Abstract

Because reading comprehension is an important skill that many students struggle with, there is an urgent need to foster it. Few studies have investigated effective comprehension practices within a response-to-intervention design. Therefore, this study investigated the impact of a tier 1 intervention implemented for 10 weeks on 491 fifth and sixth graders' reading comprehension, strategy use, and motivation by means of multilevel analyses. The tier 1 intervention included four effective comprehension practices: strategy instruction, peer-mediated instruction, reading motivation promotion, and differentiated instruction. Results revealed no significant effects on reading comprehension, but experimental condition students increased significantly more on recreational autonomous and controlled motivation and on monitoring strategies than students in the control condition. Further, struggling experimental condition students reported using significantly more monitoring and evaluating strategies than their counterparts in the control condition.

Keywords: response-to-intervention – reading comprehension – high-quality instruction – late elementary education – struggling readers

The impact of a tier 1 intervention on fifth and sixth graders' reading comprehension, reading strategy use, and reading motivation

Reading comprehension, defined as the complex process of extracting meaning from texts (Castles et al., 2018), is one of the key elements for successful learning in school and societal participation (Wijekumar et al., 2019). Consequently, guiding students towards effective reading comprehension is essential. Developing reading comprehension skills becomes increasingly crucial in the later elementary grades (Ritchey et al., 2017). From that stage on, students are progressively expected to read, comprehend, and process expository text information independently (Meneghetti et al., 2007). However, many late elementary students lack appropriate comprehension skills, especially when reading expository texts (Rasinski, 2017). In this respect, an increasing and urgent need for sustainable and effective reading comprehension practices in the critical period of late elementary education comes to the fore.

To create effective learning environments in which all learners benefit, the international educational research community recommends applying a response-to-intervention (RTI) framework to address the need for a differentiated approach to instruction (Jefferson et al., 2017; Jimerson et al., 2016). In general, three core components characterize RTI: (a) the use of evidence-based, high-quality classroom instruction; (b) varying levels of intervention for students with reading difficulties; and (c) a data-driven decision-making process (Gustafson et al., 2014; Wanzek et al., 2010). More specifically, RTI designs consist of three levels of support, which become progressively more intense: (a) high-quality whole-class instruction (tier 1); (b) supplemental small-group instruction (tier 2); and (c) more intensive, individualized instruction (tier 3) (Kaminski & Powell-Smith, 2017; Swanson & Vaughn, 2011). Because tier 1 involves providing high-quality general classroom instruction for all students, taking into account diverse learning needs, tier 1 is often considered the most

important level (Glover & Vaughn, 2011; Swanson et al., 2017). However, most RTI studies examine tier 2 and 3 interventions (e.g., Al Otaiba et al., 2015; Wanzek et al., 2015). As a result, studies documenting tier 1 interventions aimed at promoting late elementary students' reading comprehension are scarce (Swanson et al., 2017). Moreover, insights into struggling readers' reading comprehension are largely missing in reported tier 1 interventions.

Identifying effective tier 1 instructional practices is essential for successful RTI implementation (Swanson et al., 2017). The current study therefore examined the impact of a tier 1 intervention, including effective and promising reading comprehension practices, on Flemish fifth and sixth graders' comprehension of expository texts, with particular attention to struggling readers.

Struggling Readers

Given the large group of late elementary students experiencing difficulties with reading comprehension (e.g., Rasinski, 2017; Support Center for Test Development and Polls [Steunpunt Toetsontwikkeling en Peilingen], 2018), it is important to define this group of struggling readers and to examine how to respond to their specific needs (Ritchey et al., 2017). In the present study, we align with the broad definition of Edmonds et al. (2009), who considered struggling readers as an umbrella term for a wide range of students experiencing reading problems (e.g., students with dyslexia, low comprehenders). This definition addresses the criticisms in the literature regarding who is diagnosed and how to deal with undiagnosed low comprehenders (Cainelli & Bisiacchi, 2019; Van den Broeck, 2010). In addition, this aligns with the aim of tier 1 interventions to reach unidentified struggling readers (Swanson et al., 2017). Furthermore, in Flanders (Belgium), the present study's context, there is a decreasing trend in diagnosing learning disabilities, and in particular diagnosing dyslexia, as this certificate is no longer a prerequisite to receive supplementary educational support (Ghesquière, 2014). Previous research has found that struggling readers lack appropriate and

consistent reading comprehension strategies, a factor correlating with effective reading comprehension (Gajria & Jitendra, 2016). Additionally, due to frequent reading failure experiences, struggling readers often show low reading motivation, which is also correlated with effective comprehension (Gambrell et al., 2018; Vaknin-Nusbaum et al., 2018).

Effective Teaching Practices for Reading Comprehension

Reading does not develop naturally and many students experience difficulties with it (National Reading Panel, 2000). Although researchers have sought to identify evidence-based teaching practices for optimizing students' comprehension, the majority of intervention studies focus on only one teaching practice at a time (e.g., strategy instruction; Hall-Mills & Marante, 2020; Pilonieta et al., 2019). In contrast, Van Ammel et al. (2021) blended three effective practices from two connected research fields (i.e., reading comprehension and motivation research): (a) reading comprehension strategy instruction, (b) peer-mediated instruction, and (c) reading motivation promotion. Additionally, in line with the call in the literature to take into account the diversity of learners, we added differentiated instruction (DI), based on the RTI research (e.g., Bondie et al., 2019; Jones et al., 2012), to the tier 1 intervention in this study as fourth teaching practice. These four practices are closely intertwined, and their interplay may enhance the effectiveness of the intervention (e.g., differentiation according to students' interests also promotes reading motivation).

Reading Comprehension Strategy Instruction

Although reading strategy use is positively correlated with students' comprehension performance (e.g., Lin, 2019; Muijselaar et al., 2017), elementary students' strategy use to comprehend expository texts has been found to be inconsistent and inappropriate (Boakye, 2017). Accordingly, explicit strategy instruction has received a great deal of attention (e.g., Gajria & Jitendra, 2016; Pilonieta et al., 2019). Strategy instruction has been repeatedly found to improve students' reading comprehension, in particular for late elementary (e.g., Okkinga

et al., 2018) and struggling readers (Nelson-Walker et al., 2013). Examples of effective strategies are self-questioning (Joseph et al., 2016; Ritchey et al., 2017), identifying main ideas (Solis et al., 2012; Stevens et al., 2019), and monitoring comprehension (Berkeley & Riccomini, 2013; Kim et al., 2012).

Three important guidelines can be derived from prior strategy instruction research. First, explicit strategy instruction should incorporate teaching which, how, and when different reading strategies can be applied (i.e., declarative, procedural, and conditional knowledge; Okkinga et al., 2018). Second, teaching a repertoire of strategies is recommended, because instruction in multiple strategies has been found to be more effective than single strategy instruction (Okkinga et al., 2018; Pressley & Harris, 2006). Third, comprehension strategies should be taught by gradually transferring responsibility from teacher to students: teacher explicit strategy instruction and modeling should be followed by guided practice including teacher feedback to support students in the transition to apply the strategies independently (Duke et al., 2011; Pilonieta et al., 2019). Notwithstanding the demonstrated effectiveness of explicit strategy instruction, it has only been applied in practice to a limited extent (Magnusson et al., 2019). Moreover, Okkinga et al. (2018) found in their meta-analysis that many reading strategy interventions are conducted in controlled settings (i.e., researchers as instructors) and use small-group instead of whole-class instruction. Therefore, further investigating strategy instruction in whole-class instruction provided by class teachers is recommended.

Peer-Mediated Instruction

Peer-mediated instruction, in which students serve as instructional assistants for each other (Topping et al., 2016, 2017), is also put forward in the reading comprehension literature as an evidence-based teaching practice (Israel et al., 2014; Wexler et al., 2015), especially for older (Ritchey et al., 2017) and struggling students (Alzahrani & Leko, 2018). It holds the

potential to respond to an increasingly diverse society by focusing on students providing help to each other to address students' diverse and individual needs (Blanch et al., 2013). In this respect, peer-mediated instruction can play an important role in the gradual responsibility transfer described previously. In line with the Vygotskian perspective, peers can act as helpful others during guided practice in addition to teachers' guidance (Palincsar et al., 1987). However, despite the important relation between peer-mediated instruction and enhanced reading comprehension (e.g., Van Keer & Verhaeghe, 2005; Wexler et al., 2015), teacher-led instruction remains most common in practice (Scruggs et al., 2007).

Reading Motivation Promotion

The well-validated Self-Determination Theory (SDT; Ryan & Deci, 2020) distinguishes different types of reading motivation, ranging from more controlled (i.e., reading by internal or external pressure) to more autonomous (i.e., reading for personal enjoyment or personal significance) types of motivation (De Naeghel et al., 2012, 2016). Autonomous reading motivation is significantly associated with reading comprehension according to the meta-analytic review of Toste and colleagues (2020) on students in kindergarten through 12th grade. Unfortunately, autonomous reading motivation declines as students progress in their educational careers (e.g., De Naeghel & Van Keer, 2013; Wigfield et al., 2016), which makes it important to buffer this decline in the critical period of late elementary education (De Naeghel et al., 2016).

SDT posits that autonomous reading motivation can be fostered by supporting students' psychological needs of autonomy (i.e., sense of ownership), relatedness (i.e., sense of belonging), and competence (i.e., sense of mastery; Ryan & Deci, 2020). Teachers can nurture these needs, for instance, by including autonomy supports (e.g., providing choices), stimulating relatedness (e.g., high-quality relationship between teachers and peers), and providing structure to foster competence (e.g., providing strategy instruction; Ryan & Deci,

2020). Therefore, creating autonomy-supportive and well-structured learning environments is recommended (De Naeghel et al., 2016). Notwithstanding the promising findings of the SDT research, practices explicitly nurturing students' psychological needs are not widely adopted (Ryan & Deci, 2020).

Differentiated Instruction

DI refers to addressing learning differences explicitly to provide optimal learning opportunities for all students (Coubergs et al., 2017). Given the complexity of the reading process (Duke & Cartwright, 2019), DI emerged from the RTI research as a promising teaching practice to cope with students' varied and diverse reading needs (Suprayogi et al., 2017; Tomlinson et al., 2003). DI is closely related to core RTI components: (a) high-quality instruction, (b) varying levels of intervention for struggling readers, and (c) a data-driven decision-making process. First, DI is considered as a key characteristic of high-quality RTI, required within tier 1 (Glover & Vaughn, 2011; Jones et al., 2012). Second, DI responds to the second RTI core aspect by dealing with students' diverse needs. Third, students' individual needs can be determined by systematically monitoring students' progress through the RTI framework (Förster et al., 2018). Shaunessy-Dedrick et al. (2015) found a significant positive effect of a DI approach on fourth graders' reading comprehension.

Despite its acknowledged importance, DI is not yet widely implemented (Suprayogi et al., 2017; Whipple, 2012). Moreover, there is a lack of empirical studies on the design, implementation, and impact of DI (Förster et al., 2018; Smale-Jacobse et al., 2019). Förster et al. (2018) found no effect of the combination of learning progress assessment and DI on third- and fourth graders' reading comprehension. However, in this study (a) the intervention strongly focused on reading fluency, (b) the description of DI was insufficiently detailed, and (c) the control classes' reading instruction was not observed. To further respond to the call for

more research on the effects of DI, we added DI as a fourth practice to promote students' reading comprehension.

Purpose of the Current Study

This study explicitly examines the effectiveness of a tier 1 intervention comprised of four effective and promising teaching practices (i.e., strategy instruction, peer-mediated instruction, reading motivation promotion, and DI). The first research aim is to evaluate the effectiveness of the tier 1 intervention on late elementary students' (a) reading comprehension, (b) reading comprehension strategy use, and (c) reading motivation. The second research aim is to examine the differential impact of the tier 1 intervention for three groups of struggling readers (i.e., students identified with dyslexia, students identified with and at risk for dyslexia, and low comprehenders). Based on the extant research base, it is hypothesized that providing the tier 1 intervention will have a significant positive effect on the reading comprehension performance, strategy use, and motivation for all late elementary students. Furthermore, it is hypothesized that the intervention will differentially benefit struggling readers because the intervention includes teaching practices shown to be effective for them (e.g., strategy instruction, Nelson-Walker et al., 2013; peer-mediated instruction, Alzahrani & Leko, 2018; DI, Suprayogi et al., 2017).

Method

This manuscript is a registered report. The stage-1 manuscript that was accepted in principle can be accessed at https://osf.io/4zvt6/.

Participants

We conducted a simulation study in R mimicking the design of our study to ensure we recruited a sample that was adequately powered to detect expected effects. We calculate that a study with 10 schools (five randomized to intervention and five to control), three classes in each school, 15 pupils per class, and two measurements (pre- and posttest) would have at least

80% power to detect a difference between the intervention and control condition in comprehensive reading skills at the 5% significance level. We based our calculations on a pilot study and set the within-subject variance at 1.45, the within-subject correlation at 0.30, the between-class variance at 0.35, and the between-school variance at 0.35.

A total of 27 late elementary teachers and their 491 students from 11 different Flemish schools participated in this study. Students' overall mean age was 11.11 (*SD* = 0.66). 4.28% of the students was officially diagnosed with dyslexia. Because of the decreasing trend in Flanders to diagnose dyslexia, teachers also indicated students at risk for dyslexia (i.e., still going through the diagnosing process or showing dyslexia symptoms). 5.91% of the students was officially diagnosed or nominated by their teacher to be at risk for dyslexia. Table 1 represents students' individual characteristics (i.e., gender, grade, dyslexia, and reading comprehension proficiency level) in both conditions.

<<Table 1>>

Chi-square analyses indicated no significant differences between conditions in the distribution of gender (χ^2 = 1.74, *df* = 1, *p* = .19), reading comprehension proficiency level (χ^2 = 4.70, *df* = 2, *p* = .10), or dyslexia (χ^2 = 0.02, *df* = 1, *p* = .90). A significant difference in distribution was found for grade (χ^2 = 11.12, *df* = 1, *p* = .001), as the control condition included more sixth graders. Active informed consent was obtained from all the participants and their parents, in line with the country's privacy legislation.

Design

A cluster-randomized controlled trial with repeated measures design with a pre- and posttest was conducted in authentic classes between November 2020 and April 2021. Schools were randomly assigned to either the experimental or the control condition. In this way, teachers from the same school were engaged into the same condition to avoid contamination of treatment effects. In the experimental condition, teachers implemented the reading

comprehension intervention for ten weeks. Control condition teachers received no additional instructional materials or training and implemented their regular classroom curriculum and teaching approach (i.e., business as usual).

Intervention

Core Components of the Intervention

A ten-session intervention was developed based on the theoretical and empirical insights discussed in the introduction (e.g., Okkinga et al., 2018; Van Ammel et al., 2021). The lessons were closely connected to the curricular standards for reading in elementary education. The intervention consisted of ten 50-min expository reading comprehension lessons, which took place once a week during regular classroom hours. On the other four week days, teachers focused on other parts of the literacy curriculum during their literacy lessons (e.g., listening, speaking, writing, vocabulary; Support Center for Test Development and Polls, 2018). Our intervention was called “Iedereen Leesatleet” (Everybody Reading Athlete). Following Van Ammel et al. (2021), the athlete metaphor referred to the high level of training and engagement required to comprehend texts (Duke et al., 2011; Goldman et al., 2016). The intervention condition students received no other reading comprehension instruction beyond the intervention itself.

Intervention lessons incorporated explicit *reading comprehension strategy instruction* in a repertoire of diverse effective reading strategies that were applied before, during, and after reading (see Gajria & Jitendra, 2016; Merchie et al., 2019) (see Table 2 for an overview of strategy lessons). The lessons build upon on another and students became acquainted with the strategy repertoire step-by-step. Attention was also paid to the integration of the strategies. The “gradual release of responsibility model” was used by including the following elements in each strategy lesson (except for the integration lessons): (a) emphasis on the value of reading strategy use, (b) explicit strategy instruction (i.e., declarative, procedural, and

conditional knowledge) by means of strategy cards (see Appendix A) and instructional videos, (c) modeling, (d) guided practice including teacher feedback, and (e) independent strategy use (Duke et al., 2011). During the integration lessons, guided practice was emphasized.

Peer-mediated instruction was applied during guided practice. Students worked at least 20 min in pairs during each lesson to practice the strategies. Students were assigned roles (e.g., player or coach, referring to the athlete metaphor), with the player reading the text aloud and the coach drawing attention to the learned strategies by means of the strategy cards illustrated in Appendix A (e.g., What does this word mean?) (based on Van Ammel et al., 2021). The students alternated roles each lesson. During this peer-mediated reading, the teacher observed the pairs and provided additional support when needed (e.g., "Which steps did you already apply?"). The instructional teacher's manual contained recommendations to create various group compositions based on students' interests or reading comprehension performance.

Each lesson also contained recommendations to nurture students' psychological needs in view of promoting students' autonomous *reading motivation* (De Naeghel et al., 2016). Autonomy was supported by integrating functional and interesting reading tasks, relatedness was supported by the inclusion of peer-mediated instruction, and competence was supported by teaching reading strategies and well-structured instructions.

Finally, students were introduced to various types of *DI* through the ten lessons. The DI-Quest model (Coubergs et al., 2017; Gheyssens et al., 2020) served as the basis for DI in the intervention. For example, the teacher manual contained examples regarding differentiation in instruction (e.g., extended and accelerated instruction) and tempo (e.g., differences in how long students use strategy cards) to respond to readiness differences. Further, various interesting texts topics were provided to meet differences in interests. The

intervention also responded to differences in students' learning profiles by, for example, teaching the strategies in various ways (e.g., modeling the strategies) and by allowing students to take up different roles during reading. Additionally, three assessment measures were implemented to enable data-driven decision-making process (i.e., second RTI core component) in the context of DI (Förster et al., 2018). More specifically, reading comprehension tests, teacher observations, and teacher reflection at the end of each lesson served as input to align instruction to students' individual needs, especially for struggling readers. In this respect, teachers were encouraged to identify students' difficulties and tailor their further instruction to address them.

<<Table 2>>

Teacher Training

Before the intervention, experimental condition teachers attended an online, half-day training provided by the main researcher based on best practices in teacher training (Desimone, 2009; Merchie et al., 2016). Detailed information was provided on the underlying rationale, effective practices, intervention goals, and using the instructional materials and teacher manual.

Measures of Treatment Fidelity and Social Validity

In line with previous research (De Smedt & Van Keer, 2018; Merchie & Van Keer, 2016), multiple methods were combined to enhance and assess treatment fidelity. First, during the intervention, the researcher was in close contact with the experimental condition teachers (e.g., phone calls, electronic reminders, and at least one teacher visit). Second, treatment fidelity was assessed by the main researcher. The researcher observed each experimental and control condition teacher at least once. These observations were structured with a fidelity form (based on Bouwer et al., 2018) focusing on (a) time spent on the reading comprehension lessons, (b) teachers' time on and off task, (c) the degree of implementation of the effective

practices and (d) the global quality of the observed lesson. The implementation degree and the global quality was measured on a five-point Likert scale, ranging from 1 (not observed at all; very low quality) to 5 (very often observed; very high quality). Third, experimental condition teachers completed a diary (1 per lesson), consisting of a structured protocol containing (a) the specific lesson date, hour, and time; (b) a lesson evaluation on a ten-point Likert scale (e.g., achievement of the objectives, clarity and feasibility of the lessons); and (c) an open question asking for additional remarks. Additionally, at the end of the intervention, the experimental condition teachers received a questionnaire, asking for their general intervention experiences (e.g., experienced difficulties, possibility to achieve the lessons' objectives).

Outcome Measures

Students' reading comprehension, strategy use, and reading motivation were measured at pre- and posttest. Given the Covid-19 pandemic, all pre- and posttests were administrated by the classroom teachers following an extensive, structured protocol.

Reading Comprehension Progress Monitoring (RC-PM) tool

Given the lack of reliable, valid, and contextualized measurement instruments to map Flemish late elementary students' reading comprehension in expository texts, a newly developed progress monitoring instrument (Bogaert et al., 2021a) was used at pre- and posttest. The RC-PM tool consists of six comparable tests (for more detailed information see Bogaert et al., 2021a). In this study, the first and fourth test of the RC-PM tool were used as pre- and posttest. Each test contains a set of 17 to 18 three-option multiple-choice questions associated with two to three expository texts. The multiple-choice questions reflect the three comprehension levels as described by the construction-integration (CI) model (van Dijk & Kintsch, 1983). For instance, the question "What is another word for fade away?" reflects the surface text model (i.e., unraveling a text's literal representation); "What is the relationship between these two sentences?" reflects the textbase model (i.e., understanding text

propositions and relations); and "What does the author think about smartphone use in Belgian schools?" reflects the situation level (i.e., integrating text information with prior knowledge/experiences). Item response theory scaled reading comprehension scores, ranging from -3 to +3, were computed for each student, taking into account both item difficulty and item discrimination (Baker & Kim, 2004; Muraki & Engelhard, 1985).

Reading Comprehension Strategy Questionnaire (RCSQ)

The RCSQ is a task-specific self-report questionnaire to map late elementary students' reading strategy use. Task specific means that the questionnaire items were explicitly linked to a previous comprehension reading task, for example, "During reading, I made short notes to better understand the text". Based on extensive EFA and CFA analyses, the 26-item RCSQ was developed in previous research and consists of five subscales: overt cognitive reading strategies, covert cognitive reading strategies, monitoring, evaluating, and - for non-native and bilingual students - using home language in view of comprehending texts (Bogaert et al., 2021b). Students completed these items on a five-point Likert scale, ranging from 1 (not applied at all) to 5 (completely applied). Reliability coefficients are presented in Table 3.

Self-Regulation Questionnaire – Reading Motivation (SRQ – Reading Motivation)

Students' reading motivation was measured by means of the SRQ-Reading Motivation questionnaire (De Naeghel et al., 2012). More specifically, students reading motivation was measured by means of autonomous and controlled reading motivation subscales, containing 17 items in total. These items were administrated twice on a five-point Likert scale to respectively measure students' reading motivation in academic and recreational contexts. Reliability coefficients are presented in Table 3.

Background Information

A background information questionnaire was administered to map student (e.g., gender, home language) and teacher (e.g., age, years of experience) characteristics. Teachers

completed a supplementary questionnaire on students' background information (e.g., students officially diagnosed with or at risk for dyslexia, home language) and rated students as low, average, or high reading comprehenders, as experienced teacher judgments have been found to be accurate in this respect (Südkamp et al., 2012).

<<Table 3>>

Data Analysis

To investigate the impact of the tier 1 intervention, multilevel analyses were applied in MLwiN 3.02 (Rasbash et al., 2009) to account for the hierarchical three-level structure. In this respect, the interdependency between students, belonging to the same class and school, was taken in account (Maas & Hox, 2005). More specifically, students (level 1) are clustered within classes (level 2), which are nested within schools (level 3).

To test the first research hypothesis three analysis steps were performed for each of the dependent variables. First, an unconditional three-level null model was estimated (model 0), serving as baseline with which more complex models were compared. This model, without explanatory variables, partitioned the total variance of the dependent variables into between-schools (level 3), between-classes within schools (level 2), and between-students within classes (level 1) variance. Since variances on school level were not significantly different from zero for all variables, two-level analyses (student and class level) were conducted (see Appendix C). Second, students' pretest scores on the respective dependent variable were included as covariates to control for baseline performance, strategy use, and motivation (model 1). Third, treatment conditions were added to examine the differential impact of the experimental condition contrasted with the control condition (model 2). For the variables where class-level variance was not significantly different from zero, unilevel analyses of covariance (ANCOVA) were conducted instead of multilevel analyses, also with students' pretest scores on the respective dependent variable included as covariate.

To investigate the second research aim, dyslexia identification (model 3), dyslexia identification and risk for dyslexia (model 4), and reading comprehension level (model 5) were added as explanatory variables. As to students' *reading comprehension proficiency level*, low comprehenders were compared with average and high comprehenders. Subsequently, interaction effects with the condition were added to evaluate differential effectiveness for each group of struggling learners.

Results

Treatment Fidelity and Social Validity

The experimental condition teachers' diaries showed that the intended frequency of one lesson per week was maintained, with an average duration of 52 min (*SD* = 10.07). The average observed lesson duration (*M* = 53.68 min, *SD* = 9.37) was approximately equal to the prescribed time and to the reported diary time. Control condition teachers also gave on average one reading comprehension lesson per week of an average 48 min (*SD* = 12.05). Experimental and control condition teachers were respectively on task for an average of 97.41% and 90.73% of the observed lessons. The global lesson quality was high for all teachers (Appendix B), with high-quality instruction (*M* = 4.04, *SD* = 0.87), good class management (*M* = 4.41, *SD* = 0.62), and good student engagement (*M* = 4.66, *SD* = 0.59), without significant differences between conditions (*t*(25) = -0.42, *p* = .68); *t*(25) = -0.78, *p* = .44); *t*(25) = -0.38, *p* = .71).

Analysis of the observed experimental lessons indicated that most of the critical intervention elements were implemented (Appendix B). Almost all experimental condition teachers started with a high-quality introduction (*M* = 4.79, *SD* = 0.43), followed by practicing the strategies (*M* = 4.46, *SD* = 0.58). The quality of the reflection phase was lower, with two of fourteen teachers ending their lesson without a reflection and other teachers could have reflected with the students in more depth (*M* = 3.96, *SD* = 1.47). The four effective

practices were included in all observed lessons with high alignment to the teacher manual. However, DI according to students' readiness (M = 3.89, SD = 0.60) and learning profile (M = 3.21, SD = 0.54) were rated lower.

Overall, the experimental teachers indicated that the lesson objectives were generally achieved (M = 7.88, SD = 0.47). They experienced the provided materials as very clear (M = 8.76, SD = 0.48), valuable to promote reading comprehension (M = 8.15, SD = 1.22), and feasible in practice (M = 8.40, SD = 1.14). According to the teachers, students experienced the lessons as not too difficult or too easy (M = 7.22, SD = 2.15) and as motivating (M = 7.65, SD = 1.31).

The mode of delivery of the reading comprehension lessons in the business-as-usual condition varied (i.e., using own materials and/or regular textbooks; whole-class teaching, individual, and in small group; separate comprehension lesson and lesson integrated in another learning domain). Further, the four effective practices implemented in the experimental condition were noticeably less featured in the control condition (Appendix B). For instance, mainly content questions were asked instead of strategy instruction, teachers mainly made the text choices, and most lessons ended abruptly without reflection.

Research Aim 1: Effectiveness of the Tier 1 Intervention

Descriptive statistics and model estimates for each dependent variable are presented in Appendix D and E, respectively. As described in the method section, two-level analyses (student and class level) were examined, since variances on school level were not significantly different from zero for all variables. Because variances on class level were significantly different from zero for reading comprehension, multilevel analyses are justified (see Appendix C). However, no significant differences were found between the control and experimental condition in students' reading comprehension postscores (χ^2 = 0.01, df = 1, p = .91).

Variances on class level were significantly different from zero for all strategy use variables, except for *monitoring* and *using home language in view of comprehending texts* (see Appendix C). No significant pre- to posttest differences were found between conditions for use of overt cognitive (χ^2 = 3.42, *df* = 1, *p* = .065), covert cognitive (χ^2 = 3.00, *df* = 1, *p* = .083), or evaluating (χ^2 = 0.07, *df* = 1, *p* = .79) strategies. Based on the ANCOVA analyses, experimental condition students reported using significantly more monitoring strategies after the intervention than control condition students (*F*(1,443) = 4.08, *p* = .04). No significant differences were found in students' *using home language* (*F*(1,67) = 0.84, *p* = .36).

Variances on class level were only significantly different from zero for students' academic autonomous reading motivation (see Appendix C). No significant differences between conditions were found for academic autonomous reading motivation (χ^2 = 2.02, *df* = 1, *p* = .16). Based on the ANCOVA analyses, no significant differences were found between conditions on academic controlled reading motivation (*F*(1,412) = 0.57, *p* = .73). However, experimental condition students reported significantly higher recreational autonomous and controlled motivations than control condition students (*F*(1,420) = 7.00, *p* = .008; *F*(1,416) = 5.82, *p* = .016, respectively). More specifically, the experimental condition students' recreational autonomous motivation increased from pre- to posttest, whereas their recreational controlled motivation did not (but control condition students' recreational controlled motivation decreased).

Research Aim 2: Differential Impact of the Tier 1 Intervention

Model estimates are provided in Appendix E. Regarding reading comprehension, no interaction effects were found for reading comprehension level by condition. Further, no interaction effects were found regarding overt or covert cognitive reading strategies, evaluating, or using home language for reading comprehension level by condition. However, the ANCOVA analyses revealed that low comprehenders in the experimental condition

reported significantly more monitoring strategy use at posttest than low comprehenders in the control condition ($F(1,441) = 3.26$, $p = .021$). No reading comprehension level by condition interaction effects were found for any reading motivation variables.

No interaction effects were found regarding reading comprehension, any reading motivation variables, overt or covert cognitive reading strategies, monitoring strategies, and using home language for students' with or at risk for dyslexia. However, an interaction effect was found for reported use of evaluating strategies ($\chi^2 = 5.67$, df = 1, $p = .017$), with experimental students with or at risk for dyslexia reporting significantly higher use of evaluating strategies than control condition students with or at risk for dyslexia at posttest.

Discussion

Analyses revealed no significant differences across conditions in students' reading comprehension postscores, but differences in students' reading strategy use. Our findings are consistent with the results of Ritchey et al.'s (2017) reading comprehension intervention study for fifth-grade students, which found significant effects only for proximal measures. In the context of RTI interventions, null and small effects are common, especially for older students (Ritchey et al., 2017; Vaughn et al., 2010). A plausible explanation might be that the progress in one specific subdomain (e.g., specific instructed strategies, such as monitoring in our case) might not have translated yet to more distal measures (Donegan & Wanzek, 2021; Okkinga et al., 2018; Ritchey et al., 2017). Ritchey et al. also suggested that reading comprehension progress in general is more difficult to identify than progress in a specific comprehension area.

Experimental condition students did report significantly higher recreational autonomous and controlled motivation than control condition students. These results are in line with previous research (De Naeghel et al., 2012) that reported significant results concerning reading motivation in the recreational context. The explicit and in-depth focus on

reading during the intervention period is a possible explanation for the finding that experimental condition students' controlled motivation does not decrease during the intervention period in comparison with the control condition. More specifically, the feeling of being obliged to read may not diminish because students are explicitly encouraged to read more during the intervention period.

Our second hypothesis (i.e., struggling experimental condition students will achieve higher postscores than struggling control condition students) was partially confirmed. Although significant effects were not observed for the distal outcome of reading comprehension, experimental condition students with or at risk for dyslexia reported significantly higher use of evaluation strategies than control condition students with or at risk for dyslexia at posttest. The intervention also significantly increased use of monitoring strategies for low comprehenders. In sum, the intervention made a significant difference for struggling readers in metacognitive higher-level reading strategies (i.e., monitoring and evaluating strategies). These positive effects for struggling readers might be attributed to the inclusion of teaching practices shown to be effective for this target group in the intervention (i.e., strategy instruction, peer-mediated instruction, reading motivation promotion, and differentiated instruction).

Limitations and Recommendations for Future Research

To measure strategy use and motivation for a large group of students, we used self-report questionnaires (Merchie & Van Keer, 2014; Schellings & van Hout-Wolters, 2011). However, self-reports are susceptible to social desirability and may over- or under-estimate actual behavior (Bråten et al., 2020; Schellings & van Hout-Wolters, 2011). Therefore, future studies might consider using online (e.g., think aloud protocols, eye-tracking) and offline (e.g., trace methodology, retrospective interviews) data collection methods in addition to the self-reports (Bråten et al., 2020). Second, measuring dependent variables after a more

extended period would allow for investigation of whether improvements on proximal measures in the intervention condition (e.g., greater use of monitoring strategies) translated to meaningful effects on distal measures (e.g., reading comprehension) over time. It would also be interesting in subsequent research to identify how and why the intervention resulted in greater use of some higher-level cognitive strategies. Third, future research could also include more intensive training on DI to ensure a more high-quality implementation. Another limitation is that we did not adjust alpha level of the multilevel analyses to account for the multiple models run. Finally, the relatively short time span over which the intervention was implemented may have dampened effects. For example, the meta-analysis on reading comprehension interventions of Li et al. (2021) concluded that long-term interventions (i.e., interventions implemented for more than three months compared to less than three months) generate larger effect sizes on students' reading outcomes. On the other hand, other researchers concluded that longer interventions do not necessarily lead to better effects on students' reading performance (Okkinga et al., 2018; Yapp et al., 2021). Future research could further investigate the effect of intervention duration.

Implications for Practice

The tier 1 intervention implemented in this study showed promising results for improving students' strategy use and reading motivation. However, it did not result in meaningful gains in reading comprehension. Perhaps a longer intervention period would result in the positive effects on reading strategy use translating to improved reading performance, as the complex and multifaceted nature of reading comprehension calls for years of development (Castles et al., 2018). Further, more intensive training may be necessary for high treatment fidelity, especially in relation to DI.

In summary, study results indicate that educators should not expect "Everybody Reading Athlete" to result in improved reading comprehension when implemented over a 10-

week period. However, given the positive effects for the use of some reading strategies and for recreational reading motivation, it is possible that future research may find the intervention results in improved reading comprehension when implemented over a longer timeframe.

Acknowledgement

The authors would like to thank prof. dr. Tom Loeys from the Department of Data Analysis at the Faculty of Psychology and Educational Sciences of Ghent University for conducting the power analyses of this study.

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Table 1

Descriptive Information on Students' Characteristics.

	Control condition		**Experimental condition**		**Total sample**	
	N	%	*N*	%	*N*	%
Gender						
Male	105	42.86	120	48.78	225	45.82
Female	140	57.14	126	51.22	266	54.18
Grade						
Fifth grade	125	51.00	162	65.85	287	58.45
Sixth grade	120	49.00	84	34.15	204	41.55
Reading comprehension proficiency level						
High comprehenders	143	58.37	123	50.00	266	54.18
Average comprehenders	75	30.61	82	33.33	157	31.97
Low comprehenders	27	11.02	41	16.67	68	13.85
Dyslexia						
Students with dyslexia	11	4.49	10	4.07	21	4.28
Students with or at risk for dyslexia	14	5.71	15	6.10	29	5.91
Total	**245**	**100**	**246**	**100**	**491**	**100**

Table 2

Overview of the Strategy Lessons.

Strategies/lessons topics	Lessons 1	2	3	4	5	6	7	8	9	10	Based on
Genre and relevance knowledge	■	▒	▒	▒	▒	▒	▒	▒	▒	▒	(e.g., Hall-Mills & Marante, 2020; Magnusson et al., 2019)
Looking ahead: previewing text (e.g., (sub)titles, images), making predictions and activating prior knowledge	▒	■	▒	▒	▒	▒	▒	▒	▒	▒	(e.g, Boardman et al., 2018; Vaughn et al., 2011)
Looking back: reflecting on text content, used strategies and affective text-based reactions	▒	▒	■	▒	▒	▒	▒	▒	▒	▒	(e.g., Kim et al., 2017; Pressley, 2000)
Time-out: word-level strategies (e.g., using a dictionary or text content to understand unknown words)	▒	▒	▒	▒	■	▒	▒	▒	▒	▒	(e.g., Fogarty et al., 2014; Vaughn et al., 2011)
Time-out: sentence/paragraph-level strategies (e.g., rereading or looking ahead in the text)	▒	▒	▒	▒	▒	■	▒	▒	▒	▒	(e.g., Duke et al., 2011; Fogarty et al., 2014)
Time-out: selecting keywords	▒	▒	▒	▒	▒	▒	■	▒	▒	▒	(e.g., Solis et al., 2012; Stevens et al., 2019)
Time-out: self-questioning	▒	▒	▒	▒	▒	▒	▒	■	▒	▒	(e.g., Daniel & Williams, 2019; Joseph et al., 2016)

Note. Dark cells represent strategies that were focused on during the lessons. Grey cells represent strategies that were additionally used.

Table 3

Cronbach's α*-Coefficients of the Reading Comprehension Strategy Questionnaire and the Self-Regulation Questionnaire – Reading Motivation.*

	n_{items}	Cronbach's α_{pre}	Cronbach's α_{post}
Reading Comprehension Strategy Questionnaire			
Overt cognitive reading strategies	7	.71	.78
Covert cognitive reading strategies	7	.64	.74
Monitoring	3	.65	.76
Evaluating	6	.76	.77
Using home language in view of comprehending texts [a]	3	.69	.70
Self-Regulation Questionnaire – Reading Motivation			
Recreational context			
Autonomous reading motivation	8	.95	.97
Controlled reading motivation	9	.86	.88
Academic context			
Autonomous reading motivation	8	.94	.95
Controlled reading motivation	9	.84	.87

[a] The subscale *Using Home language in View of Comprehending Texts* was only administrated with non-native and bilingual students.

Appendix A

Strategy Card 'Keywords'.

Keywords

I do this before **during** after reading

Step 1: Stop reading after each paragraph. Tell in one sentence what the paragraph is about.

Step 2: Highlight the most important word(s)/word group in the paragraph AND explain why this is the most important:

- **Repetition**
- **First and/or last sentence of the paragraph**
- **Title or subtitle**
- **Layout**
- **…**

Step 3: Highlight the explanation of the keword(s) with a different color.

Appendix B

Average Class Time, Teachers' Time on/off Task, and Global Quality of the Observed Reading Comprehension Lessons.

	Control condition	Experimental condition	All teachers
Average time spent on observed lesson[a]	52.39 (11.62)	54.96 (6.62)	53.68 (9.37)
Teachers' time on/off task			
Time on task	90.73%	97.41%	94.15%
Time off task	9.27%	2.59%	5.85%
Global quality[b]			
Quality of instruction	3.93 (0.98)	4.14 (0.77)	4.04 (0.87)
Class management	4.32 (0.61)	4.50 (0.65)	4.41 (0.62)
Student engagement	4.63 (0.70)	4.71 (0.46)	4.66 (0.59)
Degree of implementation[c] of the effective practices			
Fixed lesson format[d]			
Introduction	-	4.79 (0.43)	-
Practice	-	4.46 (0.58)	-
Reflection	-	3.96 (1.47)	-
Explicit strategy instruction			
Pointing out the value of the strategy	1.64 (0.93)	4.71 (0.61)	3.18 (1.74)
Discussing students' current strategy use	1.36 (0.50)	4.86 (0.36)	3.11 (1.83)
Explicit instruction of the strategy	2.07 (1.00)	4.71 (0.61)	3.39 (1.57)
Modeling the strategy	1.79 (0.97)	4.79 (0.58)	3.29 (1.72)
Peer-mediated instruction			
Students practice in pairs	3.29 (1.82)	4.93 (0.27)	4.11 (1.52)
Role assignment	1.00 (0.00)	4.86 (0.27)	2.93 (1.98)
Additional support by the teacher	4.00 (1.18)	4.86 (0.36)	4.32 (1.06)
Reading motivation promotion			
Autonomy	3.17 (1.19)	4.46 (0.37)	3.86 (1.06)
Competence	2.67 (0.78)	4.36 (0.57)	3.58 (1.08)
Relatedness	3.58 (0.67)	4.43 (0.43)	4.04 (0.69)
Differentiated instruction			
Interests	2.93 (1.38)	5.00 (0.00)	3.97 (1.43)
Readiness	2.86 (1.46)	3.86 (0.60)	3.36 (1.21)
Learning profile	2.57 (1.60)	3.21 (0.54)	2.93 (1.24)

Note. [a] Average time in minutes. Standard deviations are placed between brackets.
[b] Global quality was measured by a five-point Likert scale, ranging from 1 (not observed at all; very low quality) to 5 (very often observed; very high quality). [c] Implementation degree was measured by a five-point Likert scale, ranging from 1 (not observed at all; very low quality) to 5 (very often observed; very high quality). [d] The lessons in the control condition did not follow a prescribed standard format, so no data is available for the control condition on this criterion.

Appendix C

Summary of the Variances at the Three Levels of all Dependent Variables.[a]

	Variances at the three levels[b] **σ^2 (*SD*)**	**Proportions of the variances at three levels**	**Variances at the two levels**[c] **σ^2 (*SD*)**	**Proportions of the variances at two levels**
Reading comprehension	3 0.18 (0.10)	3 9.50%		
	2 0.02 (0.04)	2 0.98%	2 0.18 (0.08)*	2 9.95%*
	1 1.65 (0.11)*	1 89.52%*	1 1.65 (0.11)*	1 90.05%*
Overt cognitive reading	3 0.01 (0.02)	3 3.70%		
strategies	2 0.05 (0.02)*	2 11.91%*	2 0.06 (0.02)*	2 15.61%*
	1 0.32 (0.02)*	1 84.39%*	1 0.32 (0.02)*	1 84.39%*
Covert cognitive	3 0.00 (0.00)	3 0.00%		
reading strategies	2 0.06 (0.03)*	2 9.00%*	2 0.06 (0.03)*	2 9.00%*
	1 0.62 (0.04)*	1 91.00%*	1 0.62 (0.04)*	1 91.00%*
Monitoring	3 0.00 (0.00)	3 0.00%		
	2 0.07 (0.04)	2 5.34%	2 0.07 (0.04)	2 5.34%
	1 1.17 (0.08)*	1 94.66%*	1 1.17 (0.08)*	1 94.66%*
Evaluating	3 0.01 (0.02)	3 2.51%		
	2 0.05 (0.03)	2 9.27%	2 0.06 (0.03)*	2 12.14%*
	1 0.46 (0.03)*	1 88.22%*	1 0.46 (0.03)*	1 87.86%*
Using home language in	3 0.00 (0.00)	3 0.00%		
view of comprehending	2 0.00 (0.00)	2 0.00%	2 0.00 (0.00)	2 0.00%
texts	1 0.95 (0.14)*	1 100.00%*	1 0.95 (0.14)*	1 100.00%*
Academic autonomous	3 0.02 (0.04)	3 1.90%		
reading motivation	2 0.07 (0.04)	2 6.89%	2 0.09 (0.04)*	2 8.51%*
	1 0.91 (0.06)*	1 91.21%*	1 0.91 (0.06)*	1 91.49%*
Academic controlled	3 0.04 (0.03)	3 5.53%		
reading motivation	2 0.00 (0.00)	2 0.00%	2 0.03 (0.02)	2 4.72%
	1 0.68 (0.05)*	1 94.47%*	1 0.69 (0.05)*	1 95.28%*
Recreational	3 0.00 (0.00)	3 0.00%		
autonomous reading	2 0.08 (0.05)	2 5.10%	2 0.08 (0.05)	2 5.11%
motivation	1 1.49 (0.10)	1 94.90%*	1 1.49 (0.10)*	1 94.89%*
Recreational controlled	3 0.01 (0.01)	3 2.08%		
reading motivation	2 0.00 (0.00)	2 0.00%	2 0.02 (0.02)	2 2.37%
	1 0.66 (0.05)*	1 97.92%*	1 0.66 (0.05)*	1 97.63%*

Note. [a] Significant parameters are indicated with an asterisk (*), standard error estimates are placed between brackets; [b] 3= school-level variance, 2 = class-level variance, 1 = student-level variance in the fully unconditional three-level null models. [c] 2 = class-level variance, 1 = student-level variance in the fully unconditional two-level null models.

Appendix D

Descriptive Statistics for Dependent Variables.

			Mean	*SD*
Reading comprehension[a]	Pretest	Control	-0.04	1.32
		Exper.	0.05	1.33
	Posttest	Control	0.02	1.25
		Exper.	0.04	1.45
Reading strategy use[b]				
Overt cognitive reading strategy	Pretest	Control	1.51	0.53
		Exper.	1.53	0.55
	Posttest	Control	1.51	0.56
		Exper.	1.73	0.66
Covert cognitive reading strategy	Pretest	Control	2.99	0.71
		Exper.	3.06	0.74
	Posttest	Control	2.86	0.83
		Exper.	3.09	0.81
Monitoring	Pretest	Control	2.94	1.02
		Exper.	2.95	0.96
	Posttest	Control	2.81	1.18
		Exper.	2.97	1.04
Evaluating	Pretest	Control	3.67	0.69
		Exper.	3.57	0.69
	Posttest	Control	3.61	0.75
		Exper.	3.54	0.69
Using home language	Pretest	Control	1.70	0.83
		Exper.	2.30	1.11
	Posttest	Control	1.86	0.86
		Exper.	2.18	1.09
Reading motivation - Academic context[b]				
Autonomous reading motivation	Pretest	Control	3.46	1.08
		Exper.	3.21	1.08
	Posttest	Control	3.24	1.01
		Exper.	3.22	0.99
Controlled reading motivation	Pretest	Control	2.36	0.81
		Exper.	2.30	0.75
	Posttest	Control	2.23	0.84
		Exper.	2.21	0.86
Reading motivation - Recreational context[b]				
Autonomous reading motivation	Pretest	Control	3.55	1.12
		Exper.	3.22	1.20
	Posttest	Control	3.38	1.30
		Exper.	3.34	1.21
Controlled reading motivation	Pretest	Control	2.10	0.81
		Exper.	2.00	0.76
	Posttest	Control	1.90	0.80
		Exper.	1.99	0.84

[a] Reading comprehension scores were computed based on IRT-scaled scores, ranging from -3 to +3. [b] Reading strategy use and reading motivation was measured on a five-point Likert scale, ranging from 1 (not applied at all) to 5 (completely applied).

Appendix E

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Reading Comprehension.

	Reading comprehension test score					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	0.02 (0.10)	0.03 (0.06)	0.03 (0.09)	0.05 (0.09)	0.06 (0.09)	0.08 (0.10)
Pretest reading comprehension score		0.52	0.52	0.52	0.52	0.48
		(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***
Condition (experimental)[a]			-0.01 (0.12)	-0.03 (0.13)	-0.03 (0.13)	0.02 (0.14)
Students with dyslexia[b]				-0.29 (0.38)		
Students with dyslexia * condition[a]				0.28 (0.57)		
Students with or at risk for dyslexia					-0.48 (0.33)	
Students with or at risk for dyslexia					0.32 (0.48)	
* condition[a]						
Low comprehenders						-0.44 (0.17)*
Low comprehenders * condition[a]						0.03 (0.33)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.18 (0.08)*	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)	0.04 (0.03)
Level: student						
Student-level variance	1.65	1.34	1.34	1.34(0.09)***	1.34	1.31
	(0.11)***	(0.09)***	(0.09)***		(0.09)***	(0.09)***
Log likelihood	1576.56	1434.38	1434.36	1433.79	1432.06	1427.98

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Overt Cognitive Reading Strategy Use.

	Overt cognitive reading strategies					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	1.60	1.60	1.51	1.51	1.51	1.51
	(0.05)***	(0.05)***	(0.07)***	(0.07)***	(0.07)***	(0.07)***
Pretest overt cognitive reading		0.43	0.42	0.42	0.42	0.42
strategy use score		(0.05)***	(0.5)***	(0.05)***	(0.05)***	(0.05)***
Condition (experimental)[a]			0.18 (0.10)	0.17 (0.10)	0.17 (0.10)	0.18 (0.10)
Students with dyslexia[b]				-0.05 (0.17)		
Students with dyslexia * condition[a]				0.37 (0.26)		
Students with or at risk for dyslexia					-0.05 (0.16)	
Students with or at risk for dyslexia					0.24 (0.22)	
* condition[a]						
Low comprehenders						0.02 (0.13)
Low comprehenders * condition[a]						-0.01 (0.16)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.06	0.06	0.05	0.05	0.05	0.05
	(0.02)**	(0.02)***	(0.02)**	(0.02)**	(0.02)**	(0.02)**
Level: student						
Student-level variance	0.32	0.27	0.27	0.27	0.27	0.27
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
Log likelihood	808.90	711.531	708.37	705.64	706.80	708.33

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u 0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e 0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Covert Cognitive Reading Strategy Use.

	Covert cognitive reading strategies					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	2.96	2.97	2.87	2.87	2.86	2.90
	(0.06)***	(0.06)***	(0.09)***	(0.09)***	(0.09)***	(0.09)***
Pretest covert cognitive reading		0.45	0.04	0.44	0.44	0.45
strategy use score		(0.05)***	(0.05)***	(0.05)***	(0.05)***	(0.05)***
Condition (experimental)[a]			0.21 (0.12)	0.21 (0.12)	0.22 (0.12)	0.17 (0.12)
Students with dyslexia[b]				-0.02 (0.26)		
Students with dyslexia * condition[a]				-0.08 (0.38)		
Students with or at risk for dyslexia					0.01 (0.23)	
Students with or at risk for dyslexia *					-0.17 (0.33)	
condition[a]						
Low comprehenders						-0.32 (0.18)
Low comprehenders * condition[a]						0.31 (0.23)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.06 (0.03)*	0.07	0.06 (0.03)*	0.06 (0.03)*	0.06 (0.03)*	0.06 (0.03)*
		(0.03)**				
Level: student						
Student-level variance	0.62	0.52	0.52	0.52	0.52	0.52
	(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***
Log likelihood	1047.55	914.012	911.23	911.10	910.74	908.05

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u 0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e 0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Monitoring Reading Strategy Use.

	Monitoring					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	2.88 (0.07)***	2.86 (0.07)***	2.78 (0.10)***	2.78 (0.10)***	2.78 (0.10)***	2.78 (0.10)***
Pretest monitoring reading strategy use score		0.51 (0.05)***	0.51 (0.05)***	0.51 (0.05)***	0.51 (0.05)***	0.50 (0.05)***
Condition (experimental)[a]			0.16 (0.14)	0.16 (0.14)	0.16 (0.14)	0.09 (0.15)
Students with dyslexia[b]				-0.18 (0.32)		
Students with dyslexia * condition[a]				0.44 (0.47)		
Students with or at risk for dyslexia					-0.05 (0.28)	
Students with or at risk for dyslexia * condition[a]					-0.01 (0.40)	
Low comprehenders						-0.04 (0.23)
Low comprehenders * condition[a]						0.48 (0.29)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.07 (0.04)	0.09 (0.04)*	0.08 (0.04)*	0.08 (0.04)*	0.08 (0.04)*	0.08 (0.04)*
Level: student						
Student-level variance	1.17 (0.08)***	0.91 (0.06)***	0.91 (0.06)***	0.91 (0.06)***	0.91 (0.06)***	0.90 (0.06)
Log likelihood	1392.62	1249.478	1248.20	1247.33	1248.14	1242.00

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y\ ij = \beta 0 ij + \beta 1$ Pretest $ij + \beta 2$ Experimental Condition j

$\beta 0\ ij = \beta 0 + u0j + e0ij$

$[u0j] \sim N(0,\Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0ij] \sim N(0,\Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Evaluating Reading Strategy Use.

	Evaluating					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	3.57	3.58	3.56	3.58	3.58	3.55
	(0.06)***	(0.04)***	(0.06)***	(0.06)***	(0.06)***	(0.06)***
Pretest evaluating reading strategy		0.56	0.56	0.56	0.56	0.55
use score		(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***
Condition (experimental)[a]			0.02 (0.08)	0.01 (0.08)	-0.01 (0.08)	0.04 (0.09)
Students with dyslexia[b]				-0.30 (0.19)		
Students with dyslexia * condition[a]				0.37 (0.30)		
Students with or at risk for dyslexia					-0.26 (0.17)	
Students with or at risk for dyslexia *					0.60 (0.25)*	
condition[a]						
Low comprehenders						0.12 (0.15)
Low comprehenders * condition[a]						-0.17 (0.19)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.06 (0.03)*	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)
Level: student						
Student-level variance	0.46	0.35	0.35	0.35 (0.03)	0.34	0.35
	(0.03)***	(0.03)***	(0.03)***		(0.02)***	(0.03)***
Log likelihood	951.17	757.04	756.97	754.56	751.31	756.15

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest using Home Language in view of Comprehending Texts Strategy Use.

	Using home language in view of comprehending texts					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	2.02	1.97	1.88	1.88	1.88	1.84
	(0.10)***	(0.12)***	(0.15)***	(0.15)***	(0.15)***	(0.18)***
Pretest using home language reading		0.32	0.30 (0.12)*	0.30 (0.12)*	0.30 (0.12)*	0.28 (0.12)*
strategy use score		(0.11)**				
Condition (experimental)[a]			0.22 (0.24)	0.22 (0.24)	0.22 (0.24)	0.21 (0.30)
Students with dyslexia[b]				0.00 (0.00)		
Students with dyslexia * condition[a]				0.00 (.0.00)		
Students with or at risk for dyslexia					0.00 (0.00)	
Students with or at risk for dyslexia *					0.00 (.0.00)	
condition[a]						
Low comprehenders						0.14 (0.35)
Low comprehenders * condition[a]						-0.01 (0.48)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Level: student						
Student-level variance	0.95	0.92	0.91	0.91	0.91	0.91
	(0.14)***	(0.16)***	(0.15)***	(0.15)***	(0.15)***	(0.15)***
Log likelihood	273.29	193.06	192.19	192.19	192.19	191.92

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Academic Autonomous Reading Motivation.

	Academic autonomous reading motivation					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	3.23	3.24	3.18	3.21	3.20 (0.06)***	3.20
	(0.07)***	(0.04)***	(0.06)***	(0.06)***		(0.06)***
Pretest academic autonomous reading		0.66	0.66	0.66	0.66	0.66
motivation score		(0.03)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***
Condition (experimental)[a]			0.117 (0.08)	0.09 (0.08)	0.10 (0.08)	0.13 (0.09)
Students with dyslexia[b]				-0.47 (0.24)		
Students with dyslexia * condition[a]				0.54 (0.34)		
Students with or at risk for dyslexia					-0.21 (0.21)	
Students with or at risk for dyslexia *					0.20 (0.29)	
condition[a]						
Low comprehenders						-0.15 (0.10)
Low comprehenders * condition[a]						-0.05 (0.21)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.09 (0.04)*	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)
Level: student						
Student-level variance	0.91	0.46	0.46	0.46	0.46	0.46
	(0.06)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***
Log likelihood	1230.56	890.26	888.35	884.37	887.30	886.20

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Academic Controlled Reading Motivation.

	Academic controlled reading motivation					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	2.21	2.21	2.20	2.20	2.2	2.15 (0.06)***
	(0.05)***	(0.04)***	(0.06)***	(0.06)***	(0.06)***	
Pretest academic controlled reading		0.64	0.64	0.64	0.64	0.62 (0.04)***
motivation score		(0.4)***	(0.04)***	(0.04)***	(0.04)***	
Condition (experimental)[a]			0.03 (0.09)	0.02 (0.09)	0.03 (0.09)	0.01 (0.09)
Students with dyslexia[b]				-0.02 (025)		
Students with dyslexia * condition[a]				0.02 (0.38)		
Students with or at risk for dyslexia					0.11 (0.22)	
Students with or at risk for dyslexia *					-0.07 (0.31)	
condition[a]						
Low comprehenders						0.46 (0.10)***
Low comprehenders * condition[a]						-0.06 (0.21)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.03 (0.02)	0.02 (0.1)	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)
Level: student						
Student-level variance	0.67	0.46	0.46	0.46	0.46	0.44 (0.03)***
	(0.05)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***	
Log likelihood	1098.63	866.65	866.54	866.53	866.25	846.32

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y\ ij = \beta 0 ij + \beta 1$ Pretest $ij + \beta 2$ Experimental Condition j

$\beta 0\ ij = \beta 0 + u0j + e0ij$

$[u0j] \sim N(0,\Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0ij] \sim N(0,\Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Recreational Autonomous Reading Motivation.

	Recreational autonomous reading motivation					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	3.36	3.38	3.26	3.27	3.27	3.28
	(0.08)***	(0.05)***	(0.07)***	(0.07)***	(0.07)***	(0.07)***
Pretest recreational autonomous reading		0.79	0.80	0.80	0.80	0.80
motivation score		(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***
Condition (experimental)[a]			0.27	0.22 (0.10)*	0.22 (0.10)*	0.20 (0.10)*
			(0.10)***			
Students with dyslexia[b]				-0.25 (0.28)		
Students with dyslexia * condition[a]				0.30 (0.41)		
Students with or at risk for dyslexia					-0.16 (0.25)	
Students with or at risk for dyslexia *					0.07 (0.35)	
condition[a]						
Low comprehenders						-0.08 (0.13)
Low comprehenders * condition[a]						0.21 (0.25)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.08 (0.05)	0.03 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.01 (0.02)
Level: student						
Student-level variance	1.49	0.71	0.71	0.70	0.70	0.71
	(0.10)***	(0.05)***	(0.10)***	(0.05)***	(0.05)***	(0.05)***
Log likelihood	1440.07	1065.89	1060.98	1060.12	1060.45	1060.01

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(X\beta, \Omega)$

$y_{ij} = \beta 0_{ij} + \beta 1$ Pretest $_{ij} + \beta 2$ Experimental Condition $_j$

$\beta 0_{ij} = \beta 0 + u0_j + e0_{ij}$

$[u0_j] \sim N(0, \Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0_{ij}] \sim N(0, \Omega e)$: $\Omega e = [\sigma 2 e0]$

Summary of the Model Estimates for the Two-Level Analysis of Students' Posttest Recreational Controlled Reading Motivation.

	Recreational controlled reading motivation					
Fixed part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Intercept	1.95	1.95	1.87	1.87	1.87	1.83 (0.06)***
	(0.05)***	(0.04)***	(0.06)***	(0.06)***	(0.06)***	
Pretest recreational controlled reading		0.56	0.57	0.57	0.57	0.54 (0.04)***
motivation score		(0.04)***	(0.04)***	(0.04)***	(0.04)***	
Condition (experimental)[a]			0.17 (0.08)*	0.16 (0.08)*	0.17 (0.08)*	0.13 (0.08)
Students with dyslexia[b]				0.04 (0.22)		
Students with dyslexia * condition[a]				0.12 (0.33)		
Students with or at risk for dyslexia					0.07 (0.21)	
Students with or at risk for dyslexia *					0.03 (0.29)	
condition[a]						
Low comprehenders						0.43 (0.10)***
Low comprehenders * condition[a]						0.10 (0.20)
Random part	Model 0	Model 1	Model 2[d]	Model 3	Model 4	Model 5
Level: class						
Class-level variance	0.02 (0.02)	0.02 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Level: student						
Student-level variance	0.66	0.47	0.47	0.46	0.47	0.45 (0.03)***
	(0.05)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***	
Log likelihood	1065.92	880.92	876.26	875.86	875.97	857.46

Note. [a] Control condition as reference category. [b] Students without dyslexia as reference category. [c] The complete group of average and high comprehenders as reference category. Standard error estimates are placed between brackets.

*** p < 0.001, ** p < 0.01, * p < 0.05.

[d] Model equation with control condition as reference condition as an example:

$y \sim N(XB, \Omega)$

$y\ ij = \beta 0 ij + \beta 1$ Pretest $ij + \beta 2$ Experimental Condition j

$\beta 0\ ij = \beta 0 + u0j + e0ij$

$[u0j] \sim N(0,\Omega u)$: $\Omega u = [\sigma 2 u0]$

$[e0ij] \sim N(0,\Omega e)$: $\Omega e = [\sigma 2 e0]$