Received: 30 November 2018 | Revised: 18 February 2020 | Accepted: 2 March 2020

DOI: 10.1002/dys.1656

RESEARCH ARTICLE

WILEY

School-entry language outcomes in late talkers with and without a family risk of dyslexia

Ømur Caglar-Ryeng[1] | Kenneth Eklund[2] | Trude Nergård-Nilssen

[1]Department of Education, UiT—The Arctic University of Norway, Tromsø, Norway

[2]Department of Psychology, University of Jyväskylä, Jyväskylä, Finland

Correspondence
*Ømur Caglar-Ryeng, Department of Education, UiT—The Arctic University of Norway, 9037 Tromsø, Norway.
Email: omuer.caglar-ryeng@uit.no

Funding information
Tromsø Research Foundation, Grant/Award Number: A42966

Children with familial risk (FR) of dyslexia and children with early language delay are known to be at risk for later language and literacy difficulties. However, research addressing long-term outcomes in children with both risk factors is scarce. This study tracked FR and No-FR children identified as late talkers at 2 years of age and reports development from 4;6 through 6 years. We examined the possible effects of FR-status and late talking (LT) status, respectively, on language skills at school entry, and whether FR-status moderated the associations between 4;6-year and 6-year language scores. Results indicated an effect of LT status on language at both ages, while FR status affected language skills at 6 years only. The interaction between LT and FR statuses was not significant, implying that LT status affected language skills independently of the child's FR status. A proportion of late talkers developed typical language at 6 years of age, while some FR children with typical vocabulary skills in toddlerhood had emerging developmental language disorder by school entry. FR status had a moderating effect on the association between expressive grammar at ages 4;6 and 6 years. Possible explanations for the effect of FR status on language skills are discussed. We highlight limitations in the study size and suggest how these preliminary findings can inform future research.

KEYWORDS
emerging developmental language disorder, family risk of dyslexia, grammar, late talkers, vocabulary

1 | INTRODUCTION

Dyslexia is a heritable language-based disorder characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities, which are often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction (Lyon, Shaywitz, & Shaywitz, 2003; Olson, 2011; Vellutino, Fletcher, Snowling, & Scanlon, 2004). Poor phonological processing is assumed to be the major cognitive risk factor for literacy impairments in dyslexia (Snowling, 2019). The aetiology of dyslexia is multifactorial, involving a complex interaction of genetic factors with environmental influences (Snowling & Melby-Lervåg, 2016; van Bergen, van der Leij, & de Jong, 2014). A recent meta-analysis of studies of children at familial risk (FR) of dyslexia has reported that approximately 29–66% of these children develop a reading disorder later in life, confirming that family history is one of the earliest risk indicators of dyslexia (Snowling & Melby-Lervåg, 2016). This meta-analysis has further revealed different developmental trajectories in language development in FR children compared to those with no familial risk (NoFR). FR children typically have problems in the phonological domain; however, they tend, as a group, to perform more poorly than their NoFR peers on tasks assessing lexical and grammatical knowledge in the preschool years (Caglar-Ryeng, Eklund, & Nergård-Nilssen, 2019; Carroll & Myers, 2010; Gallagher, Frith, & Snowling, 2000; van Viersen et al., 2018). This can be taken to suggestion that some of these children might also be at risk for developmental language disorder (DLD; Bishop et al., 2017; Bishop & Snowling, 2004), which typically manifests itself as a difficulty in acquiring vocabulary and grammar skills (Leonard, 2014).

It is important to highlight here that different diagnostic terms, such as language impairment and specific language impairment, have been used to refer to children whose language difficulties are not due to physical, cognitive or neurological conditions (Conti-Ramsden, Durkin, Toseeb, Botting, & Pickles, 2018). In line with the current recommendation for the use of DLD as the established term for these children (Bishop et al., 2017), this paper utilizes the terminology of DLD, both in reference to our subsample (considered to be "at risk of DLD") and in reference to previous literature. This is also in line with recent longitudinal studies, which have adopted this terminology (e.g., St Clair, Forrest, Yew, & Gibson, 2019).

A recent study by Snowling, Nash et al. (2019) followed children at FR of dyslexia, children with language difficulties, and children with typical development (N = 234) from 3;6 years of age and classified them as having dyslexia or DLD at 8 years. The authors reported that language difficulties, including vocabulary and grammar, were small in early childhood. However, they appeared to increase with age and were large after school entry in the dyslexia-only, the DLD-only, and the dyslexia+DLD group. Along these lines, longitudinal data from different studies have pointed out that oral language difficulties are most evident in FR children who go on to become dyslexic (e.g., Carroll, Mundy, & Cunningham, 2014; Snowling, Muter, & Carroll, 2007; Torppa, Lyytinen, Erskine, Eklund, & Lyytinen, 2010; van Viersen et al., 2018), suggesting that early signs of dyslexia include difficulties not only in phonological but also in broader language skills.

It is widely assumed that late emergence of oral language (i.e., late talking [LT]) in toddlerhood is the first marker of difficulties in language development (Zubrick, Taylor, Rice, & Slegers, 2007). The limited evidence suggests that FR children with late language emergence are less likely to overcome their difficulties than their LT peers without FR and that these children frequently display deficits in reading and spelling (Lyytinen, Eklund, & Lyytinen, 2005). Additional research is, therefore, needed to gain more insight into the longitudinal development of oral skills in FR children who have been identified as late talkers.

2 | LANGUAGE DEVELOPMENT IN LT CHILDREN

Children typically acquire their first spoken words at around 12 months and begin to put words together by 24 months (Zubrick et al., 2007). However, LT children approach these language milestones much later in the absence of a known underlying pathology, such as a neurological, sensory, or cognitive deficit (Desmarais, Sylvestre, Meyer, Bairati, & Rouleau, 2008). These children aged between 18–35 months are often referred to as late talkers (Rescorla, 1989, 2011). Some late talkers present with an expressive delay only, whereas others have delayed receptive language as well (Rescorla, 2013). The most common measure used to identify LT children is limited productive vocabulary based on a parental report (Desmarais et al., 2008; Rescorla & Dale, 2013a), whereas the criteria for LT vary widely across studies with cut-off scores ranging from approximately the second to the 30th percentile (Fisher, 2017; Jones, 2003).

A number of varying long-term linguistic outcomes have been noted in LT children (e.g., Rescorla, 2011; Rescorla & Dale, 2013a, for overviews), which is not surprising when the heterogeneity in ages at intake, expressive vocabulary sizes, and comprehension abilities is taken into account. In general, evidence suggests a good prognosis for late talkers as approximately 50–75% develop appropriate language skills in subsequent years (Paul & Ellis Weismer, 2013). These children typically perform within age expectations on receptive and expressive vocabulary as well as receptive grammar by 3–5 years of age (Ellis & Thal, 2008; Moyle, Stokes, & Klee, 2011; Paul, Murray, Clancy, & Andrews, 1997; Rescorla, 2011). On the other hand, they seem to have ongoing delay in expressive grammar development throughout the preschool period (Ellis Weismer, 2007; Rescorla, Dahlsgaard, & Roberts, 2000; Rescorla & Turner, 2015; Rice, Taylor, & Zubrick, 2008) suggesting that this particular area of language might be relatively more challenging to master for LTs at the group level.

Evidence also shows that in a subset of LT children (around 20%) language difficulties persist throughout the school years (Rescorla & Dale, 2013a; Rice et al., 2008), leading to a diagnosis of DLD that is often associated with literacy impairments, poor social competence, attention deficit, and behavioural problems (Henrichs et al., 2011). A number of large-scale longitudinal studies sought to explore the contribution of demographic, genetic, linguistic, and environmental factors to longer term language outcomes in LT children (e.g., Ghassabian et al., 2014; Henrichs et al., 2011; Lyytinen, Poikkeus, Laakso, Eklund, & Lyytinen, 2001; Reilly et al., 2010). For example, Lyytinen et al. (2001) traced language skills from 14 months to 3;6 years in Finnish FR children (n = 106) and NoFR children (n = 94), and they identified two LT groups, one with FR (n = 20) and one without (n = 14). For the full sample (N = 200), children's early play and receptive and expressive language skills, parents' education, and FR status explained 34 and 48% of the variance in receptive and expressive language, respectively, at the age of 3;6 years. Interestingly, Lyytinen et al. (2001) found that FR status did not contribute children's receptive language, whereas it made a significant contribution to expressive language.

Henrichs et al. (2011) assessed predictors of 30 months vocabulary skills in a sample of 3,759 Dutch children. Their regression model, which included multiple perinatal, demographic, and maternal factors together with earlier language scores, explained 18% of the variance in expressive vocabulary at 30 months, leaving most variance unexplained. Expressive vocabulary at 18 months appeared to account for 11% of this variance. Following up 2,724 of the children from Henrichs et al.'s sample, Ghassabian et al. (2014) examined the relationship between LT and vocabulary comprehension at school age. They reported that their prediction model explained 15% of the variance in receptive vocabulary at the age of 6 years. Receptive and expressive vocabulary at 18 months accounted for 0.3 and 1.5% of the total variance, respectively, and expressive vocabulary at 2;6 years explained only 2%. These findings suggested that the model's ability to predict long-term language outcomes was limited. Ghassabian et al. also found that most late talkers had normal range receptive vocabulary scores at the age of 6 years and that the majority of children with receptive vocabulary difficulties at 6 years had no expressive vocabulary delay at 18 months and 2;6 years.

The latter finding reported by Ghassabian et al. (2014) suggests an emerging DLD profile, which has been observed in 6–19% of children in several longitudinal studies (Armstrong et al., 2017; Poll & Miller, 2013; Reilly

et al., 2010; Rice et al., 2008). Despite having language skills in the normal range early in development, children with this profile eventually meet criteria for DLD at a later time point (Moyle et al., 2011). Interestingly, two recent studies found a significant association between FR of dyslexia and emerging DLD (Snowling, Duff, Nash, & Hulme, 2016; Zambrana, Pons, Eadie, & Ystrom, 2014). Following the development of Norwegian children (N = 10,587) from 3 to 5 years of age, Zambrana et al. (2014) found that FR for literacy difficulties was the most crucial risk factor for emerging DLD, and children born with FR had significantly higher odds for persistent language difficulties. Likewise, Snowling et al. (2016) followed English-speaking children (N = ~220), who were initially classified as having either FR of dyslexia or risk of DLD or typical language, from the age 3;9 to 8;1 years. In this study, three groups of children were identified; one with resolving, one with persisting, and one with emerging DLD. Despite having average oral language abilities in early childhood, children in the last group appeared to have emerging DLD at the age of 8;1 years. Importantly, FR children were overrepresented in this group, stressing the importance of following language skills of FR children from early years through to school age to track possible emerging difficulties in their linguistic growth.

3 | THE LINK BETWEEN EARLY LANGUAGE DELAY AND DIFFICULTIES WITH LITERACY ACQUISITION

The underlying cause of vocabulary delay in LTs is unknown. However, a phonological basis has been suggested due to observed delays in babbling frequency and complexity in infants and toddlers who later were identified as late talkers (MacRoy-Higgins, Shafer, Fahey, & Kaden, 2016). In support of this, Ellis Weismer, Venker, Evans, and Moyle (2013) found that LT children are less sensitive to phonological properties of novel words during word learning tasks than typical children. In a similar vein, several studies have found that FR is associated with a deficit in perception and segmentation of speech, which may eventually lead to phonological deficits (Lohvansuu, Hämäläinen, Ervast, Lyytinen, & Leppänen, 2018; Snowling, Lervåg, Nash, & Hulme, 2019). Taken together, these findings point out that early delays and deficiencies in phonological processing skills are observed, though to varying degrees, in LT children as well as in FR children of dyslexia.

Converging evidence shows that phonological awareness is one of the most crucial predictors of variation in learning to decode print in alphabetical languages and that preschool children with deficient phonological skills run a greater risk of developing problems with word decoding (Caravolas et al., 2012; Kamhi & Catts, 2012). However, the end goal of reading is comprehension, which requires access to the meanings of words and higher level processes such as sentence integration and inferencing (Snowling & Hulme, 2012). Consequently, literacy development does not only depend on the phonological skills but also on the broader oral language skills, including vocabulary and grammar, that children bring to the task of reading. For instance, in a study of English FR children (N = 245), Hulme, Nash, Gooch, Lervåg, and Snowling (2015) demonstrated that language skills at the age of 3;6 years predicted the preliteracy skills (i.e., phoneme awareness, rapid naming, and letter-sound knowledge) at the age of 4;6 years, which in turn predicted word-level literacy at 5;6 years. Furthermore, Hulme et al. (2015) found that oral language skills assessed at the age of 3;6 years had a direct influence on reading comprehension at 8;6 years, indicating that development of decoding as well as reading comprehension abilities depend on oral language skills. This study also showed that children with family history of dyslexia had broad deficits in oral language skills in the preschool years. Importantly, a proportion of these children met the criteria for the diagnosis of DLD, highlighting the overlap between risk factors for language and literacy disorders in FR samples (Bishop & Snowling, 2004; Nash, Hulme, Gooch, & Snowling, 2013).

A point to note regarding Hulme et al.'s (2015) study is that children with FR of dyslexia and children with a risk of DLD were combined into one single group in the data analyses. This makes it difficult to rule out whether the observed effect of FR on later language skills and reading development was due to children's FR status or due to the potential influence of language difficulties of those who were at risk of DLD. Importantly, results from prospective

studies conducted in languages with more transparent orthographies than English (e.g., Dutch: van Viersen et al., 2017, 2018; Finnish: Torppa et al., 2010) suggest that the influence of FR on language and reading development is not related to children's FR status, but rather to their reading status (i.e., dyslexic or not). For example, in van Viersen et al.'s (2017) study, although FR dyslexic children had poorer vocabulary scores than FR non-dyslexic and control children between ages 17 and 35 months, the latter two groups did not differ from each other. This finding suggests that poor early vocabulary is associated with dyslexia status not with FR. Thus, in studies comparing FR versus NoFR children only, it remains unclear to what extent an overall significant effect of FR on language skills reflects children's FR status, reading status or DLD-risk status.

Results from several studies have suggested an association between LT and lower outcomes in reading and spelling throughout the school years (e.g., Lyytinen et al., 2005; Psyridou, Eklund, Poikkeus, & Torppa, 2018; Rescorla, 2002, 2005, 2009). In her longitudinal study, Rescorla (2002) examined language and reading outcomes in late talkers and controls (N = 59) at 6–9 years of age and reported that the two groups did not differ in reading skills at ages 6 and 7 years, when all children were in the early stages of learning to read. However, significant group differences were found in aggregate measures of reading (i.e., decoding, comprehension, spelling, and written language) at 8 and 9 years, suggesting that late talkers, as a group, may show lower performance in a wide range of reading skills that can be more apparent as literacy demands increase over time. Similar results were reported by Lyytinen et al. (2005), who followed a sample of Finnish children with and without FR (n = 107, n = 93, respectively) from 2 years until the end of the second grade (M = 8;9 years). A subsample of late talkers (n = 22 FRLT, n = 10 NoFRLT) was also identified. The authors found that in comparison with late talkers in the NoFR group, LT children with FR were more likely to experience persistent difficulties in both receptive and expressive language at ages 3;6 and 5;6 years. Further, the combination of FR of dyslexia and LT was reported to impede the development of reading, reading comprehension, and spelling skills in the early grades.

4 | THE PRESENT STUDY

Family risk of dyslexia and early expressive language delay are known to place children at increased risk for later language and literacy problems (Rescorla & Dale, 2013a; Snowling & Melby-Lervåg, 2016, for overviews). However, research addressing the language development and long-term outcomes in children with both risk factors is still scarce. Most FR studies of dyslexia do not report original expressive vocabulary data (i.e., an index measure of LT) at 2 years of age and, consequently, do not have a clearly defined LT group. An exception was the study by Lyytinen et al. (2005), which implied that FR status might moderate the language outcomes, although such an effect was not directly examined by the authors. In the present study, we were able to test whether FR status moderated the association between 4;6 years and 6 years language skills in children. In addition, we examined the possible interaction effects between FR status and LT status, which were not reported in Lyytinen et al. (2005). A study by Carroll and Myers (2010), which explored the interaction between FR status and speech and language-therapy group status, is comparable to ours to some extent. Carroll and Myers reported measures from oral language tasks in children with FR (n = 46), children receiving speech and language therapy (n = 36), and typically developing children (n = 128) aged 4–6 years. Their results indicated a significant effect of speech and language therapy group status on both vocabulary and grammar scores, whereas FR status did not have such an effect. There were also no significant interactions between speech and language therapy group status and FR status, suggesting that children in the speech and language therapy group did not manifest different strengths and weaknesses on these tasks depending on their FR status.

In this small-scale study, we investigated whether FR of dyslexia and LT affect subsequent language abilities. To do so, we examined lexical and grammatical skills in a group of FR and NoFR children who were initially assessed at 2 years and were followed up at ages 4;6 and 6 years. We posed the following research questions:

1. What is the effect of FR and LT status on vocabulary and grammar outcomes at ages 4;6 and 6 years, respectively? Furthermore, what is the proportion of children, if any, who were at risk of DLD at the age of 6 follow-up? Based on the findings that FR children's difficulties in vocabulary and grammar seem to increase over time (Snowling, Nash et al., 2019), we hypothesized that FR status might have a main effect on oral language outcomes at 6 years rather than at 4;6 years. LT children generally develop age appropriate skills in expressive vocabulary and receptive grammar by 3–5 years of age (Moyle et al., 2011; Paul et al., 1997), whereas their difficulties in expressive grammar tend to be more protracted (Rescorla & Turner, 2015; Rice et al., 2008). We thus anticipated that we would not detect a significant effect of LT status on expressive vocabulary and receptive grammar at ages 4;6 and 6 years but instead find an effect on expressive grammar skills at both ages. We further expected that some of the late talkers (with or without FR) would have recovered from their early delays and develop typical language skills by age of 6 years, whereas others would have persistent language problems (Rescorla, 2011). As some evidence suggests FR status as a potential risk factor for emerging DLD, it was also hypothesized that a number of FR children with typical expressive vocabulary in toddlerhood might have emerging DLD at 6 years (Snowling et al., 2016; Zambrana et al., 2014). It should be highlighted that due to the small sample size of the subgroups, this research question was of exploratory nature and examined using descriptive data only.
2. How much of the variability in expressive vocabulary, and in receptive and expressive grammar at 6 years of age is explained by children's group statuses (LT and FR) and earlier language skills assessed at the age of 4;6 years? Does FR status moderate the associations between 4;6 years and 6 years language skills? Reported findings suggest that early language skills, together with children's group status, account for higher variance in expressive than in receptive skills (Lyytinen et al., 2001). We therefore anticipated that language skills of age 4;6 years together with group statuses would explain more variance in expressive than in receptive language outcomes at 6 years. To our knowledge, no previous research has examined whether FR status moderates the effect of earlier language skills on later language development. The study by Lyytinen et al. (2005) suggests that this might be the case, although the issue of moderation was not directly addressed. We thus hypothesized that FR status might moderate the 4;6-year language skills in predicting the 6-year language outcomes.

5 | METHOD

5.1 | Participants

The 46 children reported here participated in the prospective Tromsø Longitudinal Study of Dyslexia (TLD). All children were monolingual Norwegian, and they had no known neurological conditions. There was no difference in general cognitive ability between the FR group (M = 105.16, SD = 8.90) and the NoFR group (M = 108.64, SD = 9.28) t (51) = 1.14, p = .175 at the age of 24 months (Bayley, 2006).

The families were recruited from the Arctic region of Norway via advertisements in local newspapers and brochures at local child health clinics. The families were selected in a three-stage procedure. In stage 1, parents who volunteered to participate in the study completed a short questionnaire. The questionnaire asked whether the parent had ever experienced reading and spelling problems and whether close relatives (i.e., their own parents and siblings) had experienced such problems (on a yes/no scale). In stage 2, parents were invited to a semi-structured interview. A detailed questionnaire was mailed to the parents before the interview. Parents who reported current impairments and/or a history of reading and writing impairments were asked to give a more detailed description in the interview. In stage 3, all parents were tested on a wide battery of literacy tests to validate their self-reported reading and spelling abilities. Parents were also tested on a wide battery of reading-related cognitive skills (see Nergård-Nilssen & Hulme, 2014, for a more detailed description of the tests and procedures employed).

Altogether 53 children started as participants in the TLD, but unfortunately, seven of the families dropped out from the project during the follow-up period due to relocation outside the region. Little's Missing Completely at

Random test showed that missing data were not completely at random χ^2 (df = 6) = 19.52, p < .01. Further comparisons revealed that those who withdrew from the study had poorer productive language skills measured with the MacArthur-Bates Communicative Development Inventories (CDI) at the age of 2 years (t(14.54) = −3.62, p < .01) compared to children who stayed in the longitudinal follow-up (up to 6 years of age). Data for the seven children who dropped out from the study were not used in the current analyses.

5.1.1 | FR group

If one of the parents (or both) performed below −1 standard deviation on a composite score of standardized measures of reading fluency and spelling, and, if this parent (or both) had self-reported history of reading problems, the child was classified as being at FR. According to these criteria, 24 children (10 girls, 14 boys) were categorized as being at FR of dyslexia.

5.1.2 | NoFR group

Children whose parents performed within normal range on standardized literacy tests and had no self-reported history of reading impairments, formed our no-FR group. According to these criteria, 22 children (10 girls, 12 boys) were allocated to the NoFR group.

5.2 | Family characteristics

Table 1 displays demographic variables and characteristics for FR and NoFR parents at the beginning of the study. Parents' educational level is indexed by 1 = compulsory school (year 1–10); 2 = upper secondary school/high school (year 11–13); 3 = bachelor's degree; 4 = master's degree and/or PhD, respectively. Education after compulsory school is indexed by the number of years completed after Year 10 in lower secondary. Household's total income in Norwegian Krone (NOK) is indexed by 1 = less than NOK 600,000; 2 = between NOK 600,000 and 700,000; 3 = between NOK 700,000 and 900,000; and 4 = NOK 900,000 or more. Performance IQ was assessed by Wechsler Abbreviated Scale of Intelligence (Ørbeck & Sundet, 2007; Wechsler, 1999), and the scaled scores were reported.

There were no group differences on any demographic variables except educational level, that is, NoFR parents had significantly higher educational level compared to FR parents. The household income was however unaffected

TABLE 1 Demographic variables of parents at the beginning of the study

	FR parents (n = 44)			NoFR parents (n = 36)						Effect size
	Mean	*SD*	*Range*	*Mean*	*SD*	*Range*	*t*	*df*	*p*	*Cohen's d*
Age	34.80	5.41	25–50	35.00	5.26	26–46	0.22	115	.83	0.04
Educational level	2.85	0.87	1–4	3.17	0.85	1–4	1.99	118	.05	0.37
Education after compulsory school	3.22	2.74	0–10	4.06	2.91	0–10	1.51	109	.13	0.29
Total household income	2.69	1.10	1–4	2.71	1.14	1–4	0.98	114	.92	0.18
Performance IQ	118.11	11.47	89–138	120.17	8.98	99–134	0.55	74	.58	0.13

Abbreviations: FR, FR of dyslexia; NoFR, no FR of dyslexia; SD, standard deviation.

by differences in extent of education. There were no group differences in general ability (as indexed by Performance IQ) or reading comprehension. However, there were large group differences on tests measuring decoding and spelling skills (Nergård-Nilssen & Hulme, 2014).

5.3 | Instruments

5.3.1 | Defining expressive vocabulary delay at 2 years

The MacArthur-Bates CDI: Words and sentences (CDI W&S; Fenson et al., 1993; Fenson, Marchman, Thal, Dale, & Reznick, 2007; Norwegian adaptation by Kristoffersen & Simonsen, 2012) was used to identify late talkers for the study. Parents completed the CDI W&S form, and items marked as "word produced by the child" were summed to yield the CDI productive vocabulary score (maximum score of 731). The reported reliability for the CDI W&S Vocabulary checklist, Cronbach's α is .99 (Kristoffersen & Simonsen, 2012).

Children were classified as late talkers if their CDI W&S productive vocabulary scores were at or below the 20th percentile of the gender-specific normative values. This is less stringent than the more commonly used 10th percentile but was adopted to achieve adequate numbers of LT cases for analysis. More liberal cut points have been reported in the literature, though (e.g., the 30th percentile for late talkers aged 25–41 months in Jones, 2003; the 20th percentile for late talkers aged 21–24 months in Rujas, Casla, Mariscal, Lázaro López-Villaseñor, & Murillo Sanz, 2019). There is still little scientific basis for selecting the precise criterion for LT (Rescorla & Dale, 2013b). Therefore, in keeping with Marchman and Fernald (2013), the term late talker is used descriptively in the present study, referring to those who fall at the low end of the continuum in language production (i.e., the lowest 20th percentile). Using this criterion, six children in the FR group and six children in the NoFR group were determined as late talkers.

5.4 | Receptive grammar measure at 4;6 years

The Test for Reception of Grammar-2 (TROG-2; Bishop, 2003; Norwegian adaptation by Lyster & Horn, 2009) was used to measure children's receptive grammar skills at the age of 4;6 years. This test, henceforth called "Receptive Grammar TROG 4;6," assessed grammatical comprehension by using a multiple choice format, where a picture depicting the target sentence is contrasted with three foils depicting a sentence that is altered by a grammatical or lexical element. There is a block of four items for each grammatical contrast, and the block is passed if the child responds correctly to all four items. Blocks are arranged in order of increasing difficulty, and the test is discontinued after one error or more in five consecutive blocks. The score here is the number of correct responses. Internal reliability for the test is α = .95 (Lyster & Horn, 2009).

5.5 | Expressive vocabulary and expressive grammar measures at 4;6 years

Four subtests from *The Clinical Evaluation of Language Fundementals-4 (CELF-4*; Semel, Wiig, & Secord, 2003; Norwegian adaptation by Monsrud & Rygvold, 2013) were administered to the children to measure their vocabulary and grammar knowledge at the age of 4;6 years. The CELF-4 is not normed for the age of 4;6 years in the Norwegian version (normed for the age of 5 years and over), and therefore, the scores were standardized based on the means and standard deviations of the current sample before calculating arithmetic means used in the analyses. No floor effects were detected.

The *Expressive Vocabulary* subtest, henceforth called "Expressive Vocabulary CELF 4;6," was taken to evaluate the children's ability to name illustrations of people, objects, and actions (i.e., referential naming). Reliability for this subtest is α = .82 (Monsrud & Rygvold, 2013).

Scores from three subtests of CELF-4 (*Word Structure*, *Formulated Sentences*, and *Recalling Sentences*) were standardized and then combined into a composite score henceforth called "Expressive Grammar CELF 4;6." Cronbach Alpha reliability for this composite score is .68. The *Word Structure* subtest was used to evaluate the children's knowledge of grammatical rules in a sentence completion task. Here, the child completes an orally presented sentence that pertains to an illustration and is required to apply targeted word structure rules such as inflections and derivations. Reliability for this subtest is α = .78 (Monsrud & Rygvold, 2013). The *Formulated Sentences* subtest was used to evaluate the ability to formulate compound and complex sentences when given grammatical (semantic and syntactic) constraints. Here, the child was asked to formulate a sentence, using target words or phrases, while using an illustration as a reference. Reliability for this subtest is α = .94 (Monsrud & Rygvold, 2013). The *Recalling Sentences* subtest was used to evaluate the ability to recall and reproduce sentences of varying length and syntactic complexity. Here, the child imitates sentences presented orally by the examiner. Reliability for this subtest is α = .89 (Monsrud & Rygvold, 2013).

5.6 | Expressive vocabulary, expressive grammar, and receptive grammar measures at 6 years

Six subtests from *CELF-4* were used at the age of 6 years. The subtest *Expressive Vocabulary*, henceforth called "Expressive Vocabulary CELF 6," was re-administered to measure children's vocabulary skills. The subtests *Word Structure*, *Formulated Sentences*, *and Recalling Sentences* were re-administered to assess children's expressive grammar skills. The scores from these three subtests were standardized and then combined into a composite score henceforth called "Expressive Grammar CELF 6." Cronbach Alpha reliability for this composite score is .81.

The subtest *Concepts and Following Directions* was used to evaluate the ability to interpret, recall and execute verbal instructions of increasing length and complexity that contain concepts of functional language. Here, the child points to pictured objects in response to oral directions. Reliability for this subtest is α = .94 (Monsrud & Rygvold, 2013). The subtest *Sentence Structure* was used to evaluate the ability to understand grammatical rules at the sentence level. Here, the child responds to a sentence by pointing to the correct picture stimuli. Reliability for this subtest is α = .74 (Monsrud & Rygvold, 2013). The *Concepts and Following Directions* and the *Sentence Structure* scores were standardized and then combined into a composite score henceforth called "Receptive Grammar CELF 6." Reliability for this composite score is α = .81.

5.7 | Defining risk of DLD at 6 years

Classification of children's language status at 6 years was based on their *CELF-4 Core Language* score, which is derived by summing the scaled scores from the following four subtests, *Word Structure*, *Formulated Sentences*, *Recalling Sentences*, and *Concepts and Following Directions* and is standardized around a mean of 100 and a standard deviation of 15. The CELF-4 Core Language score is a representative measure of general language ability that quantifies a child's overall language performance and is used to make decisions about the presence or absence of DLD (Monsrud & Rygvold, 2013). Reliability for the CELF-4 Core Language scale is α = .92 (Monsrud & Rygvold, 2013).

In a manner similar to Snowling et al. (2016) and Carroll and Myers (2010), a cut-off of language impairment corresponding to a score 1 *SD* below the mean (i.e., ≤85) for the normative population was adopted. Also, in accordance with St Clair et al.'s (2019, p. 2754) study, we adopted the term "risk of DLD" instead of the diagnostic label of DLD when referring to language difficulties in children at the age of 6 years. This is also in line with the consensus that although test scores provide useful information they should not be used as the sole criterion for identifying DLD (Bishop, 2017). Based on this cut-off point (i.e., ≤85), nine out of 24 children in the FR group and three out of 22 children in the NoFR group were classified as being at risk of DLD at the age of 6 years.

5.8 | Research design and general procedure

All children were tested individually at ages 2, 4;6, and 6 years, ±3 weeks. Thus, they were of approximately the same age at each individual time point. Assessments were administered in a laboratory at the university and were videotaped and audio-recorded for later analyses. Each session lasted 2–3 hr and was completed with one examiner and one parent in the room (i.e., up to the age of 4;6 years). Parents received and completed the CDI form regarding their child's expressive vocabulary and grammar at home a day or two before the visit to the university laboratory. The CDI forms were inspected by the examiners at the clinic to identify possible errors.

6 | RESULTS

All distributions of continuous language measures were normal or close to normal and no extreme values were detected in Box Plot analyses. Therefore, no transformations of measures or moving of outliers were necessary. FR status was coded as follows: 1 = FR and 0 = no FR. Likewise, the dichotomous LT status was coded as follows: 1 = LT and 0 = no LT.

6.1 | Group comparisons in language outcomes at ages 4;6 and 6 years

Our first research question was related to possible effects of FR status and LT status on vocabulary and grammar outcomes at ages 4;6 and 6 years. Descriptive statistics for the four groups in language skills at 4;6 and 6 years are presented in Table 2. The effects of FR and LT statuses were examined using multivariate analyses of variance (MANOVA) with FR status and LT status as the independent measures and expressive vocabulary, receptive grammar, and expressive grammar as the dependent measures. Separate analyses were performed for the two outcome ages, 4;6 and 6 years. At both ages, covariance matrices were equal based on Box Test of Equality of Covariance Matrices ($F(18, 1{,}303.83) = 0.92$, $p = .55$, and $F(18, 1{,}273.79) = 0.88$, $p = .60$, 4;6 and 6 years, respectively).

TABLE 2 Means and standard deviation in expressive vocabulary, receptive and expressive grammar at 4;6 and 6;6 years in the four groups

		FR + LT *n* = 6		FR + NoLT *n* = 18		NoFR + LT *n* = 6		NoFR + NoLT *n* = 16	
	Range	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age 4;6 years									
Expressive vocabulary CELF	−2.02 – 1.93	−0.41	1.03	−0.21	1.03	0.32	1.10	0.39	0.85
Receptive grammar TROG	−2.13 – 1.52	−.28	.83	0.00	1.04	−.56	0.51	.38	0.93
Expressive grammar CELF	−1.49 – 1.82	−0.75	0.76	−0.10	0.69	−0.55	0.44	0.66	0.62
Age 6 years									
Expressive vocabulary CELF	−1.90 – 1.86	−.30	1.31	−0.25	0.98	0.54	1.00	0.20	0.867
Receptive grammar CELF	−1.87 – 1.50	−0.19	0.73	−0.03	1.06	0.19	0.49	0.19	0.73
Expressive grammar CELF	−2.16 – 1.48	−0.87	1.07	−0.04	0.72	−0.00	0.79	0.73	0.47

Abbreviations: CELF, Clinical Evaluation of Language Fundementals-4; FR, FR of dyslexia; LT, late talking; NoFR, no FR of dyslexia; NoLT, no late talking; SD, standard deviation; TROG, test for reception of grammar-2.
Note: All measures reported in z-scores. Expressive Grammar at 4;6 years as well as Receptive Grammar at 6 years and Expressive Grammar at 6 years are average means from three standardized test scores.

6.1.1 | Age 4;6 years outcome

At 4;6 years, the main effect of LT status was significant ($F(3, 39) = 5.30$, $p = .004$, $\eta_p^2 = .29$), whereas the effect of FR of dyslexia was not ($F(3, 39) = 2.07$, $p = .12$, $\eta_p^2 = .14$). No FR × LT status interaction was found either ($F(3, 39) = 0.95$, $p = .54$, $\eta_p^2 = .05$). The univariate analyses of variance (ANOVA) test of between-subject effects showed further that LT children scored significantly lower in Expressive Grammar at 4;6 years compared to no late talking (NoLT) children (see Table 3) but not in Expressive Vocabulary or Receptive Grammar at 4;6 years. The effect size (see Table 4) for the difference between these two groups was large in expressive grammar, moderate in receptive grammar and small in expressive vocabulary. In addition, moderate effect size was found for the difference between FR and NoFR groups in expressive vocabulary and expressive grammar.

TABLE 3 Pairwise group (FR and late talker statuses) comparisons in expressive vocabulary, receptive grammar and expressive grammar at 4;6 and 6 years

	FR status			LT status			Pairwise group comparisons[a]
	df	*F*	η_p^2	*df*	*F*	η_p^2	
Age 4;6 years							
Expressive vocabulary				(1, 41),	0.08	.002	
Receptive grammar				(1, 41)	2.60	.06	
Expressive grammar				(1, 41)	12.11**	.23	LT < NoLT
Age 6 years							
Expressive vocabulary	(1, 41)	3.70	.08	(1, 41)	0.21	.005	
Receptive grammar	(1, 41)	1.05	.02	(1, 41)	0.07	.002	
Expressive grammar	(1, 42)	11.82***	.22	(1, 42)	10.81*	.20	FR < NoFR, LT < NoLT

Note: $N = 42$ or 43 depending on missing values in separate measures.
Abbreviations: FR, FR of dyslexia; LT, late talking; NoFR, no FR of dyslexia; NoLT, no late talking.
[a]Group differences are significant at least at $p < .05$.
*$p \leq .05$.
**$p \leq .01$.
***$p < .001$.

TABLE 4 Effect sizes between 1) the two FR groups and 2) the two late talker groups

	FR ($n = 24$) vs. NoFR ($n = 22$)	Late talker ($n = 34$) vs. No late talker ($n = 12$)
Age 4;6 years		
Expressive vocabulary	**0.59**	0.10
Receptive grammar	0.10	**0.61**
Expressive grammar	**0.64**	**1.21**
Age 6 years		
Expressive vocabulary	**0.57**	0.15
Receptive grammar	0.31	0.09
Expressive grammar	**1.01**	**0.87**

Note: Effect sizes were estimated with Cohen's *d* (computed with pooled standard deviations).
Note: Effect sizes larger than 0.5 in bold.
Abbreviations: FR, familial risk of dyslexia; NoFR, no FR of dyslexia.

6.1.2 | Age 6 years outcome

Both main effects, FR status and LT status, were significant in MANOVA concerning language skills at 6 years (F (3, 40) = 4.58, p = .008, η_p^2 = .26 and F(3, 40) = 7.06, p = .0006, η_p^2 = .35, respectively), whereas the FR × LT status interaction was not (F(3, 40) = 0.99, p = .94, η_p^2 = .01). The test of between-subject effects showed, first, that children with FR of dyslexia scored lower than children without such a risk in Expressive Grammar at 6 years (see Table 3). Moreover, late talkers scored significantly lower in Expressive Grammar at 6 years compared to NoLT children. Effect sizes for the difference between two groups were large in expressive grammar in both two-group comparisons, that is, FR versus NoFR and LT versus NoLT (see Table 4). No differences were found between the FR and NoFR groups in Expressive Vocabulary or Receptive Grammar at 6 years. Likewise, no differences were found between the LT and NoLT groups in Expressive Vocabulary or Receptive Grammar at 6 years either. Moderate effect size for the difference between the two FR groups was found in expressive vocabulary. All other effect sizes were small.

6.1.3 | Describing language outcomes at 6 years

We further examined the proportions of children in the current sample who were at risk of DLD at the age of six follow-up. Two of the six (33%) FR children identified as late talkers at the age of 2 years showed typical language by performing within normal limits (i.e., >85) on the 6-year CELF-4 Core Language scale. The remainder four out of the six (67%) LT children in the FR group obtained standard scores ranging from 58 to 72, with a mean of 63.75. They were accordingly defined as at risk of DLD. The 6-year CELF-4 Core Language scale identified an additional five children in the FR group (28%) who were not identified as late talkers at 2 years, but obtained scores ≤85 at the age of 6 years. The standard scores of these children were between 77 and 85, with a mean score of 80.08. Hence, they were also at risk of DLD. However, in comparison with their peers who had poor expressive vocabulary at the age of 2 years and had persistent language problems at 6 years of age, these children had normal vocabulary skills at 2 years of age but had language problems at the age of 6 years. We thus refer to this profile as emerging DLD in the remainder of the paper.

In the NoFR group, three of the six late talkers (50%) performed within normal limits on the CELF-4 Core Language scale, whereas the other three children (50%) were at risk of DLD. The standard scores of the children at risk of DLD were between 46 and 82, and the mean score was 64.33. In the NoFR group, none of the children with typical expressive vocabulary at the age of 2 years had emerging DLD at 6 years. These results must be interpreted with caution though because the number of children is small.

6.2 | Predicting language outcomes at the age of 6 years

In our second research question, we examined how much of the variability in expressive vocabulary, and receptive and expressive grammar at the age of 6 years was explained by children's group statuses and earlier language skills assessed at the age of 4;6 years. We also examined whether FR status moderated the relationship between 4;6 and 6 years language skills. To answer these questions, we performed three separate hierarchical linear regression analyses having Expressive Vocabulary, Receptive Grammar, and Expressive Grammar at 6 years as the dependent measure, at a time. We examined the effect of (a) FR status and LT status, (b) the 4;6-year language skills, and (c) FR status x the 4;6-year language skills interaction effects on age of 6 years language outcomes (separate analysis for each of the 6-year language outcome). The independent measures were entered into the model as follows: In the first step, the dichotomous FR status and LT status were entered. In the second step, the 4;6-year measure of the outcome language skill was entered (e.g., expressive vocabulary at 4;6 years when predicting the 6-year expressive vocabulary). Finally, in the third step, an interaction measure FR status x the 4;6 year language skill was entered into

the model to see whether the effect of previous language skills varied according to the FR status. No serious multicollinearity between the independent measures was detected (VIF values ranged from 1.01 to 3.04). In addition, in all regression analyses, the residuals were distributed normally. Pearson correlations between all language measures separately for the whole sample, the FR group, and the NoFR group are available through the Table S1.

6.2.1 | Expressive vocabulary

Altogether 24% of the variance in Expressive Vocabulary at the age of 6 years could be explained by the predictors (see Table 5). Only the 4;6-year measure of expressive vocabulary predicted significantly expressive vocabulary at 6 years when entered into the model at the second step (β = .43, p = .006). However, the effect of Expressive Vocabulary at 4;6 years changed to be nonsignificant when the FR status × Expressive Vocabulary 4;6 years interaction term was entered into model in the final step, that is, none of the predictors were significant when all the independent predictors were entered into the model.

6.2.2 | Receptive grammar

Likewise, 27% of the variance in Receptive Grammar at 6 years was explained, Receptive Grammar at 4;6 years being the only significant predictor when entered into the model in the second step (β = .52, p = .0007) (see Table 6). Contrary to predicting Expressive Vocabulary at 6 years, it remained significant even when the FR status × Receptive Grammar at 4;6 years interaction measure was entered into the model at step three.

6.2.3 | Expressive grammar

Finally, altogether 72% of the variance in Expressive Grammar at 6 years could be predicted by the independent measures (see Table 7). FR status, Expressive Grammar at 4;6 years, and FR status x Expressive Grammar at 4;6 years

TABLE 5 Summary of hierarchical linear regression analysis predicting expressive vocabulary at 6 years (N = 43)

	Expressive vocabulary			
Predictor	**ΔR^2**	**β**	**b (Se)**	**95% CI for b**
Step 1: Grouping	.08			
FR status		−.14	−.65 (.70)	−2.01 – 0.77
Late talker status		.10	.52 (.75)	−1.01 – 2.04
Step 2: Previous language skill	.16**			
Expressive vocabulary 4;6 years		.42	.44 (.23)	−0.03 – 0.91
Step 3: Interaction effect	.00			
FR status × expressive vocabulary 4;6 years		.01	.04 (.71)	−1.40 – 1.48
Total R^2/adjusted R^2	.24/.16			
Model fit	F(4, 39) = 3.11*			

Note: Standardized beta-values (β) and unstandardized beta-values together with standard errors (b (Se)) presented according to the final model with all independent measures included into the model.
Abbreviation: CI, confidence interval; FR, familial risk.
*p < .05.; **p < .01.

TABLE 6 Summary of hierarchical linear regression analysis predicting receptive grammar at 6 years (N = 43)

	Receptive grammar			
Predictor	**ΔR^2**	**β**	**b (Se)**	**95% CI for b**
Step 1: Grouping	.03			
FR status		−.10	−.16 (.23)	−0.62 – 0.31
Late talker status		.11	.21 (.28)	−0.35 – 0.77
Step 2: Previous language skill	.25***			
Receptive grammar 4;6 years		.52*	.03 (.01)	0.01–0.05
Step 3: Interaction effect	.00			
FR status × receptive grammar 4;6 years		−.00	−.00 (.25)	−0.51 – 0.50
Total R^2/adjusted R^2	.27/.20			
Model fit	F(4,39) = 3.63*			

Note: Standardized beta-values (β) and unstandardized beta-values together with standard errors (b (Se)) presented according to the final model with all independent measures included into the model.
Abbreviation: CI, confidence interval; FR, familial risk.
*p < .05.; ***p < .001.

TABLE 7 Summary of hierarchical linear regression analysis predicting expressive grammar at 6 years (N = 43)

	Expressive grammar			
Predictor	**ΔR^2**	**β**	**b (Se)**	**95% CI for b**
Step 1: Grouping	.37***			
FR status		−.20*	−.34 (.16)	−0.67 – −0.02
Late talker status		−.07	−.13 (.20)	−0.54 – 0.27
Step 2: Previous language skill	.31***			
Expressive grammar 4;6 years		.49**	.51 (.15)	0.20–0.82
Step 3: Interaction effect	.04*			
FR status × expressive				
Grammar 4;6 years		.29*	.37 (.15)	0.06–0.68
Total R^2/adjusted R^2	.72/.69			
Model fit	F(4,39) = 25.47***			

Note: Standardized beta-values (β) and unstandardized beta-values together with standard errors (b (Se)) presented according to the final model with all independent measures included into the model.
Abbreviation: CI, confidence interval; FR, familial risk.
*p < .05.; **p < .01.; ***p < .001.

interaction effect were significant predictors of expressive grammar at 6 years in the final model. Having FR of dyslexia decreased the score in expressive grammar at 6 years by .20 standard deviation compared to children without FR. Expressive Grammar at 4;6 years had a positive relation to Expressive Grammar 1.5 years later; the better the skill at 4;6 years, the better it was at 6 years. However, also the FR status x Expressive Grammar at 4;6 years interaction effect was significant. Further hierarchical linear regression analyses separately in the FR and NoFR groups showed that the effect of Expressive Grammar at 4;6 years on Expressive Grammar at 6 years was larger in the FR group compared to the NoFR group (β = .81, p = .000005 and β = .67, p = .008, FR and NoFR group, respectively).

7 | DISCUSSION

The aim of this study was to examine the potential effects of FR of dyslexia and LT, respectively, on subsequent language abilities and the possible interaction effect between these two risk factors. We followed a group of FR and NoFR children from 24 months through age 4;6–6 years. We examined expressive vocabulary as well as expressive and receptive grammar separately to provide a comprehensive picture of long-term language outcomes in these children. We found a significant effect of LT status on language both at the ages 4;6 and 6 years. We also found that FR status had an impact on expressive language skills at the age of 6 years rather than at 4;6 years. The interaction between LT and FR statuses was not significant, implying that LT children achieved lower scores, regardless of their FR status. We observed that some of the FR children (but none in the NoFR group) with typical expressive vocabulary skills at age 2 years appeared to have emerging DLD at the age six follow-up. Furthermore, the regression model showed that the 4;6-year language measures together with LT and FR statuses could explain more of the variation in expressive grammar than in vocabulary and receptive grammar at age 6 years. A significant moderating effect of FR status was found on the association between the 4;6-year and the 6-year expressive grammar skills; the predictive power of 4;6 years skill was larger in the FR group.

8 | EFFECT OF LT STATUS AND FR STATUS ON LANGUAGE SKILLS

The current results indicate that the LT group performed significantly poorer on expressive grammar at both 4;6 and 6 years, suggesting that this particular domain of language poses a greater risk for long-term problems in this group of children. On the other hand, late talkers' performance in expressive vocabulary and receptive grammar were comparable to their NoLT peers at both ages. These findings corroborate with previous research showing that although late talkers, as a group, continue to lag behind their typically developing peers on expressive grammar skills throughout the preschool years, they perform within age expectations on vocabulary and receptive grammar by the age of 6 years (e.g., Ellis & Thal, 2008; Moyle et al., 2011; Paul et al., 1997; Rescorla, 2011; Rescorla & Turner, 2015; Rice et al., 2008). Furthermore, five of the 12 LT children with and without FR showed age-appropriate language skills, while the remainder of them (i.e., seven children) were at risk of DLD by the time they entered school (i.e., 6 years), in agreement with previous research (Paul & Ellis Weismer, 2013). Socioeconomic status has been reported as one of the most robust correlates of later language challenges in LTs (Armstrong et al., 2017; Reilly et al., 2010). It might thus explain the variability in the rate of recovery from early language delay among late talkers with and without FR. However, in the present study, there were no differences between the groups in terms of their household income, suggesting that this variable is not likely to account for the current group differences.

Our data also revealed that despite having typical expressive vocabulary at the age of 2 years, five children in the FR group appeared to have emerging DLD at the age of 6 years. This suggests that FR status might include other language-related risk factors (e.g., deficits in perception and segmentation of early speech; Lohvansuu et al., 2018; Snowling, Lervåg, et al., 2019), which are not covered by the early vocabulary measure, but resulted in language difficulties at a later age. However, due to low number of FR children who seemed to have emerging DLD, this result should be considered preliminary. Reporting a similar finding in their longitudinal study with a larger FR sample (N = 75), Snowling et al. (2016) argue that this particular result might be suggestive of a different aetiology, possibly of genetic origin, which leads to atypical language trajectories seen in some FR children. More research following FR children from toddlerhood into school years may contribute to gaining more insight into the rate and pattern of language growth in this group of FR children, who seem to start in the normal range for language but fall in the impaired range at a later time point in childhood.

Furthermore, our results indicated that FR status had an effect on expressive language skills more clearly at the age of 6 years but not so much at 4;6 years. A plausible explanation of this finding might be related to our observation that a number of FR children who were not classified as late talkers at the age of 2 years appeared to have emerging DLD at 6 years. In other words, these children with emerging DLD probably pulled down the mean level of

the FR group at this age. However, it should also be mentioned that we found moderate effect sizes for between-group on both expressive vocabulary and expressive grammar at age 4;6 years. This might be suggestive of a decreasing trend in language skills in the FR group as a whole in the period from the age of 2 to 6 years, which became most apparent by the age of 6 years. A similar pattern of results has also been reported in a recent study by Snowling, Nash et al. (2019), which found that oral language deficits in English FR children diagnosed with dyslexia increased with age and became large after school entry. Likewise, van Viersen et al. (2018) reported that despite a number of differences detected on language measures between Dutch FR and NoFR groups, the effect sizes were larger for FR children who later developed dyslexia. Therefore, it is interesting to speculate that the observed effect of FR on expressive language skills in the present study might concern only those FR children who will go on to become dyslexic readers. In other words, it might be children's reading status (whether they become dyslexic or not) rather than their FR status which has had an impact on language development in our study. Reading status of the children in the current sample is yet unknown. A future study thus needs to establish whether this result is a reading-related or FR-related effect. Furthermore, our finding that nine FR children were also at risk of DLD suggests that the observed effect of FR on expressive language skills might mainly concern FR children, who will later be diagnosed with DLD (with or without comorbid dyslexia). It follows that the overall effect of FR on language outcomes reported here should be interpreted with caution.

Our finding that FR did not have a main effect on language outcomes at the age of 4;6 years could also be due to the small sample reported here. A small sample size limits statistical power for detecting the potential differences in lexical and grammatical knowledge particularly at younger ages at the group level. This is because difficulties in these language domains are relatively more subtle than phonological processing difficulties that the majority of FR children seem to experience to varying degrees from early years on (Lohvansuu et al., 2018; Snowling, Lervåg, et al., 2019; Snowling & Melby-Lervåg, 2016). In other words, the current sample size was probably too restricted to detect the small differences between FR and NoFR groups. This suggests that a larger sample is needed to be able to find a possible effect of FR on children's early lexical and grammatical development. Another concern with small sample sizes is the sample bias. As noted above, not all FR children will develop dyslexia and those who will eventually get a diagnosis form the minority of the FR group as a whole (mean prevalence 45%, Snowling & Melby-Lervåg, 2016). Thus, small samples have a higher chance of not including an adequate number of affected children, which may partly explain the non-significant differences in comparisons between only FR and NoFR children. Future longitudinal studies with larger FR samples will contribute to a better understanding of whether and how FR status exerts an effect on oral skills early in development.

With respect to interaction effects, our data failed to find significant interactions between LT and FR statuses, indicating that late talkers had similar developmental trajectories regardless of their FR status. This result might seem unexpected based on the findings by Lyytinen et al. (2005) that late talkers with FR scored significantly lower than late talkers without such risk in preschool years. However, it should be noted that in the current study, LT children with FR of dyslexia achieved somewhat lower scores at both assessment points, suggesting that interaction might have become significant in a larger sample. That said, in line with our results, Carroll and Myers (2010) failed to detect interaction between the FR and the speech and language-therapy group statuses in terms of their effects on language outcomes. The authors reported though significant interactions between the two group statuses on the measures of phonological processing skills, one of the core deficits related to dyslexia. Results of the current study seem to suggest that in lexical and grammatical skills interaction effects might be harder to detect, especially when the sample size is small. Thus, if our study had included tasks assessing children's phonological abilities, we might have found that the LT group with FR scored more poorly than late talkers with NoFR. This issue needs to be addressed in future studies.

9 | PREDICTION OF LANGUAGE OUTCOMES AT AGE 6 YEARS

We found that performance on vocabulary and grammar at age 4;6 years was a significant predictor of the corresponding outcomes at age 6 years. This is congruent with previous evidence that the major predictor of later

language status is language at an earlier age (Ellis Weismer, 2007; Henrichs et al., 2011). When the other predictors were entered into the model, the 4;6-year expressive vocabulary was no longer significant. This is probably due to overlapping variance in the dependent measure explained by both Expressive Vocabulary at 4;6 years and the interaction term FR status × Expressive Vocabulary at 4;6 years, since regression analyses tap and test the significance of unique variance of each predictor on the dependent measure. Results also indicated that the amount of variance explained by the model was much larger for expressive grammar (72%) than for expressive vocabulary (24%) and receptive grammar (27%) at the age of 6 years. These values appear to be higher than earlier published research, which included language skills assessed before the age of 3 years. For example, the regression model in Henrichs et al. (2011) study, including perinatal, demographic, and maternal factors together with earlier language scores explained 18% of the variance in expressive vocabulary at 30 months. Eleven percentage of this variance was explained by expressive vocabulary at 18 months. Likewise, the model in Ghassabian et al. (2014) using a similar set of predictors to that of Henrichs et al. (2011) explained 15% of the variance in receptive vocabulary at age 6 years. 0.3 and 1.5% of this variance was accounted for by receptive and expressive vocabulary at 18 months, respectively, and 2;6 years expressive vocabulary explained only 2%. There is, however, evidence of more stability in language development between ages 4 and 7 years than in the period from 2 to 4 years (Armstrong et al., 2017). Therefore, our results might be mainly due to the inclusion of language measures taken at a later age point (i.e., 4;6 years) and also due to the relatively shorter prediction period (i.e., from 4;6 to 6 years) studied in the current study.

On the other hand, the prediction model in Lyytinen et al. (2001) including FR status and earlier language skills, among others, accounted for 34 and 48% of the variance in receptive and expressive language, respectively, at 42 months. The percentage of variance explained by Lyytinen et al.'s model seems to be higher than those reported in the epidemiological studies above, and therefore, relatively more similar to the current ones. However, the outcome measures in Lyytinen et al. (2001), both receptive language and expressive language at 42 months were based on receptive vocabulary and grammar, and expressive vocabulary and grammar, respectively. In the present study, we differentiated between vocabulary and grammatical knowledge in the oral language outcomes at 6 years, suggesting that results of these two studies are not fully comparable.

Prediction studies vary greatly in terms of the ages of children and the way predictors and outcomes were defined. Consequently, their results are not directly comparable, as they do not reflect completely the same skills in children studied. Nevertheless, the present study and previous studies indicate that despite including a number of potential demographic, linguistic and environmental factors, the predictive models in these studies still leave much of the variance in later language outcomes unexplained across preschool years. This can be taken to suggest that factors that not yet addressed are influencing language progress. The fact that our model accounted for more than 70% of variance in later expressive grammar is thus noteworthy. It is also notable that both expressive grammar at age 4;6 years and FR status significantly predicted expressive grammar at age 6 years. FR status was observed to play a significant predictive role on expressive, but not on receptive language outcomes in Lyytinen et al. (2001) study as well. These results imply that expressive grammar difficulties might be related to FR of dyslexia. In addition, we found that expressive grammar at 4;6 years predicted expressive grammar at 6 years in both groups. However, FR status significantly moderated the association between the 4;6-year and the 6-year expressive grammar skills in children, suggesting that in the FR group the effect of earlier expressive grammar skill on subsequent expressive grammar was significantly larger than in the group without family history of dyslexia. A possible explanation for significantly lower expressive grammar skills in the FR group might be related to our observation that altogether nine children in this group (N = 24) were classified as being at risk of DLD. Children with DLD (with or without comorbid dyslexia) are known to display deficits particularly in semantics, syntax, discourse (Bishop & Snowling, 2004). Therefore, these results suggest that a proportion of FR children in the present study are not only at risk of dyslexia but also DLD. Moreover, their difficulties in grammar place these children at higher risk for reading comprehension problems as evidence shows that early oral skills have a direct influence on reading comprehension development (Hulme et al., 2015; Psyridou et al., 2018).

Although strengthened by a longitudinal design, there are a number of limitations to this research study. First, as noted earlier, our results are based on a small sample of children, and therefore, should be interpreted with

appropriate caution. Despite being aligned with previous research, they certainly need to be validated in future studies employing larger samples. Second, the present study did not include a measure of receptive language ability at 2 years. Therefore, we were unable to determine whether the delay in language at age 2 years was limited to expressive language. Late talkers with early receptive language problems are reported to be more at risk for subsequent poor language outcomes. Thus, inclusion of receptive measures is recommended in future studies to gain more insight into the developmental profiles of late talkers with a FR of dyslexia. Third, seven children withdrew from the study by the age of 3 years due to relocation outside the region and data from these children were not included in the analyses. This dropout did not appear to be at random though, pointing to some selective attrition. That is, the 2-year expressive vocabulary scores of excluded children were lower than those who continued in the study during the follow-up period. This may have reduced the variance of the sample and therefore the statistical power of the current analyses. That said, it is also likely that the selective drop out has decreased the differences between groups, making the current significant results relatively more convincing.

In conclusion, these preliminary findings indicate that expressive language skills, in particular expressive grammar, are compromised in children born at FR of dyslexia at the group level by school age. We cannot discern though with certainty whether this is due to children's FR status or their future reading status (dyslexic or not). The current results further suggest that language skills at age 4;6 years, in combination with the child's FR status predict the child's language outcomes at 6 years, and may serve as an index of need for additional support. It is not straightforward though to translate current results into clinical practice for use at the individual level, as they are based on group means. However, they clearly point to the importance of considering not only early language skills but also whether the child has an additional risk factor, such as a family history of literacy difficulties, when deciding who might be most in need of early and sustained intervention. They also warrant that language development in at-risk children be monitored throughout preschool years and in particular before school entry to secure early identification and timely educational support during the early school years.

ACKNOWLEDGEMENTS

This study was supported by a grant from the Tromsø Research Foundation (grant number A42966) to the third author of the paper. We thank all families who took part in the study.

ORCID

Ømur Caglar-Ryeng https://orcid.org/0000-0001-9127-8750
Trude Nergård-Nilssen https://orcid.org/0000-0002-1183-8613

REFERENCES

Armstrong, R., Scott, J. G., Whitehouse, A. J., Copland, D. A., Mcmahon, K. L., & Arnott, W. (2017). Late talkers and later language outcomes: Predicting the different language trajectories. *International Journal of Speech-Language Pathology*, *19*(3), 237–250. https://doi.org/10.1080/17549507.2017.1296191

Bayley, N. (2006). *Bayley scales of infant and toddler development* (3rd ed.). San Antonio, TX: Harcourt Assessment.

Bishop, D. V. (2017). Why is it so hard to reach agreement on terminology? The case of developmental language disorder (DLD). *International Journal of Language & Communication Disorders*, *52*(6), 671–680. https://doi.org/10.1111/1460-6984.12335

Bishop, D. V., & Snowling, M. J. (2004). Developmental dyslexia and specific language impairment: Same or different? *Psychological Bulletin*, *130*(6), 858–886. https://doi.org/10.1037/0033-2909.130.6.858

Bishop, D. V., Snowling, M. J., Thompson, P. A., Greenhalgh, T., & The CATALISE-2 Consortium. (2017). Phase 2 of CATALISE: A multinational and multidisciplinary Delphi consensus study of problems with language development: Terminology. *Journal of Child Psychology and Psychiatry*, *58*(10), 1068–1080. https://doi.org/10.1111/jcpp.12721

Bishop, D. V. M. (2003). *The test for reception of grammar* (2nd ed.). London, England: Pearson.

Caglar-Ryeng, Ø., Eklund, K., & Nergård-Nilssen, T. (2019). Lexical and grammatical development in children at family risk of dyslexia from early childhood to school entry: a cross-lagged analysis. *Journal of Child Language*, *46*(6), 1102–1126. https://doi.org/10.1017/S0305000919000333

Caravolas, M., Lervåg, A., Mousikou, P., Efrim, C., Litavský, M., Onochie-Quintanilla, E., … Seidlová-Málková, G. (2012). Common patterns of prediction of literacy development in different alphabetic orthographies. *Psychological Science*, *23*(6), 678–686. https://doi.org/10.1177/0956797611434536

Carroll, J. M., Mundy, I. R., & Cunningham, A. J. (2014). The roles of family history of dyslexia, language, speech production and phonological processing in predicting literacy progress. *Developmental Science*, *17*, 727–742. https://doi.org/10.1111/desc.12153

Carroll, J. M., & Myers, J. M. (2010). Speech and language difficulties in children with and without a family history of dyslexia. *Scientific Studies of Reading*, *14*(3), 247–265. https://doi.org/10.1080/10888430903150634

Conti-Ramsden, G., Durkin, K., Toseeb, U., Botting, N., & Pickles, A. (2018). Education and employment outcomes of young adults with a history of developmental language disorder. *International Journal of Language & Communication Disorders*, *53*(2), 237–255. https://doi.org/10.1111/1460-6984.12338

Desmarais, C., Sylvestre, A., Meyer, F., Bairati, I., & Rouleau, N. (2008). Systematic review of the literature on characteristics of late-talking toddlers. *International Journal of Language & Communication Disorders*, *43*(4), 361–389. https://doi.org/10.1080/13682820701546854

Ellis, E. M., & Thal, D. J. (2008). Early language delay and risk for language impairment. *Perspectives on Language Learning and Education*, *15*(3), 93–100. https://doi.org/10.1044/lle15.3.93

Ellis Weismer, S. (2007). Typical talkers, late talkers, and children with specific language impairment: A language endowment spectrum? In R. Paul (Ed.), *Language disorders and development from a developmental perspective* (pp. 83–101). Mahwah, NJ: Lawrence Erlbaum Associates.

Ellis Weismer, S. E., Venker, C. E., Evans, J. L., & Moyle, M. J. (2013). Fast mapping in late talking toddlers. *Applied PsychoLinguistics*, *34*(1), 69–89. https://doi.org/10.1017/S0142716411000610

Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, J. P., … Reilly, J. S. (1993). *The MacArthur communicative development inventories: user's guide and technical manual*. San Diego, CA: Singular Publishing Group.

Fenson, L., Marchman, V. A., Thal, D. J., Dale, P. S., & Reznick, J. S. (2007). *MacArthur-Bates communicative development inventories: User's guide and technical manual*. Baltimore, MD: Brookes.

Fisher, E. L. (2017). A systematic review and meta-analysis of predictors of expressive-language outcomes among late talkers. *Journal of Speech, Language, and Hearing Research*, *60*(10), 2935–2948. https://doi.org/10.1044/2017_JSLHR-L-16-0310

Gallagher, A., Frith, U., & Snowling, M. J. (2000). Precursors of literacy delay among children at genetic risk of dyslexia. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *41*(2), 203–213. https://doi.org/10.1017/S0021963099005284

Ghassabian, A., Rescorla, L., Henrichs, J., Jaddoe, V. W., Verhulst, F. C., & Tiemeier, H. (2014). Early lexical development and risk of verbal and nonverbal cognitive delay at school age. *Acta Paediatrica*, *103*(1), 70–80. https://doi.org/10.1111/apa.12449

Henrichs, J., Rescorla, L., Schenk, J. J., Schmidt, H. G., Jaddoe, V. W., Hofman, A., … Tiemeier, H. (2011). Examining continuity of early expressive vocabulary development: The generation R study. *Journal of Speech, Language, and Hearing Research*, *54*(3), 854–869. https://doi.org/10.1044/1092-4388(2010/09-0255)

Hulme, C., Nash, H. M., Gooch, D., Lervåg, A., & Snowling, M. J. (2015). The foundations of literacy development in children at FR of dyslexia. *Psychological Science*, *26*(12), 1877–1886. https://doi.org/10.1177/0956797615603702

Jones, S. S. (2003). Late talkers show no shape bias in a novel name extension task. *Developmental Science*, *6*(5), 477–483. https://doi.org/10.1111/1467-7687.00304

Kamhi, A. G., & Catts, H. W. (2012). *Language and Reading Disabilities* (3rd ed.). Boston, MA: Pearson.

Kristoffersen, K. E., & Simonsen, H. G. (2012). *Tidlig språkutvikling hos norske barn: MacArthur-Bates foreldrerapport for kommunikativ utvikling [Early language development in Norwegian children: MacArthur-Bates Communicative Development Inventories]*. Oslo, Norway: Novus.

Leonard, L. B. (2014). *Children with specific language impairment* (2nd ed.). Cambridge, MA: MIT Press.

Lohvansuu, K., Hämäläinen, J. A., Ervast, L., Lyytinen, H., & Leppänen, P. H. (2018). Longitudinal interactions between brain and cognitive measures on reading development from 6 months to 14 years. *Neuropsychologia*, *108*, 6–12. https://doi.org/10.1016/j.neuropsychologia.2017.11.018

Lyon, G. R., Shaywitz, S. E., & Shaywitz, B. A. (2003). A definition of dyslexia. *Annals of Dyslexia*, *53*(1), 1–14. https://doi.org/10.1007/s11881-003-0001-9

Lyster, S. A. H, & Horn, E. (2009). *Norsk håndbok for Test for Reception of Grammar-2* [Norwegian Manual of Test for Reception of Grammar-2]. Stockholm: 08 Tryck AB.

Lyytinen, P., Eklund, K., & Lyytinen, H. (2005). Language development and literacy skills in late talking toddlers with and without FR for dyslexia. *Annals of Dyslexia*, *55*(2), 166–192. https://doi.org/10.1007/s11881-005-0010-y

Lyytinen, P., Poikkeus, A. M., Laakso, M. L., Eklund, K., & Lyytinen, H. (2001). Language development and symbolic play in children with and without FR for dyslexia. *Journal of Speech, Language, and Hearing Research*, *44*, 873–885. https://doi.org/10.1044/1092-4388(2001/070)

MacRoy-Higgins, M., Shafer, V. L., Fahey, K. J., & Kaden, E. R. (2016). Vocabulary of toddlers who are late talkers. *Journal of Early Intervention*, *38*(2), 118–129. https://doi.org/10.1177/1053815116637620

Marchman, V. A., & Fernald, A. (2013). Variability in real-time spoken language processing in typically developing and late-talking toddlers. In L. A. Rescorla & P. S. Dale (Eds.), *Late talkers: Language development, intervention, and outcomes* (pp. 145–166). Baltimore, MD: Brookes.

Monsrud, M. B., & Rygvold, A. L. (2013). *Clinical evaluation of language Fundamentals-4* [Norwegian adaptation]. Stockholm, Sweden: Pearson Assessment.

Moyle, J., Stokes, S. F., & Klee, T. (2011). Early language delay and specific language impairment. *Developmental Disabilities Research Reviews*, *17*(2), 160–169. https://doi.org/10.1002/ddrr.1110

Nash, H. M., Hulme, C., Gooch, D., & Snowling, M. J. (2013). Preschool language profiles of children at FR of dyslexia: Continuities with specific language impairment. *Journal of Child Psychology and Psychiatry*, *54*(9), 958–968. https://doi.org/10.1111/jcpp.12091

Nergård-Nilssen, T., & Hulme, C. (2014). Developmental Dyslexia in Adults: Behavioural Manifestations and Cognitive Correlates. *Dyslexia*, *20*(3), 191–207. https://doi.org/10.1002/dys.1477

Olson, R. K. (2011). Genetic and environmental influences on phonological abilities and reading achievement. In S. Brady, D. Braze, & C. Fowler (Eds.), *Explaining individual differences in reading: Theory and evidence* (pp. 197–216). New York, NY: Psychology Press/Taylor-Francis.

Ørbeck, B., & Sundet, K. S. (2007). *WASI* [Wechsler Abbreviated Scale of Intelligence, Norwegian version]. Stockholm: Harcourt Assessment.

Paul, R., & Ellis Weismer, S. (2013). Late talking in context: The clinical implications of delayed language development. In L. A. Rescorla & P. S. Dale (Eds.), *Late talkers: Language development, interventions and outcomes* (pp. 203–218). Baltimore, MD: Brookes.

Paul, R., Murray, C., Clancy, K., & Andrews, D. (1997). Reading and metaphonological outcomes in late talkers. *Journal of Speech, Language, and Hearing Research*, *40*(5), 1037–1047. https://doi.org/10.1044/jslhr.4005.1037

Poll, G. H., & Miller, C. A. (2013). Late talking, typical talking, and weak language skills at middle childhood. *Learning and Individual Differences*, *26*, 177–184. https://doi.org/10.1016/j.lindif.2013.01.008

Psyridou, M., Eklund, K., Poikkeus, A. M., & Torppa, M. (2018). Reading outcomes of children with delayed early vocabulary: A follow-up from age 2–16. *Research in Developmental Disabilities*, *78*, 114–124. https://doi.org/10.1016/j.ridd.2018.05.004

Reilly, S., Wake, M., Ukoumunne, O. C., Bavin, E., Prior, M., Cini, E., … Bretherton, L. (2010). Predicting language outcomes at 4 years of age: Findings from early language in Victoria study. *Pediatrics*, *126*(6), e1530–e1537. https://doi.org/10.1542/peds.2010-0254

Rescorla, L. (1989). The language development survey: A screening tool for delayed language in toddlers. *Journal of Speech and Hearing Disorders*, *54*(4), 587–599. https://doi.org/10.1044/jshd.5404.587

Rescorla, L. (2002). Language and reading outcomes to age 9 in late talking toddlers. *Journal of Speech, Language, and Hearing Research*, *45*(2), 360–371. https://doi.org/10.1044/1092-4388(2002/028)

Rescorla, L. (2005). Age 13 language and reading outcomes in late talking toddlers. *Journal of Speech, Language, and Hearing Research*, *48*(2), 459–472. https://doi.org/10.1044/1092-4388(2005/031)

Rescorla, L. (2009). Age 17 language and reading outcomes in late talking toddlers: Support for a dimensional perspective on language delay. *Journal of Speech, Language, and Hearing Research*, *52*(1), 16–30. https://doi.org/10.1044/1092-4388(2008/07-0171)

Rescorla, L. (2011). Late talkers: Do good predictors of outcome exist? *Developmental Disabilities Research Reviews*, *17*(2), 141–150. https://doi.org/10.1002/ddrr.1108

Rescorla, L. (2013). Late talking toddlers: A 15-year follow-up. In L. A. Rescorla & P. S. Dale (Eds.), *Late talkers: Language development, intervention, and outcomes* (pp. 219–239). Baltimore, MD: Brookes.

Rescorla, L., Dahlsgaard, K., & Roberts, J. (2000). Late talking toddlers: MLU and IPSyn outcomes at 3; 0 and 4; 0. *Journal of Child Language*, *27*(3), 643–664. https://doi.org/10.1017/S0305000900004232

Rescorla, L., & Dale, P. S. (Eds.). (2013a). *Late talkers: Language development, intervention, and outcomes*. Baltimore, MD: Brookes.

Rescorla, L., & Dale, P. S. (2013b). Where do we stand now? Conclusions and future directions. In L. A. Rescorla & P. S. Dale (Eds.), *Late talkers: Language development, intervention, and outcomes* (pp. 377–387). Baltimore, MD: Brookes.

Rescorla, L., & Turner, H. L. (2015). Morphology and syntax in late talkers at age 5. *Journal of Speech, Language, and Hearing Research*, *58*(2), 434–444. https://doi.org/10.1044/2015_JSLHR-L-14-0042

Rice, M. L., Taylor, C. L., & Zubrick, S. R. (2008). Language outcomes of 7-year-old children with or without a history of late language emergence at 24 months. *Journal of Speech, Language, and Hearing Research*, *51*(2), 394–407. https://doi.org/10.1044/1092-4388(2008/029)

Rujas, I., Casla, M., Mariscal, S., Lázaro López-Villaseñor, M., & Murillo Sanz, E. (2019). Effects of grammatical category and morphology on fast mapping in typically developing and late talking toddlers. *First Language*, *39*(3), 249–280. https://doi.org/10.1177/0142723719828258

Semel, E., Wiig, E. H., & Secord, W. A. (2003). *Clinical evaluation of language fundamentals* (4th ed.). San Antonio, TX: Harcourt Assessment.

Snowling, M. J. (2019). *Dyslexia: A very short introduction*. Oxford, England: Oxford University Press.

Snowling, M. J., Duff, F. J., Nash, H. M., & Hulme, C. (2016). Language profiles and literacy outcomes of children with resolving, emerging, or persisting language impairments. *Journal of Child Psychology and Psychiatry*, *57*(12), 1360–1369. https://doi.org/10.1111/jcpp.12497

Snowling, M. J., & Hulme, C. (2012). Annual research review: The nature and classification of reading disorders–a commentary on proposals for DSM-5. *Journal of Child Psychology and Psychiatry*, *53*(5), 593–607. https://doi.org/10.1111/j.1469-7610.2011.02495.x

Snowling, M. J., Lervåg, A., Nash, H. M., & Hulme, C. (2019). Longitudinal relationships between speech perception, phonological skills and reading in children at high-risk of dyslexia. *Developmental Science*, *22*(1), e12723. https://doi.org/10.1111/desc.12723

Snowling, M. J., & Melby-Lervåg, M. (2016). Oral language deficits in familial dyslexia: A meta-analysis and review. *Psychological Bulletin*, *142*(5), 498–545. https://doi.org/10.1037/bul0000037

Snowling, M. J., Muter, V., & Carroll, J. M. (2007). Children at FR of dyslexia: A follow-up in adolescence. *Journal of Child Psychology and Psychiatry*, *48*(6), 609–618. https://doi.org/10.1111/j.1469-7610.2006.01725.x

Snowling, M. J., Nash, H. M., Gooch, D. C., Hayiou-Thomas, M. E., Hulme, C., & Wellcome Language and Reading Project Team. (2019). Developmental outcomes for children at high risk of dyslexia and children with developmental language disorder. *Child Development*, *90*(5), e548–e564. https://doi.org/10.1111/cdev.13216

St Clair, M. C., Forrest, C. L., Yew, S. G. K., & Gibson, J. L. (2019). Early risk factors and emotional difficulties in children at risk of developmental language disorder: A population cohort study. *Journal of Speech, Language, and Hearing Research*, *62*(8), 2750–2771. https://doi.org/10.1044/2018_JSLHR-L-18-0061

Torppa, M., Lyytinen, P., Erskine, J., Eklund, K., & Lyytinen, H. (2010). Language development, literacy skills, and predictive connections to reading in Finnish children with and without FR for dyslexia. *Journal of Learning Disabilities*, *43*(4), 308–321. https://doi.org/10.1177/0022219410369096

Van Bergen, E., van der Leij, A., & de Jong, P. F. (2014). The intergenerational multiple deficit model and the case of dyslexia. *Frontiers in Human Neuroscience*, *8*. https://doi.org/10.3389/fnhum.2014.00346

van Viersen, S., de Bree, E. H., Verdam, M., Krikhaar, E., Maassen, B., van der Leij, A., & de Jong, P. F. (2017). Delayed early vocabulary development in children at FR of dyslexia. *Journal of Speech, Language, and Hearing Research*, *60*(4), 937–949. https://doi.org/10.1044/2016_JSLHR-L-16-0031

van Viersen, S., de Bree, E. H., Zee, M., Maassen, B., van der Leij, A., & de Jong, P. F. (2018). Pathways into literacy: The role of early oral language abilities and FR for dyslexia. *Psychological Science*, *29*(3), 418–428. https://doi.org/10.1177/0956797617736886

Vellutino, F. R., Fletcher, J. M., Snowling, M. J., & Scanlon, D. M. (2004). Specific reading disability (dyslexia): What have we learned in the past four decades? *Journal of Child Psychology and Psychiatry*, *45*(1), 2–40. https://doi.org/10.1046/j.0021-9630.2003.00305.x

Wechsler, D. (1999). *Wechsler abbreviated scale of intelligence*. New York, NY: The Psychological Corporation/Harcourt Brace & Company.

Zambrana, I. M., Pons, F., Eadie, P., & Ystrom, E. (2014). Trajectories of language delay from age 3 to 5: Persistence, recovery and late onset. *International Journal of Language & Communication Disorders*, *49*(3), 304–316. https://doi.org/10.1111/1460-6984.12073

Zubrick, S. R., Taylor, C. L., Rice, M. L., & Slegers, D. W. (2007). Late language emergence at 24 months: An epidemiological study of prevalence, predictors, and covariates. *Journal of Speech, Language, and Hearing Research*, *50*(6), 1562–1592. https://doi.org/10.1044/1092-4388(2007/106

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Caglar-Ryeng Ø, Eklund K, Nergård-Nilssen T. School-entry language outcomes in late talkers with and without a family risk of dyslexia. *Dyslexia*. 2020;1–21. https://doi.org/10.1002/dys.1656