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EARLY LEXICON AND LANGUAGE SKILLS AT 42 MONTHS

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Abstract

Previous studies have shown that early lexical development is associated with later language development. It is less clear which language domains early receptive/expressive lexicons are associated with. This study analyses these associations. The study also investigates whether children with slow/typical/fast developing early receptive/expressive lexical skills differed in their language skills at 3.5 years and the predictive value of early receptive/expressive lexical skills for later language skills.

The participants of this longitudinal study were 68 healthy, monolingual Finnish-speaking children whose language development was measured using the Finnish, short-form-version of the Communicative Development Inventories at 12, 15, 18 and 24 months. At 3.5 years, language skills of the participants were assessed using tests measuring lexical, phonological, morphological and general receptive/expressive language skills.

Early receptive lexicon was associated with later morphological skills from 15 months and onwards and with other language domains at 24 months. Early expressive lexicon was associated with later morphological skills at 15 months and onwards but with other language domains from 18 months. A trend was found that children with different early lexical growth rates differed in their language skills at 3.5 years. The best models for predicting later receptive/expressive language skills included variables from both early receptive and expressive lexicons. These models worked well to explain receptive/expressive language skills at 3.5 (63/78% of the variance).

This study provides novel information on the specific associations between receptive and expressive lexicon growth and later language skills. For clinicians, measuring both receptive and expressive lexicons provides the most representative information on children's language development.

Keywords: language acquisition, assessment, morphology, phonology, lexicon

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Introduction

Variation in language skills between individual children are already evident at the very beginning of lexical development (Fenson et al., 2007). Nonetheless, it is not clear whether these individual differences have predictive value for later language skills and, if they have, to what language domain specifically. This study aims to analyse the associations between very early receptive/expressive lexicon growth and later language skills, and the possible predictive value of the early lexicon.

Typically, the receptive lexicon starts to develop at 8–10 months of age, as the child shows the first clear reactions of understanding spoken language (Fenson et al., 2007; Stolt, Haataja, Lapinleimu & Lehtonen, 2008). At 12 months of age, the receptive lexicon is typically 70–100 words, and at 18 months, 200–350 words (Bleses et al., 2008; Fenson et al., 2007; Lyytinen, 1999; Stolt et al., 2008). At 24 months, the size of the typical receptive lexicon is so extensive that its valid assessment with traditional vocabulary checklists, such as the MacArthur-Bates Communicative Development Inventories (CDI; Fenson et al., 2007), is challenging. Regarding the receptive lexicon, clear individual differences are apparent at an early developmental stage (Bates, Dale & Thal, 1995; Stolt et al., 2008). Furthermore, the growth rate of the early receptive lexicon is very fast by the beginning of the second year. Therefore, the receptive lexicon may provide important information on language development. The expressive lexicon, on the other hand is easier to measure, but it begins to develop later than the receptive lexicon. Even variation between individuals is smaller in the beginning stage of early expressive lexicon growth, and the acquisition rate typically accelerates after the child has acquired a small basic vocabulary (30–50 words; Bates et al., 1995; Mervis & Bertrand, 1995; Stolt et al., 2008). At 12 months, children typically have uttered their first word and the

average lexicon size is under 10 words. At 18 months, the typical lexicon size is 80–100 words, and at 24 months 200–400 words (Bleses et al., 2008; Fenson et al., 2007; Stolt et al., 2008).

The associations between early lexicon growth and later language skills and the predictive value of early lexicon growth in terms of later language development have been analysed in previous studies (Can, Ginsburg-Block, Golinkoff & Hirsh-Pasek, 2013; Feldman et al., 2005; Lyytinen & Lyytinen, 2004; Stolt et al., 2014, 2016; Torppa, Lyytinen, Erskine, Eklund & Lyytinen, 2010). It is still open to question as to which language domains (i.e. lexicon, phonology, morphology, syntax; receptive vs. expressive language) early lexicon growth has associations with later in life. It is also possible that the associations between early receptive/expressive lexicon and concurrent and later language skills differ. Earlier studies have focused on the development of late-talking children (i.e. children with a small expressive lexicon at 24 months and the absence of major neurological diagnoses, Rescorla & Dale, 2013) and on groups of children at risk for language difficulties (e.g. dyslexia, see. Lyytinen, Poikkeus, Laakso, Eklund & Lyytinen, 2001; and prematurely born children, see Stolt et al., 2016). There is less knowledge on the predictive values of early receptive lexical skills. Further information is also needed on the predictive values of early lexicon growth in typically developing and precocious children, i.e. children developing clearly in advance of their peers. Furthermore, early expressive lexical development has been shown to be associated strongly with early grammatical development at the end of the second year and beyond (Bates et al., 1995; Dionne, Dale, Boivin & Plomin, 2003; Feldman et al., 2005; McGregor, Sheng & Smith, 2005; Moyle, Weismer, Evans & Lindstrom, 2007; Thordardottir, Weismer & Evans, 2002; in Finnish children, see Lyytinen et al., 2001; Stolt, Haataja, Lapinleimu & Lehtonen, 2009). The associations between early expressive lexicon growth and later language skills, however, are not clear (see, however, Can et al., 2012; Lee, 2011; Lyytinen et al., 2005).

Both late-talkers and lexically precocious children can provide important knowledge on the continuity of language skills and the connection between lexical skills and other language domains (Lee, 2011; McGregor et al., 2005; Preston et al., 2010; Smith, McGregor & Demille, 2006; Thal, Bates, Goodman & Jahn-Samilo, 1997; Thal, Bates, Zappia & Oroz, 1996). Especially among these extreme groups, language skills have been typified as relatively stable (Bates et al., 1995; McGregor et al., 2005). Late-talkers are at risk of having persistent language difficulties (Lyytinen et al., 2001, 2005; Rescorla, 2009, 2011; Rescorla & Dale, 2013). Even though many late-talkers catch up with their peers between the age of 3.5 years and school entry, late-talkers have been shown to exhibit lower scores at least in grammatical, narrative and reading/spelling skills and verbal memory later in childhood and adolescence (Lyytinen et al., 2005; Rescorla, 2000, 2009). It is still not well-known which language domains early expressive lexicon has the most effect on and what the role of the early receptive lexicon plays in the language development of late-talking children. In addition, relatively few studies have focused on lexically precocious children and the association between their lexical skills and later language skills. Thal's study group (1997) found that lexically precocious children had stability in lexical skills during their second and third year of life at a group level. In more recent studies, lexically precocious children have been found to have the highest performance in receptive language, phonological skills and literacy-related skills at school age compared to their peers (Preston et al., 2010). They have also been reported to have better language and literacy skills up to the fifth grade (Lee, 2011) as well as more activation in certain brain functions during language/literacy-related tasks compared to typically developed children and late talkers (Preston et al., 2010). Studies on the later language development of lexically precocious children are still rather scarce (see, however, Crain-Thorenson & Dale, 1992; McGregor et al., 2005; Skeat, Wake, Reilly & Eadie, 2010) and further information is needed.

This study aims to answer the following questions:

1) Is there an association between early receptive and/or expressive lexicon and different language domains (lexicon, phonology, morphology; receptive vs. expressive language) at 3.5 years?

2) If there is an association, what language domains (lexicon, phonology, morphology; receptive vs. expressive language) are specifically associated with an early receptive/expressive lexicon?

3) Do children with slow/typical/fast receptive/expressive lexical development differ in their language skills at 3.5 years?

4) How much does early receptive/expressive lexicon development explain receptive/expressive skills at 3.5 years?

Participants and methods

Participants

There were 68 participants (boys, n = 32; 47 %; girls, n = 36; 53 %), all healthy, typically developing children from monolingual Finnish families. The children were invited to the study at eight months of age by a nurse during a normal follow-up visit in the child health centre. Children's language development was followed longitudinally between 9 months and 3.5 years of age. Age 3.5 was chosen for the outcome age point since many children have acquired a basic knowledge of their native language by this age. It was found to be of interest to analyse the possible predictive value of early receptive and expressive lexicon for the language development at that age. The participants were not known to have any neurological disorders

(hearing or seeing impairments, autism spectrum disorder deficits or developmental disorders) at 8 months of age. The exclusion criteria for parents were as follows: known problems with alcohol consumption, drug usage or mental health issues at the time when the families were recruited to the study. All parents had finished at least nine years of compulsory schooling; 18% (n=12) of fathers and 10 % (n=7) of mothers had completed 12 years of basic education (upper secondary school or vocational school); 78% (n=52) of fathers and 90% (n=61) of mothers had more than 12 years of basic education. The education level of the parents in this study parallels the education levels of young adults in Finland in general (Official Statistics of Finland, 2017).

Methods

This study is part of the adaptation and norming study of the Finnish short form version of the MacArthur Communicative Development Inventories (FinCDI-SF; project leader: Dr. Suvi Stolt; original version Fenson et al., 2000). The procedure of the FinCDI-SF study has been approved by the Ethical Committee at the University of Turku in December 2010. Parents received written feedback on their child's language skills at 24 months and 3.5 years. In the case of their child having delayed language skills, the families were advised to contact their local child health centre.

The infant and toddler versions of the FinCDI-SF (Fenson et al., 2000; in Finnish Stolt & Vehkavuori, 2018) were used to study the early lexical skills of the participants. This method has been adapted into Finnish and has Finnish norms (N = 82; Stolt & Vehkavuori, 2018) for ages 9, 12, 15, 18 and 24 months. The FinCDI-SF infant version (9–18 months) consists of an 89-word checklist. Both receptive and expressive lexical skills are evaluated. The toddler version (18–24 months) consists of a 100-word checklist for the assessment of expressive

lexical skills. The checklists contain words from different semantic categories. The semantic categories and the number of words within each category for the infant and toddler form of the FinCDI-SF are as follows: social terms 15 (17 %) and 14 (14%); nouns 46 (52 %) and 46 (46 %); verbs 11 (12 %) and 14 (14 %); adjectives 7 (8 %) and 8 (8 %); words referring to time 2 (2%) and 5 (5 %); closed class words 8 (9%) and 13 (13%). The FinCDI-SFs were completed by parents within two weeks of their child turning 12, 15, 18 and 24 months.

The Reynell Developmental Language Scales III (RDLS III; Kortesmaa, Heimonen, Merikoski, Warma & Varpela, 2001) was used in language assessment at 24 months (+2 weeks). The RDLS III is a structured language test. It is adapted into Finnish and has Finnish norms. It consists of receptive (RDLS-Rec) and expressive (RDLS-Expr) parts which measure lexical skills, morphology and syntax. The sum of the receptive and expressive scores forms a total score. Raw points can be converted into standard scores (mean value 100; 15 standard points +/- 1 SD), which was applied in the present study.

The children participated in two separate assessments for the evaluation of language skills at 3.5 years. The following language domains were studied: expressive lexicon, phonology and morphology as well as general receptive and expressive language skills. The tests used were the Boston naming test (BNT; Kaplan, Goodglass & Weintraub, 1983, in Finnish Laine, Koivuselkä-Sallinen, Hänninen & Niemi, 1997), the Finnish Phonology test (FPT, Kunnari, Savinainen-Makkonen, Saaristo-Helin, 2012), the Finnish Morphology test (FMT, Lyytinen, 1988) and the Finnish version of the RDLS III (Kortesmaa et al., 2001). All tests have been adapted into Finnish and are widely used by speech and language therapists in Finland. The BNT consists of 60 pictures, which are presented to children in an order in where the following picture is designed to be more difficult to name than the previous one. Children gain a score

point for every picture they can name until they are unable to name three pictures in a row (max. 60 points). The FPT was used to assess the phonological development of children. The FPT assesses all phonemes appearing in Finnish in different word positions (word beginnings/endings, in clusters and with other phonemes in the same word; paradigmatic skills). In addition, children receive points for the length of phonemes and syllables (max. 26 points), the length of the word in syllables (max. 18 points) and phoneme combinations (max. 83 points), which together comprise the phonotactic score. The phonotactic score was used in this study (max. 127 points). Furthermore, as Finnish is a highly agglutinative language in which grammatical and case relationships are expressed mainly with suffixes, morphological development of the children was studied using the FMT. The FMT measures children's knowledge of six inflections (adverbs; comparative, superlative and elative for nominals; present and past tense for verbs; 5 words for each inflection) which differ according to the age they are typically learnt at. The children receive points (0–3 per word) depending on how well they can use the inflections (max. 90 points). The RDLS III test was used to assess general receptive/expressive language skills at 3.5 years.

Data analysis

Spearman's correlation co-efficient values (r-values) were used to analyse associations between early lexical skills and language skills at 3.5 years. The information gathered using the FinCDI-SF at 12, 15 and 18 months of age and the receptive score of the RDLS III (RDLS-Rec) at 24 months of age were used to form variables for slow, typical and fast receptive lexical development. The information gathered with the RDLS III was used, since only the expressive lexicon is measured using the FinCDI-SF at 24 months of age. In addition, the first two sections of the receptive language score of the RDSL III measure receptive lexicon (altogether 15 items) and the typical development of two-year-old Finnish children does not extend much further

(Kortesmaa et al., 2001). The variables for slow, typical and fast expressive lexical development were formed using the data of the FinCDI-SF from 12 to 24 months. The mean percentile value for receptive (the RDLS-Rec included) and expressive lexicons were calculated for each child from the age points mentioned above. Slow receptive lexical development was defined as having a mean percentile score of receptive skills of 25 or less (18% of children, n = 14), typical receptive development was defined as having the mean score between 26 and 74 (75 %, n = 51) and fast as having the mean at 75 or more (10%, n = 8). Developmental rates for expressive lexical development were defined in a parallel manner (slow 12%, n = 8; typical 69 %, n = 47; fast 19%, n = 13). These same cut-off limits (25 and 75 percentiles) were used at 3.5 years. The analysis on whether children belonging to different early lexical growth rate groups (slow, typical, fast) differed in their language skills at 3.5 was based on the descriptive statistics due to the differing sizes of the subgroups.

An automatic stepwise linear regression analysis was used to gain information on the predictive value of early receptive and expressive lexical development. Two models were run: in the first one, the RDLS-Rec at 3.5 years was the outcome variable, and, in the second one, the RDLS-Expr at 3.5 years was the outcome variable. The SPSS program chose the best predictors for both models. For the model with the RDLS-Rec as the outcome variable at 3.5 years, all possible predictors (receptive/expressive lexical skills at 12, 15, 18 and 24 months, mean percentile score of early receptive/expressive lexical development, gender and mothers' education level) were first inserted in the model. The best predictor was kept in the model. In the next stage, the analysis program chose the second variable to improve the model. Adding or removing other variables did not improve the model further. For the RDLS-Expr at 3.5, a similar procedure was used.

Results

Data description

The descriptive statistics for receptive lexical skills at 12, 15 and 18 months and expressive lexical skills at 12, 15, 18 and 24 months, when measured using the FinCDI-SF, are presented in table 1. All children had words in their receptive lexicon at 12 months. There was high individual variation in receptive lexical skills at 12 months and onwards. Regarding receptive language skills at 24 months, the participants performed roughly in parallel to the Finnish normative data (mean 107, SD 16, min.–max. 73–142; Kortesmaa et al., 2001) when measured using the RDLS III. The expressive lexicon grew at a slower pace compared to the receptive lexicon. Differences in expressive lexical skills increased during the follow-up period.

(Insert table 1 about here)

The descriptive statistics for language skills at 3.5 years are presented in table 2. At group level, the participants performed roughly in parallel to the Finnish norms for all the measured variables. High rates of variation were found in all measured variables of the participants' performance. There was no clear sign of a ceiling effect in any of the measured variables.

(Insert table 2 about here)

Associations between early lexicon and language skills at 3.5 years

Associations between early receptive/expressive lexical development and language domains at 3.5 years are presented in table 3. Significant correlations between early receptive lexical development and morphological development already existed at 15 months. This correlation

between receptive lexical skills and morphological development at 3.5 years of age stayed significant throughout all the measured age points and was strongest between 24 months and 3.5 years. At 24 months, receptive language skills measured using the RDLS III correlated clearly with all measured variables at 3.5 years. Regarding expressive lexical skills, significant correlations were found between expressive lexical skills at 15 months and morphological development at 3.5 years. Expressive lexical skills at 18 and 24 months had parallel, clear and significant correlations to all language variables measured at 3.5 years.

(Insert table 3 about here)

Early lexical growth rate and later language skills

The performance (descriptive statistics) for children in different growth rate groups (slow, typical and fast developing children) at 3.5 years is presented in table 4. Regarding receptive lexical development during the second year, a clear trend in language performance between the early growth rate groups was found in lexical, morphological and general language skills (RDLS-Rec/RDLS-Expr) at 3.5. The only exception was in phonological skills at 3.5 years, where children did not differ clearly based on their early receptive lexical skills. Regarding expressive lexical development during the second year, a clear trend was found between early expressive lexical growth rate groups and performance in most measured variables (i.e. phonology, morphology, RDLS-Rec, RDLS-Expr), but not in lexical development between slow and typically developing children.

(Insert table 4 about here)

The overall correlations between the average receptive growth rate value (i.e. the mean percentile value in receptive lexicon growth between ages 12 and 24 months of age) and lexical, phonological, morphological, and RDLS-Rec/RDLS-Expr scores at 3.5 years were: 0.14 ($p>0.05$), 0.15 ($p>0.05$), 0.51 ($p<0.001$), 0.18 ($p>0.05$), 0.35 ($p<0.01$), respectively. Thus, the receptive lexical growth rate during the second year had the strongest correlations to morphological and RDLS-Expr score at 3.5 years.

Correlations between the average expressive lexical growth rate value (i.e. the mean percentile value in expressive lexical growth between ages 12 and 24 months of age) and lexical, phonological, morphological, and RDLS-Rec/RDLS-Expr scores at 3.5 years were: 0.31 ($p<0.05$), 0.29 ($p<0.05$), 0.46 ($p<0.001$), 0.35 ($p<0.01$) and 0.32 ($p<0.01$), respectively. The early mean expressive growth rate correlated clearly and in a statistically significant way with all the measured language variables at 3.5 years; the strongest correlation was with morphological skills.

The predictive value of early lexical skills to later language skills

According to the automatic stepwise linear regression analysis, the RDLS-rec at 24 months and the mean expressive lexical development during the second year explained the RDLS-Rec at 3.5 years best ($R^2 = 0.28$). The RDLS-Rec score at 24 months explained 39% of the variance ($t = 3.37$, $p < 0.01$) and the mean percentile value of expressive lexical development during the second year explained 24% of the variance ($t = 2.04$, $p < 0.05$). Altogether, these two variables explained 63% of the variance of RDLS-Rec score at 3.5 years.

The RDLS-Expr score at 3.5 years was explained by the following variables based on the automatic stepwise linear regression analysis. The RDLS-Rec score at 24 months and

expressive lexical skills at 18 months predicted the RDLS-Expr score at 3.5 years the best (R^2 = 0.43). The former variable explained 56% (t = 5.60, p < 0.001), and the latter variable explained 22% (t = 2.19, p < 0.05) of the variation of RDLS-Expr at 3.5 years. Altogether these two variables explained 78% of the variation of RDLS-Expr score at 3.5 years.

Discussion

The main aim of this study was to analyse the possible relations between early receptive/expressive lexical skills and language skills at 3.5 years of age. In addition, this study aimed to gain information on whether children with slow/typical/fast early receptive/expressive lexical development differ in their language skills at 3.5 years of age, and whether early lexical skills explain later language skills. Receptive lexical skills at 24 months associated in a broad and relatively even manner with lexical and other language domains at 3.5 years, whereas clear associations between expressive lexical development and language skills at 3.5 years were already attested at 18 months. Both receptive and expressive lexicons had clear associations with later morphological skills from 15 months onwards. A trend was also found where late-talkers, children with typical language development and lexically precocious children differed in their language skills at 3.5 years of age relative to their early receptive/expressive lexical development. In other words, children with slow language development had the lowest scores, children with fast language development had the highest scores while typically developing children performed in between, in general. An exception to this trend was found in phonological skills where children with typical/fast early receptive lexical development did not differ on the group level. The best models predicting later receptive/expressive language skills included variables from both early receptive and

expressive lexical skills. These models accounted for 63%/78% of the variance in later receptive/expressive language skills at 3.5 years.

Associations between early lexical skills and language skills at 3.5 years

Both early lexicons, receptive and expressive, were significantly associated with different language domains at 3.5 years, although there were some differences between the associations. Early receptive lexical skills were associated with later morphological skills from 15 months onwards. Clear associations to other language domains at 3.5 years, however, were not significant until 24 months. The expressive lexicon had steady and significant associations from 18 months onwards with all language domains at 3.5 years. These differences imply that receptive and expressive lexicons do not develop in a comparable manner, as has been presented earlier (e.g. Bates et al., 1995). It is important to take these differences into consideration in clinical work. Furthermore, findings of the present study show that early receptive and expressive lexicons, especially at the end of the second year, had significant and steady associations with all language domains (lexicon, phonology, morphology; receptive vs. expressive language) a year and a half later. This result suggests that the early lexicon provides the basis for later language development and not lexical development alone. Thus, our finding supports continuity in language development already at an early stage in development (Lyytinen & Lyytinen, 2004; Stolt et al., 2016).

Associations between early lexical skills and subsequent morphological development can be explained in different ways. As Finnish is a highly agglutinative language with the word endings changing the meaning of the word, children may start paying special attention to discriminating the stem from different endings in language processing from an early age (Lyytinen & Lyytinen, 2004; Silvén, Ahtola & Niemi, 2003). Individual differences in

morphological skills are already clear at 3.5 years (Lyytinen & Lyytinen, 2004). This may suggest, that morphological skills present an acquisitional challenge for Finnish children. Poor morphological skills may also be an early indicator of later language difficulties, especially in risk populations (Lyytinen et al., 2004; Stolt et al., 2014). As the present study focuses on an agglutinative type of language with rich morphology, the question arises as to what language domain would associate with early receptive/expressive lexicon most in a different type of language (i.e. with less complex morphology). Further research is needed to answer this question. Finally, our findings support the critical mass hypothesis, meaning children must first acquire lexical skills to develop grammar, e.g. morphological skills (Bates et al., 1995; Eriksson, 2014; Marchman & Bates, 1994; McGregor et al., 2005; Moyle et al., 2007; Thordardottir et al., 2002).

Early lexical skills growth rate and language skills at 3.5 years

A trend was found where children with slow, typical and fast developing early receptive/expressive lexical skills differed in their language skills at 3.5 years. In other words, those children with slow/fast receptive/expressive lexical development had the lowest/best test scores at 3.5 years at the group level. Previous studies have provided plenty of information on late-talkers (Rescorla & Dale, 2013). Present results extend these findings by providing information on different growth rates in the early receptive/expressive lexical development. Instability in lexically precocious children during the second year has been reported previously (e.g. Skeat et al., 2010; Thal et al., 1997). Nonetheless, it is possible that stability in precocious children increases after the second year of life (Thal et al., 1997). Our finding provides information on stability in lexical skills in lexically precocious children beyond the second year of life. Further research is needed on typical and fast early lexical development and what kind

of information they can provide on language development (Lee, 2011; McGregor et al., 2005; Preston et al., 2010; Smith et al., 2006; Thal et al., 1997; Thal, Bates, Zappia & Oroz, 1996).

Present results show a steady connection between both early lexicons and different language domains later in life. Previous studies (Taylor, Zubrick & Rice, 2013; Rescorla, 2000, 2011) have shown associations between early expressive lexicon and some language domains, such as morphology and syntax in childhood and language/literacy skills at school age and adolescence in late-talkers. Findings from the present study suggest that early lexical skills influence most of the subsequent language domains. This trend, however, was not found between early receptive lexical development and later phonological skills. It may be, that phonological development is more strongly associated with the expressive than the receptive lexicon (for the relationship between the expressive lexicon and phonology, see e.g. Kunnari, Savinainen-Makkonen & Paavola, 2006; Smith et al., 2006).

Predictive values of early lexical skills

According to the automatic linear stepwise analysis, the best models to predict receptive and expressive language skills at 3.5 years included both receptive and expressive variables from the measurements taken at 12, 15, 18 and 24 months. These models explained later receptive/expressive language skills considerably (63%/78%). Our findings support previous findings on the importance of assessing both receptive and expressive language skills in clinical practice (Friend, Schmitt & Simpson, 2012; Stolt et al., 2016; Torppa et al., 2010; Vehkavuori & Stolt, 2018). In this manner, it is possible to achieve the most representative information on the language development of children as shown by the results of the present study. Difficulties in both language domains suggest a greater risk of persistent language difficulties, especially if evident with other risk factors of language difficulties, such as familial risk for dyslexia

(Boyle, McCartney, O'Hare & Law, 2010; Law, Boyle, Harris, Harkness & Nye, 2000; Lyytinen et al., 2005; Paul & Weismer, 2013; Rescorla, 2011).

Strengths and limitations

The strength of this study is that it provides longitudinal data on early lexical skills, receptive and expressive, assessed at four age points during the second year of life and their associations with different language domains at 3.5 years. The number of the participants was reasonably large, enough to make generalisations. The limitation is that the small and uneven distribution of children in the lexical subgroups may not provide enough substance for distinguishing statistical differences. Further information on the predictive value of the receptive/expressive lexicon in the development of different language domains later in life is also needed from special populations, such as children with risk for language difficulties (e.g. preterm children).

Clinical implications

This study provided novel, specific information on continuity in language development. Our findings underline the need to assess both receptive and expressive lexical skills during the second year of life in clinical work, especially in children at risk for language difficulties. Those late-talkers with difficulties in both receptive and expressive lexicons early in their lives will most likely have difficulties in language development later (Lyytinen, Eklund & Lyytinen, 2005). Later language difficulties may appear in language domains, other than lexicon, e.g. language/literacy skills in school age and adolescence (Rescorla, 2000, 2011, 2013; Taylor et al., 2013; Torppa et al., 2010). It is also difficult to predict language outcomes of an individual child later in childhood or adolescence with complete accuracy, since language skills are affected by various biological and environmental factors (e.g. Reilly et al., 2010; Määttä et al., 2016).

This study provides further information on the usability of the short-form version of the CDI in clinical work. There are only a few studies which provide longitudinal information on the CDI-SF. As for previous studies, the different versions of the CDI-SF have been shown to associate with both concurrent lexical skills (Corcum & Dunhan, 1996; Fenson et al., 2000; Pan, Rowe, Spier & Tamis-LeMonda, 2004) and subsequent language skills, such as receptive lexical skills at 3 years (Pan et al., 2004), verbal IQ scores at 4 years (Corcum & Dunham, 1996), and lexical, syntactical and semantical skills at 6 years (Can et al., 2013). Our findings suggest that the results of the FinCDI-SF can explain the large amounts of variation in subsequent receptive and expressive language development and thus can provide relevant information for screening purposes. Based on these findings, the FinCDI-SF can provide valuable information on early lexical development for the practitioner.

Conclusions

The main aim of the present study was to obtain specific information on the longitudinal associations between early receptive/expressive lexicon and later language skills and on the predictive value of the early lexicon. There was a clear association between the early receptive/expressive lexicon and later language skills. Early lexicon, both receptive and expressive together, explained a considerable amount of receptive and expressive language ability at 3.5 years. The findings of the present study indicate that by taking both early lexicons, receptive and expressive, into consideration it is possible to gain the most representative information on language development in clinical work.

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Declaration of interest

The authors report no conflicts of interest.

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Table 1. Descriptive statistics for early receptive and expressive lexical skills when measured using the Finnish Short-form version of the Communicative Developmental Inventories (FinCDI-SF)

Age (months)	Receptive lexical skills				Expressive lexical skills			
	Mean (words)	SD	Median	Min.–Max.	Mean (words)	SD	Median	Min.–Max.
12	23	12	22	3–54	3	3	2	0–20
15	48	16	49	6–86	10	10	6	0–43
18	65	14	68	34–89	26	21	23	0–77
24	–	–	–	–	57	27	59	4–100

Note: Lexical skills at age points 12–18 were measured using the FinCDI-SF infant version and at 24 months using the toddler version.

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Table 2. Descriptive statistics for test results measuring specific language domains at 3.5 years of age

	Test	Mean	SD	Median	Min.–Max.
Receptive					
	RDLS-Rec	108	11	109	76–134
Expressive					
	Lexicon/BNT	23	6	21	10–35
	Phonology/FPT	108	13	109	52–127
	Morphology/FMT	33	17	32	2–70
	RDLS-Expr	104	13	104	75–131

Note. RDLS = Reynell Developmental Language Scales III, Rec = Receptive, BNT = Boston naming test, FPT = Phonology test, FMT = Morphology test, Expr = Expressive.

Table 3. Correlations (Spearman's *r*-values) between early lexical skills when measured using the FinCDI-SF from 12 to 24 months and RDLS receptive scores at 24 months and language skills at 3.5 years of age

			Expressive language at 3.5			Receptive language at 3.5
Age (months)	Domain	Lexicon/ BNT	Phonology/ FPT	Morphology/ FMT	RDLS-Expr	RDLS-Rec
12	Rec.	–0.12	–0.05	0.15	0.09	0.02
	Exp.	0.03	0.08	0.16	0.19	0.21
15	Rec.	0.04	0.08	0.36**	0.17	0.09
	Exp.	0.16	0.16	0.29*	0.16	0.28*
18	Rec.	0.19	0.05	0.36**	0.20	0.07
	Exp.	0.38**	0.37**	0.45***	0.35**	0.36**
24	RDLS-Rec.	0.42***	0.43***	0.61***	0.63***	0.41**
	Exp.	0.38**	0.40**	0.52***	0.45***	0.44***

Note. Rec. = Receptive, Exp. = Expressive, BNT = Boston naming test, FPT = Finnish Phonology test, FMT = Finnish Morphology test, RDLS Reynell Developmental Language Scales III, Expr = Expressive. * = $p < 0.05$, ** $p < 0.01$, *** = $p < 0.001$

Table 4. Mean and standard deviations of different language domains at 3.5 based on early lexical growth rate groups

Lexicon 12–24 months		Expressive language at 3.5				Receptive language at 3.5
	Group	Lexicon/ BNT	Phonology /FPT	Morphology/ FMT	RDLS-Expr	RDLS-Rec
Receptive	Slow n = 15	20 (5)	102 (16)	20 (13)	95 (13)	103 (14)
	Typical n = 34	23 (6)	110 (12)	34 (16)	104 (11)	109 (9)
	Fast n = 16	24 (7)	109 (11)	44 (15)	111 (13)	112 (10)
Expressive	Slow n = 8	22 (4)	101 (9)	28 (19)	105 (14)	104 (8)
	Typical n = 44	22 (6)	108 (11)	31 (14)	101 (12)	107 (10)
	Fast n = 15	26 (7)	114 (10)	46 (15)	110 (13)	114 (9)

Note. Slow = average lexical development between ages 12 and 24 months' percentile £ 24; Typical = average lexical development percentile 25–75 between ages 12 and 24; Fast = average lexical development between ages 12 and 24 months' percentile ³ 75. BNT = Boston naming test, FPT = Finnish Phonology test, FMT = Finnish Morphology test, RDLS = Reynell Developmental Language Scales III, Rec = Receptive, Expr = Expressive