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CHILD DEVELOPMENT

EMPIRICAL REPORT

Tracking vocabulary and reading growth in children from lower and higher socioeconomic backgrounds during the transition from primary to secondary education

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Abstract

We examined the relation between socioeconomic status (SES), vocabulary, and reading in middle childhood, during the transition from primary (elementary) to secondary (high) school. Children (N = 279, 163 girls) completed assessments of everyday and curriculum-related vocabulary, (non)word reading, and reading comprehension at five timepoints from age 10 to 13. Piecewise linear mixed-effects models showed significant growth in everyday vocabulary and word reading between every time point. Curriculum vocabulary and reading comprehension showed significant growth during the school year, but not during the summer holidays. There were significant effects of SES on all measures except word reading; yet, SES differences did not widen over time. Our findings motivate targeted reading and vocabulary support for secondary school students from lower SES backgrounds.

A family's economic, social, and cultural capital is strongly associated with the academic attainments and job prospects of the next generation (Broer et al., 2019; Ilie et al., 2017). Unpacking the multiple and dynamic ways in which family social position affects children's outcomes is challenging. Nevertheless, evidence points to a strong link between indices of socioeconomic status (SES) and children's language abilities (von Stumm et al., 2020). In some cases, the association between SES and language may reflect the nature of the language spoken at home: children from lower SES families tend to be exposed to a reduced quantity and diversity of talk (Rowe, 2012). A lower level of language exposure in turn has consequences for learning vocabulary and reading (Hoff, 2006; Lervåg et al., 2019). Previous research has focused on the early school years when growth in vocabulary and reading is rapid (e.g., Lervåg et al., 2018; Quinn et al., 2015). However, there is concern from teachers that the "word gap" (limited vocabulary levels that impede learning) does not improve, and if anything widens as children progress through education (The Oxford Language Report, 2018). A more recent report (The Oxford Language Report, 2020) highlights that teachers are especially concerned about low levels of vocabulary at the transition to secondary school, which they believe presents a barrier to learning for almost half of pupils. Despite these concerns, we know very little about how vocabulary and reading development unfold in children, beyond the first few years of school. The current study provides the first detailed longitudinal evidence on the association between SES and development of vocabulary and reading in middle childhood,

Abbreviations: EAL, English as Additional Language; FSM, free school meal; IMD, Index of Multiple Deprivation; SES, socioeconomic status.

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specifically focusing on the transition from primary to secondary school.

Associations between SES, vocabulary, and reading

The association between vocabulary and SES is well established (Letourneau et al., 2013; von Stumm et al., 2020). Children from lower SES backgrounds tend to enter primary school knowing fewer words than their higher SES peers, and this gap remains throughout primary education (Dupere et al., 2010; Pace et al., 2017). However, the association between SES and vocabulary development is complex and multifaceted. It is difficult to disentangle genetic and environmental effects, with both factors likely playing a role (Romeo et al., 2018). Regardless of the underlying causes, early disadvantages in vocabulary knowledge will have consequences for reading development, as vocabulary supports the early stages of reading development (Dyson et al., 2017; Taylor et al., 2015) and is crucial for reading comprehension (Foorman et al., 2015; Language and Reading Research Consortium, 2015; Lervåg et al., 2018). Children from lower SES backgrounds, for example, show lower word reading and reading-related skills in early reading development (D'Angiulli et al., 2004; Kieffer, 2012; Neuman & Celano, 2006) and are at greater risk of reading difficulties later in primary school (Buckingham et al., 2013; Kieffer, 2010). They often also have less access to print materials (Burris et al., 2019; Carroll et al., 2019) than their higher SES peers and read less fiction outside school (McGeown et al., 2016).

Importantly, the disadvantages of low SES are not inevitable, and the effect of SES on children changes over time. Despite early differences at the start of primary, gaps in word reading often narrow or disappear by age 8 (Aikens & Barbarin, 2008; Crowe et al., 2009; D'Angiulli et al., 2004; Kieffer, 2012; von Hippel et al., 2018; but see Hecht et al., 2000), most likely due to formal reading instruction (e.g., D'Angiulli et al., 2004). In contrast, when reading comprehension is measured disadvantages are more persistent, perhaps because of the strong association between reading comprehension and vocabulary (Ricketts et al., 2020; Wagner & Meros, 2010). Kieffer (2012) included reading comprehension in their reading achievement composite and found that children from lower SES backgrounds showed slower growth from age 8 to 14 than higher SES peers. On a similar vein, Hecht et al. (2000) reported that SES accounted for differences in reading comprehension ability throughout primary school (up to about 10 years of age) even after controlling for early reading and reading-related skills. However, Little et al. (2022) found no significant effect of SES on growth in a composite measure of reading comprehension and writing ability between ages 10 and 14. Although these studies provide some evidence of persistent SES disadvantages, few studies have investigated how SES affects vocabulary and reading comprehension beyond age 10.

School transition

The aim of this study was to focus on a key period of schooling: the transition from primary to secondary education (i.e., elementary to middle school or high school). In most countries, pupils move from primary to secondary education between the ages 11 and 12. This typically involves moving to a larger more complex environment (Jindal-Snape et al., 2020). Pupils are more likely to move between classrooms and are taught by a greater number of teachers each with different specialisms, and many children will find that their priorities shift toward adjusting to the new school environment and on building relationships. Importantly, language and literacy skills become increasingly vital as pupils are expected to develop autonomy over their learning, including increased independent reading (Deignan & Love, 2019).

Teachers have expressed concerns that this transition is associated with a dip in attainment and motivation (Topping, 2011). However, there have been few studies examining how academic-related skills, such as vocabulary and reading are affected during the transition. A few studies have examined reading comprehension development during primary-secondary school transition and either found a small drop (West & Schwerdt, 2012) or a lack of growth (Hopwood et al., 2017).

Many of the concerns associated with school transition are likely to disproportionately affect students from lower SES backgrounds. For example, lower SES children are more likely to be susceptible to socio-emotional difficulties or disadvantages associated with the home or school environment (e.g., lack of resources). If school transition exacerbates these existing disadvantages, then students from lower SES backgrounds are more likely to experience a difficult school transition, leading to worsening of behavioral and educational outcomes and thus, increased differences between children from lower and higher SES backgrounds (Anderson et al., 2000; Broer et al., 2019; McGee et al., 2003; von Stumm et al., 2020).

Nevertheless, a widening of SES-related differences during school-transition is not inevitable. Topping (2011) found that parental support mitigated the negative effects of SES background on school transition. Further, West et al. (2010) found that SES predicted school grades in secondary school, but SES was not associated with more general difficulties with school transition. Studies of SES effects on broad educational attainments suggest that higher SES children have a growing advantage, as SES predicts both initial differences as well as growth in educational attainment (von Stumm et al., 2019), but there has not yet been a detailed analysis of the effects of SES and school transition on

the development of reading and vocabulary. Since language and literacy are so fundamental to subsequent learning, it is vital that we understand how these skills are influenced by school transition, and whether disadvantages for lower SES children are exacerbated. This will inform future work to specify which skills should be supported, and which children are likely to be most in need of support.

Present study

In our study, we investigate vocabulary and reading development in children from higher and lower SES backgrounds, drawing on longitudinal data from the UK. We tracked vocabulary, word reading, and reading comprehension development in 296 children between the ages of 10 and 13 years, as pupils transferred from primary to secondary education. Our vocabulary measures distinguished between everyday vocabulary and words that are linked to the UK science curriculum, to be able to distinguish between vocabulary that is typically acquired in everyday life and vocabulary that is typically learned in a school setting (see Beck & McKeown, 1985). To examine growth in vocabulary and reading across the primary-secondary transition, piecewise linear mixed-effects models compared this to growth in the school year before this transition (Phase 1), directly after the transition (Phase 3) and a "normal" summer without school transition (Phase 4). The following questions were addressed:

1. Does growth in vocabulary, word reading and reading comprehension between 10 and 13 years differ for children from higher and lower SES backgrounds? We predicted that SES differences would be observed for vocabulary and reading comprehension, but would be small or non-existent for word reading for this age group. Due to a high rank-order stability in vocabulary and reading development in adolescence (Ricketts et al., 2020), we also predicted that any SES effects on vocabulary and reading would be stable over time, where children from higher SES backgrounds perform better than the lower SES group.
2. How does the primary-secondary school transition affect growth in vocabulary and reading in children from higher and lower SES backgrounds? We expected that growth in our measures would be slower across the transition period, compared to during the school year or compared to a summer without a school transition. For reading comprehension, this hypothesis was informed by previous empirical work (Hopwood et al., 2017; West & Schwerdt, 2012). For vocabulary and word reading, this hypothesis was more tentative as we have found no detailed analysis of the development of these skills during or directly after the school transition. Finally, although this hypothesis was also more tentative, we anticipated that any slowing of growth during school transition might be more pronounced for children from lower SES backgrounds. A potentially more negative experience of school transition (e.g., West et al., 2010) or fewer resources for lower SES children (Broer et al., 2019) might be reflected in slower growth in academic-related skills. Also, given the increasing importance of independent reading and language and literacy demands, any differences between lower and higher SES children might become more prominent at the start of secondary school.

METHOD

Participants

Participants were 296 children (58% girls), who were part of a larger ongoing longitudinal study examining reading development from school entry (e.g., Cunningham et al., 2020; Van der Kleij et al., 2022). The present study examines measures that were introduced from age 10 (Figure 1, Time 1). We report data at age 10, 1 year later at age 11, 5 months later (shortly after the school transition), 7 months later (end of the first year of secondary), and 6 months later (shortly after moving to the next

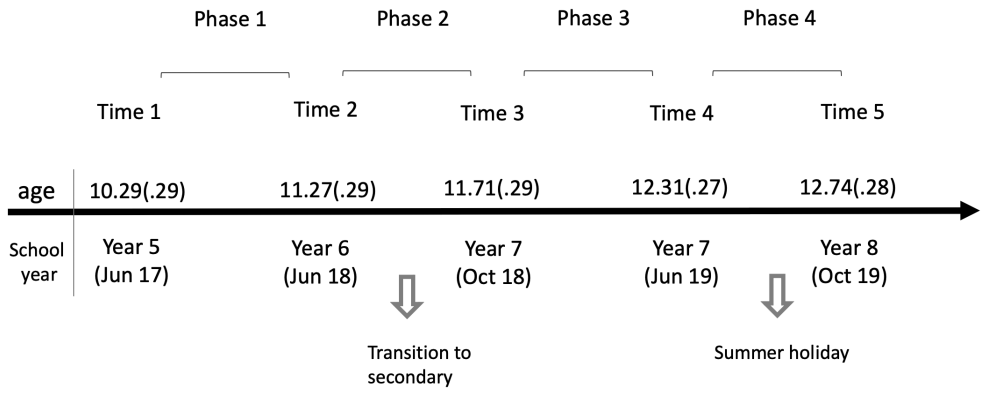

FIGURE 1 Timeline longitudinal study.

school year). At the first two time points, pupils were attending 16 different primary schools in suburban areas of Birmingham, UK. School-level data showed a range of SES backgrounds: Index of Multiple Deprivation (IMD) deciles ranged from 1 to 10 (Noble et al., 2019), eligibility for free school meals (FSMs) ranged from 1% to 48% (mean 18%). Participants with English as Additional Language (EAL) made up 10%. For the remaining time points they were attending 53 secondary schools (IMD decile range 1–10; 16% FSM; 9% EAL). The study was approved by Aston University's Ethics Committee. At each testing point, we worked with all participants from the ongoing study for whom we had parental consent and child assent.

Measures

We collected two measures of SES: FSM and parental educational background. Children were classified as lower SES if they had ever been eligible for FSM and/or their mothers' highest qualification was A-level or lower (equivalent to a high school degree; our inclusive classification of lower SES is preferable to FSM status alone which is known to miss many children from low-income families who are at risk of low attainment; Hobbs & Vignoles, 2010). This combined FSM and parent education measure was used for our analyses. *Everyday vocabulary knowledge* was measured using The British Picture Vocabulary Scale (BPVS-3; Dunn et al., 2009), for which participants were verbally presented with a word and asked to indicate which of four pictures represented its meaning. The test consists of 14 sets of 12 items increasing in difficulty and is discontinued after eight incorrect responses within a set. *Curriculum vocabulary knowledge* was assessed using a bespoke measure comprising 17 items from the physics curriculum, and 16 from the biology curriculum (see https://osf.io/c3vmg for the list of items). Participants were asked to indicate which of four pictures corresponded to the target word. A UK platform for teaching resources (https://www.stem.org.uk/) was used to select words from the Key Stage 2 and 3 (ages 9–14) curriculum; these words were then reviewed by several school teachers. Each set was discontinued if a child scored less than 40% correct. The total items correct on both sets were used for analysis. *Word* and *nonword reading* were assessed with the Test of Word Reading Efficiency (TOWRE-2; Wagner et al., 2011), for which children read as many words (Sight Word Efficiency subtest) or nonwords (Phonemic Decoding Efficiency subtest) as possible within 45 s. To measure *reading comprehension*, participants read one age-appropriate fiction passage from the York Assessment of Reading for Comprehension (secondary edition; Stothard et al., 2010) and answered 13 open-ended literal and inferential questions about the passage.

Procedure

Socioeconomic status indices were obtained throughout primary school. The remaining measures were administered at all time points, with the exception of reading comprehension, which was not included at the first time point. Tasks were administered by trained research assistants in a fixed order, in one 45-min session.

Analyses

The analyses were performed on data for all children with SES measures (n = 279). Piecewise linear mixed-effects models were fitted using the lme4 (Bates et al., 2015) and lmerTest package (Kuznetsova et al., 2017) in R (R Core Team, 2013) with everyday vocabulary, curriculum vocabulary, word reading, nonword reading, and reading comprehension as outcome measures and Time and SES (lower, higher) as predictors. For all variables, raw scores were used for analyses. Participant and School were added as random factors. Time was coded as four phases (see Figure 1): Phase 1 (school year, final year primary), Phase 2 (summer holiday, primary-secondary transition), Phase 3 (school year, first year in secondary school), and Phase 4 (summer holiday, within secondary year group transition). Final models were determined through a process of model comparison (using χ^2 tests; Baayen et al., 2008) where variables were only included in the final model if they lead to a significantly better fit (to fit the most parsimonious model). First, fixed effects of Phases 1, 2, 3, 4 and SES were added in that order, followed by the interactions between SES and each phase. We tested for each phase whether the inclusion of a participant and school-level random slope improved the model fit. If adding a random slope led to estimation problems, correlations between the random slopes were removed. If this still resulted in non-convergence, the random effect structure was simplified by leaving out the random slope. All analyses were confirmatory. Analysis scripts and detailed model summaries for the final models are available here: https://osf.io/c3vmg.

RESULTS

The development of everyday vocabulary, curriculum vocabulary, sight word reading, phonemic decoding, and reading comprehension is shown in Figure 2a–e. Additional descriptive statistics, including reliability estimates and missing data for each measure at each wave, and correlations between measures are available in Supporting Information (Tables S1 and S2). Our criteria for classifying children into higher and lower SES (see above) resulted in a relatively even split: Higher SES group n = 107, 54 girls; Lower SES group n = 172, 109 girls.

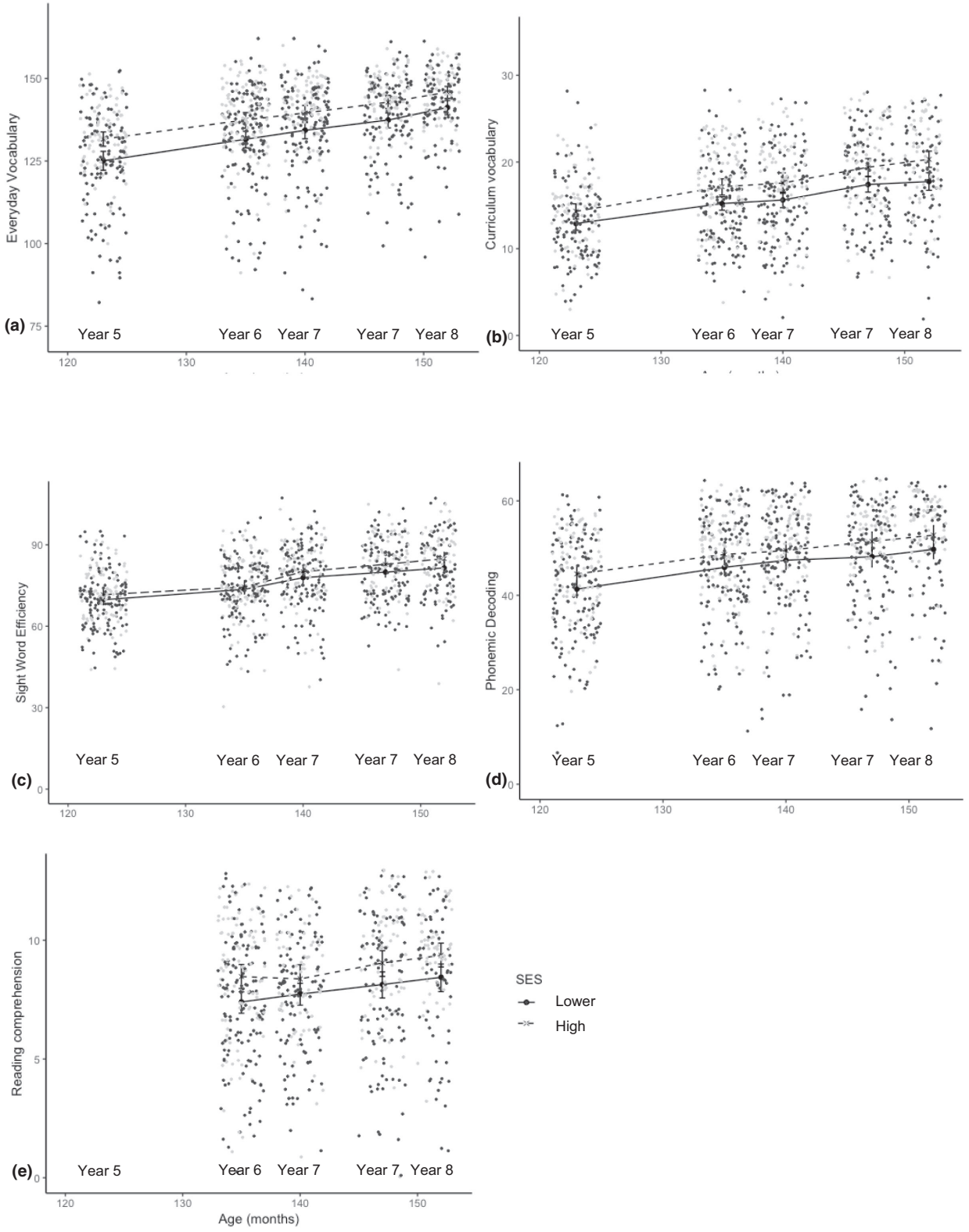

FIGURE 2 Development of children from lower (solid line) and higher (dashed line) SES backgrounds in everyday vocabulary (a), curriculum vocabulary (b), sight word reading (c), nonword reading (d), and reading comprehension (e).

Vocabulary models

The final model for *Everyday Vocabulary* (see Table 1; Figure 2a) included a fixed effect for each phase, demonstrating significant growth in between each time point. The final model for *Curriculum Vocabulary* (Figure 2b) only included significant fixed effects for Phases 1 and 3, but not for Phases

2 and 4. Thus, there was significant growth during the school year, but not over the summer holidays. Both models included a fixed effect for SES, indicating that children from higher SES backgrounds overall showed higher vocabulary scores than the lower SES group. In both models, phase × SES interactions did not significantly increase the model fit. Thus, the initial gap between higher and lower SES groups was consistent over time.

Reading models

The final models for *word reading* (see Table 2; Figure 2c) and *nonword reading* (Figure 2d) included fixed effects for all phases, indicating significant growth in word-level reading between each time point. Only the model for nonword reading included a fixed effect for SES, indicating that children from higher SES backgrounds overall showed higher nonword reading scores than the lower SES group, but no significant interaction. Notably, only for this model, the random effect for School did not reach significance and was not included in the final model.

The results for *Reading Comprehension* (Figure 2e) were more in line with the curriculum vocabulary model. The final model included a significant fixed effect for Phase 3, but not for Phase 2 and 4 (Phase 1 was not modeled). Thus, there was significant growth during the first year of secondary school, but not during the summer holidays. It also included a significant main effect of SES, but no interactions between SES and the four phases. Children from higher SES backgrounds overall showed higher reading comprehension scores than the lower SES group, and this did not change over time.

TABLE 1 Summary of piecewise linear mixed-effects model for the vocabulary measures

Predictor fixed effects	Everyday vocabulary		Curriculum vocabulary	
	Estimate	95% CI	Estimate	95% CI
Intercept	123.80**	120.99, 126.60	12.68**	11.78, 13.58
Phase 1	7.08**	6.11, 8.05	2.56**	1.98, 3.13
Phase 2	2.93**	2.02, 3.83	0.47	−0.001, 0.94
Phase 3	2.71**	1.85, 3.57	1.79**	1.31, 2.26
Phase 4	2.45**	1.43, 3.48	0.44	−0.04, 0.93
SES lower versus higher	5.57*	2.16, 8.97	1.69*	0.65, 2.73

Note: See https://osf.io/c3vmg for more detailed model summaries including model comparisons and random effects.
*p<.01; **p<.001.

DISCUSSION

We tracked the development of vocabulary and reading in 279 children from higher and lower SES backgrounds. We report progress over five time points between ages 10 and 13 years to capture progress before, during, and after transition from primary to secondary education. Everyday vocabulary, word reading, and nonword reading showed significant growth at every phase, whereas curriculum vocabulary and reading comprehension showed significant growth during the school years, but not across the summer holidays. We found the effects of SES on all measures, except for word reading, and the disadvantage for the lower SES group was consistent over time. In what follows, we discuss how these findings challenge expectations that SES differences increase over time, and that vocabulary and reading comprehension growth declines during school transition.

The disadvantage of having a lower SES background was most pronounced for vocabulary and reading comprehension measures, compared to word reading measures, reflecting the strong association between SES and language development. Nevertheless, it is important to note the substantial overlap between groups, highlighting that low vocabulary and poor reading are not inevitable consequences of a lower

TABLE 2 Summary of piecewise linear mixed-effects model for the reading measures

Predictor fixed effects	Word reading		Nonword reading		Reading comprehension	
	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Intercept	70.23**	68.24, 72.23	41.31**	39.78, 42.83	7.30**	6.83, 7.77
Phase 1	3.29**	2.19, 4.39	4.25**	3.33, 5.17	—	—
Phase 2	5.36**	4.33, 6.39	1.89**	1.09, 2.70	0.23	−0.12, 0.57
Phase 3	2.41**	1.57, 3.26	1.40**	0.68, 2.13	0.52*	0.16, 0.87
Phase 4	1.88**	1.01, 2.75	1.70**	0.96, 2.44	0.27	−0.09, 0.63
SES lower vesus higher	—	—	2.98*	0.71, 5.24	0.94*	0.35, 1.53

*p<.01; **p<.001.

SES background. Further, these SES effects were consistent over time, indicating a persistent, but not widening disadvantage that was not exacerbated by secondary school transition. These findings contrast with expectations of a widening gap for lower SES children (e.g., The Oxford Language Report, 2020). However, previous empirical evidence for early differences to be compounded over time ("Matthew effects") is inconclusive (as discussed in Ricketts et al., 2020). Findings of both widening and narrowing of spread have been reported, depending on the measure used. Reports of widening gaps tend to have used measures closest to typical school tests, whereas reports of stable or narrowing gaps tend to have focused on specific skills that can be assessed precisely (see Kieffer, 2012; Ricketts et al., 2020). In our study, we have broken down our constructs into relatively narrow measures of word reading, reading comprehension, and two separable types of vocabulary. It is possible that a different pattern would be observed for academic tests that tap into a wider range of skills (e.g., interpreting the test instructions, understanding the teacher's expectations).

Overall, growth in reading and vocabulary was small but still significant, resonating with previous research (Parrila et al., 2005; Ricketts et al., 2020). Our findings build on these studies by demonstrating different patterns of growth across measures. Everyday vocabulary and word and nonword reading showed significant growth at all phases, indicating continued development. In contrast, curriculum vocabulary and reading comprehension showed slower growth during the summer holidays than during the school year. School-based activities provide extra opportunities for the development of curriculum vocabulary and reading comprehension, and this may outweigh the opportunities provided by everyday activities and at home. Most children read less during the summer holidays, and certainly they will gain less practice on responding to targeted comprehension questions. A stagnation in these areas could therefore be due to unrehearsed learning (see Reed et al., 2021).

Nevertheless, for all these measures, growth across the school transition showed the same pattern as that over a normal summer holiday: there was no evidence of a transition-related stagnation. This is surprising given teachers' concerns that there is a mismatch between vocabulary at the end of primary and beginning of secondary school (The Oxford Language Report, 2018, 2020). One possible interpretation that reconciles teachers' observations with our findings is that the secondary school context is very different from primary, with a greater reliance on independent learning and lessons taught by multiple subject-specialist teachers. Plausibly, children's existing everyday vocabulary is no longer sufficient in this context and therefore does not match teacher's expectations. Instead, the challenge for early secondary school students is to rapidly adapt to this new context, and build new "curriculum-relevant" vocabulary (see Deignan & Love, 2019).

Our two measures of vocabulary, capturing general word knowledge (everyday vocabulary) and knowledge of words that are specific to the school curriculum (curriculum-relevant vocabulary) enabled us to identify subtle differences in the growth pattern for these different types of vocabulary. The everyday vocabulary measure mostly captured vocabulary that children are exposed to during a typical day at home and school, without explicit instruction (e.g. "fictional," also referred to as Tier 1 vocabulary, Beck & McKeown, 1985; McKeown, 2019). The curriculum-related measure was designed to capture vocabulary which children are typically exposed to through direct teaching or through reading of curriculum materials (e.g., "refraction," also referred to as Tier 3 vocabulary, Beck & McKeown, 1985). Thus, words that are encountered in everyday life (in conversations, reading and other media) are acquired consistently over the year, whereas academic vocabulary knowledge grows more as children are attending school. While this finding may seem expected, this is an ecologically valid demonstration of the power of teaching on word knowledge: the teachers of our participants were not told to teach particular words (nor were participants instructed to learn them). Instead, these words were selected from shared STEM resources, aiming to overlap with the curriculum. It is therefore striking that their learning of this vocabulary coincided so neatly with the school year. This is a particularly novel finding since research does not usually distinguish between these types of vocabulary knowledge. Indeed, our results emphasize the importance of monitoring both types of vocabulary separately, as they follow distinct developmental pathways.

Limitations and future directions

A more precise vocabulary measure would include a vocabulary subtest capturing Tier 2, or "academic vocabulary." This vocabulary is acquired at a later age and occurs more commonly in written text rather than conversational speech (e.g., "increase," Beck et al., 2002) and is particularly important for accessing secondary learning materials (Deignan & Love, 2019; Snow, 2010). Although the everyday vocabulary test did include some of this vocabulary, we were not able to track this separately. The curriculum vocabulary measure also only contained a limited number of items (33 vs. 168 for the general vocabulary measure), and only covered vocabulary related to the science curriculum. Future research could include a larger set of items containing words from other aspects of the school curriculum, better capturing the variance and range in this type of vocabulary.

Our second limitation relates to SES. Our comparison of only two levels, higher and lower SES groups, only provides a very approximate indication of children's home

backgrounds, and a continuous measure might have been more sensitive to subtle differences between individuals. Moreover, although the measures we used (parental education and FSM) are likely to correlate strongly with academic outcomes, our analysis does not do justice to the complex causal relationships between parental input and academic attainments (e.g., parental involvement in a child's education is known to be beneficial, over and above SES; Pinquart & Ebeling, 2019). Nevertheless, our finding of a persistent SES-related disadvantage in skills that crucially underpin subsequent learning is striking and highlights the need for us to continue to support basic skills beyond primary school. Finally, although we focused on participant-level differences in SES on reading and vocabulary development, the school environment is also very likely an important factor in how children experience the school transition and how it may affect their learning (von Stumm et al., 2019; West et al., 2010). Future research is needed to gain more insight in the role of the school context (e.g., availability of support and resources) during the school transition.

CONCLUSION

To our knowledge, this is the first study to track vocabulary and reading development during the transition from primary to secondary school in children from different SES backgrounds. Our findings underpin three key conclusions. First, we observed significant growth between 10 and 13 years of age in all measures, including word reading. Second, the distinct trajectories for different types of vocabulary we observed add weight to arguments that vocabulary knowledge is not a unitary construct (Beck et al., 2002; McKeown, 2019) and reinforce the importance of using multiple measures to capture vocabulary development. Third, SES-related differences in vocabulary and reading are maintained over the course of primary and early secondary education, with the exception of word reading. Importantly, however, there was substantial overlap between groups and gaps between children from lower and higher SES backgrounds did not widen, and were not exacerbated by the school transition.

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CONFLICT OF INTEREST

The authors have no conflicts of interest.

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SUPPORTING INFORMATION

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

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