)} = 11.309$, $p = 0.002$; TD: $F_{(1;111)} = 8.550$, $p = 0.005$). A similar pattern was also observed regarding the number of syntagmatic associations ($F_{(1;111)} = 0.816$; $p = 0.368$). The number of syntagmatic responses also increase with age in both groups, but in this case it was not statistically significant in any group (DLD: $F_{(1;111)} = 2.666$, $p = 0.108$; TD: $F_{(1;111)} = 0.084$, $p = 0.773$).

In the case of unrelated associations interaction of language status and age was present ($F_{(1;111)} = 10.004$; $p = 0.002$) (Figure 2). In children with DLD, the number of unrelated responses increases with age and in TD children decreases. Developmental changes that were observed in children with DLD are not statistically significant ($F_{(1;111)} = 1.407$; $p = 0.240$), in contrast to those that were detected in TD children ($F_{(1;111)} = 19.523$; $p \leq 0.000$).

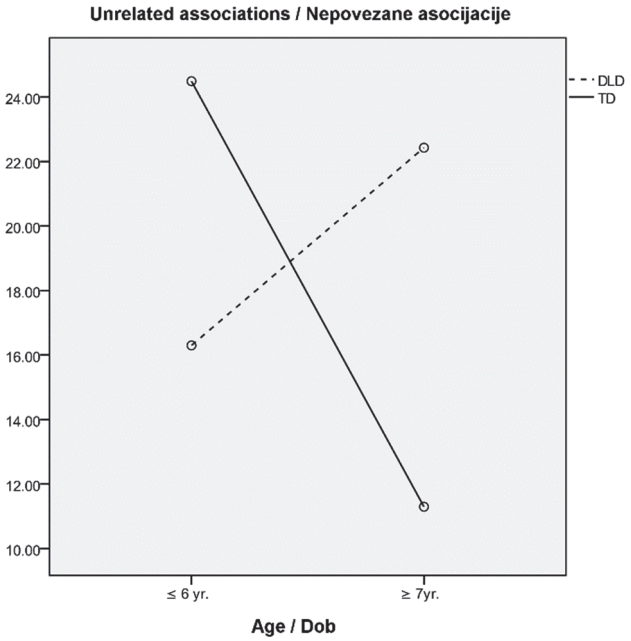


Figure 2. Unrelated associations – age related changes in DLD and TD children
Slika 2. Nepovezane asocijacije – dobne promjene kod djece s razvojnim jezičnim poremećajem i djece tipičnog razvoja

Regarding phonological associations, the interaction of language status and age was not determined ($F_{(1;111)} = 2.461$; $p = 0.120$). However, the analysis of mean values indicated a different pattern in both groups. In DLD group the number of phonological responses increased with age (mean = 1.18; SD = 2.22 vs. mean = 7.04; SD = 21.47), while in TD group decreased (mean = 0.71; SD = 1.01 vs. mean = 0.41; SD = 0.62). Nevertheless, the observed differences were not statistically significant (DLD: Welch $F_{(1;\ 26.456)} = 1.994$, $p = 0.170$; TD: Welch $F_{(1;\ 38.270)} = 1.728$, $p = 0.197$. Similar pattern was also observed regarding omissions ($F_{(1;111)} = 1.833$; $p = 0.179$). Like in a case of phonological associations, the number of omissions decreased with age in TD children (mean = 0.84; SD = 2.47 *vs.* mean = 0.04; SD = 0.20) while that number increased in DLD children (mean = 1.78; SD = 3.78 *vs.* mean = 2.88; SD = 6.06). However, this developmental trend was not statistically significant (TD: Welch $F_{(1;24.270)} = 2.656$, $p = 0.116$; DLD: Welch $F_{(1;41.715)} = 0.670$, $p = 0.418$).

Regarding echolalic responses, the interaction of language status and age was determined ($F_{(1;\ 111)} = 12.317$; $p = 0.001$) (Figure 3). The number of echolalic

responses in TD children, regardless of age, was very small, and was reduced to almost insignificant level (mean = 0.58, SD = 1.29 vs. mean = 0.07, SD = 0.28; Welch $F_{(1;\ 25.921)} = 3.678$; $p = 0.066$) at school-age. On the other hand, age-related differences in the number of echolalic responses were much more evident in DLD children. The number of echolalic responses significantly dropped at school age (mean = 55.42, SD = 45.30 vs. mean = 16.34, SD = 33.77; Welch $F_{(1;\ 57.555)} = 14.629$; $p \leq 0.000$).

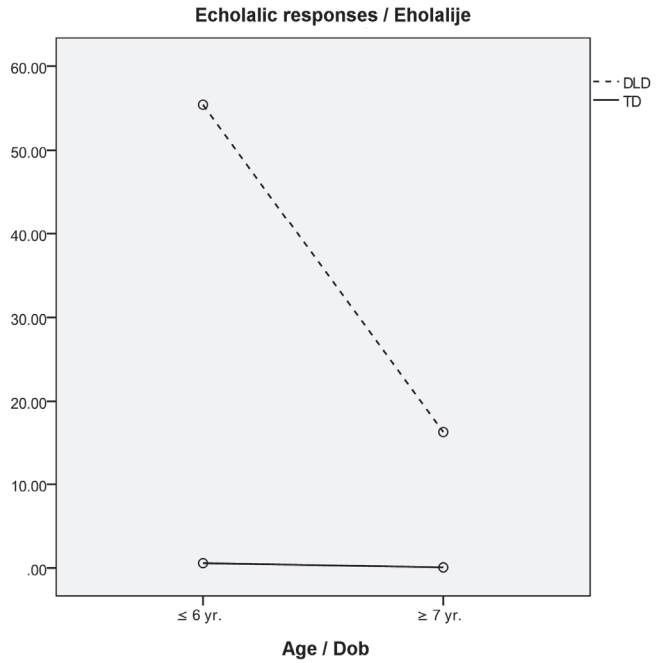


Figure 3. Echolalic responses – age related changes in DLD and TD children
Slika 3. Eholalije – dobne promjene kod djece s razvojnim jezičnim poremećajem i djece urednog razvoja

4. DISCUSSION

4.1. Lexical-semantic processing in DLD and TD children

Comparing DLD children and their TD peers, significant differences in the number of paradigmatic, syntagmatic and echolalic associations were observed. Children with DLD had significantly fewer paradigmatic and syntagmatic associations and significantly more echolalic responses and omissions. These results indicate a deficit

in the lexical-semantic processing in children with DLD. According to Spreading-activation theory (Collins & Loftus, 1975), stimulus word activates whole network of semantically connected words. Which association will be activated depends on the access to the lexicon and semantic richness of particular conceptual field (semantic features and connotative meanings), as well as on the strength of semantic network (number of links connecting conceptual nodes). Paradigmatic associations indicate semantically rich conceptual fields, as well as strong links within semantic network. On the other hand, the repetition of the stimulus word (echolalic responses), depending on the age, may indicate a deficit in the lexical and semantic processing, or deficits in access to the lexicon.

These findings confirmed that children with DLD have deficits in lexical-semantic organization. Furthermore, our results are consistent with the existing studies demonstrating deficits in semantic learning (Alt & Plante, 2006; Alt, Plante, & Creusere, 2004; Gray, 2005; Nash & Donaldson, 2005) and deficits in semantic prosessing (Dockrell et al., 2003; McGregor & Appel, 2002; McGregor et al., 2012; McGregor et al., 2002).

Sheng and McGregor (2010) also used word association task (specifically *repeated word association task*) in order to compare lexical-semantic processing in DLD children with typically developing children who were matched to the DLD group on chronological age and typically developing children who were matched to the DLD group on expressive vocabulary. The results of this study also showed that children with DLD had significantly fewer semantic association, as well as significantly more immature associations (phonological and other error responses), comparing to their typically developing peers. Similarly, children with DLD had significantly poorer performance comparing to expressive vocabulary matched TD children. Based on these findings, the authors concluded that children with DLD have deficits in lexical-semantic processing that exceeds vocabulary deficits in these children.

The correlations analysis indicated different patterns of associations in DLD children and TD peers. While typically developing children shifting from sintagmatic to paradigmatic association (significant negative correlation of paradigmatic and syntagmatic responses), children with DLD are still shifting between immature types of associations (significant negative correlation between unrelated and echolalic responses, as well as between omissions and echolalic responses). Namely, it is possible that echolalic responses represent the most immature type of associations because the child is unable to access the lexical-semantic system, or to process a stimulus word in

any other way, so it only repeats the word (Cronin, 2002). Although there is no detailed analysis of immature types of associations in previous studies, the echolalic responses were usually classified as the last and most infrequent type of errors in children with DLD (McGregor et al., 2012; Sheng & McGregor, 2010). Further, the qualitative analysis of individual samples of DLD children in our study showed that a large number of unrelated associations were related to improper use of grammatical morphemes with stimulus word (e.g. negative prefixes + stimulus word – *tvrd*/*netvrd*). It is possible that children learned certain morphosyntactic rules but still lack in proper use, so when they are not able to semantically process the stimulus word they apply these learned rules and make an inadequate compound words. In the case where a child made an adequate compound word, which exists in lexical corpus of Serbian language (e.g. *miran*/*nemiran*), it was considered as a mature type of association. On the other hand, if a child gave an answer consisting of negative prefixes + real word, making a compound word which does not exist in lexical corpus of Serbian language, like in the case of *netvrd*, that was considered the immature type of association (real antonym of *tvrd* is *mekan*). This type of unrelated associations can indicate not only deficits in lexical processing, but also morpho-syntactic deficits. Also, a large number of unrelated associations can occur because a child does not have stimulus word in his/her vocabulary. As a result, the child can name an object in the surrounding or randomly selected word (Sheng & McGregor, 2010). Therefore, it is possible that in the hierarchy of associations, unrelated responses, although belonging to the immature type of associations, are more mature responses than echolalic ones.

Regarding omissions, it is possible that a child cannot access the lexical-semantic network or does not have the stimulus word in vocabulary. We considered omissions as more mature compared to echolalic responses. Observed negative correlation between omissions and echolalic responses in children with DLD, partially confirmed this. Also, in DLD children, omissions positively correlated with more mature types of associations, such as paradigmatic and syntagmatic, although correlations were not statistically significant. In DLD lexical processing studies we did not find same associations coding as one used in our study, however, Gewirth, Shindler, and Hier (1984) used similar coding in a study of semantic processing of people with aphasia and dementia. Results of their study showed that echolalic responses are the most frequent in people with Wernicke's aphasia while omissions were most frequent in people with Broca's aphasia. Moreover, patients with Broca's aphasia had significantly more paradigmatic associations comparing to patients with Wernicke's aphasia.

Whereas Wernicke's aphasia is characterized by severe deficits in semantic organization, while people with Broca's aphasia have more difficulties in accessing lexicon than in semantic organization (Vuković, 2011), we can assume that echolalic responses indicate more severe deficit of semantic processing.

4.2. Developmental trend of association skills in DLD and TD children

Comparing the development trend in DLD and TD children, some differences were noted. Regarding the most mature type of associations, the paradigmatic ones (McGregor et al., 2012), they increase significantly in both school-age groups. Also, the increase of syntagmatic associations was also noted in both groups although it was not statistically significant one. In the case of immature associations, some slightly different trends were observed. TD children showed decrease of immature associations related to age, but only unrelated associations have reached statistical significance. On the other hand, in DLD children the number of immature associations (phonological, unrelated, and omissions) slightly increased but did not reach statistical significance. However, the number of echolalic responses significantly decreases with age in DLD group. Still, school-age children with DLD had significantly less mature types of associations and more immature ones comparing to their TD peers.

These results indicate that children with DLD have significant difficulties in lexical-semantic processing even at early school age. These children do improve significantly with age but the delay in semantic organization skills is still considerable. While early school period is characterized by syntagmatic – paradigmatic shift (Cronin, 2002), children with DLD are still at a level of immature associations shift. This indicates that school-age children with DLD have poor lexical concepts and weak activation of the lexical-semantic network.

These findings are consistent with previous studies demonstrating lexical-semantic deficits in school-age children with DLD (Mainela-Arnold et al., 2010; Marinellie & Johnson, 2002).

Comparing the developmental changes in DLD and TD children, aged from five to eight, we can say that children with DLD have very immature organization of lexical-semantic network. However, these children follow a similar developmental trend as typically developing children. Other studies have showed that, regarding lexical-semantic abilities, children with DLD do not exhibit a significantly different developmental pattern comparing to typically developing peers (Alt et al., 2004; Gray, 2005; Marinellie & Johnson, 2002; McGregor et al., 2012).

5. CONCLUSION

The results of our study showed that children with DLD have deficit in the organization and development of the lexical-semantic network. Deficits are manifesting as sparse semantic fields, pure semantic categories, as well as difficulties in lexicon activation. However, children with DLD follow a similar developmental pattern as typically developed children, although they have significant deficits in the lexical-semantic processing at early school period.

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APPENDIX / PRILOG

List of chosen words for Word Association Task / Popis izabranih riječi za zadatak povezivanja riječi

1. tepih / carpet
2. mračan / dark
3. muzika / music
4. bolest / illness
5. muškarac / man
6. dubok / deep
7. mek / soft
8. jelo / meal
9. plakati / to cry
10. kuća / house
11. crn / black
12. ruka / arm
13. kratak / short
14. voće / fruit
15. leptir / butterfly
16. stolica / chair
17. sladak / sweet
18. žena / woman
19. hladan / cold
20. želeti / to want
21. reka / river
22. beo / white
23. lep / pretty
24. prozor / window
25. seći / to cut
26. stopalo / foot
27. pauk / spider
28. igla / needle
29. crven / red
30. spavati / to sleep
31. devojčica / girl
32. visok / tall
33. rad / work
34. kiseo / sour
35. zemlja / land
36. vojnik / soldier
37. sedeti / to sit
38. tvrd / hard
39. orao / eagle
40. stomak / belly
41. stabljika / stem
42. sanjati / to dream
43. žut / yellow
44. hleb / bread
45. dečak / boy
46. svetlost / light
47. ovca / sheep
48. kupanje / bathing
49. koliba / cottage
50. smejati / to laugh
51. plav / blue
52. gladan / hungry
53. glava / head
54. šporet / kitchen range
55. dugačak / long
56. dete / child
57. gorak / bitter
58. pevati / to sing
59. žedan / thirsty
60. grad / city
61. kvadrat / square
62. puter / butter
63. lekar / doctor
64. glasan / loud
65. čitati / to read
66. lav /lion
67. krevet / bed
68. težak / heavy
69. duvan / tobacco
70. beba / baby
71. ljubiti / to kiss
72. makaze / scissors
73. miran / calm
74. zelen / green
75. so / salt
76. ulica / street
77. kralj / king
78. sir / cheese
79. cvetati / to blossom
80. uplašen / frightened
81. leteti / to fly
82. mesec / moon
83. lopov / thief
84. guliti / to peel
85. brdo / hill
86. brz / fast
87. kupus / cabbage
88. čekić / hammer
89. grub / rough
90. hodati / to walk

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Usporedba leksičko-semantičkog procesiranja djece s razvojnim jezičnim poremećajem i vršnjaka urednog razvoja

Sažetak

Novija istraživanja pokazuju da leksički i semantički deficit kod djece s razvojnim jezičnim poremećajem (engl. *developmental language disorder*, DLD) nije rezultat samo smanjenog vokabulara i poteškoća u prizivu, već je uzrokovan siromašnijom leksičko-semantičkom mrežom te lošijom semantičkom organizacijom. U ovom se radu istražuju kvalitativne razlike u leksičkom procesiranju između djece s DLD-om i vršnjaka urednog razvoja te razvojni trendovi u leksičko-semantičkom procesiranju kod predškolaca i djece rane školske dobi. U istraživanju je sudjelovalo 115 ispitanika u dobi od pet do osam godina, od kojih je 60 ispitanika bilo s DLD-om, dok je 55 pripadalo kontrolnoj skupini urednog razvoja (TD). Grupiranje uzorka prema dobi također obuhvaća dvije skupine; predškolci (u dobi od pet i šest godina) i školarci (sedam i osam godina). Za ispitivanje leksičko-semantičkog procesiranja korišten je zadatak povezivanja riječi. Odgovori su kodirani u tri kategorije: razvijene asocijacije (paradigmatske i sintagmatske), nerazvijene asocijacije (fonološke, nepovezane i eholalija) te omisija. Rezultati pokazuju da djeca s DLD-om imaju statistički značajno manje razvijenih asocijacija, a više nerazvijenih. Također, rezultati djece s DLD-om u ranoj školskoj dobi značajno su niži u usporedbi s vršnjacima urednog razvoja. Siromašna leksičko-semantička mreža i deficit u semantičkoj organizaciji kod djece s DLD-om uzrokovani su siromašnijim semantičkim poljima i kategorijama, jednako kao i poteškoćama tijekom aktivacije leksikona. Ipak, analiza razvojnih trendova pokazuje da djeca s DLD-om unatoč značajnom kašnjenju u leksičkom procesiranju pokazuju jednake razvojne obrasce kao i djeca urednog razvoja.

Ključne riječi: razvojni jezični poremećaj, leksičko-semantičko procesiranje, razvojni trend