Abstract

We examined whether different parent- and teacher-related factors had an effect on at-risk children’s reading development during the first six months of the Covid-19 pandemic. Seventy Grade 1 English-speaking Canadian children (28 females, 42 males; $M_{\text{age}}=6.60$, $SD=0.46$) who were at-risk for reading difficulties were administered word and pseudoword reading, nonverbal IQ, and phonological awareness tasks before the school closures (February 2020; Time 1). Reading tasks were administered again when they returned to school in September 2020 (Time 2). In April-May 2020, their parents ($n=70$) and teachers ($n=40$) filled out a questionnaire on the home literacy environment and the frequency of teaching reading and providing reading materials, respectively. Results of multilevel regression analyses showed that children’s reading enjoyment and home learning activities predicted both word and pseudoword reading at Time 2. Differentiation of instruction for struggling readers also predicted children’s pseudoword reading at Time 2. These findings reinforce the important role of parents in their children’s early reading development particularly when the typical agents of instruction (i.e., teachers) have less time and opportunities to interact with their students because of the pandemic.

Keywords Covid-19 · Differentiation · Home learning environment · Reading · Reading enjoyment · Self-efficacy
In March 2020, schools in Alberta (Canada) as well as in many other places around the world closed because of the Covid-19 pandemic. The decision to close schools meant that teaching transitioned to an online environment, teachers had to become comfortable teaching through a computer, and children had to get used to spending a considerable amount of time in front of a monitor. This decision also meant that children at risk for reading difficulties no longer received their typical face-to-face, small group, pull out intervention, and any additional support was henceforth provided online by the classroom teacher with the help of parents. Despite evidence showing that parents engaged more frequently in different home learning activities with their children during the pandemic than before (e.g., Aram et al., 2022; Sonnenschein et al., 2021; Wheeler & Hill, 2021), it remains unclear if their more frequent involvement had an impact on their at-risk children’s reading development. Thus, in this study we examined whether different parental (i.e., frequency of home learning activities, access to literacy resources, and parent-rated children’s reading enjoyment) and teacher-related (i.e., perceived ability in teaching struggling readers, frequency of teaching reading online, frequency of providing instructional materials, differentiation of instruction for struggling readers, and difficulty teaching reading online) factors had an effect on at-risk children’s reading development during the school closures. To our knowledge, this is the first attempt to link parental and teacher instruction during the pandemic to children’s reading outcomes.

Home literacy environment and children’s reading performance

The effects of parents on their children’s reading performance have typically been captured by home literacy environment (HLE). HLE refers to the experiences, attitudes and materials related to literacy that a child encounters and interacts with at home (Burgess et al., 2002; Roberts et al., 2005). According to the most popular HLE theoretical account, the home literacy model (Sénéchal & LeFevre, 2002; see also Sénéchal et al., 2017, for a review), the home literacy experiences can be grouped into two broad categories: the code-related, or “formal”, home literacy experiences that engage children directly with print through activities such as teaching of letters and words, and the meaning-related, or “informal”, home literacy experiences that expose children to print incidentally through activities such as shared book reading. Studies conducted in different countries have shown that the code- and meaning-related HLE experiences predict word reading indirectly through their effect on emergent literacy skills. More specifically, code-related HLE has been found to predict word reading through its effects on letter knowledge and phonological awareness, and meaning-related HLE has been found to predict word reading through its effects on vocabulary (e.g., Frijters et al., 2000; Hamilton et al., 2016; Lehrl et al., 2020; Manolitsis et al., 2013; Sénéchal, 2006; Torppa et al., 2022; Zhang et al., 2020).

More recently, researchers have argued that the HLE model needs to expand to also include “access to literacy resources” (ALR; most often operationalized with the number of children’s books at home) and children’s interest in reading (see Georgiou et al., 2021; van Bergen et al., 2016; Vasilyeva et al., 2018; Wang & Liu, 2021; Zhang et al., 2020 see also Martini & Sénéchal, 2012). It is important to have age-appropri-
ate literacy materials at home as they are significant tools for facilitating children’s engagement in literacy activities and parent-child interactions. Importantly, whenever ALR is included in the same model with code- and meaning-related activities, the effects of meaning-related activities on vocabulary and/or word reading becomes non-significant (e.g., Inoue et al., 2020; Wang & Liu, 2021; Zhang et al., 2020). Similar to ALR, children who are interested in learning to read/spell words or enjoy reading will likely request literacy activities more often and also participate in them more deeply. Previous studies that examined the role of reading interest/enjoyment in children’s reading performance have provided mixed findings. Whereas some studies have shown that literacy interest was predictive of emergent literacy skills (e.g., Baroody & Diamond, 2012; Martini & Sénéchal, 2012), other studies have reported no significant relations (e.g., Calgar-Ryeng et al., 2020; Roberts et al., 2005; Silinskas et al., 2020).

It should be noted here that most of the aforementioned HLE studies have been conducted with typically-developing children transitioning from preschool/kindergarten to primary school (see Sénéchal et al., 2017, for a review). A natural follow-up question would be if similar relations could be observed in children at-risk for reading difficulties. This is important for several reasons: First, what we know regarding the role of HLE in reading in typically-developing children may not generalize to at-risk children. In fact, preliminary evidence from studies that included at-risk or struggling readers show some important differences (see below for details). Clearly, the findings of these studies need to be replicated. Second, there is evidence from longitudinal studies that parents adjust their teaching in response to their children’s reading performance (e.g., Inoue et al., 2018; Manolitsis et al., 2011; Silinskas et al., 2012). Given that the parents of the children in our sample had been informed that their child was experiencing reading difficulties and they had consented for their child to receive pull out reading intervention (even though this never happened because the schools closed), this may have provoked more parental involvement in their children’s learning at home. However, according to the family risk model (Snowling et al., 2007), parents of low-literate children often have low literacy skills themselves and may be unable to help if schools are closed. Finally, reports from parent surveys during the pandemic have revealed that parents were particularly concerned for the academic growth of children with learning difficulties because they did not feel well equipped to replace the expert teachers in providing instruction to their children (e.g., Garbe et al., 2020; Sonnenschein et al., 2022; Thorell et al., 2021). Because much of the teaching of these children fell on parents’ shoulders when the schools closed, examining the role of different parental factors (e.g., frequency of home learning activities, access to literacy resources) in at-risk children’s reading performance is important.

The studies that have examined the HLE-reading relationship in at-risk/struggling readers can be grouped into two categories: those that compared children with or without a risk for reading difficulties in different HLE aspects (e.g., Kirby & Hogan 2008; Zhang et al., 2019) and those that examined the relations of different HLE aspects with children’s reading in different reading ability groups (e.g., Baroody & Diamond, 2012; Inoue et al., 2018; Silinskas et al., 2013; see also Hamilton et al., 2016; Torppa et al., 2022, for studies with children at familial risk of dyslexia). In regard to the former category, Kirby and Hogan (2008) compared a group of poor and
good Grade 1 readers in Canada on a number of HLE aspects and found that children who were good readers were read to by adults and were taught printed letters, letter sounds, and words more frequently than children who were poor readers. Parents of children who were good readers also reported a greater total number of books at home. In addition, results of discriminant function analyses indicated that the combination of family environment and SES variables (mother’s and father’s education) could successfully classify over 88% of the children in the good and poor readers’ groups, respectively.

In regard to the latter category, Silinskas et al. (2013) performed a longitudinal study in which they followed 1460 mother-child dyads in Finland from the beginning of Grade 1 to the end of Grade 1. The results of regression mixture modeling identified four latent subgroups of children in which the frequency of maternal teaching showed a differential contribution to children’s subsequent reading skills: Among 14% of the children with low reading skills at the beginning of Grade 1, maternal teaching was positively associated with children’s reading skills at the end of Grade 1 (β = 0.34); among 22% of the children who showed relatively low reading skills, maternal teaching had no association with children’s reading skills (β = −0.04, ns); among 12% of the children who were good readers, maternal teaching had no association with children’s reading skills (β = −0.19, ns); and among the remaining 52%, maternal teaching had a negative association with children’s reading skills (β = −0.23). In a study with Japanese children followed from the Grade 1 to Grade 2, Inoue et al. (2018) also showed no effects of either parents’ teaching or shared book reading in Grade 1 on children’s reading performance in Grade 2 in the group of poor readers. Assuming the findings of these studies with struggling readers will generalize to the Covid-19 pandemic era, we should not observe any significant effects of parents teaching on their at-risk children’s reading performance in our study. Unfortunately, Silinskas et al.’s study assessed only the frequency of mother’s teaching and neither Silinskas et al. nor Inoue et al. measured children’s reading enjoyment. In our study, we assessed parents’ teaching and access to literacy resources as well as children’s reading enjoyment.

**Teacher-related factors and children’s reading performance**

According to the ecological systems theory (Bronfenbrenner, 1979), teachers also play a key role in children’s development and their effect is independent of that exerted by parents. For the purpose of this study, we examined the role of four teacher-related factors in at-risk children’s reading development: their self-rated ability in teaching struggling readers (i.e., self-efficacy), the frequency of providing online reading instruction and different reading-related materials, whether they differentiated instruction for struggling readers, and how challenging they found providing reading instruction online.

Teachers’ self-efficacy, defined as the extent to which a teacher is confident about his/her ability to promote students’ learning (Bandura, 1994), can be a significant driver of children’s academic growth. Teachers with high levels of self-efficacy tend to have high levels of planning and organization skills, and adjust strategies and
pedagogy to the level of their students. These teachers also set and hold higher expectations for their students and themselves, and make it a priority to assist students who need extra help (e.g., Ashton & Webb 1986; Tschannen-Moran & Barr, 2004; Tschannen-Moran & McMaster, 2009). Given that our sample comprised struggling readers, teachers’ self-efficacy in teaching these children should be a significant predictor of their reading development.

Equally important for struggling readers during the Covid-19 pandemic should be teachers’ ability to adapt their instruction to meet their students’ learning needs. The argument put forward to support differentiation of instruction is that it contributes to student learning (e.g., Connor et al., 2009, 2013; Juel & Minden-Cupp, 2000). Effective literacy instruction in early grades in English includes explicit and systematic instruction of letter knowledge, phonemic awareness, and the relationship between graphemes and phonemes (e.g., Connor et al., 2004; de Graaff et al., 2009; Savage et al., 2020). Kiuru et al. (2015) and Ruotsalainen et al. (2022) provided evidence that Grade 1 teachers are sensitive to their students’ reading performance and adapt their instructional practices accordingly. Given that the teachers who participated in our study received professional development on how to differentiate instruction and they were given access to materials targeting phonemic awareness and phonics (the skills that most Grade 1 poor readers struggle with), we would expect teachers who differentiated their instruction to have a positive impact on their students’ reading performance.

Because during the first wave of Covid-19 teachers were given the freedom of choosing the best way of providing reading instruction to their students, this led to a situation where some teachers would meet online every day with their students whereas others would only meet once a week and substituted the additional instructional time with different reading materials that students were supposed to complete on their own or with the help of their parents. It remains unclear if the frequency of engaging in online teaching or providing reading materials to their students would predict their students’ reading outcomes. Finally, teachers have a different level of comfort with technology (Dogan et al., 2021; Leech et al., 2020). During the school closures teachers had to shift quickly to online teaching with the help of different programmes (e.g., Google Meets, Microsoft Teams) and to become familiar with their many features within a very short period of time. We expected that the teachers who felt more comfortable teaching reading online would have a more positive effect on their students’ reading development.

The present study

The purpose of this study was to examine whether different parent and teacher-related factors contributed to at-risk children’s reading development during the Covid-19 pandemic. We asked the following two questions:

1) Did frequency of parent teaching of reading, access to literacy resources, and children’s reading enjoyment (as rated by their parents) influence at-risk children’s reading development during Covid-19 pandemic?
2) Did teachers’ self-rated ability in teaching struggling readers, the frequency they provided online reading instruction and reading materials, whether they reported differentiating instruction for struggling readers, and how challenging they found teaching reading online influence at-risk children’s reading development during Covid-19 pandemic?

Importantly, we examined the role of different factors before and after controlling for children’s reading performance at an earlier point in time (i.e., the autoregressor). Given that reading ability is relatively stable during the early grades (e.g., Landerl et al., 2019; Leppänen et al., 2006), controlling for children’s earlier reading ability provides a conservative test of parents’ and teachers’ contributions to children’s reading performance.

**Method**

**Participants**

The participants in this study were 70 Grade 1 children (28 females, 42 males; $M_{\text{age}} = 6.60, SD=0.46$) who were at-risk for reading difficulties as well as their parents ($n=70$) and teachers ($n=40$). The children were participating in a larger study examining the role of early intervention in children’s reading performance (Georgiou, 2019) and they were deemed to be at-risk for reading difficulties if their scores in the Wide Range Achievement Test-5 (WRAT-5) Word Reading (Wilkinson & Robertson, 2017) and Comprehensive Test of Phonological Processing-2 (CTOPP-2) Phoneme Deletion (Wagner et al., 2013) tasks were below the 25th percentile, and their nonverbal IQ was above 80. The children were recruited from 40 to 1 classes at 26 public schools in Edmonton, Canada and they were assessed twice: in February 2020 (before the school closures; Time 1) and in September 2020 (when they returned back to school; Time 2). 92% of the children were White, 4% East Asian, 3% First Nations, Metis or Inuit, and 1% Other. The children had normal or corrected-to-normal vision, average nonverbal IQ ($M_{\text{index score}}=97.04; SD=11.49$) and no sensory or behavioural difficulties (based on teachers’ reports).

In April 2020 (a month after the school closures in Edmonton), we invited the parents and teachers of the participating children to fill out a questionnaire via Qualtrics. Parents were asked to report on their educational level, how often they engaged with their child in different home learning activities (e.g., teaching their child to read words, reading a story to their child), how much their child enjoyed reading alone, and how many children’s books they had at home. The questionnaire was filled out by 64 mothers (91.4% of our sample). Parents of six children (8.6% of our sample) reported filling out the questionnaire together. Teachers were asked to report on their perceived ability in teaching struggling readers, the frequency of providing reading instruction online and worksheets focusing on reading, whether they differentiated instruction, and how challenging they found online teaching of reading. Ethics permission for this study was obtained from the research ethics board of the University...
of Alberta (Pro00100353). In addition, written consent was obtained from both parents and teachers.

Materials

Child measures. Children were administered two reading measures (WRAT-5 Word Reading and WIAT-3 Pseudoword Decoding) at both times and measures of nonverbal IQ and phonological awareness at Time 1.

Nonverbal IQ. The Simultaneous Matrices from the Cognitive Assessment System-2 Brief (Naglieri et al., 2014) was administered to assess nonverbal IQ. Children were asked to select one of six options that best completes a matrix with a missing piece. The task was discontinued after four consecutive errors and a participant’s score was the total number of correctly answered items (max = 44). The raw score was subsequently converted to an index score following the instructions in the manual. Cronbach’s alpha reliability in our sample was 0.94.

Phonological awareness. The Phoneme Deletion task from CTOPP-2 (Wagner et al., 2013) was administered to assess phonological awareness. Children were asked to say a word and then say the word without one of its sounds (e.g., Say “cup”. Now say “cup” without saying /k/). The task was discontinued after three consecutive errors and a participant’s score was the total number correct (max = 33). The raw score was subsequently converted to a scaled score with a mean of 10 and a standard deviation of 3. Cronbach’s alpha reliability in our sample was 0.90.

Word reading. In Word Reading from WRAT-5 (blue form; Wilkinson & Robertson, 2017), children were asked to first name 15 letters and then read aloud individual words from a list of 55 lowercase words arranged in increasing difficulty. The task was discontinued after six consecutive errors and a participant’s score was the total number of words read correctly (max = 70). Cronbach’s alpha reliability in our sample was 0.96 at both measurement points. In WIAT-3 Pseudoword Decoding (Wechsler, 2009), children were asked to name aloud a list of 52 pronounceable pseudowords. The task was discontinued after six consecutive errors and a participant’s score was the total number of pseudowords read correctly (max = 52). Cronbach’s alpha reliability in our sample was 0.92 at Time 1 and 0.94 at Time 2. In both reading tasks, we converted the raw scores into standard scores following the instructions in the manuals.

Parent measures. Parents were asked to fill out a questionnaire with four questions. First, we asked parents to report on their highest achieved education. There were nine options ranging from “completed elementary school” to “completed graduate studies”. The score for parents’ education was calculated by averaging the z scores for mother’s and father’s education. The correlation between mother’s and father’s education was 0.46 in our sample. Second, we asked parents to indicate on a Likert scale ranging from 0 (none) to 4 (more than 150 books) how many children’s books they had at home. Third, we asked parents to indicate on a Likert scale ranging from 0 (never) to 4 (daily) how often in the previous week their child read alone for enjoyment (i.e., not as part of his/her homework). Finally, we asked parents to think of their last week and indicate how much time they spent daily on home learning activities related to reading (e.g., teaching their child to read words, read a story
to their child) with their children. We gave them five options: 1–2 h (0), 2–3 h (1), 3–4 h (2), 4–5 h (3), and more than 5 h (4). These questions have been sampled from previous HLE studies (e.g., Kirby & Hogan 2008; Sénéchal, 2006) and are similar to questions included in other HLE questionnaires used during the pandemic (e.g., King et al., 2020; López-Escribano et al., 2021).

**Teacher measures.** Teachers were asked to fill out a questionnaire with six questions. First, we asked teachers to rate their ability to teach struggling readers. The Likert scale had four options (minimal, moderate, good, expert). Second, we asked them to indicate using a Likert scale the frequency of providing their students online reading instruction. They were given five options ranging from 0 (never) to 4 (daily). Third, we asked teachers to indicate using a Likert scale the frequency of providing their students worksheets focusing on reading. They were given five options ranging from 0 (never) to 4 (daily). Fourth, we asked them to indicate by choosing Yes or No if they differentiated reading instruction for their struggling readers. Finally, we asked them to indicate on a scale from 0 to 10 (10 being very easy) how challenging they found providing reading instruction online.

**Statistical analysis**

To examine the effects of both child-level and teacher-level variables on children’s later reading outcomes, we performed multilevel regression analyses (Heck & Thomas, 2009). Children’s scores on the two reading tests at Time 2 were used as the dependent variables. For the child-level predictors, we used parents’ education, number of books in the home, reading enjoyment, and home learning activities. For the teacher-level predictors, we used their perceived ability of teaching, the frequency of providing online reading instruction and worksheets, differentiation of instruction, and how challenging they found providing online instruction. We ran the analyses twice: with and without controlling for the effects of reading ability at Time 1 (i.e., the autoregressor).

All multilevel analyses were performed using Mplus (Version 8; Muthén & Muthén, 1998–2017) with the TYPE=TWOLEVEL function. Given the relatively small sample sizes at both within- and between-levels (we had 40 teachers in our sample, and the number of children in each class ranged from one to six \(M=1.75, SD=1.08\)), we used the Bayesian estimation, which was expected to be more precise at small sample sizes (Hox & McNeish, 2020), with Markov chain Monte Carlo algorithms. Each of the models was run for 10,000 iterations across three parallel chains.

**Results**

**Preliminary analysis**

Table 1 shows the descriptive statistics for all measures used in the study. The results of paired \(t\)-tests showed that the raw score improvements in our sample were statistically significant in both WRAT word reading and WIAT pseudoword decoding (WRAT: \(t=7.27, df=69, p<.001, d=0.87\); WIAT: \(t=5.12, df=69, p<.001, d=0.61\),
whereas the standard scores were not significantly different between Times 1 and 2 (WRAT: $t = 1.01$, $df = 69$, $p = .32$, $d = 0.12$; WIAT: $t = 0.28$, $df = 69$, $p = .78$, $d = 0.03$). This indicates that the children did not fall further behind in their reading skills after the school closures compared to the norming samples. Intraclass correlations (ICC$s$) of children’s word reading skills indicated that 4% and 9% of the total variances in WRAT Standard Scores were due to classroom differences at Times 1 and 2, respectively; 14% and 36% of the total variances in WIAT standard scores were due to classroom differences at Times 1 and 2, respectively.

The results further showed that the mode of teachers’ perceived ability of teaching struggling readers was ‘moderate’ (60.0%), followed by ‘good’ (37.5%). The modes of providing online reading instruction and worksheets on reading were both ‘never’ (37.5% and 30.0%, respectively), followed by ‘less than one day a week’ (22.5%) for online instruction and ‘daily’ (25.0%) for worksheets. Finally, more than half of the teachers (65.0%) differentiated their instruction for struggling readers. All variables were standardized before further analyses to ease the interpretation of coefficient estimates.
Table 2 shows the correlations among the variables in the study. At the child-level, parents’ education correlated with WRAT word reading at Times 1 and 2. Reading enjoyment and home learning activities also correlated with children’s reading outcomes at Time 2. These results indicate that the more children enjoyed reading alone and the more engaged they were in home learning activities during the school closures, the higher their Time 2 reading outcomes. At the teacher-level, how challenging they found providing online instruction was positively associated with WRAT word reading at Times 1 and 2, indicating that the lower the children’s word reading, the more challenging the teachers found it to teach reading online.

**Multilevel regression analysis**

Table 3 shows the results of the multilevel regression analysis. In the model without the autoregressor (top half of Table 3), reading enjoyment and home learning activities during school closures predicted both WRAT word reading and WIAT pseudoword decoding at Time 2. On the other hand, no teacher-level variables during the school closures predicted children’s reading outcomes at Time 2. However, it should be noted that the effect of teachers’ differentiation of instruction on WIAT pseudoword decoding approached significance. Similarly, in the models with the autoregressor (bottom half of Table 3), reading enjoyment during the school closures predicted WRAT word reading at Time 2 even after controlling for WRAT word reading at Time 1. Additionally, home learning activities during the school closures predicted both WRAT word reading and WIAT pseudoword decoding at Time 2. Finally, teachers’ differentiation of instruction had a significant effect on WIAT pseudoword decoding at Time 2 when WIAT pseudoword decoding at Time 1 was taken into account. This result suggests that teachers who differentiated their instruction for their struggling readers had a relatively stronger impact on their decoding skill development. Indeed, WIAT pseudoword decoding at Time 2 was significantly higher among children whose teachers differentiated instruction ($M=86.55$, $SD=11.19$) than those who did not ($M=80.62$, $SD=8.09$; Welch’s $t=-2.46$, $df=61.77$, $p=.017$, Hedges’ $g=0.58$).

**Discussion**

The purpose of this study was to examine whether different parent- and teacher-related factors influenced at-risk children’s reading performance during the Covid-19 pandemic. Before we discuss the results related to our research questions, it is important to note four other interesting results. First, even though most of our participants continued to experience reading difficulties at Time 2, they did not lose ground in their reading performance (based on the fact that their standard scores remained largely the same over time). This could be seen as relatively good news because preliminary evidence has shown that Covid-19 played out harder for some groups of children like those with learning disabilities (e.g., Georgiou, 2021). Second, teachers reported that on average they provided online reading instruction and worksheets focusing on reading 1–2 days a week. Even though we did not ask if the worksheets were accompanying their online teaching of reading or if they were given on the days
Table 2  Child-level (below the diagonal) and Teacher-level (above the diagonal) Correlations among the Observed Variables

|       | 1.     | 2.     | 3.     | 4.     | 5.     | 6.     | 7.     | 8.     | 9.     | 10.    | 11.    | 12.    | 13.    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1.    |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2.    | 0.58** |        | 0.43*  | 0.82** | 0.31   | −0.30  | 0.56** | 0.41*  | −0.01  | −0.11  | −0.10  | 0.18   | 0.34*  |
| 3.    | 0.41** | 0.38** |        | 0.54** | 0.04   | 0.08   | 0.24   | 0.20   | 0.22   | −0.32* | 0.23   | −0.10  | 0.04   |
| 4.    | 0.46** | 0.83** | 0.58** |        | 0.12   | −0.26  | 0.56** | 0.40*  | 0.01   | −0.25  | 0.00   | 0.22   | 0.12   |
| 5.    | 0.35** | 0.28*  | −0.10  | 0.10   | −0.15  | 0.18   | 0.01   | −0.15  | 0.00   | −0.27  | −0.03  | 0.08   |
| 6.    | 0.00   | −0.17  | 0.02   | −0.18  | 0.11   | −0.27  | 0.13   | 0.21   | 0.10   | 0.03   | 0.11   | −0.02  |
| 7.    | 0.11   | 0.44** | 0.21   | 0.46** | 0.13   | −0.43**| 0.21   | −0.12  | −0.13  | −0.04  | −0.12  |
| 8.    | 0.16   | 0.31*  | 0.14   | 0.31*  | −0.02  | −0.03  | 0.16   | 0.09   | 0.00   | −0.13  | 0.06   | 0.31   |
| 9.    |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 10.   |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 11.   |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 12.   |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 13.   |        |        |        |        |        |        |        |        |        |        |        |        |        |

Note. a Child-level variables (N=70). b Teacher-level variables (N=40). (–) Not estimated. T1=Time 1; T2=Time 2. WRAT=Wide Range Achievement Test; WIAT=Wechsler Individual Achievement Test

*p<.05; **p<.01
there was no online teaching, providing reading instruction 1–2 days a week is too little for Grade 1 students, particularly for children identified as being at-risk for reading difficulties and who would have received reading intervention four times a week had Covid-19 never happened. Third, intraclass correlations in both reading tasks increased over time (particularly in WIAT pseudoword decoding), possibly suggesting larger differences between teachers in their online teaching than in their in-class teaching. Finally, given that teachers’ perceived ability to teach struggling readers was not correlated with any of the students’ reading outcomes, we could argue that, similar to existing results (Stark et al., 2016; Washburn et al., 2011), they may not be particularly accurate at estimating their own ability to teach at least the word reading skills that WRAT and WIAT most closely assess.

In regard to the role of different parent- and teacher-related factors in at-risk children’s reading performance, our findings were consistent across the reading outcomes. Of the different parent-related factors, only home learning activities had a unique effect on children’s reading skills and their effect remained significant even after controlling for the effects of the autoregressors. This finding reinforces those of previous studies showing a significant effect of HLE experiences on children’s early reading skills (e.g., Inoue et al., 2020; Lehrl et al., 2020; Manolitis et al., 2011; Sénéchal & LeFevre, 2002; Zhang et al., 2020). However, our finding is in contrast to those of previous studies showing no significant effects of parental teaching in children’s reading among Grade 1 struggling readers (Inoue et al., 2018; Silinskas et al., 2013). It is possible that the new realities created by Covid-19 pandemic with reduced school instructional time forced parents to take a more active role in their children’s teaching, which, in turn, resulted in some positive effects. For example, Aram et al. (2022) showed that the frequency of shared book reading at home increased during Covid-19 compared to what it was before Covid-19. In contrast to home learning activities, ALR did not have a significant effect on children’s reading. There might be two explanations for this finding. First, our sample consisted of predominantly White, middle-class families with limited variability in book provision. Second, it is possible that during Covid-19, it was not the actual number of books that made a difference but how much time children spent on digital devices that included reading-related content. Unfortunately, we did not assess how much time children spent reading on electronic devices.

Frequency of reading for enjoyment was also a significant predictor of children’s reading skills and its effect survived the statistical control of the autoregressor (when predicting WRAT Word Reading). This is in line with recent findings (Torppa et al., 2019) and suggests that the amount of time children spend reading independently is important because it gives children (particularly those at risk for reading difficulties) opportunities to practice words they know (thus enhance the orthographic representations of these words in memory), opportunities to decode words they encounter for the first time (see Share’s, 1995, self-teaching hypothesis), and opportunities to have further discussions about what they read with their parents.

Among the teacher-related factors, only differentiation of instruction was a significant predictor of children’s reading skills at Time 2 and only when predicting WIAT pseudoword decoding in the model with the autoregressor. This finding should be seen in conjunction with the large intraclass correlation for WIAT pseudoword
Home and school interventions aided at-risk students’ literacy during decoding at Time 2. As indicated earlier, one interpretation of the observed increase in the intraclass correlations is that it may suggest larger differences between teachers in their online teaching than in their in-class teaching. Given the reported challenges of teachers in teaching online (particularly in early grades when students were not used to be spending much time in front of a monitor; see van der Spoel et al., 2020), it would be fair to assume that differentiation of instruction for struggling readers was more difficult to achieve. Obviously, those teachers who managed to differentiate their instruction for their struggling readers had a stronger impact on their decoding skill development. This view is reinforced by our earlier findings from classroom observations in the same classroom context showing that the teachers’ ability to dif-

### Table 3  Results of Multilevel Regression Models

|                      | Word Reading | Pseudoword Decoding |
|----------------------|--------------|---------------------|
|                      | Est  | LL  | UL  | Est  | LL  | UL  |
| **Model 1: Without autoregressor** |      |      |     |      |      |     |
| Child variables      |      |      |     |      |      |     |
| Parents’ education   | 0.24 | −0.04| 0.52| 0.03 | −0.25| 0.30|
| Number of books      | −0.03| −0.28| 0.22| −0.02| −0.27| 0.22|
| **Reading enjoyment**| **0.33**| **0.07**| **0.58**| **0.34**| **0.08**| **0.59**|
| Home learning activities | **0.25**| **0.03**| **0.47**| **0.26**| **0.04**| **0.48**|
| Residual variance    | 0.70 | 0.48 | 1.05| 0.64 | 0.41 | 0.98|
| Teacher variables    |      |      |     |      |      |     |
| Teacher’s perceived ability | −0.09| −0.39| 0.19| −0.04| −0.35| 0.25|
| Providing online instruction | −0.11| −0.39| 0.15| −0.22| −0.51| 0.08|
| Providing worksheets | 0.09 | −0.19| 0.34| 0.12 | −0.16| 0.38|
| Differentiation of instruction | 0.15| −0.14| 0.43| 0.28 | −0.02| 0.58|
| How challenging they found | 0.21| −0.08| 0.52| 0.03 | −0.29| 0.36|
| Intercept            | 0.00 | −0.22| 0.24| 0.02 | −0.21| 0.28|
| Residual variance    | 0.07 | 0.00 | 0.38| 0.15 | 0.01 | 0.55|
| **Model 2: With autoregressor** |      |      |     |      |      |     |
| Child variables      |      |      |     |      |      |     |
| Autoregressor        | **0.48**| **0.26**| **0.69**| **0.48**| **0.28**| **0.68**|
| Parents’ education   | 0.06 | −0.19| 0.31| 0.13 | −0.11| 0.36|
| Number of books      | −0.04| −0.26| 0.18| −0.11| −0.31| 0.10|
| **Reading enjoyment**| **0.29**| **0.06**| **0.51**| **0.21**| −0.02| 0.44|
| Home learning activities | **0.20**| **0.00**| **0.39**| **0.20**| **0.02**| **0.39**|
| Residual variance    | 0.53 | 0.36 | 0.80| 0.45 | 0.28 | 0.69|
| Teacher variables    |      |      |     |      |      |     |
| Teacher’s perceived ability | −0.08| −0.32| 0.16| −0.07| −0.32| 0.17|
| Providing online instruction | −0.05| −0.28| 0.19| −0.11| −0.35| 0.12|
| Providing worksheets | 0.07 | −0.18| 0.31| 0.07 | −0.16| 0.30|
| **Differentiation of instruction** | **0.21**| −0.06| 0.46| **0.28**| **0.04**| **0.54**|
| How challenging they found | 0.00| −0.29| 0.27| 0.01 | −0.27| 0.27|
| Intercept            | 0.00 | −0.22| 0.19| 0.01 | −0.21| 0.22|
| Residual variance    | 0.05 | 0.00 | 0.25| 0.11 | 0.01 | 0.42|

*Note. Bold font indicates the significant effects. CI = credible interval; Est = estimate; LL = lower limit; UL = upper limit.*
Differentiate instruction was a significant predictor of their children’s future decoding skills (Parrila et al., 2022).

In regard to the other teacher-related factors, there might be four explanations for their non-significant effect. First, it is possible that these factors do play a significant role when predicting children’s reading skills, but only when considering all ability levels and not just those of at-risk children (e.g., Kikas et al., 2018). Second, the teacher effects may have been consistent across all at-risk children in our sample, which then led to non-significant effects in their reading skills. Third, it is possible that it is not the frequency of providing online reading instruction or reading materials but the quality of the provided instruction and materials during that time that matters. Unfortunately, we could not evaluate the quality of the online lessons or the provided materials. Finally, because during the school closures children spent relatively little time online with their teachers compared to the time they spent with their parents, variables related to teachers did not play a significant role in these children’s reading development.

Some limitations of the present study should be noted. First, our sample was relatively small and our findings should be interpreted with some caution. Second, we measured both parent- and teacher-related factors using a questionnaire. As indicated by some researchers (e.g., Inoue et al., 2020; Manolitsis et al., 2011), questionnaires are subject to social desirability bias (i.e., parents responding based on what the society values and not based on what they actually did). Unfortunately, because of the Covid-19 pandemic and the health protocols in place, it was impossible to visit houses to examine in vivo what the parents were doing with their children. Third, our parent and teacher questionnaires were relatively brief. We intentionally kept them brief because parents and teachers were stressed during the pandemic (Garbe et al., 2020; Jakubowski & Sitko-Dominik, 2021) and would have been less willing to fill out long surveys. We acknowledge that our choice may have concealed important aspects of the home environment (e.g., what kinds of parent-child interactions had the greatest impact). Thus, our findings cannot contribute to the discussion around the role of code- versus meaning-related activities on children’s reading performance. Fourth, we did not ask parents to indicate if they were experiencing any reading difficulties themselves. This is important because even if they were willing to help their children, their own reading difficulties could affect the quality of the assistance they provided. Fifth, Covid-19 produced a lot of variation in home situations: Some parents were furloughed on full pay and had additional time, others lost their jobs, whereas yet others were working extra-long hours. We have no index of parents’ work situations in our study and its possible consequences on parenting. Finally, our sample consisted of predominantly White middle-class families. Thus, our findings may not generalize to other ethnicities and socioeconomic groups. This is important to keep in mind in view of evidence that Covid-19 had a greater impact on low-income families and Black or Indigenous children (see Kuhfeld et al., in this issue). These groups were either poorly or not at all represented in our sample.

To conclude, our findings add to those of previous studies that examined the HLE (or aspects of it) during the pandemic (e.g., Aram et al., 2022; López-Escribano et al., 2021; Sonnenschein et al., 2021) by providing preliminary evidence that home learning activities during school closures had an effect on at-risk children’s reading.
skills. What seems to be playing an even more important role for this group of children is the frequency of reading for enjoyment. Independent reading may not exert a unique effect on future reading ability in samples of typically developing children (Silinskas et al., 2020), but may be critical for children with reading difficulties. In contrast, among the teacher-related factors, only differentiation of instruction played an important role in at-risk children’s reading skills. Taken together, these findings reinforce the important role of parents in their children’s early reading development particularly when the typical agents of instruction (i.e., teachers) have less time and opportunities to interact with their students because of the pandemic.

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**Declarations**

**Conflict of interest** The authors have no conflict of interest to declare.

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