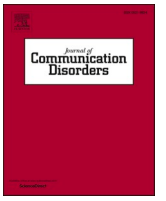
Journal of Communication Disorders 88 (2020) 106049

Contents lists available at ScienceDirect

Journal of Communication Disorders

journal homepage: www.elsevier.com/locate/jcomdis



# Can children with DLD acquire a second language in a foreign-language classroom? Effects of age and cross-language relationships

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ARTICLE INFO

*Keywords:*
Developmental language disorder
English as a foreign language
Age effects
Cross-language transfer

ABSTRACT

There is a growing pressure to teach foreign languages as early as possible, and children with Developmental Language Disorder (DLD) are not immune from these pressures. However, current scholarship lacks crucial insights into how children with DLD respond to L2 learning with minimal (classroom) exposure. In this paper, we report the results of a longitudinal study tracing the development of L1 Russian and English as a Foreign Language (EFL) skills in a group of learners with DLD (age of EFL onset: 7;9–12;1). The performance of the DLD group was compared to that of typically-developing controls, matched for classroom EFL exposure. Proficiency in English and Russian was measured three times (after one, one-and-a-half and two years of EFL instruction). At Time 1, there were no significant differences between groups on the EFL measures, but the performance of the typically-developing children significantly improved with time, and that of the DLD group did not. In the DLD group, age of EFL onset was positively related to English receptive vocabulary size. The relation between L1 and L2 proficiency in the DLD group was weaker than in the comparison group. This pattern is probably due to the floor performance of the DLD group in the grammatical domain, but may also indicate that the disorder affects cross-language transfer in the vulnerable domains.

## 1. Introduction

Children around the globe are increasingly exposed to foreign languages (FLs), usually English as a Foreign Language (EFL), at a young age. The world-wide tendency towards inclusive education and early onset of EFL instruction inevitably affects children with learning disabilities, including pupils with Developmental Language Disorder (DLD). DLD, formerly known as Specific Language Impairment (SLI), is one of the most common learning disabilities, affecting 7–8% of children (Bishop, 2010). Children with SLI/DLD have language deficits in the absence of hearing, intellectual or emotional impairments (Leonard, 2014). A more recent definition of the disorder, the one we adhere to in the present research, includes children whose non-verbal IQ "is neither impaired enough to justify a diagnosis of intellectual disability nor good enough to be discrepant with overall language level" (Bishop, 2017: 679; Bishop, Snowling, Thompson, Greenhalgh, & CATALISE consortium, 2016).

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https://doi.org/10.1016/j.jcomdis.2020.106049
Received 15 October 2019; Received in revised form 24 August 2020; Accepted 29 August 2020
Available online 28 September 2020

Following the general trend, children with DLD are increasingly taught (E)FL from early on, even though we do not know what impact early FL instruction (starting in primary school) has on these vulnerable learners. In general, FL learning by children with DLD is a heavily under-researched area. Research on dual language development in children with DLD is confined to naturalistic acquisition with ample L2 exposure. Insights in the mechanisms of *instructed* language learning with *minimal* exposure (e.g. 30−90 min of FL classes a week) are sadly, and surprisingly, lacking.

For naturalistic and immersive settings, there is compelling evidence that children with DLD can manage dual language acquisition and that DLD is not an impediment to bilingualism (see reviews in Genesee & Fortune, 2014; Genesee & Lindholm-Leary, 2013 and Paradis, 2016). It remains to be seen whether these findings obtained in naturalistic and immersive settings can be generalized to FL instruction in a classroom with minimal exposure. To the best of our knowledge, only one study has so far addressed the issue of FL learning by children with DLD. Zoutenbier and Zwitserlood (2019) studied EFL proficiency in primary-school children with DLD in the Netherlands, where English became a mandatory subject in special primary schools in 2012. The results have demonstrated that children with DLD perform below age norms on the four basic EFL skills.

Also in Russia, mandatory English lessons have recently been introduced to curricula in special education. Before 2015, only children in mainstream primary schools received FL instruction from the second grade onwards. At that time, children with DLD had no FL classes in primary or secondary education, since it was assumed that children with DLD should not be confronted with FLs because they have so much difficulty acquiring their mother tongue. At present, Russian children with DLD attending special schools receive English lessons from the second grade. However, in 2015, the when EFL was introduced in special education, children with DLD started EFL lessons across the whole school range (grade 2 through grade 10). This recent transition gives us a unique window to investigate EFL proficiency in learner cohorts with different starting ages. This paper is a first attempt to do just this. We report the results of a longitudinal study in which we traced the development of L1 (Russian) and FL (English) skills in learners with DLD, whose starting age of EFL onset varied between 8 and 12 years. The development of children with DLD is compared to that of children with typical language development (TLD) who started EFL instruction in the second grade of the primary school. Notice that the relationship between age of onset and rate of EFL learning can only be studied in the DLD sample, since all children with TLD start EFL classes at the same age (grade 2, age 8).

Given the dearth of research on FL learning by children with DLD, we can only make cautious predictions about the possible effects of early FL instruction based on indirectly relevant sources from two different research lines: (i) classroom research on FL learning by children with TLD; (ii) L2 acquisition by children with DLD in naturalistic and immersive settings. Before reporting the methodology and results of the current study, we will briefly review research along these two lines.

### *1.1. Age effects in L2 and FL learning by children with TLD*

It is generally assumed that younger learners have a language-learning advantage over older learners. This common belief is based on research evidence from L2 acquisition in naturalistic settings and in immersion schools, i.e. in settings where a child receives a great amount of input in the target language. Under such favourable conditions, younger learners have an *ultimate attainment* advantage, which means that an earlier age of onset is usually associated with better language outcomes (e.g. Genesee & Lindholm-Leary, 2013; Muñoz, 2012; Thordardottir & Juliusdottir, 2013). In contrast, older learners have an initial *rate* advantage: They learn faster due to their more advanced cognitive and (meta)linguistic skills (Blom & Bosma, 2016; Goldberg, Paradis, & Crago, 2008; Thordardottir, 2020).

The ultimate attainment advantage attested in naturalistic L2 acquisition has been swiftly generalized to FL learning in instructed settings, i.e. in a school context where children receive only 30−90 min of FL instruction a week (minimal exposure). Policymakers often claim that earlier exposure to a FL in the classroom will be associated with better FL outcomes and that introducing a FL at a younger age will lead to more positive attitudes towards languages and cultures. However, there is hardly any research evidence supporting this assumption. In fact, research shows quite the opposite. Several longitudinal projects have compared FL achievement of early and late starters with minimal exposure to EFL in Spain (Muñoz, 2006b), Sweden (Holmstrand, 1982), Switzerland (Pfenninger, 2014, 2016; Pfenninger & Singleton, 2016), Germany (Jaekel, Schurig, Florian, & Ritter, 2017), the Netherlands (Goriot, 2019) and Japan (Larson-Hall, 2008). These studies have invariably revealed two main findings: (i) older starters have a rate advantage; (ii) younger starters have *no* ultimate attainment advantage.

Children exposed to a FL around age 12 learn faster than children with an earlier age of onset and catch up with early starters very quickly (within 6–12 months). The advantage of a later start is particularly evident in the domain of morphosyntax (Muñoz, 2006a), vocabulary (Miralpeix, 2006) and literacy (Pfenninger, 2016). The acquisition of these subskills is facilitated by greater cognitive maturity and better L1 skills of children entering puberty. The only domains where an advantage of an early start is *sometimes* found include phonemic discrimination (Larson-Hall, 2008) and listening comprehension (Pfenninger, 2014). A large-scale study reported by Jaekel et al. (2017) has even revealed negative effects of an early start: In the course of secondary school, early starters (onset 6–7 years) were outperformed by late starters (onset 8–9 years), even though early starters had received more hours/years of instruction. One possible explanation is related to motivation: Older learners might have been more motivated due to their faster learning speed (cf. Pfenninger & Singleton, 2016). Another possible explanation is a mismatch between teaching approaches (mainly implicit teaching in primary schools *vs.* explicit teaching in secondary education).

### *1.2. L2/FL learning by children with DLD*

#### *1.2.1. The effect of reduced L2 exposure*

Although there is no theoretical conformity regarding the nature of DLD (see Schwartz, 2009 for an overview), it is well-established

that children with DLD need more exposure to the target language in order to acquire the same language phenomena that typically-developing children acquire with less input (Evans, Saffran, & Robe-Torres, 2009; Tomblin, Mainela-Arnold, & Zhang, 2007). Linguistic profiles of monolingual children with DLD are often similar to those of bilinguals with low exposure to one of their languages (Thordardottir, 2015; Tribushinina, Mak, Dubinkina, & Mak, 2018). Relatedly, studies on L2 acquisition reveal that L2 learners with DLD make less efficient use of input compared to L2 learners with TLD (Blom & Paradis, 2015; Govindarajan & Paradis, 2019). This might be due to difficulty with sequential pattern learning (Goffman & Gerken, 2020) or an overall procedural learning disadvantage (Ullman & Pierpont, 2005, cf. Kamhi, 2019), as well as due to various processing deficits (Leonard, 2014), including deficits in working memory (Ellis Weismer, Evans, & Hesketh, 1999), processing speed (Windsor, 2002) and categorical perception (Tallal & Piercy, 1974). Theories differ as to whether such processing difficulties are cause (Ellis Weismer & Evans, 2002; Leonard, 2014) or consequence (e.g. Rice, 2004) of language difficulties in DLD.

Processing deficits and a procedural learning disadvantage of children with DLD may become particularly problematic in FL classrooms, where the effects of the disorder are aggravated by minimal exposure. To date, there is virtually no research examining how children with DLD respond to limited L2 exposure. A welcome exception is the study by Zoutenbier and Zwitserlood (2019) that has measured EFL skills in Dutch-speaking children with DLD. Notice, however, that in the Netherlands all children have quite a lot of extra-curricular exposure to English, mostly through media (Unsworth, Persson, Prins, & De Bot, 2015). However, even under such favourable circumstances, the EFL performance of children with DLD is very poor (Zoutenbier & Zwitserlood, 2019). It is not clear whether children with DLD are able to learn a FL without significant out-of-school exposure, i.e. in conditions less favourable than those in the Netherlands. The participants of the present study grow up in Siberia and have little out-of-school exposure to English. All media are dubbed, there are virtually no foreigners in the area (only occasional business travellers and tourists), and the only more or less common types of informal exposure would be English songs and computer games. This setting gives us a relatively pure classroom setting and thus a unique chance to investigate the effect of minimal classroom exposure on FL learning by children with DLD.

#### *1.2.2. Age effects in L2 learning by children with DLD*

As explained above, children with TLD learn faster if they start FL instruction at an older age. Similarly, evidence from naturalistic L2 acquisition suggests that older children with DLD have a faster learning rate and learn more with less input compared to younger children with DLD (Paradis, Jia, & Arppe, 2017). Blom and Paradis (2015) have demonstrated that children with DLD benefit from a later onset of L2 acquisition (in naturalistic settings) even more than their peers with TLD (see also Govindarajan & Paradis, 2019). It remains to be seen whether these findings from naturalistic settings also hold for L2 learning in limited-input schools settings.

One relevant difference between L2 acquisition and FL learning is that the latter involves explicit learning supported by declarative memory. It is not entirely clear how the procedural learning deficit develops with age. Some studies suggest that procedural learning remains problematic throughout childhood (Lammertink, Boersma, Wijnen, & Rispens, 2017; Obeid, Brooks, Powers, Gillespie-Lynch, & Lum, 2016), but there is also evidence that the gap between children with and without DLD in procedural-learning tasks becomes smaller with age (Lum, Conti-Ramsden, Morgan, & Ullman, 2014). The negative impact of the deficit may abate due to improving declarative memory (in TLD and DLD) and increasing compensation through declarative memory (in DLD) (Lum, Conti-Ramsden, Page, & Ullman, 2012). If this is the case, children with DLD may benefit from a later onset of FL instruction even more than children with TLD, because (i) older children are more likely to be taught FL grammar explicitly (thus increasing the contribution of declarative memory), and (ii) declarative memory improves with age in all children, but presumably more so in children with DLD (compensatory mechanism).

#### *1.2.3. Positive cross-language transfer*

One of the reasons why older children learn languages faster is that they have a more developed L1 compared to younger children. According to the Linguistic Interdependence Hypothesis (Cummins, 1979), some of the skills already acquired in the L1 (e.g. word decoding, vocabulary, reading) can be transferred to an L2. In the same vein, the FL Linguistic Coding Deficit Hypothesis (Sparks & Ganschow, 1993) posits that L1 and L2 learning involve essentially the same learning mechanisms; therefore, deficits in a language skill (e.g. word decoding) will affect both L1 and L2 acquisition.

Very little is known about cross-language transfer in DLD. A few studies that have addressed this issue yield conflicting results. Some studies report positive transfer between language-control skills (e.g. phonological awareness, rapid automatic naming), but lack of transfer in knowledge-related tasks (e.g. vocabulary, grammar) (Ebert, Kohnert, Pham, Rentmeester Disher, & Payesteh, 2014; Verhoeven, Steenge, & Van Balkom, 2012). Similarly, Blom and Paradis (2015) report that L2 learners with DLD do not benefit from positive transfer in the acquisition of verb morphology. In their study, L2 learners with TLD made fewer verb inflection errors in L2 English if they spoke an inflectional (rather than isolating) L1. In contrast, children with DLD performed poorly, irrespective of the typological properties of their L1. Similarly, both Govindarajan and Paradis (2019) and Petersen, Thompsen, Guiserson and Spencer (2016) suggest that transfer of narrative skills from L1 to L2 might be less available to children with DLD. In contrast, both Kambanaros, Michaelides and Grohmann (2017) and Grasso et al. (2018) have found positive cross-linguistic transfer in the acquisition of vocabulary (cognates) by children with DLD.

The present study will contribute to this line of research and extend it to L2 learning in minimal-input settings. To the best of our knowledge, only one study has so far explored the relationships between L1 and FL in children with DLD. Zoutenbier and Zwitserlood (2019) related the performance of children with DLD on an EFL proficiency test to their performance on several tests of L1 (Dutch) proficiency and found only few significant correlations. Their study did not include a control group of EFL learners with TLD. However, the number of significant L1-L2 correlations reported by Zoutenbier and Zwitserlood (2019) appears rather low in comparison to what has been commonly reported for children with TLD, especially in view of the typological proximity between Dutch and English. One

explanation of this finding might be that the disorder affects mechanisms of positive L1 transfer (Blom & Paradis, 2015; Petersen et al., 2016). Another reason might be that children with DLD have a smaller pool of resources available for transfer (Ebert et al., 2014: 771). Finally, this result might be due to the nature of the tests used in this research. As indicated by Zoutenbier and Zwitserlood (2019), the English test used in their study involved heavy reliance on children's reading skills, which might have placed children with DLD at a disadvantage. The authors recommend using oral tasks, such as PPVT, TROG and CELF, for measuring EFL proficiency of children with DLD. In the present study, we will use PPVT to measure receptive vocabulary and TROG to measure receptive grammar in EFL. The two EFL measures will be related to L1 expressive/receptive vocabulary and expressive/receptive grammar, respectively.

## 2. The present study

This study aims to address the following three questions:

**Research question 1:** How does EFL proficiency of children with DLD develop with time, compared to the performance of learners with TLD?

EFL development of children with DLD is likely to lag behind that of their peers with TLD. However, in view of the lack of research on this topic, it is unclear whether there will be any development at all in the DLD group. As noticed by Paradis (2016: 81), "it is legitimate to ask whether a child who has deficits that might limit linguistic uptake can achieve successful L2 acquisition in an environment where the L2 input is greatly reduced". Given that children with DLD need plenty of exposure to the target language (Leonard, 2014; Tomblin et al., 2007) and FL settings provide only very little input, FL learning by children with DLD is likely to be a very slow process.

**Research question 2:** Does age of EFL onset predict the rate of FL development in children with DLD?

As explained above, our participants with DLD varied in their starting age of EFL instruction because English lessons in special education were introduced across the whole grade range (excluding first graders) at the same time (in September 2015). If the results obtained in naturalistic settings (Blom & Paradis, 2015; Govindarajan & Paradis, 2019; Paradis et al., 2017) can be generalized to FL learning with minimal exposure, then we may hypothesize that older starters with DLD have an advantage over younger starters in the rate of EFL learning. A similar investigation of age effects in the TLD sample is not possible, because there are no typically-developing children in Russia who would start their EFL instruction later than in the second grade of primary school.

**Research question 3:** Is there a differential L1-L2 relationship in DLD and TLD?

Research evidence regarding this issue is scarce and controversial (Blom & Paradis, 2015; Ebert et al., 2014; Govindarajan & Paradis, 2019; Grasso et al., 2018; Kambanaros et al., 2017; Petersen et al., 2016; Verhoeven et al., 2012). Therefore, a null hypothesis will be adopted.

## 3. Methods

### 3.1. Participants

Informed consent was obtained from the parents of all participating children. Data collection was approved by the institutional review board of the Kuzbas Centre for Psychological, Educational, Medical and Social Child Support.

Forty children with DLD (8 female) participated in this study: 20 of them started FL instruction in the second grade and another 20 children started EFL classes in the third grade. The children were from mid- to high SES families and attended a special school for children with language and speech disorders in a large city in West-Siberia. All participants with DLD were monolingual speakers of Russian and had been independently diagnosed for DLD (in Russian – *obščee nedorazvitie reči III urovnja*) by a multidisciplinary committee consisting of a speech pathologist, a psychiatrist, a neurologist, a paediatrician and a clinical psychologist (see Kornev, 2006 for information on the diagnostics of DLD in Russia). The participants had been followed by the second author of this paper, a certified speech language therapist, for at least one year prior to the beginning of the study. The children were selected for participation in the study if they met the following selection criteria: no evidence of neurological impairment; absence of any other known disorder, such as autism; no severe visual or auditory problems (based on the yearly medical checks at school); nonverbal IQ of 60 or higher on the DAP-test (Harris, 1963).

We started data collection in the year when all participating children began their English lessons at school (September 2015), which means that their age at the outset of this study coincided with the age of EFL onset. In regular schools, second graders are usually between ages 8 and 9. Our initial idea was to study the impact of age of onset by comparing the performance of second graders to that of third graders. However, in special schools there is more variation in ages within one class/grade, and some lower achieving second graders were older than some of the better achieving third graders (we use the term *grade* to refer to a year of education and *class* to refer to a group of students sharing the same classroom). The mean age of the second graders was 8;8 (range 7;11–10;3); the mean age of the third graders was 10;1 (range 9;2–12;1), see Table 1. Since the ages of the two grades overlap, in our subsequent analyses age was taken as a continuous predictor variable. The age range in our DLD sample (7;11–12;1) appears sufficient to pinpoint possible effects of the starting age of EFL instruction.

The DLD group was matched to a comparison group of primary-school children with TLD based on the amount, intensity and length of formal EFL instruction (see below). Both groups started EFL instruction in the year when the data collection started and were followed during the first two years of formal EFL learning. As explained above, all typically-developing children in mainstream primary education start FL learning in the second grade, and all typically-developing second graders are of the same age: Children turn 8 either prior to starting their second year at school or at the beginning of that school year (with a few exceptions of gifted students or

**Table 1**
Participant characteristics.

| Characteristic | Group | Mean | SD | Range |
|---|---|---|---|---|
| Age of EFL onset (in months) | TLD (grade2) | 98.11 | 3.61 | 93–104 |
| | DLD (grade 2) | 109.25 | 9.54 | 95–123 |
| | DLD (grade 3) | 122.12 | 8.99 | 110–145 |
| Cumulative informal exposure score (max = 12) | TLD (grade2) | 3.00 | 1.94 | 0–7 |
| | DLD (grade 2) | 2.44 | 2.07 | 0–6 |
| | DLD (grade 3) | 0.29 | 0.59 | 0–2 |
| SES score (max = 6) | TLD (grade2) | 5.61 | 0.70 | 4–6 |
| | DLD (grade 2) | 4.94 | 0.85 | 4–6 |
| | DLD (grade 3) | 4.38 | 0.89 | 2–6 |
| L1 expressive vocabulary | TLD (grade2) | 80.00 | 4.26 | 71–90 |
| | DLD (grade 2) | 72.38 | 10.22 | 42–86 |
| | DLD (grade 3) | 78.18 | 5.42 | 69–88 |
| L1 receptive vocabulary | TLD (grade2) | 108.89 | 9.09 | 85–120 |
| | DLD (grade 2) | 100.38 | 7.52 | 90–115 |
| | DLD (grade 3) | 99.24 | 9.52 | 82–117 |
| L1 expressive grammar | TLD (grade2) | 144.11 | 18.78 | 95–174 |
| | DLD (grade 2) | 82.88 | 23.92 | 37–130 |
| | DLD (grade 3) | 102.82 | 30.09 | 41–141 |
| L1 receptive grammar | TLD (grade 2) | 25.83 | 3.24 | 21–30 |
| | DLD (grade 2) | 17.63 | 6.37 | 9–30 |
| | DLD (grade 3) | 21.12 | 7.01 | 6–30 |

students repeating a year). Since there are no typically-developing third graders without prior EFL instruction, we could only have a comparison group for half of our DLD sample (i.e. only for the second graders). Twenty typically-developing second graders (10 female) from mid- to high SES homes participated in this research as a comparison group. This comparison group was recruited from a mainstream primary school in the same city. The mean age of the comparison group was 8;2 (range 7;9–8;8). These children were all monolingual speakers of Russian. The teachers were asked to select the children based on the following criteria: normal motor, social-emotional and cognitive development, as well as age-appropriate language skills.

Several children were excluded from the analyses. In the TLD group, 2 children were excluded because they could only participate in the first round of data collection. In the DLD group, 7 participants were excluded because they missed two or more data collection sessions. The final dataset included 51 children – 18 with TLD and 33 with DLD. Participants independently diagnosed with dyslexia (4 in the TLD group and 18 in the DLD group) were not excluded from the sample in order to have a more realistic representation of a FL classroom in special and regular education (none of the L1 and L2 tests used in this study involved reading or writing).

The characteristics of the final participant sample are presented in Table 1. As explained above, the age of EFL onset coincided with the age at the beginning of data collection. A score of cumulative exposure to English outside of school was calculated based on the results of the questionnaire (see below); the maximum possible score was 12. The SES score was an index of parental (maternal and paternal) education and was calculated as follows: (i) 1 point for uncompleted secondary education, (ii) 2 points for vocational secondary education; (iii) 3 points for a university degree (max 6 points per family). In case of single-parent households, the same score was used twice. The L1 Russian language measures were derived from four subcomponents of the Fotekova-Akhutina test (2002). This test was administered at the beginning of the two-year data collection period, i.e. the beginning of the school year when the children started English lessons (September 2015). During the subsequent three waves of data collection, the same four subcomponents were used to trace the development of L1 Russian proficiency.

Even though both groups belonged to the mid- to high SES spectrum, the TLD group had a higher parental education index: $t(49) = -3.88$, $p < .001$. The DLD group scored below the TLD group on all L1 language tests (all $p$ values below 0.05).

The DLD group was matched to the TLD group on the length of formal EFL instruction (9 months at Time 1, 14 months at Time 2 and 18 months at Time 3) and intensity of formal EFL instruction (90 min a week, 68 h per school year). Both the DLD and the TLD group followed a very similar teaching programme. The students in the special school used the course-book *Spotlight* (Evans, Dooley, Bykova, & Pospelova, 2011), the students in the mainstream school worked with the course-book *Rainbow English* (Afanasieva & Mikheeva, 2014). Both course-books were developed within the same collaborative Russian-British project and their syllabi are almost identical. Each lesson unit consists of small sections devoted to listening, reading, speaking, use of English (vocabulary and grammar exercises), writing, and an additional *Bonus for Eager Learners*. Both course-books are form-focused, i.e. grammar is explained and practiced in an explicit manner. New vocabulary is given in the Appendix lists and introduced with the help of small texts and simple exercises, poems, and songs. Both course-books involve the use of L1 Russian.

### 3.2. Instruments and procedure

The tests were administered three times. The first measurement was at the end of Year 1 of EFL instruction (May 2016), the second measurement was halfway through Year 2 (January 2017), and the last data collection sessions took place at the end of Year 2 (May 2017). No English pre-test prior to the onset of EFL instruction was administered. This was because children in Siberia have little

exposure to English outside of the classroom. Testing their performance prior to the beginning of EFL instruction would result in floor performance and might be very demotivating, particularly for the DLD group.

### 3.2.1. English measures

Two standardized receptive tests were used to trace the development of EFL proficiency. We selected receptive measures because productive tasks are likely to be too demanding for primary-school children after one or two years of EFL instruction (Unsworth et al., 2015), especially for children with little out-out-of-school exposure to English and, in particular, for learners with DLD.

The Peabody Picture Vocabulary Test (PPVT-IV; Dunn & Dunn, 1997) was used as a measure of receptive vocabulary. The children heard an English word and saw four pictures. Their task was to point to the picture corresponding to the word pronounced by the experimenter. PPVT-IV has two alternative versions that were designed as entirely parallel, but contain no common items (Form A and Form B). We used Form A at Time 1 and Time 3, and Form B at Time 2. Since the test was developed and normed for English-speaking children, we did not use the age entry (basal set) rule and started administration from the very first set. Each test session started with three training items. In line with the PPVT manual, the test was discontinued after a ceiling set, which was the highest set with eight or more errors. We used the total raw number of correct responses as a dependent variable in the analyses.

The Test for Reception of Grammar (TROG-2; Bishop, 2003) was used as a measure of receptive grammar. The children heard an English sentence (e.g. *The cat is looking at the boy*) and saw four pictures; their task was to select the picture matching the sentence. The response was noted as correct or incorrect. The experimenter followed the test administration procedures as specified in the TROG manual. Each test session started with two training items. After that several blocks of four items followed. For each block, the experimenter noted down 'pass' (if all responses were correct) or 'fail' (if one or more errors occurred). The test was discontinued when five consecutive blocks were failed.

The children were tested individually in a quiet room at their school. Both English tests were conducted in the same session by the third author of this paper. The order of the tests was counterbalanced. The sessions took between 15 and 35 min.

### 3.2.2. Russian measures

To assess the development of L1 Russian, we used four subcomponents from the Fotekova-Akhutina test battery (Fotekova & Akhutina, 2002). Receptive vocabulary was assessed through a picture selection task, in which the children saw ten pictures and had to choose the picture matching the words pronounced by the experimenter. The words were presented in four blocks: two noun blocks and two verb blocks. Each block started with 4 single words (e.g., *bočka* 'barrel'), followed by 3 pairs of words (e.g., *drova, kosa* 'firewood, scythe') and finished with 3 triplets (e.g., *jedet, gotovit, polivajet* 'drive-3SG', cook-3SG, water-3SG'). In case of pairs and triplets, the child was asked to listen to the whole series and then to point to the relevant pictures in the appropriate order. Each immediately provided correct response was awarded 3 points. In case the child asked the investigator to repeat the word(s) and then pointed to the correct picture(s), 2 points were given. If the correct pictures were identified in the wrong order, 1 point was credited. Incorrect responses and non-responses were scored a zero. The maximum possible score on this part was 120.

Receptive grammar was measured with a task very similar to TROG: the children saw an array of pictures and were asked to select the picture best matching the sentence (10 items). The first block targeted comprehension of noun cases and passives. The second block tested comprehension of prepositions and word order. Each immediate correct response was granted 3 points. In case of self-correction or a correct response after one repetition 2 points were awarded. Correct responses that took long were credited 1 point. Incorrect responses were scored a zero. The maximum possible score on this part was 30.

Expressive vocabulary was assessed by means of a picture naming task: the children saw 30 pictures and were asked to name the 15 objects (e.g., hoover) and 15 actions (e.g., knitting). Each correct response was given 3 points. Each response that took long and/or involved a self-correction was given 2 points. Mispronunciations of the target words and semantically plausible alternatives (e.g., *kurtka* 'jacket' instead of *pal'to* 'coat') were given 1 point. Incorrect responses and non-responses were scored a zero. The maximum possible score was 90.

Expressive grammar was assessed in a series of tasks including:

a Picture description (15 items): The children were asked to make a sentence about what they saw in the pictures (e.g., The boys are playing football). Three points were given for each correct response; 2 points were awarded for sentences containing word order errors and responses given after a single prompt. One point was given for responses containing one or two minor grammatical errors and responses elicited after multiple prompts. Responses with multiple substantial errors (e.g., use of bare infinitives, no case marking) were given zero points.

b Sentence repetition (5 items): The children were asked to repeat sentences verbatim. Three points were awarded for each correct repetition; 2 points were given when one word was omitted; 1 point was awarded for responses with multiple omissions and/or several minor grammatical errors; responses with multiple substantial errors were given 0 points.

c Constructing sentences (5 items): The experimenter pronounced a series of words (3–5 words) and the child was to make a sentence with these words. The scoring was the same as in part (a).

d Gap-fill task (5 items): The experimenter pronounced a sentence with a gap, and the child was asked to fill in a preposition (e.g., Lena is pouring tea … cups). Three points were given for each correct preposition; self-corrections were awarded 2 points; correct responses provided after a prompt received 1 point; non-responses and incorrect prepositions scored 0 points.

e Completing a subordinate clause (2 items): The children were given a main clause and a subordinate conjunction (e.g., *xotja* 'although') and were asked to finish the sentence. Two correct independently produced responses provided 15 points; one correct independently produced sentence and one correct response after a prompt yielded 10 points; 5 points were given if one sentence

was incomplete or if both sentences contained grammatical errors; non-responses or two incomplete responses were not credited any points.

f Correcting errors (5 items): The experimenter pronounced sentences, each containing one grammatical error, and the participants were to find the error and correct it. Each correct answer provided 3 points; correct responses after one prompt yielded 2 points; 1 point was given if the child could identify the error, but could not correct it; non-responses and incorrect responses were scored a zero.

g Plural formation (10 items): Five plural forms were elicited in the nominative case and 5 in the genitive case. The scoring was the same as in part (d).

Lexical errors were also counted and transformed into "penalty points": 1 point for slow word-finding, 2 points for substituting the target word with a semantically close word, and 3 points for multiple lexical errors and pronoun overuse. The cumulative penalty score was used for calculating the final expressive grammar score: 30 extra points were added to the final score if the lexical penalty score was below 6; 20 extra points were added to the final score for lexical penalty scores between 6 and 15; 10 extra points were added for 16–25 penalty points; no points were added if the number of penalty points exceeded 25. The maximum possible score on this part was 180.

The children were tested individually in a quiet room at their school. All Russian tests were conducted in the same session by the second author of this paper. The Russian tests were conducted in the same week as the English tests, but on a different day. The order of the tasks was counterbalanced across participants. The sessions on average took about 45 min for children with DLD and 25 min for children with TLD.

#### *3.2.3. English-outside-of-the-classroom questionnaire*

A questionnaire was administered at the end of Year 1 in order to collect information about the amount of out-of-school exposure to English. The students were asked to indicate how often they engaged in various extra-curricular activities with English, such as watching English movies and playing English-spoken computer games. For each of the activities the students indicated frequency on a 5-point scale (0=never, 1=rarely, 2=sometimes, 3=often, 4=very often).

### *3.3. Analyses*

We report the results in the order of the research questions. First, we compared the performance of children with TLD and DLD on the two English tests across the three time points to determine whether the development in the DLD group was significantly different from the development of children with TLD. The performance of the DLD group was compared to that of the TLD group in multilevel linear regression models, using the lme4 package in R (Bates, Maechler, & Bolker, 2013). Group (DLD; TLD), Time (Time 1, Time 2, Time 3), as well as interaction between Group and Time were included as fixed effects. In order to control for differences in extra-curricular exposure to English, Out-of-School Exposure was also added as a fixed effect to the model. Since the participants (both second and third graders) were recruited from different classes and given the fact that individuals that share the same environment must have more in common than those who do not (Hox, Moerbeek, & Van de Schoot, 2017), Participant and Class were taken as random factors. The performance of the TLD group at Time 1 was taken as a baseline.

Second, we tested whether age of onset predicted the performance of children with DLD on the two EFL tests. To this end, we created multilevel linear regression models with Age of Onset as a fixed effect and PPVT/TROG score as a dependent variable. Inspection of Table 1 reveals that third graders with DLD had less out-of-school exposure to English compared to second graders, which is supported by the significant negative correlation between Age of Onset and Out-of-School Exposure ($r = -.27$, $p = .007$). Therefore, Out-of-School Exposure, as well as interaction between Age of Onset and Out-of-School Exposure were also included in the model. Participant, Class and Time were included as random effects.

Third, we studied the relationship between L1 and L2 skills in children with TLD and DLD at different time points to establish whether DLD affects cross-language relationships. We created models that predicted EFL scores (PPVT and TROG) from Russian vocabulary and grammar scores, respectively, at different time points. Group was included as a fixed effect, as well as interaction between Group and Russian score. Class was included as a random effect.

## 4. Results

### *4.1. Out-of-school exposure*

The cumulative exposure score was significantly higher in the TLD group ($M = 3.00$, $SD = 1.94$) than in the DLD group ($M = 1.33$, $SD = 1.83$), $t(49) = -3.04$, $p < .001$. Seventeen (of 33) participants with DLD indicated to have no out-of-school exposure to English at all. The remaining 16 participants with DLD played computer games in English, most of them either rarely (N=8) or sometimes (N=5), only 2 participants reported to play computer games in English often and 1 participant very often. Other types of informal exposure were reported by only a few children with DLD: Eight participants watched movies in English (rarely=3, sometimes=4, often=1), and only 1 participant with DLD reported occasional extra-curricular reading in English. The maximum cumulative score in the DLD group was 6. One of the participants with this score reported occasional watching, reading and gaming in English; the other participant with this score reported frequent gaming and occasional watching of English-spoken films.

In the TLD group, there were 2 children without any informal exposure to English. Twelve participants reported gaming in English

(rarely = 3, sometimes = 5, often = 4). Twelve participants indicated that they rarely (N = 7) or sometimes (N = 5) watched English-spoken movies. Only 7 participants reported reading in English (rarely = 3, sometimes = 3, often = 1). The participant with the highest exposure score (7) reported frequent gaming and occasional watching and reading in English.

Surprisingly, there were also differences in exposure within the DLD group (see Table 1). Second graders had significantly more informal exposure to English than third graders ($t(31) = 4.11, p < .001$). These differences have to be controlled for in the analyses of age effects.

### 4.2. Development of EFL vocabulary and grammar in children with DLD and TLD

Fig. 1 presents mean raw PPVT scores by group and measurement time. The model coefficients are given in Table 2.

There were no differences between groups at Time 1. After that, there was a significant growth in the TLD group, but not in the DLD group, as evidenced by the significant interaction between GroupDLD and Time2/Time3. An additional analysis with DLD as a baseline group revealed that children with DLD performed worse at Time 2 than at Time 1 ($\beta = -10.36$, $SE = 3.70$, $t = -2.80$, $p = .006$). Their performance at Time 3 was not significantly different from Time 1 ($\beta = 1.37$, $SE = 3.66$, $t = 0.38$, $p = .700$).

Table 3 presents the mean number of TROG blocks taken by each group at each measurement. Since the number of blocks/items taken varies among participants (children with TLD on average took more blocks), percentages of correct responses would be misleading. Standardized TROG scores could not be used either because they were normed for L1 English children. Therefore, we used the raw scores (total number of correct responses) in our analyses. Mean TROG scores are presented in Fig. 2. Model coefficients are summarised in Table 4.

Given the means in Fig. 2, it appears surprising that no significant differences between the two groups were found at Time 1 (see Table 4). However, the difference apparent in Fig. 2 was due to the differences in out-of-school exposure to English. A model without Out-of-School Exposure revealed a significant difference between groups at Time 1 ($\beta = 9.87$, $SE = 2.09$, $t = 4.73$, $p < .001$), but the model controlling for differences in exposure did not. The latter model provided a better fit to the data ($\chi^2(1) = 11.80$, $p < .001$). The performance of the TLD group improved at Time 3, which was not the case in the DLD group. An additional analysis with DLD as a baseline group revealed no significant development between Time 1 and Time 2 ($\beta = -0.17$, $SE = 1.07$, $t = -0.16$, $p = .889$) and between Time 1 and Time 3 ($\beta = 2.06$, $SE = 1.06$, $t = 1.94$, $p = .054$).

### 4.3. Effect of EFL onset in the DLD group

To establish whether age of EFL onset predicted the development of English receptive vocabulary and receptive grammar, we created a model that predicted the performance of the DLD group on PPVT/TROG based on Age of Onset. Since younger children with DLD had more informal exposure to English, Out-of-School Exposure, as well as the interaction between Exposure and Age of Onset were also included in the fixed part of the model. Model coefficients are presented in Table 5. Age of EFL onset did not predict the performance on TROG, but it did predict performance on PPVT: Older starters had an advantage over younger starters. The significant interaction between Age of Onset and Out-of-School Exposure suggests that the influence of age decreases as a function of exposure. Put differently, older age of acquisition is particularly beneficial to learners with less English exposure outside of the classroom.

Similar analyses were performed for the four Russian measures. These analyses revealed that age of EFL onset did not predict the development of L1 Russian skills (no significant effects or interactions).

### 4.4. L1-L2 relationships

In order to establish whether there was a differential L1-L2 relationship across groups and over time, we created models that predicted EFL scores (PPVT and TROG) from Russian vocabulary and grammar scores, respectively, at different time points. The TLD group was taken as a baseline. The model coefficients are presented in Table 6 for PPVT and in Table 7 for TROG. The L1-L2

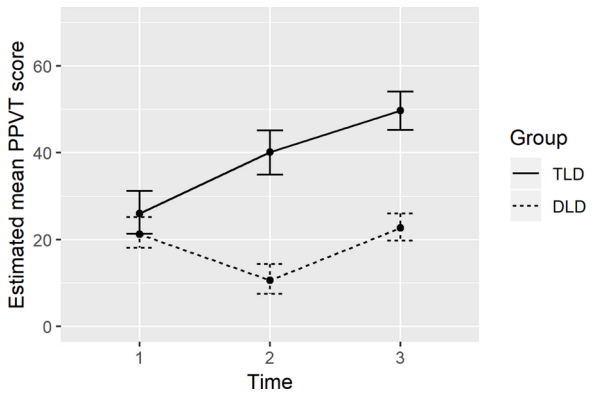


**Fig. 1.** Mean PPVT scores by Group and Time.

**Table 2**
Coefficients of the comparisons between groups on the PPVT scores.

| | *B* | *SE* | *Df* | *t* value | *p* value |
|---|---|---|---|---|---|
| (Intercept) | 15.70 | 7.63 | 2.84 | 2.06 | .137 |
| GroupDLD | 3.23 | 8.45 | 1.97 | 0.38 | .740 |
| Time2 | 13.62 | 4.99 | 96.40 | 2.73 | .008 |
| Time3 | 25.06 | 4.90 | 95.40 | 5.11 | < .001 |
| Out-of-School Exposure | 1.33 | 0.57 | 46.42 | 2.35 | .022 |
| GroupDLD*Time 2 | −23.98 | 6.21 | 96.43 | −3.86 | < .001 |
| GroupDLD*Time3 | −23.68 | 6.12 | 95.59 | −3.87 | < .001 |

**Table 3**
Number of TROG blocks taken, by group and measurement point.

| | Time 1 | | Time 2 | | Time 3 | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| DLD | 5.25 | 1.24 | 5.21 | 0.87 | 5.30 | 0.88 |
| TLD | 8.00 | 3.85 | 8.06 | 3.29 | 10.06 | 3.93 |

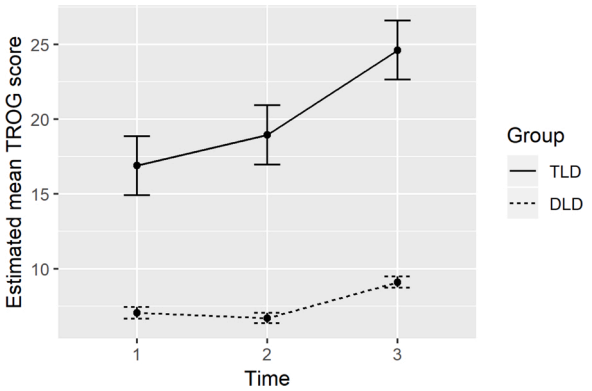


**Fig. 2.** Mean TROG scores by Group and Time.

**Table 4**
Coefficients of the comparisons between groups on the TROG scores.

| | *B* | *SE* | *Df* | *t* value | *p* value |
|---|---|---|---|---|---|
| (Intercept) | 10.91 | 2.54 | 3.14 | 4.30 | .021 |
| GroupDLD | −5.20 | 2.72 | 1.98 | −1.91 | .197 |
| Time2 | 1.45 | 1.45 | 95.01 | 0.99 | .321 |
| Time3 | 7.72 | 1.42 | 94.34 | 5.43 | < .001 |
| Out-of-School Exposure | 0.77 | 0.21 | 43.42 | 3.66 | < .001 |
| GroupDLD*Time 2 | −1.62 | 1.80 | 95.04 | −0.90 | .371 |
| GroupDLD*Time3 | −5.66 | 1.78 | 94.47 | −3.19 | .002 |

**Table 5**
Model coefficients for the relation between PPVT/TROG scores and age of EFL onset.

| | | *B* | *SE* | *df* | *t* value | *p* value |
|---|---|---|---|---|---|---|
| **PPVT** | (Intercept) | −66.71 | 33.35 | 29.43 | −2.00 | .054 |
| | Age of Onset | 8.54 | 3.35 | 28.91 | 2.55 | .016 |
| | Out-of-School Exposure | 45.92 | 20.41 | 28.83 | 2.25 | .032 |
| | AoO*Exposure | −4.72 | 2.14 | 28.85 | −2.21 | .036 |
| **TROG** | (Intercept) | −2.86 | 5.86 | 27.01 | −0.49 | .629 |
| | Age of Onset | 1.04 | 0.59 | 26.44 | 1.77 | .089 |
| | Out-of-School Exposure | 6.72 | 3.58 | 26.33 | 1.88 | .072 |
| | AoO*Exposure | −0.68 | 0.38 | 26.36 | −1.82 | .080 |

**Table 6**
Model coefficients for the relation between PPVT scores and L1 vocabulary scores.

| | | *B* | *SE* | *df* | *t* value | *p* value |
|---|---|---|---|---|---|---|
| **Receptive vocabulary:** Time 1 | (Intercept) | −35.73 | 55.28 | 43.87 | −0.65 | .521 |
| | RusRecVoc | 0.57 | 0.49 | 45.00 | 1.15 | .257 |
| | GroupDLD | −0.29 | 68.09 | 43.93 | −0.004 | .997 |
| | RusRecVoc*GroupDLD | 0.002 | 0.63 | 45.01 | 0.004 | .997 |
| Time 2 | (Intercept) | −64.06 | 51.12 | 44.00 | −1.25 | .217 |
| | RusRecVoc | 0.95 | 0.46 | 44.00 | 2.08 | .044 |
| | GroupDLD | 82.01 | 59.99 | 44.00 | 1.37 | .179 |
| | RusRecVoc*GroupDLD | −1.02 | 0.55 | 44.00 | −1.87 | .069 |
| Time 3 | (Intercept) | −157.27 | 96.21 | 46.00 | −1.64 | .011 |
| | RusRecVoc | 1.84 | 0.85 | 46.00 | 2.17 | .035 |
| | GroupDLD | 145.10 | 117.89 | 46.00 | 1.23 | .225 |
| | RusRecVoc*GroupDLD | −1.52 | 1.06 | 46.00 | −1.43 | .160 |
| **Expressive vocabulary:** Time 1 | (Intercept) | −1.27 | 87.89 | 45.94 | −0.01 | .989 |
| | RusExpVoc | 0.34 | 1.09 | 45.00 | 0.31 | .756 |
| | GroupDLD | −3.68 | 93.78 | 45.98 | −0.04 | .969 |
| | RusExpVoc*GroupDLD | 0.001 | 1.17 | 45.31 | 0.001 | .999 |
| Time 2 | (Intercept) | −57.29 | 46.74 | 44.00 | −1.23 | .227 |
| | RusExpVoc | 1.22 | .57 | 44.00 | 2.13 | .039 |
| | GroupDLD | 94.03 | 56.85 | 44.00 | 1.65 | .105 |
| | RusExpVoc*GroupDLD | −1.54 | 0.70 | 44.00 | −2.20 | .033 |
| Time 3 | (Intercept) | −115.90 | 120.14 | 46.00 | 0.97 | .340 |
| | RusExpVoc | 2.03 | 1.46 | 46.00 | 1.39 | .171 |
| | GroupDLD | 158.08 | 139.26 | 46.00 | 1.14 | .262 |
| | RusExpVoc*GroupDLD | −2.27 | 1.69 | 46.00 | −1.34 | .186 |

**Table 7**
Model coefficients for the relation between TROG scores and L1 grammar scores.

| | | *B* | *SE* | *df* | *t* value | *p* value |
|---|---|---|---|---|---|---|
| **Receptive grammar:** Time 1 | (Intercept) | −6.65 | 15.21 | 46.00 | −0.44 | .664 |
| | RusRecGram | 0.91 | 0.58 | 46.00 | 1.56 | .126 |
| | GroupDLD | 14.24 | 15.77 | 46.00 | 0.90 | .371 |
| | RusRecGram*GroupDLD | −0.94 | 0.62 | 46.00 | −1.52 | .135 |
| Time 2 | (Intercept) | −23.13 | 15.00 | 44.00 | −1.54 | .130 |
| | RusRecGram | 1.57 | 0.56 | 44.00 | 2.83 | .007 |
| | GroupDLD | 29.67 | 15.62 | 44.00 | 1.90 | .064 |
| | RusRecGram*GroupDLD | −1.56 | 0.59 | 44.00 | −2.66 | .011 |
| Time 3 | (Intercept) | −36.35 | 18.08 | 46.00 | −2.01 | .050 |
| | RusRecGram | 2.16 | 0.64 | 46.00 | 3.38 | .001 |
| | GroupDLD | 50.64 | 18.91 | 46.00 | 2.68 | .010 |
| | RusRecGram*GroupDLD | −2.40 | 0.68 | 46.00 | −3.52 | .001 |
| **Expressive grammar:** Time 1 | (Intercept) | −4.02 | 14.70 | 46.00 | −0.27 | .786 |
| | RusExpGram | 0.15 | 0.10 | 46.00 | 1.43 | .158 |
| | GroupDLD | 9.79 | 15.46 | 46.00 | 0.63 | .530 |
| | RusExpGram*GroupDLD | −0.13 | 0.11 | 46.00 | −1.17 | .247 |
| Time 2 | (Intercept) | −25.70 | 16.61 | 44.00 | −1.55 | .129 |
| | RusExpGram | 0.30 | 0.11 | 44.00 | 2.72 | .009 |
| | GroupDLD | 34.53 | 17.27 | 44.00 | 1.99 | .052 |
| | RusExpGram*GroupDLD | −0.31 | 0.12 | 44.00 | 2.71 | .009 |
| Time 3 | (Intercept) | −20.75 | 28.65 | 46.00 | −0.72 | .473 |
| | RusExpGram | 0.29 | 0.18 | 46.00 | 1.59 | .120 |
| | GroupDLD | 24.08 | 29.70 | 46.00 | 0.81 | .422 |
| | RusExpGram*GroupDLD | −0.24 | 0.19 | 46.00 | −1.28 | .207 |

relationships are visualised in Figs. 3 and 4 for vocabulary and in Figs. 5 and 6 for grammar (raw scores were used for all measures).

As can be seen in Table 6, at Time 1 there were no significant relationships between L1 and FL vocabulary scores. At Time 2 and Time 3, there was a positive relationship between L1 receptive vocabulary and EFL receptive vocabulary in the TLD group, and this relationship was not significantly different for the DLD group (no significant interaction with GroupDLD). For expressive vocabulary, we only found a significant positive relationship with the PPVT scores at Time 2 and only in the TLD group (as evidenced by the significant interaction between GroupDLD and the Russian score at Time 2).

As can be seen in Table 7, Russian grammar scores did not predict English receptive grammar scores at Time 1. At Time 2, Russian receptive and expressive grammar scores were positively related to the TROG scores, but only in the TLD group (as evidenced by the significant interactions between GroupDLD and Russian receptive/expressive grammar scores). At Time 3, Russian receptive grammar scores predicted English receptive grammar scores, but again only in the TLD group.

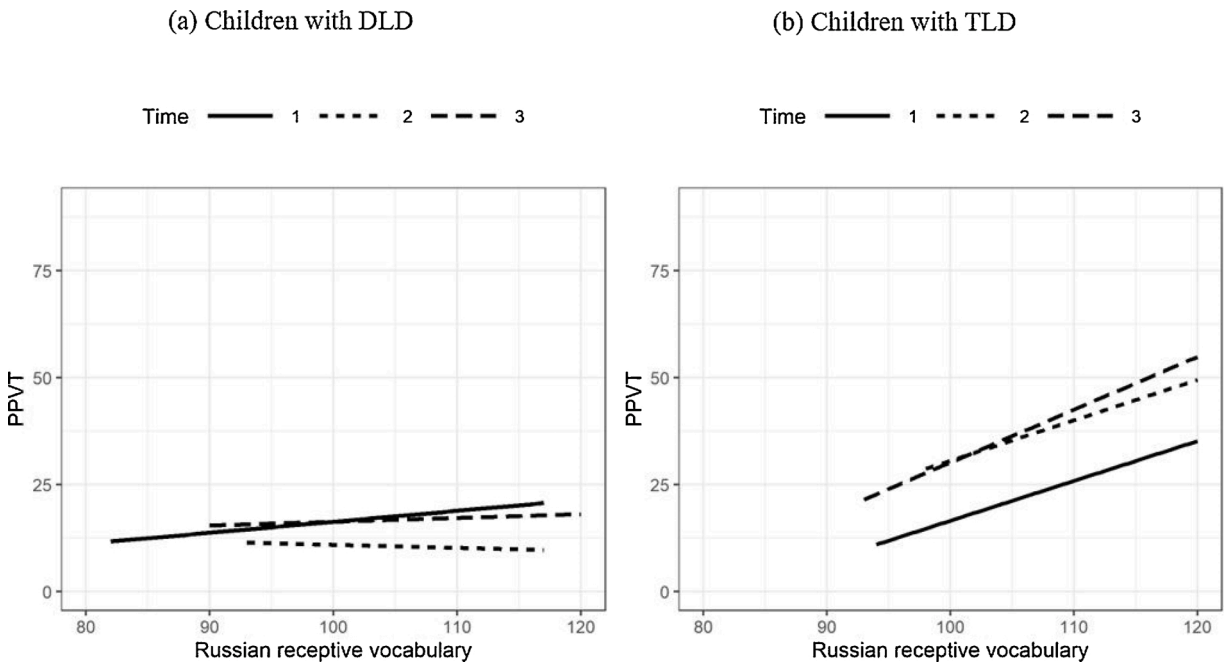


**Fig. 3.** The relationship between PPVT scores and Russian receptive vocabulary scores.

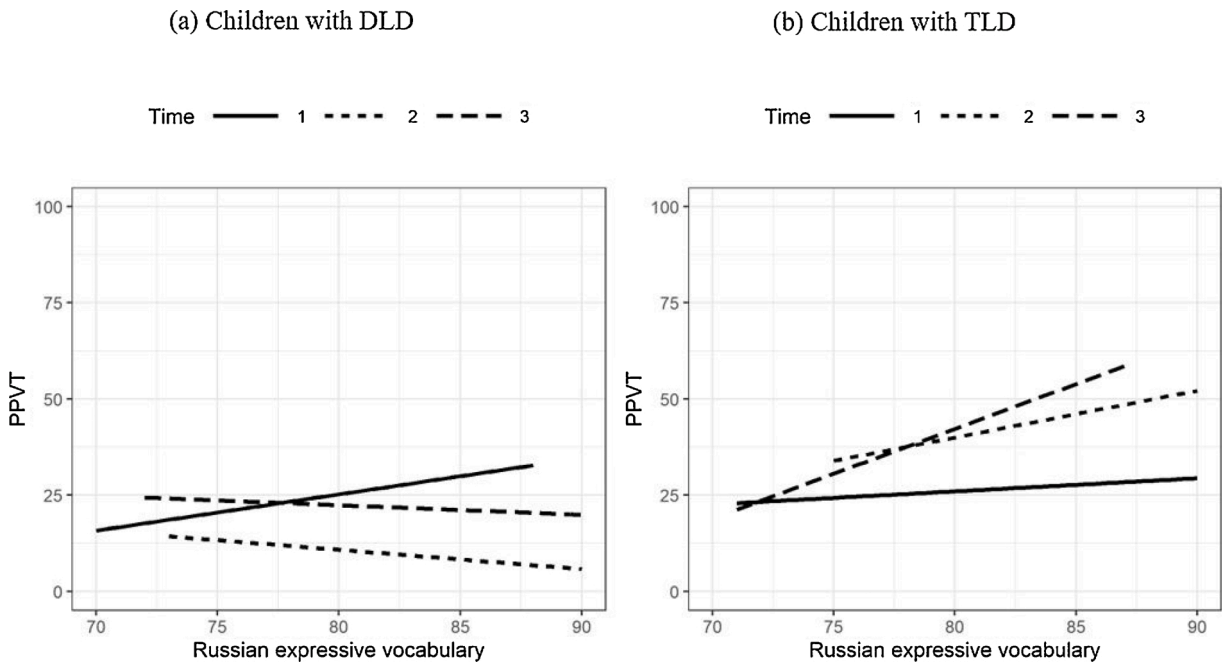


**Fig. 4.** The relationship between PPVT scores and Russian expressive vocabulary scores.

## 5. Discussion and conclusion

### *5.1. The development of initial EFL proficiency in children with DLD and TLD*

Our first aim was to establish how the development of EFL skills in children with DLD compares to that of typically-developing peers. The results have revealed no differences between children with DLD and TLD after one year of instruction. For receptive vocabulary, the performance of both groups at Time 1 was very similar. However, the TLD group showed significant improvement in receptive vocabulary skills after 1.5 and 2 years of English lessons, whereas this was not the case for the DLD group. The performance of

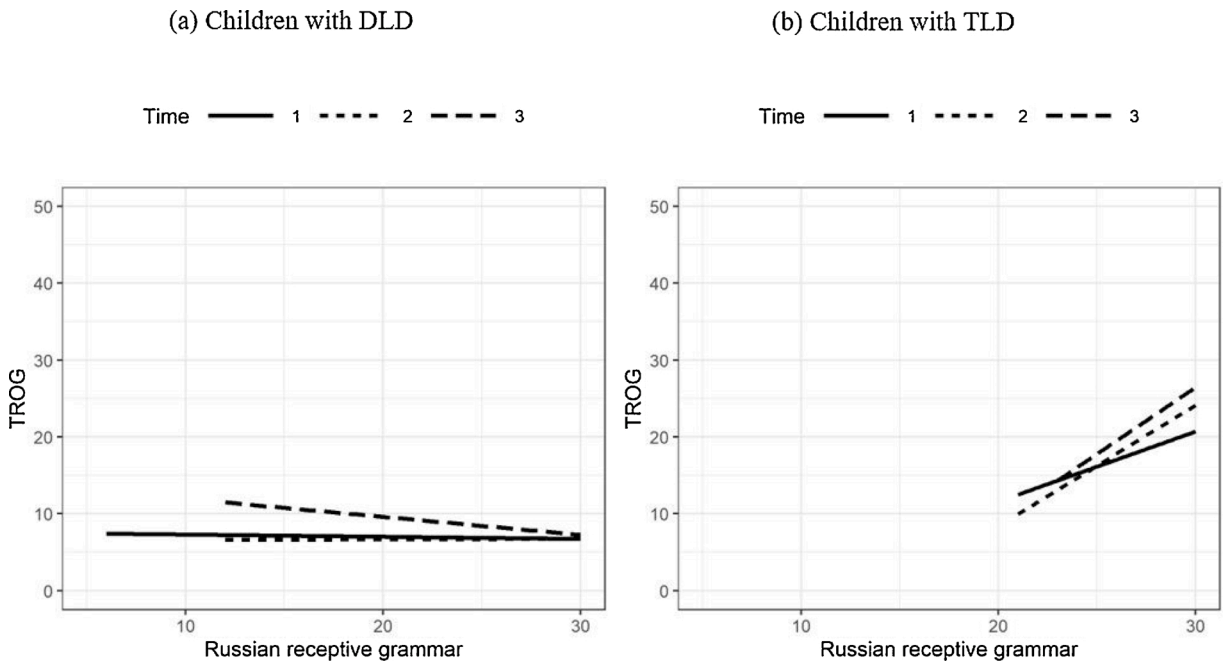


**Fig. 5.** The relationship between TROG scores and Russian receptive grammar scores.

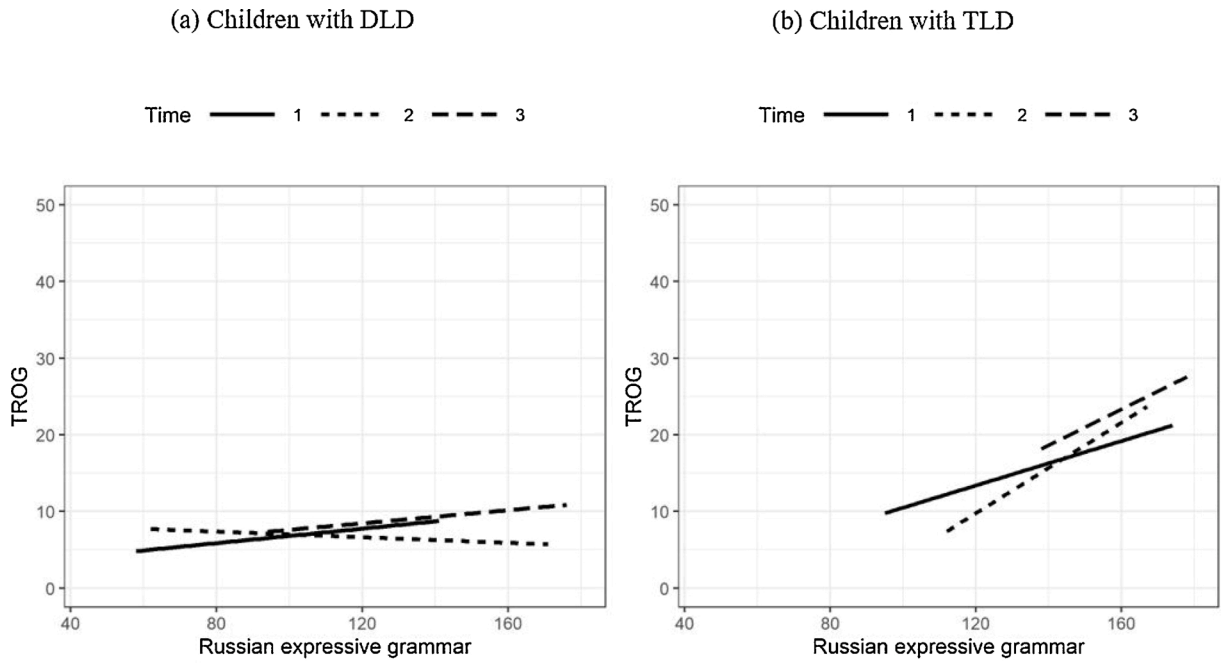


**Fig. 6.** The relationship between TROG scores and Russian expressive grammar scores.

the DLD group after two years of English classes was not significantly better than their performance on the same test a year earlier. Their performance at Time 2 was even significantly weaker than at Time 1, but this is probably due to the unsatisfactory comparability of the two PPVT-IV versions, at least for impaired populations. Despite the fact that the two versions of PPVT-IV should be parallel and largely comparable in terms of difficulty, there appears to be a difference between the two versions for children with DLD. A similar problem was earlier reported for the use of the two versions of PPVT-III in populations with DLD (Hoffman, Templin, & Rice, 2012).

For receptive grammar, children with TLD performed significantly better after one year of EFL instruction, but this difference was due to greater amount of out-of-school exposure to English in the TLD group. Once differences in extra-curricular exposure were

controlled for, there was no significant main effect of group at Time 1. The result that children with DLD have less extra-curricular exposure to English confirms earlier findings from interviews and surveys conducted with school- and clinic-based professionals (Marinova-Todd et al., 2016; Scherba de Valenzuela et al., 2016) revealing that L2 education opportunities for children with DLD are more limited because parents and teachers think that one language is already a burden in itself and adding another language would add even more pressure and "extra load" (Scherba de Valenzuela et al., 2016: 38). It is also possible that children with DLD are less motivated or more anxious to learn foreign languages because they know they have difficulty acquiring their mother tongue. Finally, even though both groups belonged to mid- to high SES, parental education of the TLD group was significantly higher, which might be an additional factor explaining differences in access to English outside of school. An important finding of this study is that differences between children with and without DLD on EFL performance can stem not only from the disorder, but also from differences in experience with FLs outside of the classroom. This might be a reason to provide vulnerable language learners with more extra-curricular exposure to English.

Just like in the case of receptive vocabulary skills, the receptive grammar scores of children with TLD improved between Year 1 and Year 2, but this was not the case for the DLD group. These differences are not likely to be caused by differences in teaching approaches. Even though our participants with DLD attended a special school for children with language disorders and the typically-developing controls came from a mainstream primary school, their English curricula were very similar and largely determined by the national regulations. Rather the observed pattern suggests that children with DLD learn EFL extremely slowly. These results are consistent with earlier findings demonstrating that children with DLD make less efficient use of L2 input compared to typically-developing L2 learners (Blom & Paradis, 2015; Govindarajan & Paradis, 2019). Unlike these prior studies, our research focussed on instructed L2 learning in a school context. It is plausible that reduced L2 exposure in school settings interacts with the processing and procedural learning deficits in DLD and aggravates the effects of the disorder.

Does this mean that it is not worth teaching FLs to primary-school children with DLD and it is better to invest valuable school time in other subjects? There may be several reasons to refrain from this conclusion. First, excluding individuals with DLD from FL education will place them at a disadvantage for academic careers and employment (Scherba de Valenzuela et al., 2016). Second, earlier onset of EFL education did not negatively affect L1 development, so it does not seem harmful. Third, the results after Year 1 were not all bad. Children with DLD could on average correctly identify about 19 English words and 7 grammatical constructions. A study by Unsworth et al. (2015) also used PPVT and TROG to trace the development of receptive English skills in the first two years of EFL instruction in a younger sample of typically-developing Dutch-speaking children (onset EFL classes at age 4). After Year 1, the performance of the Dutch-speaking children with 60−120 min of English lessons a week was very similar to that of our participants with DLD (on average around 20 correct responses on PPVT and around 10 on TROG). Of course, our participants were older and more cognitively mature. But on the other hand, the Russian participants in this study had little exposure to English outside of school, whereas most primary-school children in the Netherlands have plenty of out-of-school exposure to English. Also, Dutch-speaking children have an advantage of typological proximity between English and Dutch. For instance, the first 60 items from PPVT-IV (Form A) contain 37 cognates with Dutch and only 8 with Russian. In the light of these learning circumstances, the performance of our second and third graders with DLD acquiring a typologically distant FL with minimum classroom exposure and little out-of-school exposure is relatively good. Lack of significant improvement between Year 1 and Year 2 then indicates that these vulnerable children do indeed need more time to acquire a FL, which is not surprising given the fact that children with DLD also need more time to acquire their L1 and L2 in settings with plenty of exposure. The observed developmental pattern in the DLD group is in line with the literature reporting faster initial growth for children with a recent first significant exposure to a new language followed by less rapid development at later stages (Thordardottir, 2019, 2020).

The current amount of EFL instruction (90 min a week) is clearly insufficient for children with DLD to make progress. From earlier research we know that such slow learning may have a demotivating effect on young EFL learners and negatively affect their future EFL performance (Jaekel et al., 2017; Pfenninger & Singleton, 2016). Hence, it is deemed necessary and appropriate to increase the amount and intensity of EFL instruction in special (primary) education, also given that we have found no negative relationship between age of FL onset and the development of L1 skills. Furthermore, our results suggest the importance of creating more opportunities for out-of-school exposure to English. The amount of informal exposure to English was a strong predictor of English skills in both children with TLD and their peers with DLD. Research in countries where children have plenty of exposure to L2 English from early on, like Iceland (Lefever, 2010) or the Netherlands (Unsworth et al., 2015), indicates that children may, in fact, learn more from extra-curricular exposure than from formal EFL instruction. The effect of the amount of English outside of the classroom (possibly even prior to formal schooling) on FL learning by children with DLD deserves a closer inspection in future research. For children with TLD, amount of L2 exposure has been found to trump the effects of starting age in immersion education (Thordardottir, 2019) and in naturalistic settings (Unsworth, 2016), in the sense that cumulative exposure to the target language is more predictive of language outcomes than age of acquisition. This effect may be even stronger for children with DLD, because they need more exposure to the target language.

It is also of paramount importance to scrutinize the effectiveness of the currently used teaching approaches. For one, heavy reliance on written material may be inadequate because of high comorbidity rates between DLD and reading disorders. It is also plausible to assume that children with DLD may benefit from more explicit teaching approaches raising their metalinguistic and cross-linguistic awareness. There is evidence that explicit form-focussed interventions are beneficial to L1 learners with DLD (Poll & Miller, 2020; Ravid & Hora, 2009; Zwitserlood, Wijnen, van Weerdenburg, & Verhoeven, 2015), possibly because explicit learning relies on declarative memory that is supposedly spared (Lum et al., 2012; Ullman & Pierpont, 2005). It is possible that explicit rule teaching is even more important in FL learning, where the effects of the procedural learning deficit are aggravated by limited exposure. Intervention studies testing the effects of explicit FL learning by children with DLD would be a promising avenue for future research.

### 5.2. Age of EFL onset

With regard to our TLD sample, we cannot make any conclusions concerning the effect of the starting age of EFL instruction, because all children in Russian mainstream schools start English classes in the second grade (age 8). However, if we compare the scores of our TLD group to the PPTV and TROG scores reported by Unsworth et al. (2015), then we see that the Russian-speaking participants of the current study outperform younger Dutch-speaking children who have had roughly the same number of instruction hours in English. After two years of EFL classes (60–120 min a week), the 6-year-old participants in Unsworth et al.'s study on average scored around 30 on PPVT and around 17 on TROG, whereas our control group on average scored around 50 on PPVT and around 25 on TROG. It appears that for the Russian-speaking children in this study the positive effects of older age outweigh the negative effects of little out-of-school exposure and greater typological distance between L1 and L2.

The prediction that children with DLD would benefit from a later FL onset was only supported for vocabulary, but not for grammar. Children who started EFL lessons later outperformed earlier starters on the receptive vocabulary test. This result is consistent with prior research demonstrating that older children (with TLD) have a learning rate advantage in instructed settings (e.g., Muñoz, 2006b; Pfenninger, 2014) and is also in line with the studies showing that older children with DLD benefit from a later L2 onset in naturalistic settings (Blom & Paradis, 2015; Govindarajan & Paradis, 2019; Paradis et al., 2017). Age advantage of older starters may be due to their more developed cognitive skills and larger L1 vocabularies (and hence more possibilities for positive transfer). Interestingly, the positive effect of starting age was stronger for children with less out-of-school exposure to English, i.e. the influence of age decreased as a function of exposure (cf. Thordardottir, 2019). As shown by the current results and by a plethora of studies in the past, out-of-school exposure to English is a strong predictor of EFL proficiency in school settings. EFL learning success of children with less extra-curricular exposure is more contingent on the child's cognitive development and L1 status.

The lack of similar age effects in the grammatical domain is surprising. One plausible explanation is that our study could not capture the effects of age of onset due to the floor performance of the DLD group on the receptive grammar tasks. The overall low performance and little variance might have concealed the effects of the starting age. We used a standardized receptive grammar test, and this test did not necessarily capture the material that the children were directly exposed to in their English lessons and may not have been sensitive enough to measure growth in this population. Future studies should develop EFL tests directly addressing the material covered by the English lessons. Such tests may reveal better performance and give a wider range of performance that would allow to pinpoint possible effects of age of onset.

Another possible explanation is that two years were not enough to capture the differences in the development of grammar. For example, in Jaekel et al.'s (2017) study the advantage of a later start was not visible after 2 years of EFL instruction (in the late-starting cohort), but was visible after 4 years. This explanation seems plausible in view of the finding that children with DLD do not make efficient use of L2 exposure and may need more time for input to become uptake (Blom & Paradis, 2015; Govindarajan & Paradis, 2019), especially in the grammatical domain which is particularly vulnerable in DLD (Leonard, 2014). So a larger timespan might have revealed effects of starting age.

It is possible that age effects operate differently in children with TLD than in learners with DLD (cf. Blom & Paradis, 2015; Govindarajan & Paradis, 2019). Unfortunately, this study could only have TLD controls for half of the DLD sample (only for second graders), since all typically-developing children in mainstream primary schools start EFL lessons in the second grade and there is little variation in ages of onset. Therefore, a similar analysis of age effects in EFL learners with TLD could not be conducted. Our understanding of the workings of age effects would benefit from research in contexts where such differences do exist (e.g., in inclusive primary education in the Netherlands).

### 5.3. Cross-language relationships: effects of time and DLD

An overview of the significant inter-language relations is given in Table 8. There were more positive relations between the EFL measures and Russian receptive skills than Russian expressive skills. This might be related to the fact that both English tests were receptive, rather than productive.

Regarding time, the results reveal that L1-L2 relationships become stronger as children develop proficiency in the L1 and in the L2: None of the Russian scores was related to the EFL outcomes at Time 1, but positive relations were attested at Time 2 and Time 3. This result is in line with previous research demonstrating that L1 transfer is not likely to occur at low levels of L2 proficiency. For example, Blom and Paradis (2015) have shown that for L2 learners with TLD L1 typology only began to play a positive role after 15 months of L2 exposure, when children were "developmentally ready for transfer" (p. 971).

**Table 8**
Significant L1-L2 relationships in vocabulary and grammar.

| Skill | Time | TLD | DLD |
|---|---|---|---|
| Vocabulary | Time 1 | – | – |
| | Time 2 | receptive + expressive | receptive |
| | Time 3 | receptive | receptive |
| Grammar | Time 1 | – | – |
| | Time 2 | receptive + expressive | – |
| | Time 3 | receptive | – |

As for the effects of the disorder, it is evident that there were fewer significant L1-L2 relationships in the DLD group. Whereas for children with TLD there were positive L1-L2 relationships in both vocabulary and grammar, the DLD sample only revealed positive cross-language relationships in the domain of vocabulary.

Why could the L1-L2 relationship be weaker in the DLD group? One plausible explanation that springs to mind is that lack of significant L1-L2 relationships in the DLD group is due to the floor effects and insufficient variation in the grammatical performance of children with DLD. Notice that we only found a positive effect of age for receptive vocabulary, but not for grammar, probably due to the floor performance of children with DLD on TROG.

This said, the lack of positive L1-L2 relations in the grammatical domain is consonant with prior research demonstrating that cross-language transfer in grammar is less available to children with DLD (Blom & Paradis, 2015; Govindarajan & Paradis, 2019; Petersen et al., 2016). One explanation is that cross-language transfer is possible, but is concealed by overall poor performance and floor effects. Another suggestion made in the literature is that children with DLD do not have enough resources available for transfer because their L1 knowledge is weak (Ebert et al., 2014). Yet another possibility is that the disorder affects the transfer mechanisms (Blom & Paradis, 2015; Petersen et al., 2016). It is plausible to assume that the disorder selectively affects transfer in the vulnerable domains. Morphosyntax is known to be an area of core difficulty in DLD, whereas vocabulary acquisition is assumed to be an area of relative strength. In line with our results, Blom and Paradis (2015) demonstrate lack of positive L1 transfer in the domain of inflectional morphology, whereas Kambanaros et al. (2017) and Grasso et al. (2018) have found positive transfer in the domain of vocabulary (evidenced by the cognate facilitation effect). The idea that cross-language transfer might be hampered in the morphosyntactic domain, but less so in the lexical domain is compatible with Leonard's (2014) Surface Hypothesis predicting that children with DLD will have more difficulty with function words than with content words due to multiple processing deficits. The asymmetry between grammar and vocabulary observed in the current study and in prior research is also consistent with Ullmans's Declarative/Procedural model of DLD (Ullman & Pierpont, 2005). Cross-language relationships may be relatively intact in domains relying on declarative memory (vocabulary) and impaired in areas supported by procedural memory (morphosyntax).

Even though the current results and those of Blom and Paradis (2015), Kambanaros et al. (2017) and Grasso et al. (2018) are compatible with the idea that DLD may selectively affect L1-L2 relationships in the vulnerable domains, more research is needed to test this prediction. In this study, we used standardized language tests, which might have been too demanding and not sensitive enough for beginning EFL learners with DLD. In future studies it is crucial to address areas of grammar that have been addressed in the English lessons. It is also important to sample typologically similar and dissimilar test-items in a way that makes the workings of cross-linguistic transfer measurable.

If cross-language relationships are indeed vulnerable in DLD, this might have important implications for the way FLs should be taught to children with DLD. A widely held pedagogical premise is that FL use should be maximized and L1 use should be avoided (Cook, 2001). Children are expected to notice L1-FL similarities themselves, and there is ample evidence that children with TLD actually do so. However, if children with DLD are not able to automatically instantiate L1 transfer in the vulnerable domains, a teaching approach raising learners' cross-linguistic awareness and reinforcing positive transfer between languages is warranted. Thus far, systematic applications of such teaching methods have been scarce.

## CRediT authorship contribution statement

**Elena Tribushinina:** Conceptualization, Methodology, Formal analysis, Data curation, Writing - original draft, Visualization, Supervision, Project administration. **Elena Dubinkina-Elgart:** Conceptualization, Investigation, Data curation, Writing - review & editing. **Nadezhda Rabkina:** Investigation, Writing - review & editing.

## Acknowledgments

We would like to thank all participating children and schools. We are also very grateful to the anonymous reviewers for their valuable comments on an earlier version of the manuscript.

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