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The relationship among students' reading performance, their classroom behavior, and teacher skills

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ABSTRACT

The relationship among students' reading performance, their behavior (task-focused behavior, emotional stability, and compliant behavior) in the classroom, and the teacher's skills was investigated in 66 third-grade classrooms. Results from this study showed the students' reading performance and their behavior in the classroom are all significantly interrelated. Better reading performance at the beginning of the school year goes with better behavior at the end of the school year. In turn, better behavior at the beginning of the school year goes with better reading performance at the end of the school year. The teacher can improve the behavior of the students by providing high-quality reading instruction. Some teacher skills have differential effects, however, on the various behavioral aspects. The implications for the educational practice as well as for future research are discussed.

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When it comes to preventing reading problems, educational research has shown that the answer lies in improving the quality of the reading instruction. Firm knowledge bases have been delivered that indicate how reading instruction quality could be improved (Kuhn & Schwanenflugel, 2008; National Reading Panel, 2000). Good-quality reading instruction should include several aspects. First, research shows that the focus in reading instruction should be on the core concepts (Coyne, Kame'enui, & Simmons, 2001; Hiebert, 2009). These core concepts mark what aspects are essential to become a fluent reader. The most essential thing, when it comes to learning to read, is to read a lot; reading is a skill that can only be acquired through reading a lot. This takes time though, and time in educational practice is always running short. That is why it is important to focus on the things that actually contribute to learning to read, and to skip other, nonessential, things. This gives the teacher the opportunity to give effective instruction in the time available, especially to students lagging behind. Second, the assumption is that all children can learn to read, if they are provided with enough time for practice. Struggling readers need more time to acquire the skill. That is why these students should be given extra time (extra intervention) in addition to the regular program. This can be accomplished by using a multiple-tier model for reading instruction in which the tiers differ in both intensity and time (Allington & Walmsley, 2007; Haager, Klingner, & Vaughn, 2007). In addition to these preventive measures, the third aspect is that the teacher needs to keep track of the students' progress, by observing the reading progress of the students, monitoring the amount of books read, and collecting information from (standardized) reading tests. This way the teacher can advance the students' reading and, moreover, this makes it possible to adapt the instruction timely (Haager et al.,

2007). The last aspect of good-quality reading instruction is focus on the motivation of the students. From the research it has become very clear that motivation to read is essential. Students need both the skill and the will to read (Guthrie, Wigfield, & You, 2012; Malloy, Marinak, & Gambrell, 2010). The teacher can foster the students' reading motivation by providing support and talking with the students about books and their interests (to help them with the book choice).

Our own research underscores the importance of good-quality reading instruction as well (Houtveen, Brokamp & Smits, 2012; Houtveen, Brokamp, & Van de Grift, 2014). In a study conducted among 28 primary schools (Grades 2–6), the schools worked with a reading intervention program in which all the previously mentioned aspects of good-quality reading instruction had been incorporated. To investigate what teacher behavior explains students' growth in reading performance, we conducted a multilevel regression analysis with two levels. Our results showed that growth in reading performance of the students was explained by fostering students' time on task, fostering students' self-confidence and motivation, book introduction and modeling literate behavior, review with students at the end of the reading lesson, construction and implementation of intervention plans, and whether ineffective interventions for struggling readers were used. Furthermore, around 85–90% of the students reached the reading goals set for their grade and almost all students left primary school at the level of sufficient reading proficiency. In short, these results underscore the findings from previous research.

In the Netherlands, however, these successes regarding reading could be in jeopardy because of the fact that the percentage of students with behavior problems is increasing in primary schools. Since 2014, a new law in the Netherlands has opened

up the possibility for more children with special needs (academic but also behavioral) to be placed at regular primary schools instead of schools for special education (duty-of-care law; Government of The Netherlands, n.d.). Under this influence, we see a tendency in primary education to focus a lot of attention and resources on behavior problems. This tendency toward focusing on behavior is quite understandable, since problems in behavior disturb the climate in the classroom and impede the teacher's instruction and the whole teaching process. But it takes attention and resources away from other aspects, such as providing good-quality reading instruction.

This focus on behavior problems has sparked an ongoing discussion in the Netherlands. On one hand, there is a group of teachers and professionals that feels that behavior problems interfere with the process of learning to read and therefore the teacher's focus should be on the behavior problems.

On the other hand, there are teachers and professionals that claim that in education the focus should be on improving the reading performance of the students, because this would diminish or even resolve the behavior problems.

Theoretical framework

Ample research has recorded the co-occurrence between reading problems and behavioral problems (e.g., Hinshaw, 1992; Spira & Fischel, 2005). What is not known for sure, however, is the exact nature of this relationship; do reading problems cause behavior problems or the opposite, is there a third (unknown factor) causing both problems, or do reading problems and behavior problems cause each other (e.g., Hinshaw, 1992)? And even though several reviews have been done in an attempt to answer this question, these reviews did not focus specifically on reading problems and behavior problems in the classroom (Cornwall & Bawden, 1992; Hinshaw, 1992; Spira & Fischel, 2005; VanderStaay, 2006). From an educational perspective, student behavior that can be influenced by the teacher should be the focus. That is why we conducted a meta-analysis on the relationship between reading problems and nonclinical behavior problems in the classroom (Brokamp, Houtveen, & Van de Grift, 2017), in an attempt to answer the question whether reading problems cause behavior problems or the opposite. Of the 16 studies included in this meta-analysis, four studies showed that reading problems lead to behavior problems (average effect size: .30), and eight studies showed that behavior problems lead to reading problems (average effect size: .30). There were no studies that indicated that a third, unknown factor might be responsible for the relationship between these problems.

Four studies showed that reading problems and behavior problems cause each other. Because these studies investigated bidirectional relationships, and therefore several paths of mutual influence, calculation of one effect size per study, or a mean effect size for this group of studies was not possible. Taken together, the results from the meta-analysis made us reach the conclusion that reading problems and behavior problems do in fact cause each other; the average effect size of the studies that show that reading problems cause behavior problems is equal to the average effect size of the studies that show that behavior problems cause reading problems. The studies

that investigated the bidirectional relationship, strengthen this conclusion.

This conclusion we reached on the basis of the meta-analysis we conducted will have to be tested further. That is why, in this article, we investigate the relationship between students' reading performance and their behavior in the classroom, and attempt to answer the question whether reading and behavior do indeed influence each other. We do not presume to establish causality, but we can establish temporal precedence (which is a condition for causality); does behavior precede reading, and does reading precede behavior? Also, we will test the hypothesis (mentioned in the introduction) that the teacher can influence the behavior of the students through the quality of his or her reading instruction.

Research questions

In this study the following research questions are addressed:

- Research Question 1: Do better task-focused behavior, emotional stability, and compliant behavior at the beginning of the school year go with better reading performance at the end of the school year?
- Research Question 2: Does better reading performance at the beginning of the school year go with better task-focused behavior, emotional stability, and compliant behavior at the end of the school year?
- Research Question 3: What teacher behavior can explain the growth in task-focused behavior, emotional stability, and compliant behavior?

Method

Sample

To investigate the research questions 593 third-grade students and 66 teachers were involved. Many teachers in Dutch primary education work part-time. As a consequence, sometimes two or three teachers give instruction to the same classroom (for example: teacher A only works on Monday and Tuesday, teacher B only works on Wednesday and Thursday, and teacher C only works on Friday). Of the 66 teachers that participated in this study, 23 taught a classroom together with one or more colleagues. The consequence for data analysis will be discussed in the Data Analyses.

Information about student sample characteristics can be found in Table 1. Our sample was 49% boys. The students' average age was 110.96 months old (9 years, 3 months) when data were collected at the end of Grade 3. Intelligence averaged 113.45 (on a scale from 49 to 151), whereas socioeconomic status averaged 0.13 (on a scale ranging from 0 [high socioeconomic status] to 1.2 [low socioeconomic status]).

Table 1. Sample ($n = 593$ students).

	Range	<i>M</i>	Standard deviation
Intelligence	72–151	113.45	16.19
Socioeconomic status	0.00–1.20	0.13	0.34
Age (months)	98–135	110.96	5.61

Note. Male students = 49%.

Measures

Students' reading fluency. The students' reading performance was measured with a Dutch standardized reading aloud text test (AVI-test; Jongen & Krom, 2009). This test consists of 11 texts that increase in difficulty (levels 1–11). Each student starts with a text on his or her current level of reading fluency. If the student reads this text within the set time limit and with a minimal number of errors, he or she will be presented with the next text. This process continues until the student comes across a text that he or she cannot finish within the set time or error limit. The last text the student finishes within the time and error limit will determine their current level of reading fluency.

Students' behavior. The students' behavior during reading lessons was measured with a Dutch teacher rating scale, the *Gedragslijst* (Behavior questionnaire; Van van Doorn, 2000). This questionnaire includes four subscales, of which three were used in this study: (a) task-focused behavior (5 items); (b) emotional stability (5 items), and (c) compliant behavior (9 items). Examples of the items measuring task-focused behavior are, "the student is easily distracted by sounds and incidents in the classroom during the reading lesson" and "the student is distracted by other students' behavior during the reading lesson." Emotional stability was measured by items such as "the student seeks the teacher's approval during the reading lesson" and "the student worries a lot during the reading lesson." Compliant behavior was measured with items such as "the student corrects his or her behavior after the teacher tells him or her to" and "the student accepts the teacher's authority during the reading lesson." Teachers used a 4-point Likert-type frequency scale to rate how often the child displays a particular behavior during the reading lesson, with response ranging from 1 (*never*) to 4 (*always*). The reliabilities of these scales were sufficient: .90 (task-focused behavior), .73 (emotional stability), and .92 (compliant behavior).

Students' intelligence. Students' nonverbal IQ was measured with the SONr-test (Snijders, Tellegen, & Laros, 1988). In this test students have to understand the principle of change of an analogy and solve another analogy via this principle. Students get 15 min to solve as many analogies as they can. Their score on this test is then converted to a standard score (based on their age), which can range between 49 and 151.

Students' gender, age, and socioeconomic status. Students' gender, age, and socioeconomic status were measured with some simple questions.

Teachers' instruction quality. Teachers were observed during a silent reading lesson at the end of the school year to investigate their instruction quality. The teachers in this study all worked according to a specific silent reading approach: no reading methods are used, but students read in books, on or above their skill level, that they themselves choose. The aim of this approach is to make the students read as much as possible and to motivate them for reading through allowing them to choose their own books (Houtveen, Brokamp & Smits, 2012).

A silent reading lesson typically starts with a book introduction by the teacher in which he or she models literate behavior. This book introduction is meant to motivate the students and focus them on the reading process. After the book introduction, the students read silently for 20 minutes, during which time the

teacher walks around and helps the struggling readers, by talking to them about their reading experience and helping them with their book choice. After these 20 minutes of silent reading, at the end of the lesson, the teacher reviews the reading process together with the students.

The observation instrument measuring the instruction quality of the teacher, consisted of 18 items in total (Houtveen, Brokamp & Smits, 2012). These items could be scored on a 3-point Likert-type scale with responses ranging from 0 (*never*) to 3 (*always*).

The start of the lesson, the book introduction by the teacher in which he or she models literate behavior, was measured with 8 ($\alpha = .87$) of these 18 items. Examples of these items are, "the teacher reads part of a book to the students," "the teacher thinks aloud about his/her reading experience (something in the book that appeals to him/her)," and "the teacher interacts with the students about the aspect of the book that appeals to him/her."

The teacher's behavior during the silent reading part of the lesson was measured with 6 ($\alpha = .79$) of the 18 items. Examples of items are, "the teacher asks students about their reading experience and the content of the book", "the teacher records which students he/she talked to," and "the teacher notes his/her findings as a result of the talks he/she had with the students during silent reading."

The end of the lesson, in which the teacher reviews the reading process together with the students, was measured with 4 ($\alpha = .50$) of the 18 items, such as "the teacher enquires the students about the difficulty level of the book they read" and "the teacher recalls what has been addressed in the book introduction."

Fostering students' time-on-task. During the silent reading part of the lesson, the observer counted, every other minute, how many students were actually reading. On the basis of this information, a mean percentage of students that were focusing on the reading could be calculated.

Fostering students' self-confidence and motivation. Besides the quality of the reading instruction, the teacher's pedagogical behavior was observed and measured with 9 items ($\alpha = .78$; Houtveen & Booij, 1994). Example items are "the teacher emphasized things the students did well," "the teacher expresses confidence in the students," and "the teacher patiently awaits the students' answers."

Additional (ineffective) interventions for struggling readers. Teachers were asked to indicate whether they provide extra help for struggling readers outside of the regular reading lesson and whether they provide additional ineffective interventions for struggling readers (e.g., reading meaningless word rows).

Procedure

Students completed the reading aloud test during one-to-one sessions with their teacher or the internal school adviser, both at the beginning and at the end of Grade 3. Information about the students' gender, socioeconomic status, and age was provided by their teachers. The nonverbal IQ test was completed by the students in their classrooms.

Teachers completed the behavior questionnaire for all their students both at the beginning and at the end of Grade 3.

Observations to measure the teachers' instruction quality and their pedagogical behavior (fostering students' time on task and fostering students' self-confidence and motivation) were carried out by external school advisers, at the end of Grade 3. These external school advisers participated in a training session, conducted by the researchers, before their observations of the teachers. In this training session the observation instrument was explained and two videos of silent reading lessons were shown. The external school advisers rated these videotaped lessons using the observation instrument provided, and after each video their scores were discussed in the group. The items in the observation instrument describe very specific teacher behavior and are therefore almost impossible to misinterpret. This was reflected in the group discussion; agreement between observers was very high.

Data analyses

To answer Research Question 1 (Do better task-focused behavior, emotional stability, and compliant behavior at the beginning of the school year go with better reading performance at the end of the school year?), first, correlations between task-focused behavior, emotional stability, and compliant behavior at the start of Grade 3 and reading fluency level at the end of Grade 3 were calculated. Next, we performed a multilevel regression analysis, in which we could account for the contribution the behavior components to reading fluency level, simultaneously.

To answer Research Question 2 (Does better reading performance at the beginning of the school year go with better task-focused behavior, emotional stability, and compliant behavior at the end of the school year?), correlations between reading fluency level at the start of Grade 3 and task-focused behavior, emotional stability, and compliant behavior at the end of Grade 3 were calculated.

Research Question 3 (What teacher behavior can explain the growth in task-focused behavior, emotional stability, and compliant behavior?) was answered using multilevel regression analysis. Three sets of analyses were performed, each time with a different dependent variable: task-focused behavior, emotional stability, and compliant behavior. Each time, first, an empty model (Model 0), with no covariates, was estimated to determine the amount of variance both the students (students level variance) and the teachers (classroom level variance) explain. In doing this, it becomes clear, how much teachers can actually contribute to improve the growth in the dependent variable. Next, all covariates on the student level were introduced (Model 1). Finally, in Model 2, all covariates on both the student and the classroom level, were introduced. This way, the teacher's contribution can be determined, while accounting for the contribution of student variables.

As mentioned previously, the 66 teachers that participated in the study taught 43 classrooms. So, for 23 teachers, the relationship between their teaching behavior and their students' behavior, needed to be investigated through students that had multiple teachers. To account for this, students that had more than one teacher were duplicated in the data file. Results based on this dataset are presented in this article.

We did, however, replicate the analyses presented here on a dataset with unique students and a randomly selected teacher (see the Appendix Tables A1–A3 for results of the replicated analyses). No important differences in β coefficients were found between analyses on the dataset with 66 teachers (and duplicated students) and analyses on the dataset with 43 randomly selected teachers (and unique students). The analyses on the smaller data sample (43 randomly selected teachers) did, however, yield lower significance levels for the β coefficients (this is, of course, a result of using a smaller sample). As a consequence, some of the lower ($\leq .10$) β coefficients were no longer significant at the .05 level.

Results

Do better task-focused behavior, emotional stability, and compliant behavior at the beginning of the school year go with better reading performance at the end of the school year?

To answer the first research question, we computed correlations between reading fluency level at the end of Grade 3, and task-focused behavior, emotional stability, and compliant behavior at the start of Grade 3. The results of these calculations can be found in Table 2.

For the sake of completeness, we also computed means and standard deviations for all measures (see Table 2). Cohen's (1988) guidelines were used for the interpretation of the correlation coefficients: $r = .10$ to $.29$ small (weak); $r = .30$ to $.49$ medium (moderate); $r = .50$ to 1.0 large (strong). Following these guidelines for interpretation, we can conclude from Table 2 that the relationship between task-focused behavior at the start of Grade 3 and reading fluency level at the end of Grade 3 is positive, medium, and significant ($r = .31$); students who are more task-focused at the start of Grade 3 have a higher reading fluency level at the end of Grade 3. The relationship between emotional stability at the start of Grade 3 and reading fluency level at the end of Grade 3 is positive, significant, but small ($r = .18$); students who are emotionally more stable at the start of Grade 3 have a higher reading fluency level at the end of Grade 3. The same goes for compliant behavior; the more compliant the student is at the start of Grade 3, the higher his/her reading fluency level at the end of Grade 3 ($r = .20$; small).

In conclusion, we can say that better task-focused behavior, emotional stability, and compliant behavior do indeed lead to better reading performance. Task-focused behavior at the start of Grade 3 seems to have the strongest relationship with reading performance at the end of Grade 3.

Table 2. Means, standard deviations, and correlations of reading fluency level at the end of Grade 3, task-focused behavior, emotional stability, and compliant behavior at the start of Grade 3.

Measure	<i>M</i>	<i>SD</i>	1	2	3	4
1. Reading fluency level (end)	7.83	2.39				
2. Task-focused behavior (start)	0.67	0.22	.31**			
3. Emotional stability (start)	0.84	0.24	.18**	.40**		
4. Compliant behavior (start)	0.89	0.15	.20**	.55**	.72**	

* $p < .05$. ** $p < .01$. *** $p < .001$.

In Table 2 we also see medium (for task-focused behavior and emotional stability, $r = .40$) and large (for task-focused and compliant behavior, $r = .55$; and for emotional stability and compliant behavior, $r = .72$) correlations between the three behavior components. Because these components are moderately to strongly correlated, it would be interesting to see what would happen in a multilevel regression analysis, in which we can account for the impact the behavior components have on reading fluency level simultaneously. Moreover, we can account for the contribution of covariates like gender, intelligence, socioeconomic status, and age. Results of this analysis can be found in Table 3.

We found there was 93.2% variance (.94) to be explained on student level and 6.8% variance (.07) to be explained on classroom level in the empty model (Model 0). In Model 1 the following variables on student level have been introduced: gender, intelligence, socioeconomic status, retention (age), task-focused behavior, emotional stability, and compliant behavior. Student level variance has decreased to 79.7% (.80) in this model and classroom variance remains about the same at 6.9% (.06). Gender, intelligence, and socioeconomic status do not significantly contribute to reading fluency level at the end of Grade 3. Age (retention), however, does significantly contribute to reading fluency level at the end of Grade 3 ($\beta = -.04$). We see a negative β coefficient, which indicates that students who repeat a year, have a lower reading fluency level. For the behavior components we see that only task-focused behavior has a significant β coefficient (.30); students who are more task focused at the start of Grade 3 have a higher reading fluency level at the end of Grade 3. Emotional stability and compliant behavior at the start of Grade 3 do not significantly contribute to reading fluency level at the end of Grade 3 in this analysis. It seems that only task-focused behavior contributes significantly to reading fluency level when all behavior components are taken into account at the same time. So, taken individually, all behavior components have a significant relation with reading fluency level, but taken into account simultaneously, only task-focused behavior remains as a significant predictor. This could be caused by the correlations between the three behavior components (a phenomenon known as [multi]collinearity).

Table 3. Fixed effect estimates of multilevel analysis with reading fluency level at the end of Grade 3 as dependent variable.

	Fixed effects	
	Model 0	Model 1
Intercept	0.02 (0.06)	3.75*** (0.93)
Level 1 (student)		
Gender		-.02 (.09)
Intelligence		.08 (.05)
Socioeconomic status		-.03 (.04)
Retention (age)		-.04*** (.01)
Task-focused behavior		.30*** (.06)
Emotional stability		.05 (.07)
Compliant behavior		.04 (.07)
-2 ² log likelihood	1650.47	1169.49

Note. Standard errors are in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Does better reading performance at the beginning of the school year go with better task-focused behavior, emotional stability, and compliant behavior at the end of the school year?

To answer the second research question, we computed correlations between reading fluency level at the start of Grade 3, and task-focused behavior, emotional stability, and compliant behavior at the end of Grade 3. The results of these calculations can be found in Table 4.

First, we computed means and standard deviations for all measures, for completeness (see Table 4). Using Cohen's (1988) guidelines again for interpretation, we can conclude from Table 4 that the relationship between reading fluency level at the start of Grade 3 and task-focused behavior at the end of Grade 3, is positive, medium, and significant ($r = .40$); students with a higher reading fluency level at the start of Grade 3 are more task focused at the end of Grade 3. The relationship between reading fluency level at the start of Grade 3 and emotional stability at the end of Grade 3 is positive, significant, but small ($r = .22$); students with a higher reading fluency level at the start of Grade 3 are emotionally more stable at the end of Grade 3. The same goes for compliant behavior; the higher the reading fluency level at the start of Grade 3, the more compliant the student is at the end of Grade 3 ($r = .23$; small).

In conclusion, we can say that better reading performance at the start of Grade 3 leads to better task-focused behavior, emotional stability, and compliant behavior at the end of Grade 3. Furthermore, reading performance at the start of Grade 3 seems to have the strongest relationship with task-focused behavior at the end of Grade 3.

What teacher behavior can explain the growth in task-focused behavior, emotional stability, and compliant behavior?

To answer the third research question, we performed three sets of multilevel regression analyses, each time with a different behavior component as the dependent variable.

First, we performed a multilevel regression analysis with task-focused behavior as the dependent variable. Results of this analysis can be found in Table 5.

In this analysis, in the empty model (Model 0), we found there was 76.6% variance (.78) to be explained on student level and 23.4% variance (.24) to be explained on classroom level. In Model 1 the following variables on student level have been introduced: premeasurement task-focused behavior, gender, intelligence, socioeconomic status, retention (age), emotional

Table 4. Means, standard deviations, and correlations of reading fluency level at the start of Grade 3 task-focused behavior, emotional stability, and compliant behavior at the end of Grade 3.

Measure	<i>M</i>	<i>SD</i>	1	2	3	4
1. Reading fluency level (start)	5.28	2.16				
2. Task-focused behavior (end)	0.70	0.23	.40**			
3. Emotional stability (end)	0.89	0.15	.22**	.51**		
4. Compliant behavior (end)	0.92	0.11	.23**	.63**	.48**	

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5. Fixed effect estimates of multilevel analysis with task-focused behavior as dependent variable.

	Fixed effects		
	Model 0	Model 1	Model 2
Intercept	−0.03 (0.08)	−1.65 (0.64)	−3.61 (1.06)
Level 1 (students)			
Premeasurement task-focused behavior		.19*** (.03)	.13*** (.03)
Gender		.04 (.04)	.05 (.05)
Intelligence		.09*** (.02)	.10*** (.03)
Socioeconomic status		−.00 (.02)	−.04 (.03)
Retention (age)		.01* (.00)	.00 (.01)
Emotional stability		.21*** (.03)	.04 (.04)
Compliant behavior		.41*** (.02)	.60*** (.03)
Reading fluency level		.07*** (.01)	.08*** (.01)
Level 2 (classroom)			
Fostering students' time on task			.03** (.01)
Fostering students' self-confidence and motivation			−.08 (.04)
Book introduction and modeling literate behavior			.04 (.05)
Help for struggling readers during silent reading lesson			−.14* (.05)
Review with students			−.08 (.05)
Extra help for struggling readers			.12* (.06)
Ineffective interventions for struggling readers			−.01 (.04)
−2*log likelihood	3191.97	1901.61	1145.49

Note. Standard errors are in parentheses.
* $p < .05$. ** $p < .01$. *** $p < .001$.

stability, compliant behavior, and reading fluency level. Student level variance has decreased to 36.5% (.37) in this model and classroom variance has decreased to 7.1% (.07). Premeasurement task-focused behavior, intelligence, retention (age), compliant behavior, and emotional stability have significant β coefficients of .19, .09, .01, .41, and .21, respectively. Furthermore, reading fluency level has a significant impact on the task-focused behavior of the students ($\beta = .07$).

In Model 2, teaching variables (instruction quality, pedagogical behavior, and additional interventions for struggling readers) have been introduced as well. On the student level, we see some slight changes in which β coefficients are significant, compared with Model 1. The effect of emotional stability is no longer significant in Model 2. In Model 2 student level variance remains at 36.6% (.37). Classroom level variance has decreased to almost 0 in this model (.8%, .01). “Fostering students' time on task”, “help for struggling readers during silent reading lesson”, and “extra help for struggling readers” have significant β coefficients of .03, −.14, and .12, respectively.

It seems that growth in students' task-focused behavior is increased by students' higher intelligence, higher reading fluency level, more emotional stability, and more compliant behavior. Looking at what the teachers can do to improve student's task-focused behavior, we see, not surprisingly, teachers can improve their students' task-focused behavior by fostering the students time on task; in other words teachers need to make sure students are actually focused on the task. Also, teachers can help students with little task focus by helping them during the silent reading lesson, this means they need to talk to the students about their reading experience and the content of the book they are reading. If

Table 6. Fixed effect estimates of multilevel analysis with emotional stability as dependent variable.

	Fixed effects		
	Model 0	Model 1	Model 2
Intercept	−0.13 (0.12)	−1.17* (0.48)	−3.75 (2.55)
Level 1 (students)			
Premeasurement emotional stability		.06 (.05)	.21** (.06)
Gender		−.05 (.04)	−.04 (.05)
Intelligence		.02 (.02)	.02 (.02)
Socioeconomic status		.05* (.02)	.05 (.03)
Retention (age)		.01 (.00)	−.00 (.00)
Task-focused behavior		.20*** (.03)	.04 (.03)
Compliant behavior		.12*** (.03)	.29*** (.04)
Reading fluency level		.06** (.01)	.03** (.01)
Level 2 (classroom)			
Fostering students' time on task			.04 (.03)
Fostering students' self-confidence and motivation			.13 (.13)
Book introduction and modeling literate behavior			−.28* (.13)
Help for struggling readers during silent reading lesson			−.08 (.13)
Review with students			.18 (.13)
Extra help for struggling readers			.01 (.14)
Ineffective interventions for struggling readers			.04 (.13)
−2*log likelihood	2630.14	2021.78	1015.26

Note. Standard errors are in parentheses.
* $p < .05$. ** $p < .01$. *** $p < .001$.

students are having trouble with the book they are reading (because it is too difficult or the content is not interesting enough for them), the teacher should help them to choose a new, better suited book. Furthermore, teachers can increase students' task-focused behavior by providing extra interventions for them (outside of the regular reading lesson). By doing these things, almost all variance on the teacher level was explained.

Second, we performed a multilevel regression analysis with emotional stability as the dependent variable. Results of this analysis can be found in Table 6.

In this analysis, in the empty model (Model 0), we found there was 43.2% variance (.47) to be explained on student level and 56.8% variance (.62) to be explained on classroom level. This is a very high percentage, in comparison to the amount teachers contribute to reading fluency. In Model 1 the following variables on student level have been introduced: premeasurement emotional stability, gender, intelligence, socioeconomic status, retention (age), task-focused behavior, compliant behavior, and reading fluency level. Student level variance has decreased to 36.7% (.40) in this model and classroom variance has decreased to 42.4% (.46). In this model, socioeconomic status, compliant behavior, and task-focused behavior have significant β coefficients of .05, .12, and .20, respectively. Moreover, reading fluency level has a significant contribution to growth in emotional stability ($\beta = .06$).

In Model 2, teaching variables (instruction quality, pedagogical behavior, and additional interventions for struggling readers) have been introduced as well. Student level variance decreased to 25.6% (.28). Classroom-level variance has decreased to 20.1% (.22) in this model. On the student level, we

see some slight changes in which β coefficients are significant, compared with Model 1. Premeasurement of emotional stability is now significant, with a β coefficient of .21, and task-focused behavior is no longer significant. Of the teaching variables, only “book introduction and modeling literate behavior” has a significant β coefficient of $-.28$.

We found interesting relationships between growth in emotional stability on the one hand, and task-focused behavior, compliancy and reading fluency level on the other hand. Looking at the contribution the teacher can have to students’ growth in emotional stability, we see this contribution is limited. Only through “book introduction and modeling literate behavior” can the teacher improve the students’ emotional stability. The β coefficient is negative, which means that it is the students that show little growth in emotional stability that can be helped by a book introduction, done at the beginning of the lesson to motivate them and focus them on the subsequent silent reading.

Third, we performed a multilevel regression analysis with compliant behavior as the dependent variable. Results of this analysis can be found in Table 7.

In this analysis, in the empty model (Model 0), we found there was 68.9% variance (.72) to be explained on student level and 31.1% variance (.33) to be explained on classroom level. In Model 1 the following variables on student level have been introduced: premeasurement compliant behavior, gender, intelligence, socioeconomic status, retention (age), task-focused behavior, emotional stability, and reading fluency level. Student-level variance has decreased to 42.9% (.45) in this model and classroom variance has decreased to 12.6% (.13). Premeasurement compliant behavior, gender, task-focused behavior, and emotional stability have significant β coefficients of .35, .20, .49, and .15, respectively.

Table 7. Fixed effect estimates of multilevel analysis with compliant behavior as dependent variable.

	Fixed effects		
	Model 0	Model 1	Model 2
Intercept	−0.08 (0.09)	0.98 (0.50)	−1.93 (1.31)
Level 1 (students)			
Premeasurement compliant behavior		.35*** (.04)	.19*** (.04)
Gender		.20*** (.05)	.13** (.05)
Intelligence		.02 (.02)	.02 (.03)
Socioeconomic status		−.03 (.03)	−.03 (.03)
Retention (age)		−.01 (.00)	.00 (.00)
Task-focused behavior		.49*** (.03)	.49*** (.03)
Emotional stability		.15*** (.03)	.30*** (.04)
Reading fluency level		−.03** (.01)	−.03* (.01)
Level 2 (classroom)			
Fostering students’ time on task			.02 (.01)
Fostering students’ self-confidence and motivation			.06 (.06)
Book introduction and modeling literate behavior			.15* (.06)
Help for struggling readers during silent reading lesson			.23** (.07)
Review with students			−.02 (.06)
Extra help for struggling readers			.17* (.08)
Ineffective interventions for struggling readers			−.14* (.06)
−2*log likelihood	3113.38	2101.11	1065.17

Note. Standard errors are in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Furthermore, reading fluency level has a contribution to growth in the compliant behavior of the students ($\beta = -.03$).

In Model 2, teaching variables (instruction quality, pedagogical behavior, and additional interventions for struggling readers) have been introduced as well. Student level variance decreased to 30.4% (.32). Classroom-level variance has decreased to 2.9% (.03) in this model. On the student level, we see the same significant β coefficients as in Model 1. On the teacher level, “book introduction and modeling literate behavior,” “help for struggling readers during silent reading lesson,” “extra help for struggling readers,” and “ineffective interventions for struggling readers” have significant β coefficients of .15, .23, .17, and $-.14$, respectively.

Growth in compliancy is effected by task-focused behavior, emotional stability, and reading fluency level. The teacher can contribute to the growth in compliancy by motivating and focusing the students at the beginning of the lesson. Also, giving extra help to struggling readers, both during the regular reading lesson and outside the regular reading lesson, will lead to more compliancy. Teachers that give ineffective interventions for struggling readers have an adversary effect on the growth in compliance of their students (hence the negative beta).

Conclusions

In this study 593 third-grade students and their 66 teachers were examined to investigate the influence of students’ reading performance and their behavior (more specifically task-focused behavior, emotional stability, and compliant behavior) on each other. Furthermore, we wanted to examine the influence of teacher skills, especially the quality of their reading instruction, on the growth in students’ behavior. In this section we address the main conclusions from our study, for each research question separately, before we get to an overall conclusion.

Do better task-focused behavior, emotional stability, and compliant behavior at the beginning of the school year go with better reading performance at the end of the school year?

Better task-focused behavior, better emotional stability, and better compliant behavior at the start of Grade 3 all go with a higher reading fluency level at the end of Grade 3. When we take all three behavior components into account simultaneously however, we see that only task-focused behavior is a significant predictor for reading fluency level. The correlations between the behavior components seem to cause this ([multi]collinearity); they explain virtually the same variance in reading fluency level, which influences the calculation of the estimates (β coefficients).

Does better reading performance at the beginning of the school year go with better task-focused behavior, emotional stability, and compliant behavior at the end of the school year?

The higher the students’ reading fluency level is at the beginning of Grade 3, the better their task-focused behavior, emotional stability, and compliant behavior are at the end of Grade 3. This relationship is strongest for task-focused behavior.

What teacher behavior can explain the growth in task-focused behavior, emotional stability, and compliant behavior?

We address the conclusions for this research question for each behavior component separately:

1) Task-focused behavior

Teachers can improve the growth in students' task-focused behavior by making sure they are focused on the task, in other words making sure all students are actually reading. Also, teachers can help students with little task focus by helping them during the silent reading lesson; teachers need to talk to the students about their reading experience and the content of the book they are reading. If students are having trouble with the book they are reading (because it is too difficult or the content is not interesting enough for them), the teacher should help them to choose a new, better suited book. Furthermore, teachers can increase students' task-focused behavior by providing extra interventions for them (outside of the regular reading lesson).

2) Emotional stability

Our results show that the teacher's contribution to the students' growth in emotional stability is considerably higher than is their contribution to students' task-focused behavior and compliant behavior. We have, however, only been able to explain part of the variance with the teaching variables we measured. The only teaching aspect that has a significant contribution to the growth in emotional stability is "book introduction and modeling literate behavior." This aspect has a negative β coefficient, meaning that specifically the students that show little growth in emotional stability benefit from a book introduction, done at the beginning of the lesson to motivate them and focus them on the subsequent silent reading.

3) Compliant behavior

Students' growth in compliant behavior can be improved by motivating and focusing the students at the beginning of the lesson. Also, giving extra help to struggling readers, both during the regular reading lesson, and outside the regular reading lesson, will improve their compliance. Teachers that give ineffective interventions for struggling readers, however, have an adversary effect on the compliance of their students (less growth in compliance; hence the negative beta). Therefore, teachers should avoid these ineffective interventions (e.g., reading meaningless word rows).

Main conclusions from this study

This study clarifies that reading performance, task-focused behavior, emotional stability and compliant behavior of students are all significantly interrelated. This especially seems true for reading performance and task-focused behavior. This raises the question whether the teacher can improve the behavior of the students by the quality of his or her reading instruction, and therefore indirectly improve their reading performance. Answering this last question was the main aim of this study. The study reveals that teachers can:

- improve the growth in task-focused behavior of their students by
 - fostering students' time on task;
 - providing help for struggling readers outside the regular reading lesson.

- improve the growth in compliance of their students with
 - book introduction and modeling literate behavior at the beginning of the lesson;
 - helping struggling readers during the reading lesson;
 - providing help for struggling readers outside the regular reading lesson;
 - avoiding ineffective interventions for struggling learners like reading meaningless word rows.
- help students with little growth in task-focused behavior by
 - helping struggling readers during the reading lesson.
- help students with little growth in emotional stability by
 - book introduction, done at the beginning of the lesson to motivate and focus of their students.

Discussion

Practical implications

In the introduction of this article we underscribed the importance of untangling the relationship between reading problems and behavior problems and how the teacher may influence both problems. Our findings suggest that the teacher can in fact, improve the behavior of the students in the classroom by providing a good-quality reading lesson (and instruction). If the teacher gives a good quality reading instruction, this will result in growth in task-focused behavior, emotional stability, and compliant behavior. And because these behavior components in turn contribute to the students' reading performance, the teacher can actually improve the students' reading performance through their contribution to the students' behavior.

For both task-focused behavior and compliant behavior, it became clear the teacher can contribute a lot through his or her reading instruction; all variance for these two components has been explained away with the variables measured in this study. For emotional stability, however, providing a good-quality reading lesson alone, is not enough to improve growth in this behavior. Even though our study shows that the teacher does explain more variance for this behavior than for the other two behavior components. This means teachers should be explicitly instructed in how to improve emotional stability. Apparently, to improve this behavior, other teacher interventions are necessary than solely providing a good reading lesson.

Furthermore, we see that some teacher skills have differential effects when it comes to improving the behavior of students. For book introduction, done at the beginning of the lesson to motivate and focus students, we see a positive β coefficient with compliant behavior, but a negative β coefficient with emotional stability. It seems that a teacher who does a good job at this can increase the compliance of the students, but caution is advised; it may only work for students with little growth in emotional stability, or negatively impact the emotional stability of other students. A similar mechanism seems to be at work when it comes to help for struggling readers during the silent reading lesson. While we see a positive β coefficient with compliant behavior, the β coefficient with task-focused behavior is negative. This may indicate that this help may only work for students with little growth in task focus. For students that do not have problems with task focus, there may be an adversary effect because they get distracted by the teacher going

around the classroom and talking to students. This means teachers will have to tread with caution when addressing students with different types of behavior problems.

Future research

In the theoretical framework, we reported about the results of the meta-analysis we conducted (Brokamp, Houtveen, & Van de Grift, 2017): reading problems and behavior problems seem to cause each other. The results of the present study seem to point in the same direction. Reading performance on the one hand and task-focused behavior, emotional stability, and compliant behavior on the other hand do lead to each other. The first step for future researchers should be to repeat these analyses on a bigger sample and in different grades, to examine whether results are similar. As mentioned in the Method section, the teachers in this study all worked according to a specific silent reading approach: no reading methods were used, but students read in books, on or above their skill level, that they themselves chose. However, not all teachers use this approach. That is why this study should be replicated with teachers who use a different approach in reading instruction, for example teachers who work with a method, to see if this context yields the same results. Also, because we only accounted for two measurements, causality cannot be established. But in a time series design it can be verified whether the following conditions for inferring causality are met: (a) contiguity between the presumed cause and effect; (b) temporal precedence, in that the cause has to precede the effect in time; and (c) constant conjunction, in that the cause has to be present whenever the effect is obtained (cf. Cook & Campbell, 1979). That is why future researchers should include multiple measurements, for both reading and behavior, preferably spanning several years. This is the only way the full scope of the relationship between reading problems and behavior problems can be known.

Another result from this study is that the teacher can in fact improve the behavior of the students by providing high-quality reading instruction. One interesting conclusion from this study is, that some teacher skills have differential effects on the behavior of students. Future research should aim at clarifying the mechanisms behind this. A next step could be to try to determine whether there are actually two sets of teaching variables at work; the content specific instruction skills versus generic pedagogical skills, and to measure their effects on reading performance, compliance, task-focused behavior, and emotional stability.

Furthermore, because of the fact that we have been able to explain (almost) all the variance at the classroom level for task-focused behavior and compliant behavior, but not for emotional stability, it begs the question what sets this behavior apart from the other two. Do these three types of behavior have a common, underlying, construct or should they in fact be considered separately? In light of the educational relevance, we believe exploring this issue in further research might be worthwhile.

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Appendix

Replicated multilevel regression analyses on a dataset with unique students and a randomly selected teacher.

Table A1. Fixed effect estimates of replicated multilevel analysis with task-focused behavior as dependent variable.

	Fixed effects		
	Model 0	Model 1	Model 2
Intercept	.02 (.10)	−1.38 (.75)	−3.52*(1.40)
Level 1 (students)			
Premeasurement task-focused behavior		.17*** (.04)	.14** (.05)
Gender		.02 (.07)	.02 (.08)
Intelligence		.08* (.04)	.07 (.04)
Socioeconomic status		.01 (.03)	−.05 (.04)
Retention (age)		.01 (.01)	.00 (.01)
Emotional stability		.20*** (.05)	.13* (.07)
Compliant behavior		.43*** (.04)	.59*** (.05)
Reading fluency level		.08*** (.02)	.08*** (.02)
Level 2 (classroom)			
Fostering students' time on task			.03* (.01)
Fostering students' self-confidence and motivation			−.09* (.04)
Book introduction and modeling literate behavior			.17* (.07)
Help for struggling readers during silent reading lesson			−.14* (.06)
Review with students			−.25*** (.09)
Extra help for struggling readers			.20** (.07)
Ineffective interventions for struggling readers			−.17* (.08)
−2*log likelihood	1145.84	661.81	414.15

Note. Standard errors are in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table A2. Fixed effect estimates of replicated multilevel analysis with emotional stability as dependent variable.

	Fixed effects		
	Model 0	Model 1	Model 2
Intercept	−.05 (.16)	−.80 (.77)	−3.72 (2.98)
Level 1 (students)			
Premeasurement emotional stability		.13 (.08)	.16* (.08)
Gender		−.01 (.07)	−.01 (.07)
Intelligence		.03 (.04)	.02 (.04)
Socioeconomic status		.01 (.04)	.04 (.04)
Retention (age)		.00 (.01)	−.00 (.01)
Task-focused behavior		.18** (.05)	.08 (.06)
Compliant behavior		.09 (.05)	.25*** (.06)
Reading fluency level		.06** (.02)	.02 (.02)
Level 2 (classroom)			
Fostering students' time on task			.04 (.03)
Fostering students' self-confidence and motivation			.05 (.13)
Book introduction and modeling literate behavior			−.33 (.17)
Help for struggling readers during silent reading lesson			.10 (.15)
Review with students			.29 (.20)
Extra help for struggling readers			−.05 (.16)
Ineffective interventions for struggling readers			.18 (.19)
−2*log likelihood	920.65	689.48	391.40

Note. Standard errors are in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table A3. Fixed effect estimates of replicated multilevel analysis with compliant behavior as dependent variable.

	Fixed effects		
	Model 0	Model 1	Model 2
Intercept	-.03 (.11)	1.14 (.86)	1.79 (1.38)
Level 1 (students)			
Premeasurement compliant behavior		.26*** (.05)	.16** (.05)
Gender		.22** (.08)	.15 (.08)
Intelligence		.02 (.04)	.02 (.04)
Socioeconomic status		-.02 (.04)	.02 (.03)
Retention (age)		-.01 (.01)	-.00 (.01)
Task-focused behavior		.55*** (.05)	.52*** (.05)
Emotional stability		.13* (.05)	.27*** (.06)
Reading fluency level		-.03 (.02)	-.03 (.02)
Level 2 (classroom)			
Fostering students' time on task			-.01 (.01)
Fostering students' self-confidence and motivation			.03 (.04)
Book introduction and modeling literate behavior			-.08 (.07)
Help for struggling readers during silent reading lesson			.15* (.06)
Review with students			.08 (.09)
Extra help for struggling readers			.06 (.09)
Ineffective interventions for struggling readers			.02 (.08)
-2*log likelihood	1146.21	754.40	403.78

Note. Standard errors are in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.