Differences in oral language growth between children with and without literacy difficulties: Evidence from early phases of learning to read and spell in Greek

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Abstract

The present study examined the oral language growth differences in a sample of 256 Greek-speaking children with and without literacy difficulties (LD), during the first two elementary grades. Measures of vocabulary, phonological awareness (PA), morphological awareness (MA), and rapid automatized naming (RAN) were administered in both grades for the assessment of oral language growth. Reading skills were individually assessed in grade 1 and together with spelling in grade 2. Results showed that PA, MA, and RAN growth differed between children with and without LD. Furthermore, children with spelling difficulties, either single or mixed with reading difficulties, presented a slower MA growth rate than children with single reading difficulties. These findings are informative for the early prognosis and intervention of LD.

Keywords: Literacy difficulties, Phonological skills, Morphological awareness, Vocabulary

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Introduction

Learning to read and spell is well grounded on oral language growth (e.g., Dickinson et al., 2003; Foorman et al., 2015; Snowling et al., 2016) and subsequent difficulties (i.e., literacy difficulties; LD) are assumed as outcomes of earlier deficits in specific oral language skills (e.g., Hulme & Snowling, 2014; Landi & Ryherd, 2017; Snowling et al., 2020; Vellutino et al., 2004). Many studies have examined longitudinally the rate of developmental changes in reading and spelling skills of children with LD (see Pfost, et al., 2014). However, there is paucity of research in examining the developmental changes of children with LD in critical oral language skills, which are considered as crucial to literacy development (e.g., Caravolas et al., 2012; Lervåg et al., 2018; Manolitsis et al., 2019), even with some differentiations based on the orthographic consistency of each language (Desrochers et al., 2018; Landerl et al., 2019). Although, there is some evidence for different developmental trajectories of phonological processing skills between children with and without LD in the first two grades (Papadopoulos et al., 2020) and upper grades of elementary school (Schmidt et al., 2020), less is known about the developmental changes across different domains of oral language skills (e.g., phonology, morphology, semantics) and their effect upon literacy acquisition (Foorman et al., 2015). Taking under consideration the multidimensionality of the oral language skills in the early phases of literacy learning (Mouzaki et al., 2020), it is not sufficient to examine only the phonological deficits in children with LD. Initial findings regarding the contribution of morphological and syntactic skills to literacy development assist us to understand better, how oral

language development facilitates the access to written language. Oral vocabulary has also been found to be a longitudinal predictor of reading comprehension as it has been linked to both early decoding and mature reading (e.g., Catts et al., 2016; Desrochers et al, 2018; Landi & Ryherd, 2017).

It seems crucial to know whether the growth pattern of a broad array of oral language skills in children with LD demonstrates a steep growth across time because of their increased literacy experiences or a growth stagnation that reflects an impairment compared with typically developing (TD) children. This knowledge will enable us to understand the structure of learning difficulties in reading and spelling as well as to guide effective early prognosis and intervention of LD.

Furthermore, the well-established heterogeneity of LD, as children might experience either a more complex problem with both reading and spelling difficulties (RSD) or difficulties only with reading (RD) or spelling (SD) (Moll et al., 2020; Torppa et al., 2017; Wimmer & Mayringer, 2002), might be associated with different growth patterns of the underlying deficits in oral language skills. Based on the above evidence, the purpose of this study was to examine the growth rate of phonological awareness, rapid automatized naming, morphological awareness and vocabulary of children with and without LD during the initial phase of literacy learning in the context of a consistent orthography (Greek). Potential differences in skill development among groups of children with RD, SD, and RSD will also be examined in order to better conceptualize their association to literacy acquisition.

The importance of oral language skills for literacy development

Phonological processing skills have been examined thoroughly and they seem to play an important role in the development of literacy skills across languages (e.g., Caravolas et al., 2012; Furnes & Samuelsson, 2010; Leppänen et al., 2006; Lervåg &

Hulme, 2010; Niolaki et al., 2014; Papadopoulos et al., 2009). Particularly, phonological awareness (PA), which is the metalinguistic ability of intentional identification and manipulation of phonological units at various levels (e.g., syllable, phoneme) in spoken words (Gombert, 1992), has been shown as an important agent of literacy development across languages (Georgiou et al., 2012; Landerl et al., 2019), because orthographies represent phonetic aspects of words (see DeFrancis, 1989). Among the most influential phonological processing skills for reading development is the rapid automatized naming (RAN), which reflects children's skill of naming as fast and precisely as they can a series of visually presented stimuli, such as digits, letters, objects, or colors (Kirby et al., 2010). Likewise, RAN has been shown as a strong predictor of early spelling achievement (Savage et al., 2008), because it is suggested that impacts the refine integration of the orthographic with the phonological representations (Bowers & Wolf, 1993).

Another linguistic factor that is involved actively in literacy development is morphological awareness (MA), which refers to children's intentional identification and manipulation of the morphemic structure of words (Kuo & Anderson, 2006). Particularly, the contribution of MA to reading comprehension (Carlisle, 2000; Casalis & Louis-Alexandre, 2000; Deacon & Kirby, 2004; Author, 2017) and spelling (e.g., Casalis et al., 2011; Deacon et al., 2009; Grigorakis & Manolitsis, 2020) seems to hold across languages and to increase with reading and spelling growth. This is expected, because morphemes carry grammatical and semantic information that provide children a tool to infer meaning and the spelling patterns of words respectively.

Associations have also been found between vocabulary and literacy skills (e.g., Kendeou et al., 2012; Kim et al., 2014; Verhoeven et al., 2011). Vocabulary has been examined thoroughly for its links with reading comprehension (Cromley & Azevedo,

2007; Hoover & Gough, 1990), because it is regarded as a critical component of listening comprehension (Lervåg et al., 2018; Protopapas et al., 2013).

Oral language skills growth and literacy difficulties

Several studies from various orthographies have examined the adverse consequences of phonological deficits on literacy development, focused mainly on PA and RAN assessments (e.g., Fayol et al., 2009; Moll & Landerl, 2009; Papadopoulos et al., 2009, 2020; Torppa et al., 2010). Furthermore, it has been reported that when children are impaired in both PA and RAN skills, they are more likely to experience intense literacy difficulties (Torppa et al., 2013; Wolf & Bowers, 1999), although this hypothesis has been questioned by findings in more consistent orthographies (see Furnes et al., 2019; Papadopoulos et al., 2009). However, many dyslexic children struggle with oral language problems that are not limited to the phonological domain (Nation & Snowling, 2004; Snowling et al., 2020) supporting arguments for limitations of the phonological deficit hypothesis to capture adequately the full nature of reading and spelling difficulties (Pennington, 2006). For example, a number of studies have provided evidence demonstrating the decisive role of MA in the appearance of difficulties in word reading, reading comprehension and/or in spelling (e.g., Casalis et al., 2004; Diamanti et al., 2014; Rothou & Padeliadu, 2019; Tong et al., 2011). In addition, limited vocabulary knowledge has been found to predict subsequent difficulties in reading comprehension (e.g., Catts et al., 2016; Nation et al., 2010).

Despite the empirical support on how the above oral language skills differentiate between children with and without LD, there is no clear evidence for the developmental trajectories of these skills in children with LD. Studying the growth pattern of language skills could assist us to form better profiles of children in light of the existing developmental theories in the research field of LD. Specifically, according

to the developmental lag model, the cognitive skills, which are closely linked to literacy learning, present a slower growth rate for children with LD (Beech & Harding, 1984; Stanovich, et al., 1988; Stanovich & Siegel, 1994). This model advocates in favor of a developmental delay rather than an impairment in the acquisition of literacy-related skills for children with LD. On the other hand, the developmental deficit model suggests that children with LD continue to demonstrate underdeveloped literacy-related cognitive skills across time compared to TD children (Francis et al., 1996; Stanovich, 1986). In line with the latter model, Schmidt et al. (2020) reported that in some oral language skills the initial gap between children with and without LD remains constant while in others the differences might increase over time. Such an increase is justified either because the growth rates of children with LD are shorter than those of TD children or because a "Mathew effect" (Stanovich, 1986) is set on and the typically performing children tend to perform even better, because of broader exposure to print and more opportunities to develop literacy-related skills.

Under the perspective of these two theoretical models, it seems intriguing to examine whether the oral language skills related to literacy development follow similar developmental trajectories as the other literacy-related skills in children with LD. Particularly, do differences in oral language skills between children with and without LD decrease over time or dissipate? The answers to these questions could have important psychoeducational implications. A decrease of language deficits would necessitate screening of oral language skills at a specific age, where the deficits are still present (see Stanovich, 1986). On the other hand, if these differences remain constant or even increase over time, they will not be any time restrictions for using oral language skills to identify children with LD and provide educational interventions.

Both theoretical models have been supported by previous longitudinal studies focusing on the development of phonological processing skills. For example, de Jong's and van der Leij's (2003) study with Dutch children with and without LD from kindergarten through sixth grade showed that the developmental trajectory of RAN in children with LD seems close to a deficit model. In two other studies with English-speaking children, Georgiou and Stewart (2013) examined good and poor readers from kindergarten to third grade and Kuppen and Goswami (2016) children ages 6-10 with a reading-matching design study. Both studies provided evidence that supported rather a developmental lag model by showing that initial RAN deficits of children with LD decreased with age. Consequently, it can be argued that the growth pattern of RAN in children with LD is still a matter of debate and further research is needed. In regard to PA two studies with Dutch children with and without LD from kindergarten through sixth grade (Dandache et al., 2014; de Jong & van der Leij, 2003) reported persistent phonological deficits that lasted 5 years after the initiation of the formal literacy instruction. Similar findings were reported recently in a large-scale study by Schmidt et al. (2020), who showed that German-speaking children with LD manifested persistent lower performance in PA across three times from grades 3 to 5 compared with TD children. Thereby, these findings reflect a persistent PA deficit in children with LD. The growth rate of MA and vocabulary in children with LD are less examined. Law and Ghesquière (2017), who followed English-speaking children with and without LD from kindergarten to second grade reported findings that support a rather persistent deficit, because they showed that children with LD manifested lower performance in MA skills over time than TD children. As regards vocabulary, Quinn et al. (2020) in their longitudinal study with English-speaking children indicated that a slightly steeper

growth became apparent for TD children in grade 4 compared to children with LD, despite their equivalent initial levels of receptive vocabulary in grade 1.

Oral language skills as precursors of double dissociation between reading and spelling

Another interesting strand of research that has received less attention is the examination of whether oral language skills can be included among the cognitive skills that distinguish different subgroups of children with LD, given that it is well-documented the dissociation between reading and spelling difficulties (e.g., Moll et al., 2020; Moll & Landerl, 2009; Papadopoulos et al., 2020; Torppa et al., 2017). In particular, phonological problems observed in children with RD have been linked mainly to deficits in RAN (Moll et al., 2020; Torppa et al., 2017; Wimmer & Mayringer, 2002) and less to deficits in PA (Author, 2015; Papadopoulos et al., 2020). On the other hand, profiles of children with SD have been linked mainly to deficits in PA (Moll et al., 2020; Torppa et al., 2017; Wimmer & Mayringer, 2002), although in Greek-speaking children with SD the deficits seemed to concern mostly orthographic processing skills (Author, 2015; Papadopoulos et al., 2020). Further, the double-deficit hypothesis (Wolf & Bowers, 1999) seems to match with the profile of children with RSD who have been found to exhibit low scores in both RAN and PA (Moll et al., 2020). Interestingly, Papadopoulos et al. (2020) showed that although Greek-speaking children with RSD presented the most severe deficits in PA and RAN compared to children with RD or SD, the differences among all three groups in both phonological and literacy skills broadened in the first two grades of elementary school. Corroborating to these were the findings of Torppa et al. (2017) showing that an RSD group with stable difficulties in reading and spelling from grades 1 to 4, manifested the lowest performance on both RAN and PA measures in kindergarten compared with a

TD group. The same RSD group of children performed more poorly on RAN than an SD group and on PA than an RD group.

Despite the above evidence, there is paucity of research examining the role of other oral language skills that contribute to literacy learning in studies that dissociate between reading and spelling difficulties. As far as we know, it has not been examined whether different subgroups of children with LD differ on MA and vocabulary skills as well as potential differences in the growth patterns of non-phonological skills during the initial phases of literacy learning. Further, the joint examination of the growth pattern of children's linguistic profiles in critical oral language skills (PA, RAN, MA, and vocabulary) might facilitate the identification of those children who are in need for early intervention. Moreover, the examination of this issue in the context of a consistent orthography, as Greek, is of particular interest, as research evidence shows that consistent orthographies boost earlier development of children's reading and spelling skills (Seymour et al., 2003) and this may have an effect upon the profile of children who face difficulties in literacy learning.

The present study

The current longitudinal study aimed to address whether the growth pattern of specific oral language skills (PA, MA, vocabulary, and RAN) differs between children with LD and TD children, as well as, between different subgroups of children with LD (RSD vs RD vs SD), during the first two elementary grades in Greek[1]. The following research questions and respective hypotheses were examined by this study:

[1] Greek has a rather simple syllable structure and its orthography is characterized by a relative imbalance in terms of its feedforward (from letters to sounds) and feedback (from sounds to letters) consistency between phonological segments correspondences with orthographic units. Although, its consistency in terms of reading has been calculated to be around 95% and about 80% in terms of spelling (Protopapas & Vlahou, 2009), Greek is a much more consistent orthography than English or French in both reading and spelling direction (see Seymour et al., 2003).

(1) Does the growth pattern of oral language skills from grade 1 to grade 2 differ between children with LD and TD children?

Based on the previous findings for the role of oral language skills in literacy development and the respective learning difficulties, we hypothesized that TD children will significantly outperform children with LD in all oral language skills at both times of assessment and with no decline of the lag between them from grade 1 to grade 2 (H1). Particularly, for this hypothesis it was considered that PA and RAN (e.g., Dandache et al., 2014; de Jong & van der Leij, 2003; Papadopoulos et al., 2020), as well as MA (Law & Ghesquière, 2017) and vocabulary (Catts et al., 2016; Kim, 2017) contributes crucially to word reading, spelling, and comprehension processes of reading.

(2) Does the growth pattern of oral language skills from grade 1 to grade 2 differ among children with different types of LD?

Taking into consideration that children with RSD represent the most deficient profile in a broad array of linguistic and cognitive skills (e.g., Moll et al., 2020; Papadopoulos et al., 2020; Torppa et al., 2017), we hypothesized that oral language skills of children with RSD will lag behind those of children with RD and SD in both grades (H2). Also, we hypothesized that children with spelling difficulties (both SD and RSD) will show smaller growth in MA from grade 1 to grade 2 than children with RD (H3). This hypothesis is based on the linguistic characteristics of Greek orthography which is highly affected by morphology (see Grigorakis & Manolitsis, 2020; Ralli, 2003) and previous evidence for the role of morphological processes on spelling (Breadmore & Deacon, 2019; Diamanti et al., 2014). Finally, we hypothesized that phonological skills (PA and RAN) of children with reading difficulties (both RD and RSD) will lag behind children with SD in both grades (H4). This final hypothesis

emanates from findings which have shown that children with RD are deficient not only in RAN but also in PA in early grades (Dandache et al., 2014; de Jong & van der Leij, 2003; Author, 2015; Papadopoulos et al., 2020) compared to children without RD.

This study makes two important contributions to the literature. First, to our knowledge, this is the first study in which semantic related skills such as MA and vocabulary are examined jointly with phonological skills to illuminate underlying oral language deficits of children with different types of LD. Second, compared to previous longitudinal studies that followed children with LD before the onset of reading instruction (Law & Ghesquière, 2017; Author, 2015; Papadopoulos et al., 2020; Torppa et al., 2017) or long after the formal teaching of reading (Moll & Landerl, 2009; Schmidt et al., 2020), this study examined oral language growth of children during the first two years of literacy instruction.

Method

Participants

The participants of the present study were 256 children from 23 public mainstream primary schools in Heraklion, Greece, who were initially recruited at the beginning of the first grade (118 females; mean age = 78.85 months; *SD* = 3.50, at the first time of measurement) and were followed up until the end of second grade. Classroom teachers were asked to indicate all the children who most likely to develop reading and/or spelling difficulties in the future from the pool of children whose parents had provided written consent, and were Greek native speakers without known history of intellectual, neurodevelopmental, or sensory disorder. For each nominated child, we randomly selected from the same class one more child of the same gender with written parental consent.

Measures

Non-verbal intelligence

The Greek standardization of the Raven's Colored Progressive Matrices (Raven, 1956; Sideridis et al., 2015) was used to assess non-verbal intelligence. Cronbach's alpha reliability coefficient has been reported to be 0.90 (Sideridis et al., 2015).

Phonological awareness

Phonological awareness was assessed with the following tasks: *Elision with real words*, *Elision with pseudowords,* and *Blending*. Both Elision tasks (see Author, 2019a) consisted of four practice items and twenty-four experimental items allocated in four blocks of six items in ascending order of difficulty. Children were presented orally with one item at a time, which they had to repeat and then they were instructed to remove a specific onset, rime, syllable, or phoneme from it and say what was left. The task was terminated after four errors in a given block. The Blending task included four practice items and twenty-eight experimental items in increasing order of difficulty and was adapted from Author (2015). Children were instructed to listen to a sequence of distinct sounds and then to blend them together to create a whole word. Participants asked to put together two syllables (first three items), an onset and a rime (next six items), and phonemes ranged from two to ten (following nineteen items). A discontinuation rule of four consecutive errors was applied. Cronbach's alphas for the phonological awareness tasks in our sample in grade 1 were .93, .93, and .89, respectively. A participant's score in each task was the percentage of correct responses.

Rapid Automatized Naming (RAN)

Naming efficiency was assessed with a *Digit Naming* task adopted from Author (2019b). Children were asked to name from left to right as quickly and accurately as possible the names of four recurring digits (5, 4, 7, and 2) which were visually

presented and semi-randomly arranged in four rows of six digits per row in two separate cards. Initially, children tested in a practice trial to ensure that they were aware of the 4 digits' names. The corresponding names of the four digits in Greek are /*pende*/ for five, /*tesera*/ for four, /*efta*/ for seven, and /*ðio*/ for two. A participant's score was the average time in milliseconds to name both cards.

Morphological Awareness

Morphological awareness was assessed with three orally presented tasks adopted from Author (2017). The *Word Analogy* task comprised 20 items measured children's awareness of inflectional and derivational morphology (i.e., ten for each morphological condition). Children were instructed to identify the morphological association in an orally presented pair of words and then to employ this relation to orally complete a second pair of words (e.g., /perpa'to/: /pe'rpatisa/:: /voi'θo/: (/vo'iθisa/) – 'I walk': 'I walked':: 'I help': ('I helped') and /ku'no/: /'kunima/ :: /xti'po/: (/'xtipima/) – 'I shake': (the) 'shaking' :: 'I hit': ((the) 'hitting')). Four practice items preceded formal testing, two for each morphology condition. Testing was discontinued after six consecutive errors. Cronbach's alpha reliability coefficient was .91. The *Manipulation of Derived Word Forms* task consisted of a derivation and a decomposition subscale with ten items each evaluating children's awareness of derivational morphology. In the first subscale, children were asked to provide the correct derived form of an presented base word by modifying it with suffixation to complete a sentence (e.g. /ta'ksiði/ : /ta ka'ravja 'tora (taksi'ðevun)/ - (the) 'travel': 'the ships (are traveling) now'). In the second subscale, children were instructed to alter a derived word into a base word to complete a sentence (e.g., /'psisimo/ : /o pa'pus po'les fo'res ('psini)/ - (the) 'baking' : 'The grandfather often (bakes)'). Four practice items preceded formal testing, two for each subscale. The task was terminated after six

consecutive errors. Cronbach's alpha was .84. Finally, the *Compound Word Production* task included fifteen items assessing children's awareness of lexical compounding. Children were instructed to produce the compound word that could originate from an orally given pair of words. Children had to transform appropriately the target words into stems to correctly pronounce the resulting compound (e.g. 'How could we say?' /ti 'fluða tis pa'tatas/ 'the peel of the potato' > (/pata'tofluða/ 'potato peel') or /ton vi'vlion ti 'θiki/ 'the books' case' > (/vivlio'θiki/ 'bookcase')). Testing was terminated after four consecutive errors. Cronbach's alpha was .88. A participant's score in each task was the percentage of correct responses.

Vocabulary

The "*Vocabulary*" subscale of the Greek standardization of the Wechsler Intelligence Scale – Fifth Edition (WISC-V^{GR}; Stogiannidou et al., 2017) was used to assess children's expressive vocabulary. The scale includes four pictorial items for oral naming (with correct answers scored with 1 point) followed by 25 words requiring a verbal definition and scored with 2, 1, and 0 points based on child's depth of each word's knowledge. A discontinuation rule of three consecutive 0-point responses was applied. For each participant the maximum score on this scale was 54. The average split-half reliability coefficient (odd versus even items) across all age groups in the standardization sample was .83 (Stogiannidou et al., 2017).

Reading Accuracy

Reading accuracy was measured with the *Word Decoding* and the *Pseudoword Decoding* subscales of a Greek standardized scale (DADA) for the assessment of reading skills (Padeliadu et al., 2019). The Word Decoding subscale consists of 57 words arranged in increasing order of difficulty, in terms of syllabic and semantic complexity, as well as of scarcity of occurrence. The Pseudoword Decoding subscale

consists of 40 pseudowords with gradually increasing number of syllables and phonological complexity. Children were instructed to read each list without time constrain. In both subscales, a discontinuation rule of five consecutive errors was applied. A participant's score was the total number of words or pseudowords read correctly. Cronbach's alpha in our sample was .95 and .89, respectively.

Reading Fluency

Reading fluency was examined with the *Text-Reading Fluency* subscale of a Greek standardized measure for the assessment of reading skills (Padeliadu et al., 2019). Children were asked to read a 247-word passage about an ancient Greek myth as quickly and accurately as possible in 1 minute. A participant's score was the total number of correctly read words within the specified time limit. Test-retest reliability in the standardization study was r = .98 (Padeliadu et al., 2019).

Reading Comprehension

Reading comprehension was measured with two standardized tests in Greek. The "Reading and Sentence Completion Test" (Porpodas, 2008) and the "Screening Test of Reading Ability" (Tafa, 1995) was used in grades 1 and 2, respectively. Both of them were sentence-completion tests including sentences of increasing difficulty, in terms of word number and semantic information. The former consists of 16 items and children were asked to select among three alternatives the one that matched to a sentence with a missing word to complete. The latter (Tafa, 1995) consists of 42 items and children were asked to select among four alternatives the one that correctly completed the sentence with a missing word. Testing was discontinued after three consecutive errors in the former and in the latter testing completed after a time limit of 40 minutes. Cronbach's alpha was .92 and .94 in the tests administered in grades 1 and 2, respectively.

Spelling

Children's spelling skills were assessed with a standardized spelling test, developed by Author (2007). Children were instructed to write 60 words of increasing difficulty, which were initially presented orally in isolation, next as a part of a sentence, and finally they were repeated again in isolation. A discontinuation rule of six consecutive errors was applied. Stress omissions and misplacements were not considered as errors due to their high incidence in these grades. A participant's score was the total number of correctly spelled words. Cronbach's alpha in the standardization study was estimated at .945.

Procedure

Trained research assistants (postgraduate students of psychology or education) were assigned to administer the measures in a quiet room at the children's schools at four measurement waves. In the first measurement (M1) non-verbal intelligence and the oral language skills was assessed during two 20-minute individual sessions in the middle of the grade 1 (January - March). In the second measurement (M2) reading accuracy and reading fluency was assessed in a 15-minute individual session, while the reading comprehension test was administered in a group-session of 10 children at the end of the grade 1 (May - June). The third measurement (M3) repeated the measures of reading accuracy and fluency, as well as implemented the spelling assessment at the beginning of the grade 2 (November - December) during a 20-minute individual session. The test of reading comprehension was also administered in a 40-minute group-session of 10 children in each group. The final measurement (M4) wave was implemented in the middle of the grade 2 (January - March) by repeating the tests of oral language skills in a 30-minute individual session. The study was conducted after

receiving approval of the Ministry of Education in Greece and the Ethics Committee of the University of Crete.

Data Analysis Plan

Participants classified initially in children with and without LD based on their performance on standardized measures of reading and spelling skills, excluding children with IQ scores below 70. The LD group (N = 171; 88 females) consisted of children performing below the norms of the 25th percentile on at least one reading test (word decoding, pseudoword decoding, text fluency, and reading comprehension) in both M2 and M3 and/or below the 16th percentile on spelling test in M3. A more stringent criterion was employed for spelling, because it was assessed only once unlike the reading tests. Children, who were not included in the LD group, were classified in the TD group (N = 85; 30 females).

LD children were further categorized in three subgroups: one with single reading difficulties (RD; N = 18; 6 females), one with single spelling difficulties (SD; N = 53; 31 females), and one with both reading and spelling difficulties (RSD; N = 100; 51 females). The RD group consisted of those children who performed below the 25th percentile on at least one standardized reading test in both M2 and M3 and their spelling performance in M3 was equal to or above the 16th percentile. Children in the SD group, had scored in spelling below the 16th percentile in M3 and did not perform below the 25th percentile on reading tests in both M2 and M3. Finally, the RSD group included those children who performed below the 25th percentile on at least one standardized reading test in both M2 and M3 and below the 16th percentile on spelling in M3.

The main hypotheses of the study were examined through a series of repeated measures ANOVAs to explore whether the growth rate of oral language skills during

the first two elementary grades differentiated between children with LD and TD children, as well as, among the children of the three LD subgroups. ANOVAs included one within-subjects factor of grade (grade 1 vs grade 2) and one between-subjects factor of (a) literacy group (LD vs TD) or (b) LD subgroup (RSD vs RD vs SD). It should be noted that we calculated composite scores for MA and PA in each grade. In all instances, the composite scores calculated by averaging the percentage correct scores of the respective component tasks. The measures that made up each MA and PA composite score intercorrelated higher than .47 and .51 respectively. Furthermore, the examination of the variables used in the subsequent analyses revealed no missing values or extreme outliers.

Results

Preliminary analyses

Descriptive statistics for each literacy group at each grade are presented in Tables 1 to 4 for all the measures administered in the present study. Independent-samples t-tests with Bonferroni adjustment confirmed that the performance of children with LD was significantly lower than that of TD children on all reading and spelling tests (see Table 1). Similarly, one-way ANOVAs revealed statistically significant differences, with small to modest effect sizes, across the three LD subgroups on all literacy measures in both grades (see Table 2). Post-hoc Bonferroni comparisons showed that children with RSD lagged behind those with SD on all literacy measures in both grades, as well as, behind those with RD in all literacy skills, except from 2nd grade pseudoword decoding ($t(168) = .40$, $p > .05$, d = .10) and reading comprehension ($t(168) = 1.06$, $p > .05$, d = .32). Finally, although children with RD outperformed those with SD on spelling ($t(168) = 7.31$, $p < .001$, d = 2.02), they lagged behind them

on reading comprehension both in grade 1 ($t(168) = 2.42$, $p = .05$, d = .85) and grade 2 ($t(168) = 4.15$, $p < .001$, d = .96).

Oral language growth differences between LD and TD children

According to the repeated measures ANOVAs that was performed, it was found a significant main effect of grade[2] and literacy group[3] for all oral language skills in the absence of a significant interaction for Vocabulary, $F(1, 254) = .86$, $p > .05$, $\eta^2_\rho = .003$, in favor of grade 2 and of TD children respectively. Interaction effects reached significance for phonological awareness $F(1, 254) = 5.11$, $p < .05$, $\eta^2_\rho = .02$, morphological awareness $F(1, 254) = 6.35$, $p < .05$, $\eta^2_\rho = .02$, and RAN $F(1, 254) = 13.64$, $p < .001$, $\eta^2_\rho = .05$. Inspection of figure 1 indicates that these interactions may be due at least in part to slightly different developmental trends between the two groups. Although post-hoc comparisons showed that the significant differences in oral language scores between groups remained in both grades, the gap in grade 2 seems to be different (see Table 3).

To examine further these interactions, post-hoc analyses with Bonferroni correction were performed by computing the mean difference scores between grades 2 and 1 assessment points (see Table 5). Phonological awareness and RAN showed higher mean difference scores from grade 1 to grade 2 in favor of the LD group ($t_{PA}(254) = 2.26$, $p < .05$, d = .30; $t_{RAN}(254) = 3.69$, $p < .001$, d = .49). However, for morphological awareness the difference score of children with LD was lower than the respective score for the TD children ($t_{MA}(254) = 2.52$, $p < .05$. d = .33), indicating a slower increase between the two grades for the former than the latter group.

Oral language growth differences between LD subgroups

[2] $F_{PA}(1, 254) = 467.26$, $p < .001$, $\eta^2_\rho = .65$, $F_{MA}(1, 254) = 452.29$, $p < .001$, $\eta^2_\rho = .64$, $F_{VOC}(1, 254) = 128.65$, $p < .001$, $\eta^2_\rho = .34$, $F_{RAN}(1, 254) = 387.94$, $p < .001$, $\eta^2_\rho = .60$

[3] $F_{PA}(1, 254) = 99.59$, $p < .001$, $\eta^2_\rho = .28$, $F_{MA}(1, 254) = 67.06$, $p < .001$, $\eta^2_\rho = .21$, $F_{VOC}(1, 254) = 36.72$, $p < .001$, $\eta^2_\rho = .13$, $F_{RAN}(1, 254) = 22.98$, $p < .001$, $\eta^2_\rho = .08$

In this section the LD subgroups was the between subject factor of the repeated measures ANOVAs that were performed. Results revealed significant main effects of grade[4] in the absence of significant interactions of grade by LD subgroup for phonological awareness, $F(2, 168) = .99$, $p > .05$, $\eta^2_\rho = .01$, vocabulary, $F(2, 168) = 1.22$, $p > .05$, $\eta^2_\rho = .01$, and RAN, $F(2, 168) = 2.58$, $p > .05$, $\eta^2_\rho = .03$, in favor of grade 2. However there was a significant interaction for morphological awareness $F(2, 168) = 5.22$, $p < .01$, $\eta^2_\rho = .06$, which seems to be the outcome of the sharper developmental trend of morphological awareness in favor of the RD group compared to the other two LD subgroups (see Figure 2b). Follow-up post hoc Bonferroni tests examined further this interaction effect by computing the mean difference scores for morphological awareness between grades 2 and 1 assessment points (see Table 5). Results revealed that children with RD presented significantly higher mean difference scores from grade 1 to grade 2 than children with SD $t_{MA}(168) = 2.69$, $p < .05$, d = .68 and RSD $t_{MA}(168) = 3.22$, $p < .01$, d = .86.

Moreover, a significant main effect of LD subgroup emerged $F_{PA}(2, 168) = 9.77$, $p < .001$, $\eta^2_\rho = .10$, $F_{MA}(2, 168) = 8.93$, $p < .001$, $\eta^2_\rho = .10$, $F_{voc}(2, 168) = 8.18$, $p < .001$, $\eta^2_\rho = .09$, $F_{RAN}(2, 168) = 10.59$, $p < .001$, $\eta^2_\rho = .11$. Subsequently, post-hoc Bonferroni comparisons showed significant differences in all oral language skills only between the SD and the RSD groups, in favor of the former one ($t_{PA}(168) = 4.37$, $p < .001$, d = .33, $t_{MA}(168) = 4.22$, $p < .001$, d = .32, $t_{VOC}(168) = 3.92$, $p < .001$, d = .30, $t_{RAN}(168) = 4.39$, $p < .001$, d = .34).

Discussion

[4] $F_{PA}(1, 168) = 290.86$, $p < .001$, $\eta^2_\rho = .63$, $F_{MA}(1, 168) = 228.43$, $p < .001$, $\eta^2_\rho = .58$, $F_{VOC}(1, 168) = 58.27$, $p < .001$, $\eta^2_\rho = .26$, $F_{RAN}(1, 168) = 240.24$, $p < .001$, $\eta^2_\rho = .59$

In the present longitudinal study, we examined the differences in the growth patterns of oral language skills between children with and without LD, as well as, among different subgroups of children with LD (RSD vs RD vs SD), in the early phases of learning to read and spell in Greek. Overall, study results showed that (a) the growth patterns of PA, MA, and RAN from grade 1 to grade 2 differed between children with and without LD and (b) only the growth of MA from grade 1 to grade 2 differed between children with different types of LD. In addition, it seems that children with mixed RSD manifested lower scores in all of the oral language skills than children with single SD in both grades 1 and 2 and those with single RD in grade 2. Below we discuss the above findings responding to each research question and its respective hypotheses.

Oral language skills differences between children with LD and TD children

The present findings partially confirmed our first hypothesis (H1). Interestingly, despite the developmental lag of LD children in all oral language skills during the first two elementary grades, in line with previous studies (e.g., Dandache et al., 2014; Law & Ghesquière, 2017), the developmental trend for each oral language skill was not common between the two groups. Specifically, the initial differences between the two groups in PA and RAN reduced in grade 2, but the respective differences in MA increased and in vocabulary remained constant. Therefore, it seems that the second part of the first hypothesis, which assumed no decline of the lag observed among oral language skills from grade 1 to grade 2, was confirmed only for MA and vocabulary.

In the case of MA, our results support the developmental deficit model taking into consideration that the distinction between LD and TD group of children broadened from grade 1 to grade 2. A persistent deficit in the development of MA was observed

too by Law and Ghesquière (2017). They showed a constant lag in MA between children with and without LD from kindergarten to grade 2, but with a similar growth pattern over years. However, in the present study we extended their findings by using on one hand a larger sample than the one used by Law and Ghesquière (2017) and by including a more diverse group of LD children. Thus, we did find an interaction between growth and group, which was due to an increasing gap in MA between the two groups from grades 1 to 2. A possible explanation of this slower growth rate of children with LD compared to TD children may be attributed to limited effects of reading experience upon MA in children with LD who were primarily focused on learning to decode during the first two years of schooling. Another justification has also been discussed by a previous study suggesting that early difficulties in phonological processing and phonological awareness may justify poor progress in MA (Cunningham & Carroll, 2015).

Regarding our findings related to differences in vocabulary over years, TD children outperformed children with LD in both grades with no decline of the lag between them in line with the first hypothesis assumption. These findings are partially consistent with the recent work of Quinn et al. (2020) who showed children with and without LD to have similar growth trajectories in receptive vocabulary across grades 1 to 4, but the growth of TD children was steeper than children with LD. Interestingly, contrary to our findings, they showed that children with and without LD scored equally in the start of the study. The use of different vocabulary measures might be a source of explanation for this difference given that vocabulary breadth (i.e., receptive vocabulary) tends to associate less with reading difficulties than the depth of vocabulary knowledge (i.e., vocabulary definition tests), which was assessed by our study (see Oullette, 2006; Wise et al., 2007).

However, contrary to our expectations reported in the first hypothesis for lag stability between the two groups in phonological processing skills, children with LD slightly compensated for their initial phonological deficits, although their reading and spelling skills continued to fall substantially behind those of TD children in grade 2. The developmental course of phonological awareness and rapid naming of children with LD in consistent orthographies is still a matter of debate. Specifically, it has been argued that in consistent orthographies phonological awareness (de Jong & van der Leij, 2003; Ziegler & Goswami, 2005) and RAN (e.g., Georgiou & Stewart, 2013; Kuppen & Goswami, 2016; Schmidt et al., 2020) deficits of children with LD tend to be time limited and eventually they catch up TD children on these skills, providing support to the developmental lag hypothesis of phonological skills. However, a closer inspection of the findings reveals significant differences between the two groups until grade 2 in agreement with findings from previous studies that support persistent deficits in PA (Dandache et al., 2014; Schmidt et al., 2020) and RAN (Dandache et al., 2014; de Jong & van der Leij, 2003; Korhonen, 1995) throughout elementary school. Given that, it is not possible to rule out completely the developmental deficit hypothesis.

Further, it has been shown that the type of the phonological tasks used to assess phonological awareness (see Ramus et al., 2003) or the type of reading criteria used for identifying LD in consistent orthographies (see Schmidt et al., 2020) are critical factors for the manifestation of phonological deficits. For example, the use of more demanding PA tasks in short-term memory load such as spoonerisms and phonological substitution tasks (Dandache et al., 2014; Schmidt et al., 2020) or the classification of children as LD based mainly in reading fluency tests (de Jong & van der Leij, 2003; Korhonen, 1995) might result in revealing phonological deficits at the expense of LD children due

to an obscured third factor. Corroborating to this, are the findings from Papadopoulos et al. (2009) who showed that a rapid naming deficit group continued to manifest word reading deficits in grade 2 only for speeded tasks. Therefore, our findings for significant differences in phonological skills between the two groups and the decline of the lag in grade 2 (particularly pronounced for the RAN scores), should be seen under the perspective that in the present study (a) LD children differed form TD ones in a broad array of reading and spelling skills (see Table 1) in both grades and not mainly on reading fluency tasks, and (b) they assessed on PA tasks not requiring heavy load on short-term memory.

Oral language skills differences between children with different types of LD

Further subgroup analyses provided evidence in partial support of the second hypothesis (H2) regarding the growth differences within the LD group. Children with RSD exhibited the most pronounced deficits in all oral language skills, as they lagged behind children with SD in both grades 1 and 2 and behind children with RD only in grade 2. The lack of significant differences in oral language skills between the RSD and RD group in grade 1 could be attributed to the fact that the between-group differences tend to become more apparent as children get older, due to the increasing divergence in reading and spelling skills (Papadopoulos et al., 2020). Interestingly, children with the most severe LD (the RSD group) in grade 2 did not catch up the TD children's scores in grade 1 phonological, morphological and vocabulary skills, but children with single deficits in LD (RD and SD) showed a substantial elimination of the differences in grade 2 RAN scores. In addition, it is shown that vocabulary deficit was more evident in the RSD group who showed an increasing growth lag behind children with SD. Notably, vocabulary deficits were not evident in children with SD over the first two grades, but these were manifested for groups of children with reading

difficulties. These findings extend in younger children a similar pattern of differences between low-level and midlevel group of readers provided by Duff et al. (2015) for children with LD beyond grade 4. To sum up, this pattern of results suggests that vocabulary deficits seem quite persistent for children facing a mixture of reading and spelling difficulties aligning better to a developmental deficit rather a developmental lag model, but this is not the case for children with LD not facing reading difficulties.

Another interesting part of the present study, which highlights the relation between MA and spelling development, is the confirmation of our third hypothesis (H3) by findings showing that children belonging to LD subgroups with spelling difficulties (SD or RSD) demonstrated a slower growth rate on MA than children with RD. However, all LD subgroups kept a substantial lag from TD children, indicating a MA deficit for all children with LD, despite the different growth pattern within the group. These findings are in line with those argued for a close association of MA with difficulties in spelling (e.g., Bourassa et al., 2006; Diamanti et al., 2014; Duranovic et al., 2014; Tsesmeli & Seymour, 2006) indicating a reciprocal relation between MA and spelling skill.

Moreover, children with SD outperformed children with RSD in phonological awareness in both grades, but no significant difference emerged between them and children with RD neither in grade 1 nor in grade 2, confirming partially the fourth hypothesis (H4). The absence of significant differences between children with SD and those with RD could be attributed to the rather trivial role of phonological awareness in the prediction of reading development and the manifestation of reading difficulties in consistent orthographies (Babayiğit & Stainthorp, 2007; Furnes & Samuelsson, 2010; Leppänen et al., 2006; Wimmer & Meyringer, 2002; Papadopoulos et al., 2020). Therefore, the phonological deficit model seems to describe better children who suffer

from severe LD in multiple reading and spelling skills, while the phonological lag model seems as more suited to children with specific and limited LD.

Limitations

Some limitations of the present study have to be acknowledged and might be the basis for future research. First, our findings on LD, as well as, on the three LD subgroups have to be interpreted in the context of the diagnostic criteria and measures used here for the classification of children in these groups. Second, girls are overrepresented in our sample of children with LD, because a substantial number of the identified by teachers as at-risk boys initially, did not meet the criteria to be classified definitely as children with LD. On the other hand, some girls who were selected initially as TD, they turned to face LD after the second literacy assessment in grade 2. Third, vocabulary and RAN were assessed by only one measure, which probably set a bias on the assessment of a specific aspect of the examined oral language skill.

Educational Implications

Our findings have some important educational implications derived from the picture emerged for the growth pattern of the tested oral language skills in children with LD and particularly children with specific difficulties in reading and/or spelling. According to the present study it is underlined that the deficits of children with RSD are pervasive and they extend not only to PA and RAN but also to vocabulary and MA, aligning better to a multiple-deficit model than to a double-deficit one (Pennington et al., 2012; Ring & Black, 2008). Therefore, it could be argued that the implementation of a broad and intensive intervention policy that will focus on a wide range of oral language skills is needed to assist children with RSD to overcome their underlying linguistic difficulties.

Conclusion

In summary, our findings highlighted the differences emerged in the growth rate of oral language skills between children with and without LD and within children with LD. Notably, children with different types of LD follow different developmental rates in phonological skills, morphological awareness and vocabulary. Although, in most of the cases the differences between groups were significant in both grades, the tendency for the prevalence of a developmental lag or deficiency model, it seems that is moderated by the oral language skill assessed and by the type of LD. Specifically, we found evidence in favor of a decreasing lag for PA and RAN, an increasing lag for MA, and a persistent lag for vocabulary between children with and without LD. However, this pattern was not common for all children with LD. Further, children who faced mixed literacy difficulties (RSD) seemed to experience the most severe deficits and slowest growth in all oral language skills. All these findings provide interesting evidence for the pervasive nature of the underlying linguistic deficits of children with LD, which are not limited in phonological deficits. Therefore, a more suitable conceptualization of multiple-deficits, as suggested by Pennington (2006), that vary according to specific difficulties in the literacy arena, should guide the future research in supporting children with LD.

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Table Captions

Table 1

Means (M) and standard deviations (SD) for all literacy measures assessed in the first two grades for the LD and the TD group

Table 2

Means (M) and standard deviations (SD) for all literacy measures assessed in the first two grades for the three LD subgroups

Table 3

Means (M) and standard deviations (SD) for all the measures of oral language skills and non-verbal intelligence assessed in the first two grades for the LD and the TD group

Table 4

Means (M) and standard deviations (SD) for all the measures of oral language skills and non-verbal intelligence assessed in the first two grades for the three LD subgroups

Table 5

Means (M) and standard deviations (SD) of the difference scores between the two grades for oral language skills across literacy groups

Figure Captions

Figure 1

Means and confidence intervals (95%) of scores on phonological awareness (a), morphological awareness (b), vocabulary (c), and RAN (d) in the first two grades between the LD and the TD group

Figure 2

Means and confidence intervals (95%) of scores on phonological awareness (a), morphological awareness (b), vocabulary (c) and RAN (d) in the first two grades among the three LD subgroups

Table 1

Means (M) and standard deviations (SD) for all literacy measures assessed in the first two grades for the LD and the TD group

Measures	LD group				TD group					
	Grade 1		Grade 2		Grade 1		Grade 2			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*-test[1] Grade 1	*t*-test[2] Grade 2
Word decoding	27.82	12.05	35.92	10.11	41.29	7.83	45.14	5.92	10.75** d=1.33	9.17** d=1.11
Pseudoword decoding	20.26	6.73	23.84	5.82	26.88	4.93	28.51	5.57	8.93** d=1.12	6.13** d=.81
Text-reading fluency	26.05	10.40	38.22	13.92	44.27	16.28	59.46	19.40	9.41** d=1.33	9.01** d=1.26
Reading comprehension[3]	9.52	4.84	14.20	5.32	13.85	3.37	21.57	6.64	8.32** d=1.04	8.90** d=1.22
Spelling	-	-	12.63	3.23	-	-	20.74	5.28	-	13.02** d=1.86

Note. [1] Bonferroni correction was performed for 4 comparisons in grade 1 ($p < .0125$); [2]Bonferroni correction was performed for 5 comparisons in grade 2 ($p < .01$); [3] Two different measures were used for the assessment of reading comprehension in grades 1 and 2; LD = Children with literacy difficulties; TD = Typically developing children.

** $p < .001$.

Table 2

Means (M) and standard deviations (SD) for all literacy measures assessed in the first two grades for the three LD subgroups

Measures	RSD group		RD group		SD group		ANOVA *F*-test df = 2, 168
	M	*SD*	*M*	*SD*	*M*	*SD*	
Word decoding							
Grade 1	23.48[1]	11.87	31.00[2]	10.18	34.93[2]	9.02	19.97***, η^2_ρ = .19
Grade 2	32.20[1]	10.87	39.89[2]	5.50	41.60[2]	5.86	20.29***, η^2_ρ = .20
Pseudoword decoding							
Grade 1	17.96[1]	6.60	22.94[2]	5.30	23.68[2]	5.61	16.70***, η^2_ρ = .17
Grade 2	22.60[1]	6.08	23.17[1,2]	3.75	26.40[2]	5.12	8.12***, η^2_ρ = .09
Text-reading fluency							
Grade 1	21.53[1]	9.18	30.28[2]	8.66	33.13[2]	8.48	31.59***, η^2_ρ = .27
Grade 2	32.38[1]	12.84	43.11[2]	12.40	47.57[2]	10.32	29.08***, η^2_ρ = .26
Reading comprehension[4]							
Grade 1	7.46[1]	4.66	10.39[2]	4.13	13.11[3]	2.84	32.93***, η^2_ρ = .28
Grade 2	12.11[1]	3.83	13.33[1]	3.79	18.43[2]	5.74	34.47***, η^2_ρ = .29
Spelling							
Grade 2	11.30[1]	2.49	18.17[2]	3.00	13.25[3]	2.23	61.46***, η^2_ρ = .42

Note. [1,2,3]Superscript numbers refer to pairwise comparisons (Bonferroni). Means with the same superscript number do not differ significantly; [4]Two different measures were used for the assessment of reading comprehension in grades 1 and 2; RSD = Children with reading and spelling difficulties; RD = Children with single reading difficulties; SD = Children with single spelling difficulties; *** $p < .001$.

Table 3

Means (M) and standard deviations (SD) for all the measures of oral language skills and non-verbal intelligence assessed in the first two grades for the LD and the TD group

Measures	LD group				TD group				*t*-test	*t*-test
	Grade 1		Grade 2		Grade 1		Grade 2			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	Grade 1	Grade 2
Non-verbal IQ	95.53	12.55	-	-	104.35	13.18	-	-	5.21*** d=.69	-
Phonological awareness[a]	41.82	18.52	63.94	16.75	65.01	20.43	82.94	12.25	9.11*** d=1.21	10.30*** d=1.30
Word elision[1]	40.40	23.98	66.08	21.47	66.57	24.29	87.50	12.73	8.19** d=1.09	9.98** d=1.21
Pseudoword elision[1]	34.48	23.96	62.33	22.62	59.02	28.15	81.67	17.31	6.89** d=.94	7.57** d=.96
Blending[1]	50.58	16.05	63.41	17.11	69.45	19.56	79.66	14.85	7.70** d=1.06	7.83** d=1.02
Morphological awareness[a]	41.96	17.65	59.44	16.94	57.48	21.97	79.65	15.44	5.66*** d=.78	9.25*** d=1.23
Word Analogy[1]	39.88	25.66	57.89	23.84	51.59	31.04	79.29	20.69	3.00* d=.41	7.06** d=.94
Derivation[1]	61.87	19.49	77.19	13.53	76.06	22.26	87.12	12.59	5.23** d=.69	5.66** d=.75
Compounding[1]	24.13	22.17	43.24	25.77	44.78	27.29	72.55	22.19	6.06** d=.83	9.42** d=1.22
Vocabulary	12.35	3.79	14.67	3.69	14.73	3.05	17.47	3.73	5.42*** d=.69	5.69*** d=.76
RAN digits	19.38	4.09	14.74	2.63	16.80	3.39	13.63	2.22	5.01*** d=.67	3.35*** d=.44

Note. [a] composite percentage correct score; [1] Bonferroni correction was performed for 3 comparisons in each grade ($p < .016$); LD = Children with literacy difficulties; TD = Typically developing children.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Means (M) and standard deviations (SD) for all the measures of oral language skills and non-verbal intelligence assessed in the first two grades for the three LD subgroups

Measures	RSD group				RD group				SD group			
	Grade 1		Grade 2		Grade 1		Grade 2		Grade 1		Grade 2	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-verbal IQ	94.15	12.10	-	-	91.39	12.10	-	-	99.53	12.72	-	-
Phonological awareness[a]	37.66	17.41	59.60	17.33	42.13	16.88	68.40	12.52	49.56	18.90	70.61	14.34
Morphological awareness[a]	38.93	17.42	54.82	15.66	37.69	13.07	64.91	15.98	49.14	17.56	66.30	16.98
Vocabulary	11.70	3.85	13.68	3.50	12.78	3.70	15.67	4.27	13.42	3.51	16.21	3.25
RAN digits	20.44	4.29	15.40	2.66	18.51	4.21	13.81	2.42	17.67	2.91	13.80	2.28

Note. [a] composite percentage correct score. RSD = Children with reading and spelling difficulties; RD = Children with single reading difficulties; SD = Children with single spelling difficulties.

Table 5

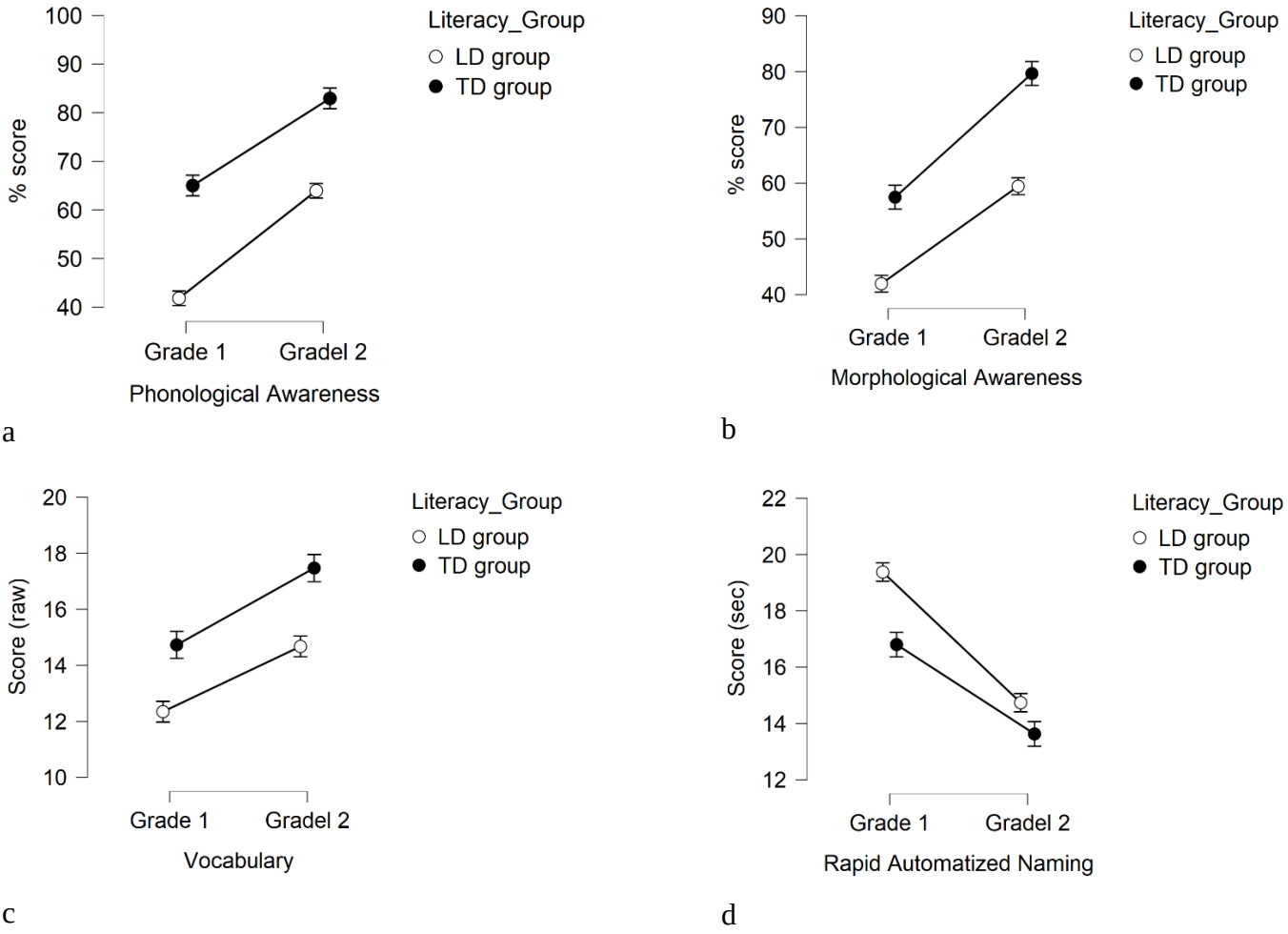
Means (M) and standard deviations (SD) of the difference scores[a] between the two grades for oral language skills across literacy groups

Measures	TD		LD		RSD		RD		SD	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Phonological Awareness	17.93	13.94	22.12	13.97	21.94	13.33	26.27	16.49	21.05	14.28
Morphological Awareness	22.18	14.03	17.48	14.06	15.89	12.98	27.22	14.69	17.16	14.75
Vocabulary	2.74	3.17	2.33	3.46	1.98	3.51	2.89	3.51	2.79	3.32
RAN digits	- 3.17	2.86	- 4.64	3.05	- 5.03	3.30	- 4.70	2.43	-3.87	2.61

Note. [a] difference scores were computed by subtracting the means of Grade 2 from Grade 1 scores; LD = Children with literacy difficulties; TD = Typically developing children; RSD = Children with reading and spelling difficulties; RD = Children with single reading difficulties; SD = Children with single spelling difficulties.

Figure 1

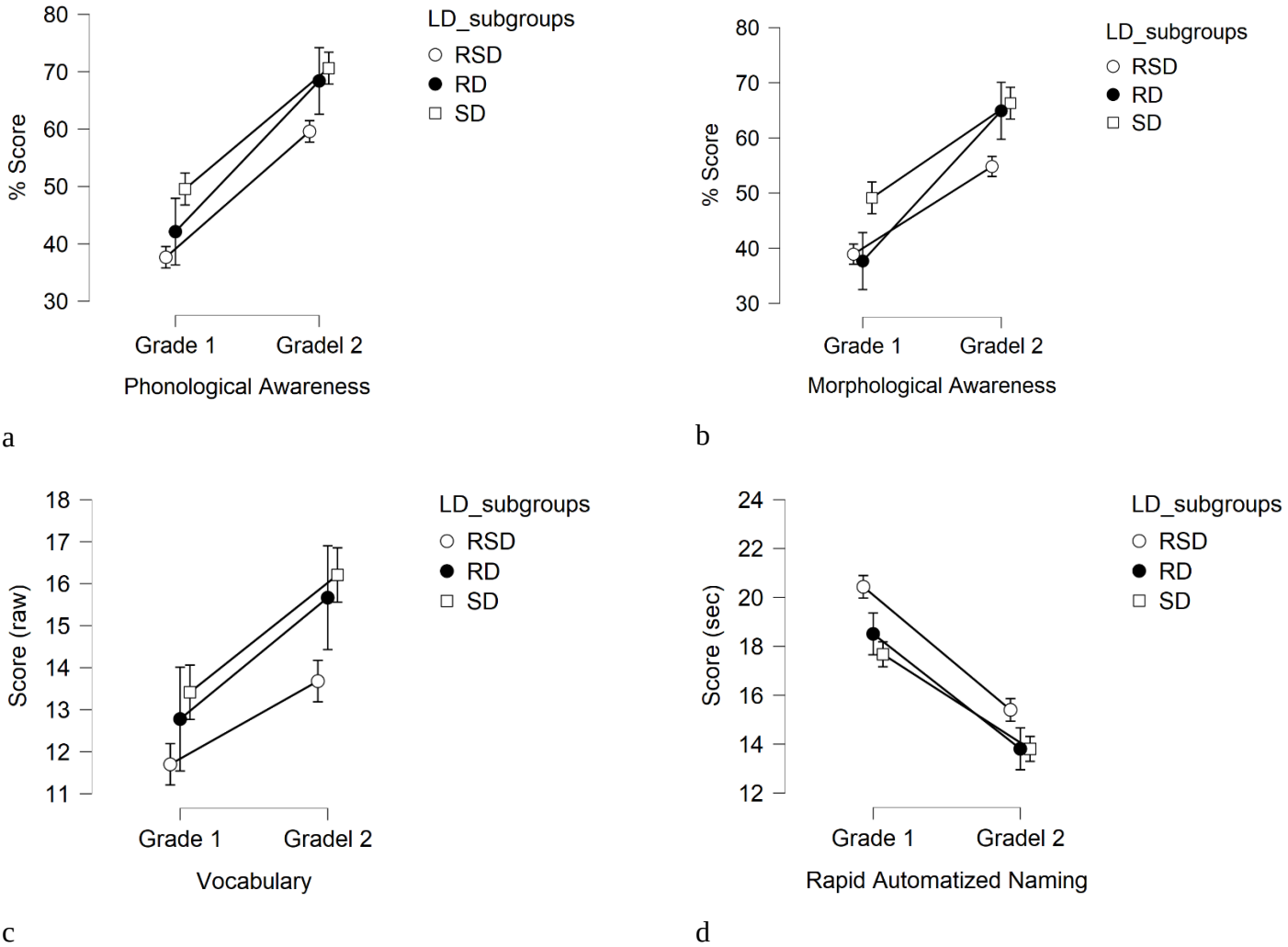
Means and confidence intervals (95%) of scores on phonological awareness (a), morphological awareness (b), vocabulary (c), and RAN (d) in the first two grades between the LD and the TD group



Note. LD group = Children with literacy difficulties; TD group= Typically developing children.

Figure 2

Means and confidence intervals (95%) of scores on phonological awareness (a), morphological awareness (b), vocabulary (c) and RAN (d) in the first two grades among the three LD subgroups



Note. RSD = Children with reading and spelling difficulties; RD = Children with single reading difficulties; SD = Children with single spelling difficulties.