Gender and Achievement Level

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ABSTRACT

In the past, several assessment reports on writing elementary school students do not develop the ess successful in school. In this respect, prior researc that cognitive and motivational challenges are at th level of elementary students' writing performance. search has revealed gender and achievement-level d students' writing. In view of providing effective w students to overcome writing difficulties, the presen depth insight into (a) how cognitive and motivationa correlate with students' writing performance and (b relations vary for boys and girls and for writers o levels. In the present study, 1,577 fifth- and sixth-g questionnaires regarding their writing self-efficacy writing strategies. In addition, half of the student tests, respectively focusing on the informational Based on multiple group structural equation model ward two models: a MG-SEM model for boys and g for low, average, and high achievers. The results u of studying writing models for different groups of more refined insight into the complex interplay be cognitive challenges related to students' writing pe

In contemporary society, effective commun reading and writing, are essential to commu professional contexts. Being able to compo structured texts is necessary for successfully ex highly valued in professional, educational, and on the social cognitive model of writing, G McKeown (2013) defined writing as

> a goal directed and self-sustained cognitive acti management of (a) the writing environment; (b) t the writing topic; (c) the intentions of the writer knowledge, and skills involved in composing. (p.

By highlighting the complexity of the writing facets, this definition goes beyond describing w tive skills, processes, and knowledge. Writing a plex for novice writers, as they often have to m simultaneously while concentrating on more b transcription skills) that are not fully autom

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cognitively challenging for this age group, as they often fail to prewriting planning (Cameron & Moshenko, 1996), have difficulties with generating sentences fluently (McCutchen, Covill, Hoyne, & Mildes, 1994), and poorly revise their text by focusing mainly on surface-level aspects (e.g., spelling; McCutchen, Francis, & Kerr, 1997).

Next to these cognitive challenges, research has also highlighted motivational challenges in writing. Educational writing experiences are often not of interest to students, who perceive writing as a difficult and daunting activity (Hidi & Boscolo, 2006). In addition, education fails to show students the potential of writing to enhance their ability to think and communicate, because writing for evaluative purposes is perceived as more important than writing to share knowledge and feelings (Bruning & Horn, 2000). Both of these cognitive and motivational challenges have implications for students' actual writing performance, most often measured by means of text length (i.e., number of words), the inclusion of basic genre elements or parts in a composition, and overall text quality (i.e., the overall value of a text; Graham, 2006). Several assessment reports on writing have repeatedly shown that elementary school students do not develop the essential writing skills to be successful in school, thereby signaling the rather basic level of students' writing skills (e.g., Inspectie van het Onderwijs, 2010; National Center for Education Statistics, 2012). Furthermore, these reports and numerous other studies have indicated that more female than male students perform at a proficient and advanced writing level (e.g., Babayiğit, 2015; Troia, Harbaugh, Shankland, Wolbers, & Lawrence, 2013) and that high-achieving students perform better in writing narrative texts (Olinghouse, 2008). Also, Troia et al. showed that students rated by their teachers as good writers indeed wrote qualitatively better texts than average and poor writers, whereas average writers, in turn, wrote better texts than poor writers.

Taking into account gender, achievement differences, and the identified rather basic level of students' writing performance, providing high-quality and differentiated writing instruction is important to foster all students' writing. In this respect, additional research is needed into both cognitive and motivational challenges related to writing. Because research from a cognitive perspective has been dominant in writing research

entific studies on the possible
factors on writing performanc
2001; Williams & Larkin, 2013
tions between cognitive and mo
of writing (Hidi & Boscolo,
Graham, 2016). Shell, Colvin, a
instance, stated that beliefs rel
mance; however, beliefs thems
cause achievement. Therefore, r
into how beliefs potentially affe
which in turn can be related to a
1995; Zimmerman & Risember
this call for further research, the
gates how cognitive and motivat
ate and correlate with students
and whether and how these relat
girls and for writers of different a

In what follows, we first pres
model of writing (Zimmerman &
theoretical foundation to addre
motivational challenges discusse
Next, we present prior resea
achievement-level differences in
tional writing challenges. Finall
cognitive view of writing and the
put forward the hypothesized r
present study. Based on this relat
tural equation models are teste
Results section. Based on these,
nitive and motivational challenge
with writing performance and (b
in the regression coefficients bet
the one hand (i.e., model 1) and
achievers on the other hand (i.e.,

A Social Cognitive V
on Writing

Earlier theoretical models of wri
the cognitive writing processes u
tion of texts (Bereiter & Scarda
Hayes, 1981). Zimmerman and
knowledged both abovementione
important accounts of cognitive
In their social cognitive mode
Zimmerman and Risemberg

management, goal setting, self-evaluative standards, cognitive strategies, mental imagery), (2) behavioral self-regulation (e.g., self-monitoring, self-consequences, self-verbalization), and (3) environmental self-regulation (e.g., environmental structuring and self-selected models, tutors, or books; Zimmerman & Risemberg, 1997).

The cognitive writing challenges mentioned previously and included in the present study can be situated within the first category of self-regulation of writing, namely, covert self-regulation. More specifically, the present study especially focuses on the cognitive strategies within covert self-regulation. Zimmerman and Risemberg (1997) defined these cognitive strategies as rule-governed methods for planning (i.e., referring to generating and organizing ideas; Berninger, Fuller, & Whitaker 1996), translating (i.e., referring to text generation and transcription; Berninger et al., 1996), and reviewing or revising (i.e., referring to the process of rewriting by detecting and repairing problems in the text; Berninger et al., 1996).

Zimmerman and Risemberg (1997) further theorized that "writing is more than a literary expression of cognitive skill" (p. 76). In this view, writing motivation is inherently connected to students' writing, as writers must be motivated to devote time and effort in planning, revising, and finalizing texts until they communicate effectively (Zimmerman & Risemberg, 1997). Finally, Zimmerman and Risemberg stated that motivational aspects such as self-efficacy beliefs are related to students' use of these self-regulatory processes (e.g., cognitive strategies), as self-efficacy beliefs predict the level of self-regulation.

Cognitive Challenges in Elementary School Writing: Gender and Achievement-Level Differences

Cognitive Writing Strategies and Writing Performance

Empirical research has supported the importance of applying cognitive writing strategies (i.e., planning, translating, reviewing) as theorized by influential cognitive models (Bereiter & Scardamalia, 1987; Flower & Hayes, 1981). Previous research has shown that prewriting activities,

Differences in Cognitiv Writing Strategies

In mapping the landscape of re writing, Jones (2011) presented field of cognitive psychology re ences concerning students' cogn More particularly, boys outperfo ency (i.e., retrieval of words; Ber whereas girls significantly outp graphic fluency (i.e., retrieval an compositional fluency (i.e., the produce words to express idea micro-organization (i.e., the ab into the syntax of language; A 2013; Berninger & Fuller, 199 Notwithstanding the fact that (2012) showed that boys and girl tive resources (i.e., working mem able to support writing developm girls have the same potential for rience more difficulties in trans in writing (Olinghouse, 2008). more difficulties with engaging processes such as planning a (Berninger et al., 1992). Compar tensive research on gender diffe ing on achievement-level dif writing processes is lacking.

Motivational Challe Elementary School Gender and Achieve Differences

In the present study, the moti writing are students' self-efficac motives for engaging in writing rooted respectively in self-effic 1997; Zimmerman & Bandu determination theory (SDT; Rya present study, we integrate both t because they are well aligned an that humans are agents of their b Strachan, & Blanchard, 2012).

structs (e.g., interest) in writing research, research on self-efficacy for writing has dominated (Zimmerman & Kitsantas, 2007). Research has indicated that writing self-efficacy beliefs provide the foundation for successful writing performance in the elementary grades (De Smedt, Van Keer, & Merchie, 2016; Pajares & Valiante, 1997). Even when controlling for other covariates (e.g., initial writing competence, gender), self-efficacy for writing still makes a significant independent contribution to elementary students' writing performance (Pajares, 2003; Pajares & Valiante, 1997). Moreover, Pajares (2003) stated that research consistently has indicated that the influence of typical motivational correlates on writing performance (e.g., writing apprehension, perceived value of writing) is nullified when self-efficacy beliefs are taken into account (Pajares, Miller, & Johnson, 1999; Pajares & Valiante, 1997).

Writing Motivation and Writing Performance

Although students often experience writing as an unpleasant activity (Hidi & Boscolo, 2006), previous research has highlighted the importance of motivating students to engage in writing activities (Bruning & Horn, 2000). In particular, research has indicated that writing motivation significantly enhances text structure and coherence (García & de Caso, 2004) and, therefore, also considerably improves elementary students' writing performance (De Smedt et al., 2016; García & de Caso, 2004; Graham, Berninger, & Fan, 2007; Troia et al., 2013). An interesting theoretical framework to investigate students' motives for writing is SDT (in line with SDT, we further refer to these motives as writing motivation). This framework distinguishes qualitatively different types of motivation, namely, autonomous and controlled (Ryan & Deci, 2000). According to SDT, students can write for inherent satisfaction or personal value (i.e., autonomous writing motivation) or because of internal or external pressure such as guilt or punishment (i.e., controlled writing motivation). In this respect, De Smedt et al. (2016) showed that autonomously motivated students write qualitatively better texts, whereas controlled motivated students perform significantly lower. In line with the theoretical framework of SDT (Ryan & Deci, 2000), De Smedt et al.

Writing and Writing M

Regarding the motivational chal
ies have pointed to particula
Research has generally indicate
positive beliefs and attitudes to
et al., 2007). Further, previous v
ing SDT as a theoretical framew
cation has shown that girls h
motivation as compared with b
More specifically, girls report s
tonomous motivation, indicatin
motivated to write because of its
because they value the activity (

Although gender differences
tion have been documented in th
tation of gender differences in
the elementary level, has been
et al., 1999). Evidence from som
that girls have more confidence
(e.g., Pajares & Valiante, 1997),
did not find gender differences i
ing (e.g., Shell et al., 1995). An in
in interpreting these findings, ho
girls may use different metrics
own writing capabilities, as they
frames of reference (Pajares et al

Concerning achievement-leve
motivation, to our knowledge, n
gating achievement-level differen
tion from the framework of SDT
the literature. However, Gottfri
mentary students' motivation wi
intrinsic motivation theories an
formers are generally more in
Further, Shell et al. (1995) found t
higher self-efficacy for writing co
and average achievers, whereas
higher self-efficacy compared wi

The Hypothesized Relational Model

First, the present study address
writing strategies) and motiva
writing motivation, self-efficacy
and correlate with students'

related to students' writing performance (e.g., De Smedt et al., 2016; Pajares & Valiante, 1997).

3. Cognitive writing strategies are directly correlated with students' writing performance (e.g., Koster et al., 2016; von Koss Torkildsen et al., 2016).

Because writing motivation and self-efficacy for writing are expected to make an independent contribution to students' cognitive writing processes and writing performance, we included both writing motivation and self-efficacy for writing as independent predictors in the present study (parallel to studies in reading research, e.g., De Naeghel, Van Keer, Vansteenkiste, & Rosseel, 2012; Guthrie, Klauda, & Ho, 2013). The hypothesized relational model is summarized in Figure 1.

Second, this study expands prior research by examining whether and how these relations, as stipulated in the hypothesized relational model, vary for boys and girls and for writers of different achievement levels. Based on the literature overview, we can conclude that there is abundant evidence for existing gender and achievement-level differences in both cognitive (e.g., Berninger & Fuller, 1992; Olinghouse, 2008) and motivational writing challenges (e.g., Guay et al., 2010; Pajares &

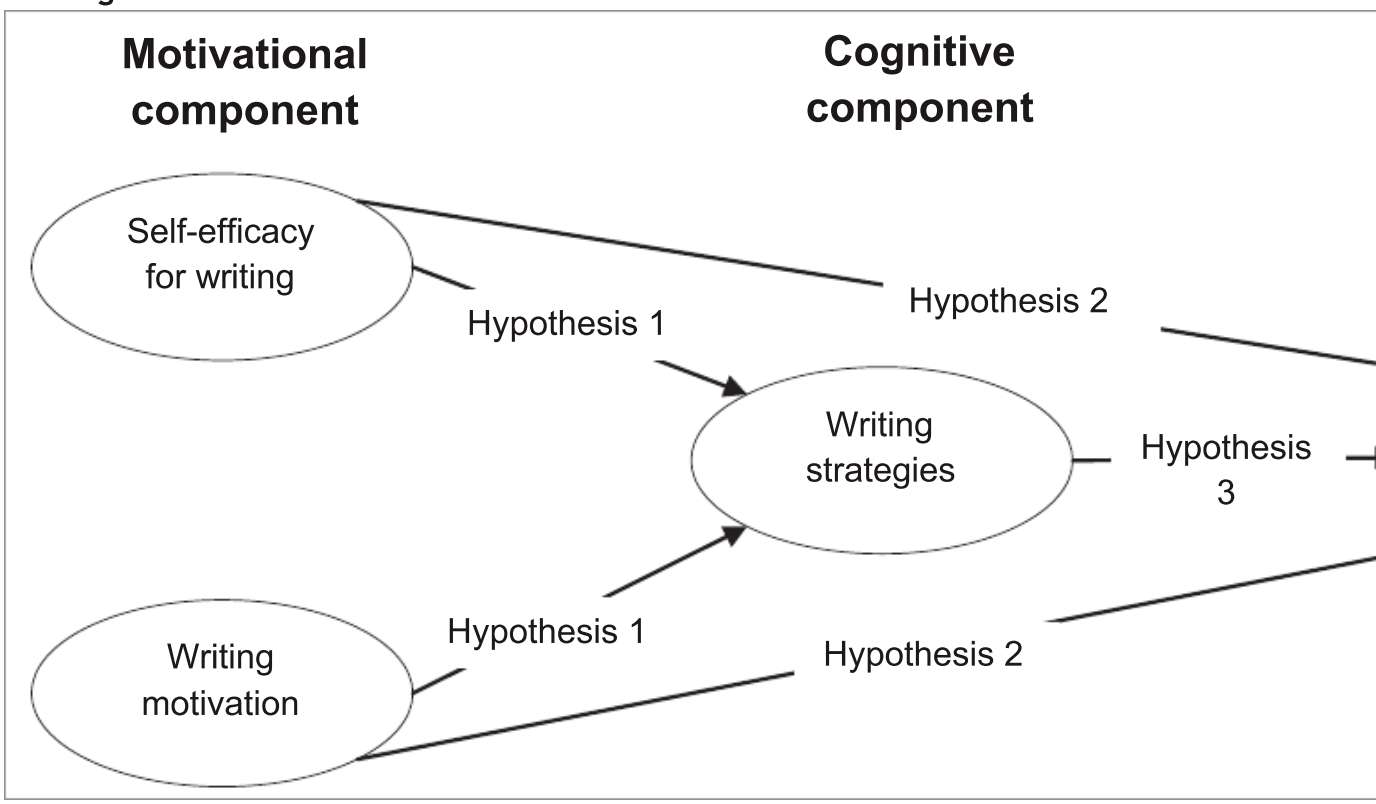
achievement-level differences in
motivational and cognitive cha
writing performance in an explo
cifically, we tested two structural
on the abovementioned relation
(a) the proposed hypotheses and
differences in the regression coe
and girls on the one hand (i.e., mo
and high achievers on the other h

Method

Educational Context

In Flanders, Belgium, the govern
ity of its elementary education (i
secutive years of study, startin
imposing attainment targets. Th
minimum objectives found neces
elementary school children, enc
titudes, and skills (Flemish Min
Training, 2008). The attainmen
writing by the end of elementary
ing and writing notes, announce

FIGURE 1
Hypothesized Relational Model Relating Self-Efficacy for Writing, Writing Motivation, and W
Writing Performance



Flanders and set up a cross-sectional survey of fifth- and sixth-grade students (i.e., 11–12 years old; $N = 1{,}577$; see Figure 2). In light of the data analytic procedure, we used the full sample to examine the structure and reliability of the questionnaires (i.e., preparatory analyses), and we worked with a subsample of the full sample to relate the questionnaire data to students' performance on writing tests (i.e., main analyses: multiple-group structural equation modeling; MG-SEM). As to the full sample, all fifth- and sixth-grade students from the selected schools completed questionnaires regarding self-efficacy for writing, writing motivation, and writing strategies. Half of the participating students (i.e., a subsample of the full sample; $n = 799$) also completed two writing tests (i.e., writing an informational and a narrative text). In this respect, 364 fifth (46.5%) and 418 sixth graders (53.5%) wrote an informational text, and 363 fifth (45.9%) and 427 sixth graders (54.1%) wrote a narrative text. To reduce testing overload for students, we conducted the writing tests on two different days, resulting in the small difference in the number of participating students.

Participants

Overall Characteristics

The fifth and sixth graders (ages 11–12) in the participating schools were mainly from middle class families, with 23.53% (standard deviation [*SD*] = 19.51) being identified as a socioeconomic status student. In Flemish elementary education, this identification indicates that a student is a nonnative speaker, that the student receives a school allowance, or that the student's mother has no certificate of

from 82 classes from 44 random
ementary schools participated.
of 51.4% boys and 48.6% girls. T
dents were native Dutch speake
of the students were bilingual
and a foreign language at home)
age (8.8%) of the students spok
guage at home (i.e., French, En
Turkish, Kurdish, other). We a
teachers to typify each student b
eral achievement. Teachers char
the students (51.4%) as averag
forming at their grade level), 2
(i.e., performing below their gra
high achievers (i.e., performing a
see Table 1).

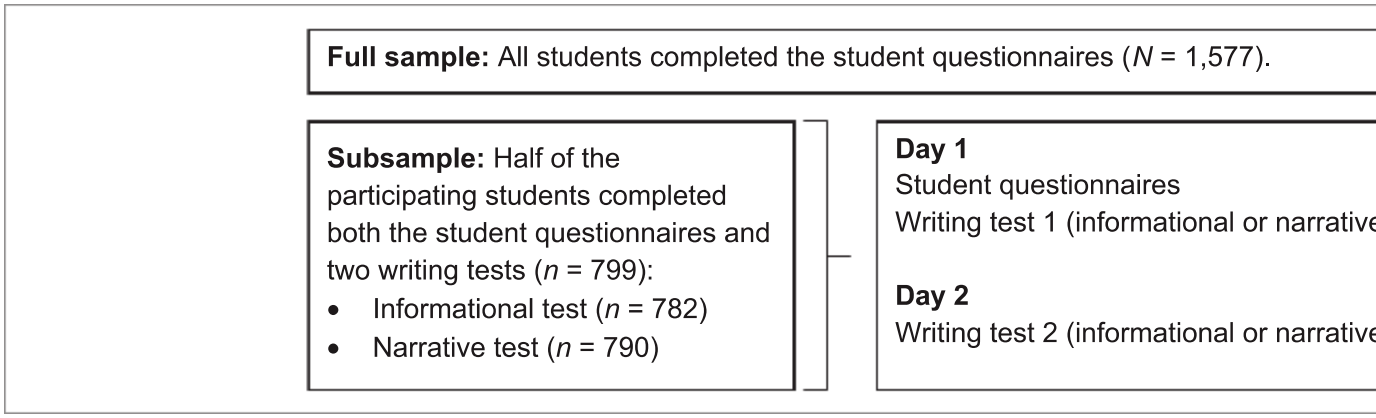
Subsample

The subsample of the students
questionnaires and writing tests
fifth (46.1%) and 430 sixth grad
posed about half of the subsamp
ity of the students were native D
18.7% were bilingual, and only
spoke a foreign home language.
about half of the students (52.4%
whereas they characterized 22.
and high achievers, respectively

Measures

In this study, we used the foll
(a) the Self-efficacy for Writing

FIGURE 2
Overview of the Data Collection Procedure



Girls	397	51.8	369	48.2	766
Home language					
Dutch	559	49.3	575	50.7	1,134
Foreign language	73	52.9	65	47.1	138
Bilingual	150	50.8	145	49.2	295
General achievement					
Low achievers	164	49.8	165	50.2	329
Average achievers	345	47.1	387	52.9	732
High achievers	191	52.5	173	47.5	364
Total	784	49.7	793	50.3	1,577
Subsample: Half of the students completed student questionnaires and writing tests.					
Gender					
Boys	193	52.3	225	52.3	418
Girls	176	47.7	205	47.7	381
Home language					
Dutch	297	80.9	282	66.5	578
Foreign language	15	4.1	49	11.6	73
Bilingual	55	15.0	93	21.9	148
General achievement					
Low achievers	68	20.2	104	24.5	172
Average achievers	179	53.3	222	52.4	400
High achievers	89	26.5	98	23.1	187
Total	369	46.1	430	53.9	799

Dempsey, Kauffman, McKim, & Zumbrunn, 2013); (b) the Self-Regulation Questionnaire–Writing Motivation (SRQ–Writing Motivation), based on the SRQ–Reading Motivation (De Naeghel et al., 2012); and (c) a questionnaire on students' planning and revising writing strategies (Kieft, Rijlaarsdam, & van den Bergh, 2006, 2008). Prior research studies tested or validated all questionnaires. In the present study, we modified these questionnaires by translating, rephrasing, or adjusting the items to the context of writing instruction in elementary grades. To ensure the validity of the questionnaires in this context, we used a multistep process.

First, two fifth graders per
testing to verify the cognitive
(Woolley, Bowen, & Bowen, 2
phrased misinterpreted items so
interpret them correctly. Second
tested all questionnaires in one
sixth-grade classes (i.e., 22 fifth
to examine the factor structure
tor analysis (EFA). Third, all
completed the questionnaires (*N*
conducted preparatory analyses
examine the structure and

we removed the items. Further, we conducted confirmatory factor analyses (CFAs) and calculated estimators of internal consistency (Bentler, 2009). Finally, we studied multiple-group measurement invariance across gender and across achievement level. Small changes in the comparative fit index (CFI; i.e., a value of ΔCFI smaller than or equal to 0.01; Cheung & Rensvold, 2002) and satisfying overall model results revealed strong invariance for the measurement model across gender and general achievement (for more information, see Appendixes A and B; all of the appendixes are available as supporting information for the online version of this article). The items of the SEWS, the SRQ–Writing Motivation, and the questionnaire on writing strategies are included in Appendix C, along with standardized factor loadings for these items and factor correlations.

Self-Efficacy for Writing

The SEWS conceptualizes self-efficacy as a multidimensional construct considering cognitive, linguistic, and self-regulatory aspects of writing (Bruning et al., 2013). Bruning et al. proposed a three-factor model of writing self-efficacy: for writing ideation (i.e., writers' beliefs about their abilities to come up with good ideas), for writing conventions (i.e., writers' beliefs about their abilities to apply language and writing conventions), and for writing self-regulation (i.e., writers' beliefs about their capabilities to regulate their writing behavior). The first author translated the SEWS, a scale ranging from 0 to 100, into Dutch and adjusted the items to the context of Flemish elementary education. The CFA results showed that the stability of the three-factor model provided a good fit to the data, Satorra–Bentler (SB) $\chi^2(51) = 204.88$, $p < .001$, CFI = 0.95, root mean square error of approximation (RMSEA) = 0.04, standardized root mean square residual (SRMR) = 0.04. Internal consistencies of the three subscales were high (ideation: Bentler's ρ = .82; conventions: Bentler's ρ = .75; regulation: Bentler's ρ = .74).

Writing Motivation

Based on SDT, which distinguishes between qualitatively different types of motivation (Ryan & Deci, 2000), the SRQ–Reading Motivation captures two types of reading motivation (De Naeghel et al., 2012). Autonomous

SRQ–Writing Motivation data, t
model was acceptable, SB χ^2(11
CFI = 0.94, RMSEA = 0.06, SRM
ties of the subscales were good (a
Bentler's ρ = .90; controlled motiv

Writing Strategies

Kieft et al. (2006, 2008) develop
a 5-point Likert-type scale, for
planning and revising writing
strategies focus on thinking, pla
text before starting to write. Re
on the writing and rewriting
writer produces a series of
Torrance, 2004). In the present
reformulated and adapted the
tionnaire to the context of ele
Flanders. The EFA showed
whereas we expected a two-fact
original instrument (Kieft et al.
factor, thinking, is the extent t
think about the content of thei
writing approach before they sta
factor, planning, assesses the ex
use planning strategies, such a
The third factor, revising, is th
dents revise the content or str
fourth factor, controlling, asses
dents check the content or struc
CFA showed a good model fit
$p < .001$, CFI = 0.94, RMSEA
Internal consistencies of the fo
ceptable (thinking: Bentler's
Bentler's ρ = .78; revising: Ben
strategies: Bentler's ρ = .67).

Writing Performance

In the present study, we speci
overall text quality to assess stu
mance. We took into account es
assess writing in a valid and re
the assessment of writing perfor
ficult (Schoonen, 2005). Two test
genres (i.e., informational and
sured students' writing performa
students had to write an inform

informational texts, they had to explain and describe what happens at school (cf. a report). We opted for this topic because all students are familiar with schools. For testing students' writing performance of narrative texts, they had to write a narrative about why and how a message in a bottle washed ashore (cf. a story).

To minimize presentation effects in scoring students' texts, the handwritten texts were typed, and spelling, punctuation, and capitalization errors were corrected (Graham, Harris, & Hebert, 2011). Next, three trained raters assessed the texts (Schoonen, 2005). To evaluate overall text quality, we used a holistic scoring procedure based on benchmarking (Bouwer, Koster, & van den Bergh, 2016; Tillema, van den Bergh, Rijlaarsdam, & Sanders, 2013). For both genres, we identified five target texts as benchmarks to represent the diversity in text quality at low, medium, and high levels (Schoonen, 2005; Tillema et al., 2013). The range of scores among the target texts was broad enough, such that the scoring procedure would be sensitive to differences across writers (i.e., benchmark score for the average text was 100, with an interval of 15 between target texts; Schoonen, 2005). Appendix E presents English translations of the benchmark texts, which illustrate the writing ability of the participating students and provide an impression of the large differences across writers.

We also described each benchmark text in detail, ensuring that the raters had an idea of which aspects of the text were strong or weak. In determining a holistic quality score, raters considered the following aspects for both the informational and narrative text: text genre (i.e., the writer provides information or tells a story), assignment (i.e., the text corresponds to the assignment), text structure (i.e., the text is well structured), sentence structure (i.e., the sentences are well composed), and word choice (i.e., the word choice varies). They also considered genre-specific aspects for the informational (i.e., idea development, quality of information) and the narrative text (i.e., story line, creativity). The raters did not assess the abovementioned aspects separately (i.e., analytic scoring), but they assessed each text holistically (for more information, see Appendix E). In total, two of the three raters scored 23% of both text genres (i.e., switching between rater 1 and 2, rater 1 and 3, and rater 2 and 3). Inter-rater reliabilities for both text genres were good (i.e., informational text: Pearson's $r = .84$, $p < .001$; narrative text: Pearson's $r = .83$, $p < .001$).

dardized tests, teacher judgmen
efficient technique to assess
level (for meta-analyses, see Ho
Südkamp, Kaiser, & Möller, 2
teachers in the present study
based on their general achie
which students were below-aver
forming below their current
achievers (i.e., performing at
above-average achievers (i.e., p
current grade level). We used th
gorical variable for grouping l
achievers. Students' writing per
informational and the narrative
rated the achievement-level dist
larly, there were significant di
scores of high achievers (
[*M*] = 101.93, *SD* = 15.60; n
SD = 19.47), average achi
M = 96.44, *SD* = 19.17; narrative:
and low achievers (informatio
20.55; narrative: *M* = 89.96, *SD*
14.61, $p < .001$; $F(2, 752) = 13.11$,

Data Analysis

MG-SEM

For all statistical analyses, we us
age (Rosseel, 2012) and lavaan.
(Oberski, 2014). We conducted
collected from the student ques
tests (i.e., subsample: *N* = 799; f
tion on the data collection proce
means of MG-SEM, we aimed to
(i.e., self-efficacy for writing an
and cognitive challenges (i.e., wr
dents' writing performance and
and how these relations vary acr
general achievement).

Nonnormal and Clustered

Because the data were not norm
ness values ranging from −1.3
values ranging from −0.49 to 1.
bust maximum-likelihood estim
SB-scaled chi-square test statistic

Model Fit Indexes

To evaluate the model fit, we reported several fit indexes: (a) the chi-square test statistic and *p*-value, (b) the CFI, (c) the RMSEA, and (d) the SRMR. Browne and Cudeck (1992) stated that the CFI should be above 0.90 for adequate fit. In addition, a cutoff value for the RMSEA close to 0.06 is necessary for an acceptable fit (Hu & Bentler, 1999), whereas a value lower than 0.08 indicates a reasonable fit (Schreiber, Nora, Stage, Barlow, & King, 2006). Following Hu and Bentler, a SRMR value of 0.08 or lower indicates acceptable fit.

Results

Descriptive Results

Table 2 presents the descriptive statistics concerning students' self-efficacy for writing, writing motivation,

revealed significantly lower sco
the reported writing strategies
level differences, the results ind
ers, as compared with average a
self-efficacy for ideation, conve
In addition, high achievers, as c
achievers, have a higher self-
conventions, and regulation a
mously motivated to write.

MG-SEM

To analyze the relations among r
(i.e., self-efficacy for writing an
cognitive challenges (i.e., writin
dents' writing performance acro
general achievement), we com
models. More specifically, we co
equal factor loadings and interce

TABLE 2
Descriptive Statistics Concerning Students' Self-Efficacy for Writing, Writing Motivation, an

	Gender		Achievement level		
Scale	*M* (*SD*) girls	*M* (*SD*) boys	*M* (*SD*) low achievers	*M* (*SD*) average achievers	*M* (*SD*) achiev
Self-efficacy for ideation	70.85 (21.74)	69.35 (22.39)	66.13 (20.22)	69.59 (22.66)	74.61 (2
Self-efficacy for conventions	81.95 (16.28)	80.45 (16.16)	73.69 (19.56)	81.35 (15.06)	87.49 (1
Self-efficacy for regulation	72.34 (20.49)	67.48 (21.51)	64.89 (23.25)	68.39 (21.31)	77.24 (1
Autonomous writing motivation	3.50 (0.88)	2.91 (0.95)	3.11 (0.95)	3.15 (0.99)	3.36 (0
Controlled writing motivation	2.64 (0.71)	2.84 (0.73)	2.77 (0.75)	2.75 (0.75)	2.72 (0
Thinking strategies	3.85 (0.57)	3.79 (0.65)	3.73 (0.61)	3.83 (0.63)	3.87 (0
Planning strategies	3.52 (0.93)	3.23 (0.99)	3.45 (0.95)	3.33 (1.02)	3.38 (0
Revision strategies	3.56 (0.81)	3.52 (0.83)	3.53 (0.74)	3.55 (0.87)	3.52 (0
Control strategies	4.04 (0.76)	3.76 (0.82)	3.81 (0.81)	3.89 (0.84)	3.96 (0

Self-efficacy for conventions	−0.11	0.07	.124	
Autonomous writing motivation	−0.70	0.08	.000***	
Controlled writing motivation	0.24	0.08	.002**	
Thinking strategies	−0.26	0.09	.003**	
Planning strategies	−0.33	0.09	.000***	
Revising strategies	−0.20	0.07	.005**	
Control strategies	−0.49	0.09	.000***	
Achievement-level differences[b]				
Factor	**Mean factor variable**	***SE***	***p***	**St**
Self-efficacy for ideation (high)	0.22	0.09	.015*	
Self-efficacy for regulation (high)	0.37	0.09	.000***	
Self-efficacy for conventions (high)	0.50	0.09	.000***	
Autonomous writing motivation (high)	0.20	0.09	.020*	
Controlled writing motivation (high)	−0.05	0.08	.523	
Thinking strategies (high)	0.04	0.09	.618	
Planning strategies (high)	−0.04	0.10	.674	
Revising strategies (high)	−0.05	0.08	.531	
Control strategies (high)	0.11	0.10	.260	
Self-efficacy for ideation (low)	−0.23	0.09	.016*	
Self-efficacy for regulation (low)	−0.20	0.10	.047*	
Self-efficacy for conventions (low)	−0.54	0.11	.000***	
Autonomous writing motivation (low)	−0.07	0.09	.413	
Controlled writing motivation (low)	0.11	0.09	.220	
Thinking strategies (low)	−0.15	0.10	.121	
Planning strategies (low)	0.06	0.10	.531	
Revising strategies (low)	−0.10	0.09	.264	
Control strategies (low)	−0.17	0.10	.093	

Note. *SE* = standard error.
[a]Girls as reference category. [b]Average achievers as reference category.
*$p < .05$. **$p < .01$. ***$p < .001$.

model 2 (i.e., equal factor loadings, intercepts, and regressions across groups). Following this procedure, significant differences between both models indicated significant differences in the regression coefficients across groups.

Gender Differences

Results concerning gender differ
model showed that there were no
between both MG-SEM model
$p = .159$; this indicated no signifi

freedom, subject to the scaling correction factors of the two models (Satorra & Bentler, 2001). In this way, we specifically tested each regression in the MG-SEM

CFI = 0.90, RMSEA = 0.03, SR
these results, we investigated a fi
which (a) intercepts, factor loa

TABLE 4
Multiple-Group Structural Equation Modeling: Comparison of Different Models Across Gende

Model	SB χ^2	*df*	Compared models
1[a]	2,867.29	2,044	
2[b]	2,913.92	2,082	Model 1 vs. model 2
Adaptions of model 2: Allowing one specific regression to vary across gender			
Self-efficacy → Writing strategies			
Self-efficacy for ideation → Thinking strategies	2,913.72	2,081	vs. model 2
Self-efficacy for ideation → Planning strategies	2,913.65	2,081	vs. model 2
Self-efficacy for ideation → Revision strategies	2,912.35	2,081	vs. model 2
Self-efficacy for ideation → Control strategies	2,914.21	2,081	vs. model 2
Self-efficacy for regulation → Thinking strategies	2,914.02	2,081	vs. model 2
Self-efficacy for regulation → Planning strategies	2,914.02	2,081	vs. model 2
Self-efficacy for regulation → Revision strategies	2,913.88	2,081	vs. model 2
Self-efficacy for regulation → Control strategies	2,913.39	2,081	vs. model 2
Self-efficacy for conventions → Thinking strategies	2,913.22	2,081	vs. model 2
Self-efficacy for conventions → Planning strategies	2,913.01	2,081	vs. model 2
Self-efficacy for conventions → Revision strategies	2,913.51	2,081	vs. model 2
Self-efficacy for conventions → Control strategies	2,913.15	2,081	vs. model 2
Writing motivation → Writing strategies			
Autonomous motivation → Thinking strategies	2,912.40	2,081	vs. model 2
Autonomous motivation → Planning strategies	2,914.45	2,081	vs. model 2
Autonomous motivation → Revision strategies	2,913.79	2,081	vs. model 2
Autonomous motivation → Control strategies	2,912.71	2,081	vs. model 2
Controlled motivation → Thinking strategies	2,914.14	2,081	vs. model 2
Controlled motivation → Planning strategies	2,913.12	2,081	vs. model 2
Controlled motivation → Revision strategies	2,913.23	2,081	vs. model 2
Controlled motivation → Control strategies	2,914.19	2,081	vs. model 2

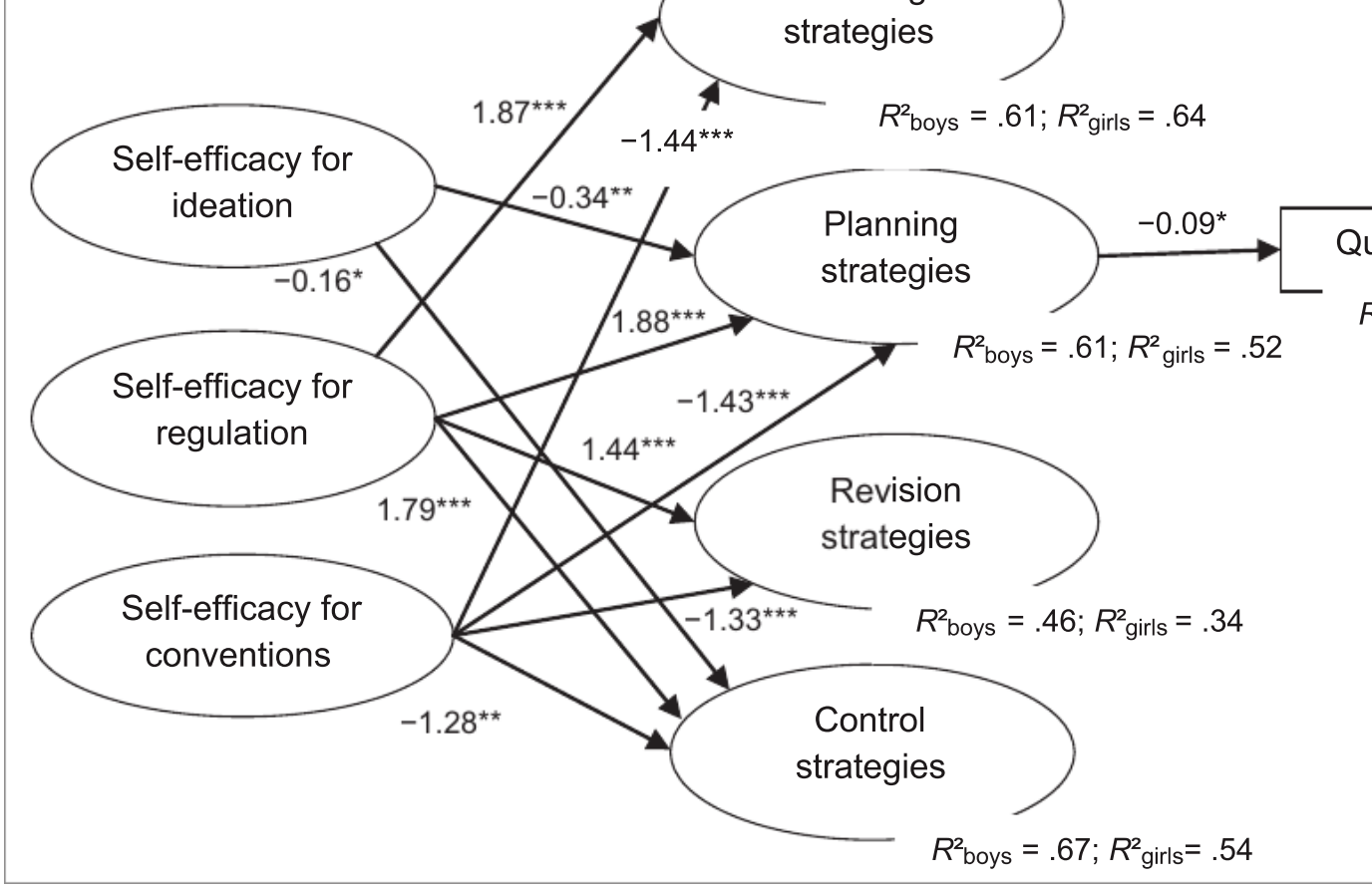
Planning strategies → Quality informational text	2,913.66	2,081	vs. model 2
Planning strategies → Quality narrative text	2,913.34	2,081	vs. model 2
Revision strategies → Quality informational text	2,912.04	2,081	vs. model 2
Revision strategies → Quality narrative text	2,913.01	2,081	vs. model 2
Control strategies → Quality informational text	2,913.59	2,081	vs. model 2
Control strategies → Quality narrative text	2,913.29	2,081	vs. model 2
Self-efficacy → Writing performance			
Self-efficacy for ideation → Quality informational text	2,914.24	2,081	vs. model 2
Self-efficacy for ideation → Quality narrative text	2,912.68	2,081	vs. model 2
Self-efficacy for regulation → Quality informational text	2,913.41	2,081	vs. model 2
Self-efficacy for regulation → Quality narrative text	2,913.07	2,081	vs. model 2
Self-efficacy for conventions → Quality informational text	2,913.27	2,081	vs. model 2
Self-efficacy for conventions → Quality narrative text	2,913.24	2,081	vs. model 2
Writing motivation → Writing performance			
Autonomous motivation → Quality informational text	2,914.51	2,081	vs. model 2
Autonomous motivation → Quality narrative text	2,913.38	2,081	vs. model 2
Controlled motivation → Quality informational text	2,913.61	2,081	vs. model 2
Controlled motivation → Quality narrative text	2,913.78	2,081	vs. model 2

[a]Equal factor loadings and equal intercepts across gender. [b]Equal factor loadings, equal intercepts, and equal regression c

were equal across gender, and (b) we deleted the nonsignificant regressions. The final model showed an acceptable fit to the data, SB $\chi^2(2{,}090) = 2{,}968.98$, $p < .001$, CFI = 0.90, RMSEA = 0.03, SRMR = 0.06. The chi-square test is consistently significant, indicating that none of the models fit the data perfectly. However, the RMSEA that takes the sample size into account is satisfactory (see Browne & Cudeck, 1992), and the SRMR also suggests an acceptable fit. Figure 3 presents the significant standardized parameter estimates of the final MG-SEM model across gender.

As to the first hypothesis, self-efficacy for writing conventions was negatively related to all writing strategies (i.e., thinking, planning, revision, control), whereas self-efficacy for regulation was positively related to them. Self-efficacy for ideation was negatively related to planning and control strategies (see Figure 3). There was no relation between autonomous and controlled writing motivation and the cognitive writing strategies. C
hypothesis, none of the different t
ideation, conventions, regulation
motivation (i.e., autonomous, con
pendent contribution to student
(i.e., quality informational and nar

As to the final hypothesis, t
were negatively related to stude
performance. In addition, there w
the thinking, revision, and cont
dents' writing performance. Thi
boys and girls accounted for onl
students' narrative writing perfo
of the variance in the thinking
61% and 52% of the variance in t
respectively; 46% and 34% of the
strategies, respectively; and 67% a
in the control strategies, respectiv



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

Achievement-Level Differences

Concerning the achievement-level differences, the procedure in which we compared both MG-SEM models was slightly adapted. Because there were too few clusters relative to the number of parameters and because of the small sample size of high and low achievers compared with average achievers, the first complete model did not converge. Therefore, we decided to directly compare the second MG-SEM model with the models in which we allowed one specific regression to vary across low, average, and high achievers. The results indeed revealed significant achievement-level differences, more particularly in the regressions between self-efficacy for regulation and revision strategies, SB $\chi^2(2) = 9.82$, $p < .01$; and between self-efficacy for conventions and revision strategies, SB $\chi^2(2) = 9.41$, $p < .01$ (see Table 5).

Therefore, we decided to study the MG-SEM model in which we allowed both regressions to vary simultaneously. The model showed a reasonable fit, SB $\chi^2(3,175) = 4,330.09$, $p < .001$, CFI = 0.87, RMSEA = 0.04, SRMR = 0.07. Based on these results, we investigated a final MG-SEM model in which (a) intercepts, factor loadings, and regressions were equal across low, average, and
for the regressions between se
tion and revision strategies and
for conventions and revision s
deleted the nonsignificant regr
CFI was not satisfactory, this
reasonable fit for the RMS
$\chi^2(3,159) = 4,339.42$, $p <$
RMSEA = 0.04, SRMR = 0.07. W
with this model. Figure 4 pr
standardized parameter estima
SEM model for low, average, an

Concerning the first hypothe
ulation was positively related to
control strategies, but self-effica
negatively related to these strat
ideation was not related to stud
strategies. The dotted lines in Fi
relation between (a) self-efficacy
sion strategies and (b) self-effica
revision strategies significantly
high, and low achievers. For aver
$p < .01$) and low achievers ($\beta = 0.$
for regulation was positively

Self-efficacy for ideation → Thinking strategies	4,337.87	3,177	vs. model 2
Self-efficacy for ideation → Planning strategies	4,338.74	3,177	vs. model 2
Self-efficacy for ideation → Revision strategies	4,336.80	3,177	vs. model 2
Self-efficacy for ideation → Control strategies	4,338.78	3,177	vs. model 2
Self-efficacy for regulation → Thinking strategies	4,340.24	3,177	vs. model 2
Self-efficacy for regulation → Planning strategies	4,338.14	3,177	vs. model 2
Self-efficacy for regulation → Revision strategies	4,330.89	3,177	vs. model 2
Self-efficacy for regulation → Control strategies	4,337.25	3,177	vs. model 2
Self-efficacy for conventions → Thinking strategies	4,340.37	3,177	vs. model 2
Self-efficacy for conventions → Planning strategies	4,339.90	3,177	vs. model 2
Self-efficacy for conventions → Revision strategies	4,331.30	3,177	vs. model 2
Self-efficacy for conventions → Control strategies	4,337.91	3,177	vs. model 2
Writing motivation → Writing strategies			
Autonomous motivation → Thinking strategies	4,338.00	3,177	vs. model 2
Autonomous motivation → Planning strategies	4,336.10	3,177	vs. model 2
Autonomous motivation → Revision strategies	4,338.28	3,177	vs. model 2
Autonomous motivation → Control strategies	4,338.20	3,177	vs. model 2
Controlled motivation → Thinking strategies	4,339.66	3,177	vs. model 2
Controlled motivation → Planning strategies	4,340.49	3,177	vs. model 2
Controlled motivation → Revision strategies	4,338.63	3,177	vs. model 2
Controlled motivation → Control strategies	4,338.91	3,177	vs. model 2
Writing strategies → Writing performance			
Thinking strategies → Quality informational text	4,337.68	3,177	vs. model 2
Thinking strategies → Quality narrative text	4,339.30	3,177	vs. model 2
Planning strategies → Quality informational text	4,339.06	3,177	vs. model 2
Planning strategies → Quality narrative text	4,337.22	3,177	vs. model 2
Revision strategies → Quality informational text	4,338.29	3,177	vs. model 2
Revision strategies → Quality narrative text	4,339.21	3,177	vs. model 2
Control strategies → Quality informational text	4,337.96	3,177	vs. model 2
Control strategies → Quality narrative text	4,338.80	3,177	vs. model 2

Self-efficacy for regulation → Quality informational text	4,338.26	3,177	vs. model 2
Self-efficacy for regulation → Quality narrative text	4,339.60	3,177	vs. model 2
Self-efficacy for conventions → Quality informational text	4,338.80	3,177	vs. model 2
Self-efficacy for conventions → Quality narrative text	4,339.36	3,177	vs. model 2
Writing motivation → Writing performance			
Autonomous motivation → Quality informational text	4,339.33	3,177	vs. model 2
Autonomous motivation → Quality narrative text	4,340.16	3,177	vs. model 2
Controlled motivation → Quality informational text	4,340.36	3,177	vs. model 2
Controlled motivation → Quality narrative text	4,337.56	3,177	vs. model 2

Note. Model 1 (equal factor loadings and equal intercepts across achievement level) was not able to converge due to havi
the number of parameters and due to the small sample size of high and low achievers.
[a]Equal factor loadings, equal intercepts, and equal regression coefficients across achievement level.
**$p < .01$.

strategies, but this relation was not significant for high achievers ($\beta = 0.23$, $p = .251$). Similarly, self-efficacy for conventions was negatively related to the revision strategies for both average achievers ($\beta = -0.69$, $p < .01$) and low achievers ($\beta = -0.41$, $p < .01$), but this relation was not significant for high achievers ($\beta = -0.12$, $p = .555$; see Figure 4). Results revealed no significant relations between the different types of writing motivation and the cognitive writing strategies.

As to the second hypothesis, students' autonomous writing motivation had a positive association with students' writing performance across both genres (i.e., quality of both the informational and narrative texts), whereas controlled writing motivation was not related to students' writing performance. The different types of self-efficacy (i.e., ideation, conventions, regulation) did not make an independent contribution to students' writing performance.

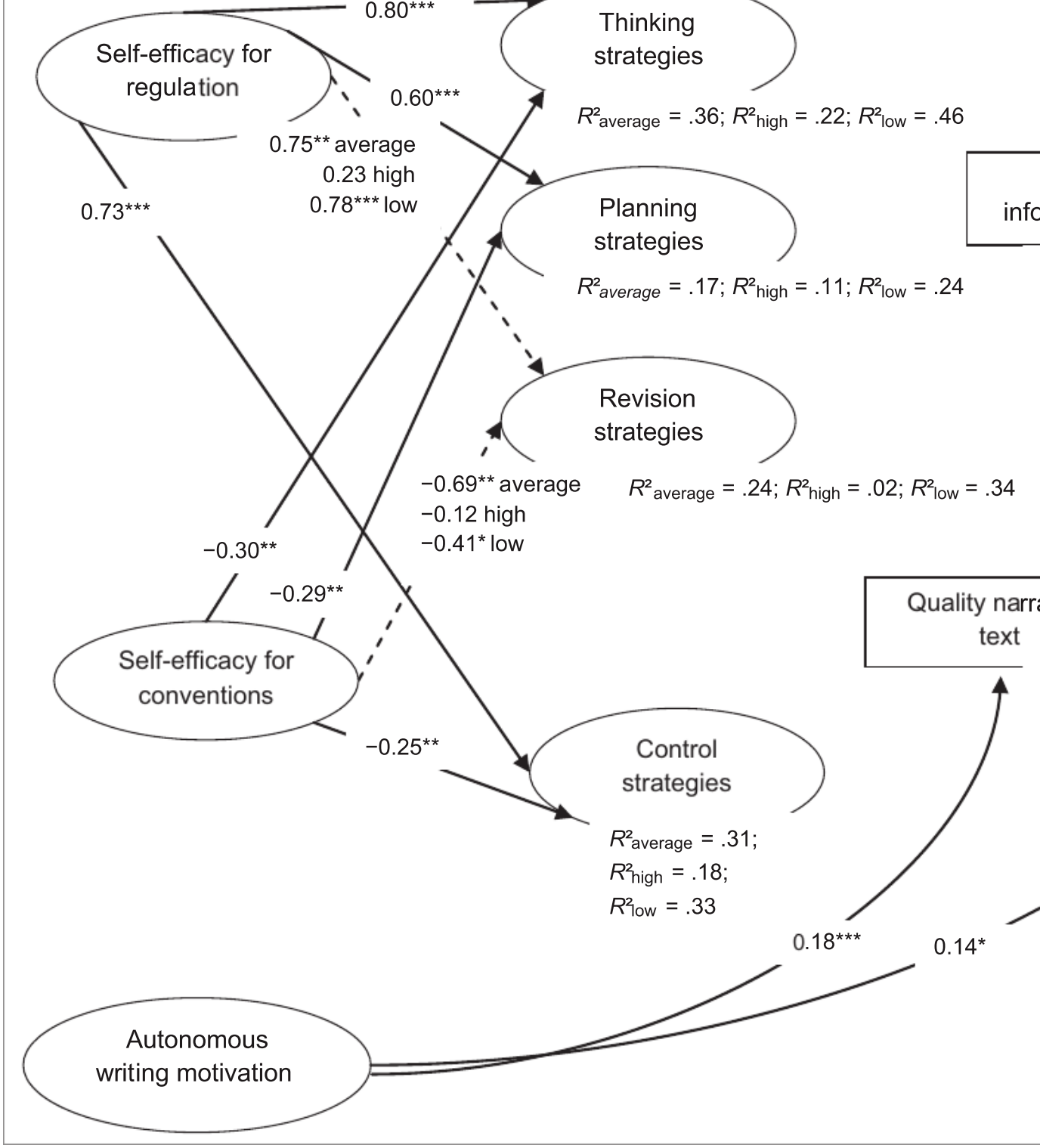
Concerning the final hypothesis, none of the cognitive writing strategies (i.e., thinking, planning, revision, control) were associated with students' writing performance. This final model for low, average, and high achievers accounted for only 3%, 4%, and 3% of the variance in students' informational writing performance, respectively; 3%, 2%, and 2% of the variance in students' narrative writing performance, respectively; 36%, 22%, and 46% of the variance in thinking strategies, respectively; 17%, 11%, and 24% of the variance in planning strategies, respectively; 24%, 2%, and 34% of the variance in revision strategies, respectively; and 31%, 18%, and 33% of the variance in cor
tively (see Figure 4).

Discussion

Based on the social cognitive
merman & Risemberg, 1997), th
vestigated how motivational (i.e.,
and writing motivation) and co
cognitive writing strategies) med
students' actual writing performa
ined whether and how these re
and achievement. We put forwa
tural models, both showing a rea
(a) a MG-SEM model for boys a
and (b) a MG-SEM model for
achievers (see Figure 4). Both mo
same hypothesized relational mo
tional and cognitive challenges,
lenges and writing performan
challenges and writing performa

Relating Cognitive and Challenges to Students Parallels Between the

Results showed some interesting
MG-SEM model for boys and gi



Note. The dotted lines indicate a significant difference in regressions between average, high and low achievers.
*p < .05. **p < .01. ***p < .001.

the MG-SEM model for low, average, and high achievers on the other hand. First, it appeared that self-efficacy for conventions was negatively related to students' writing strategies (i.e., thinking, planning, revision, control). A possible explanation for this finding might be that students who are confident about applying writing conventions are more focused on low-level transcription skills (e.g., spelling) while

in the ability to apply self-regulatory strategies was associated with greater strategy use (Pajares & Valiante, 2006; Zimmerman & Kitsantas, 1999). It therefore appears important to stimulate self-efficacy for regulation by providing students with explicit instructions in why, how, and when to apply writing strategies, which consequently can raise students' awareness and confidence about their own ability to apply these strategies (for meta-analyses of evidence-based writing practices on strategy instruction, see Graham, Harris, & Chambers, 2016; Graham, McKeown, Kiuhara, & Harris, 2012; Koster, Tribushinina, de Jong, & van den Bergh, 2015).

Finally, the present study also showed some surprising results concerning the relative strength of the significant relations in both MG-SEM models. Specifically, the effect sizes (i.e., standardized parameter estimates can be interpreted as effect sizes; Cohen, 1977) and the proportion of variance explained revealed an interesting parallel between the MG-SEM model for gender and the MG-SEM model for achievement level. The first parallel concerning the relative strength focuses on the relation between the motivational and cognitive challenges. Specifically, the reported effect sizes regarding the relations between self-efficacy for writing and the cognitive writing strategies were, in general, quite large in both models (i.e., effect sizes up to 1.88 *SD*). Accordingly, the proportion of variance explained in students' cognitive writing strategies by their perceived self-efficacy was also rather high (i.e., R^2 ranging from .17 to .67). The second parallel concerning the relative strength has to do with the relation between the motivational challenges and students' writing performance on the one hand and the relation between the cognitive challenges and students' writing performance on the other hand. As to these relations, the reported effect sizes were very small in both models (e.g., effect sizes not larger than .19 *SD*). Consequently, the proportion of variance explained in students' writing performance by the motivational and cognitive challenges was very low (i.e., R^2 ranging from .01 to .04). The findings concerning the relative strength of the relations in both MG-SEM models might be due to the specific operationalization of the variables used in the present study and is subsequently discussed in more detail.

other hand. First, girls and boy
efficacious to come up with idea
nificantly less planning and
Figure 3). It can be hypothesized
confident about generating idea
cused on planning strategies to c
planning a text by generating ide
as who, what, when, and where).
are confident in coming up with
perhaps less inclined to revise th
lated to this finding is, however,
overestimating their capability
might consequently not put suffi
ing planning and revising strateg
particular worrying that previo
that especially struggling writ
writing capabilities (Klassen, 200
portant that teachers explicitly d
confidence in writing, especially
Rather than lowering students'
should in this respect try to impro
skills by improving their task u
1996).

Second, autonomous writin
positive contribution to students
in the MG-SEM model for lo
achievers (see Figure 4). This f
previous SDT research stating t
write for its inherent satisfaction
better they write (De Smedt et
search has shown that writing m
tant predictor of students' wri
Smedt et al., 2016; García & de
et al., 2007; Lam & Law, 2007;
increase students' writing perf
tant to stimulate their autonomo
by fostering their need for auton
relatedness (De Smedt et al.,
autonomy-supportive teachers
choice between different writing
provide directions in how to p
texts (cf. competence); and be in
dents by showing interest in th
relatedness).

Finally, planning strategies
to the narrative text quality in t

model for all students simultaneously in the context of writing. It is therefore important to consider different learner characteristics when modeling and relating motivational and cognitive writing challenges and students' writing performance.

Relating Cognitive and Motivational Challenges to Students' Writing: Gender and Achievement-Level Differences

Next to the abovementioned parallels and differences between the MG-SEM models, we studied gender differences within the first model and achievement-level differences within the second model. Concerning the first MG-SEM model (see Figure 3), the results revealed no significant gender differences in the regression coefficients. Consequently, all considered relations were comparable for boys and girls, indicating that relations among cognitive challenges, motivational challenges, and students' writing performance did not differ for boys and girls. The present study is in line with previous research that indicated gender differences in the cognitive (e.g., Berninger & Fuller, 1992; Olinghouse, 2008) and motivational latent variables (e.g., Guay et al., 2010; Pajares & Valiante, 1997) of the proposed MG-SEM model.

As to the second MG-SEM model (see Figure 4), the results revealed significant achievement-level differences. In this respect, the present study underlines the importance of distinguishing among low, average, and high achievers when considering the interplay between motivational and cognitive challenges related to students' writing performance. Particularly, the results revealed differences in the relation between (a) self-efficacy for regulation and revision strategies and (b) self-efficacy for conventions and revision strategies. The higher the confidence of average and low achievers in regulating their writing behavior, the more they reported applying revision strategies. Similarly, the higher the confidence of average and low achievers in applying writing conventions, the less they reported using revision strategies. Both relations were not significant for high achievers. These findings suggest that the relations between self-efficacy and writing strategies differ for low and average achievers as compared with high achievers. In this respect, the importance of differentiated writing

Limitations and Sugges for Future Research

As stated, the findings concerni of the relations in both MG-SEM to the specific operationalizatio in the present study. Specifically, mon method variance (Lindell shared method variance (Van Tallir, Kirk, & Haerens, 2016) m associations between the motiv the cognitive challenges becau constructs by means of self-r Similarly, the weak associations tional and cognitive challenges (of subjective measures based o dents' writing performance (i.e. objective measures based on writ explained by the operationaliza major limitation of the present sured students' applied writin means of self-report questionna research has indicated that novi plan their text in advance (Ca 1996), have difficulties with ge ently (McCutchen et al., 1994), a text by focusing on surface-leve et al., 1997). In the present study ported rather high levels of thi sion, and control strategies. Thi an overestimation of the reporte to a tendency to provide social Consequently, the issue of self-

are extremely valuable because students regulate their learning behavior in relation to how they view their own learning (Winne & Jamieson-Noel, 2002). These findings within the field of self-regulated learning can be transferred to the context of students' writing because writers have to self-regulate their writing behavior to compose their texts (Graham & Harris, 1997; Zimmerman & Risemberg, 1997). Taking into account this parallel, self-report measures on writing strategies can therefore provide valuable information and input for educational practice and research. Notwithstanding the value of self-report information, data-triangulation should be considered in further research to meet the related, abovementioned shortcomings.

Consequently, in addition to using off-line measures (e.g., student questionnaires based on self-report) to assess students' applied writing strategies, we need to integrate more objective, online measures, such as trace methodology (e.g., Bråten & Samuelstuen, 2007; Fidalgo, Torrance, Rijlaarsdam, van den Bergh, & Álvarez, 2015), analysis of pen movements (e.g., Alamargot, Plane, Lambert, & Chesnet, 2010; Alves et al., 2016; Merchie & Van Keer, 2014), keystroke logging (e.g., Leijten & Van Waes, 2013; von Koss Torkildsen et al., 2016), or think-aloud measures (e.g., Beauvais, Olive, & Passerault, 2011). These online measures can overcome the methodological limitations related to the exclusive reliance on students' self-report (e.g., shared method variance resulting in artificially inflated associations) and could therefore strengthen the results of the present study. Online measures such as trace methodology, analysis of pen movements, or think-aloud measures are, however, often very time- and labor-intensive methodologies. Taking the large sample size in the present study into account (i.e., about 790 elementary students writing two texts), it would have been impractical to administer and examine all of the online data. In the present study, we specifically focused on elementary students writing texts via pen and paper, as students in elementary education in Flanders are not used to writing on computers (De Smedt et al., 2016). Therefore, applying keystroke logging (i.e., observing students' writing processes on a computer (Leijten & Van Waes, 2013) would have not addressed the authentic writing situation in the classroom.

Further, the present study only focused on gender and achievement-level differences in writing. Future

Finally, as we examined ge
level differences in the relations
and cognitive components and
formance in an exploratory way,
should confirm and cross-valida
els. Additionally, longitudinal r
vestigate how writing performa
students' cognitive (i.e., cognit
and motivational challenges (i.e.
ing, writing motivation), as well
ing strategies can affects studen
and writing motivation (Zimm
1997).

Conclusion: Implica for Teaching Writin for Research on Mo Students' Writing

Based on the results of the pre
some implications for teaching
tary grades and for research
writing. As to the implications
that tackling motivational writin
importance as teaching stude
strategies. In this respect, educat
and experiences should foster st
egy usage and enhance their se
and writing motivation. Additio
differentiated writing instruc
showed achievement-level differe
tween motivational and cognitive
this respect, more in-depth ins
level differences can be obtained
intervention, and progress mo
writing within an RTI approach.

As to the implications for r
studying complex models for d
dents is necessary to receive mo
how motivational and cognitive
relate to students' writing perfor
researchers must meet two preco
a lot of parameters must be est
kinds of complex models, a large
When testing structural models

to ensure the power to run the intended complex writing models, we had to set up a large-scale study. Consequently, investigating elementary students' writing strategies by online writing measures was infeasible because of the amount of data. To conclude, we underline the paradox within research focused on modeling elementary students' writing, namely, conducting solid research in which online writing measures are essential to accurately assess students' applied writing strategies and taking the feasibility of this type of research into account. The present study revealed this paradox by the incompatibility of the abovementioned preconditions to model the complex writing models.

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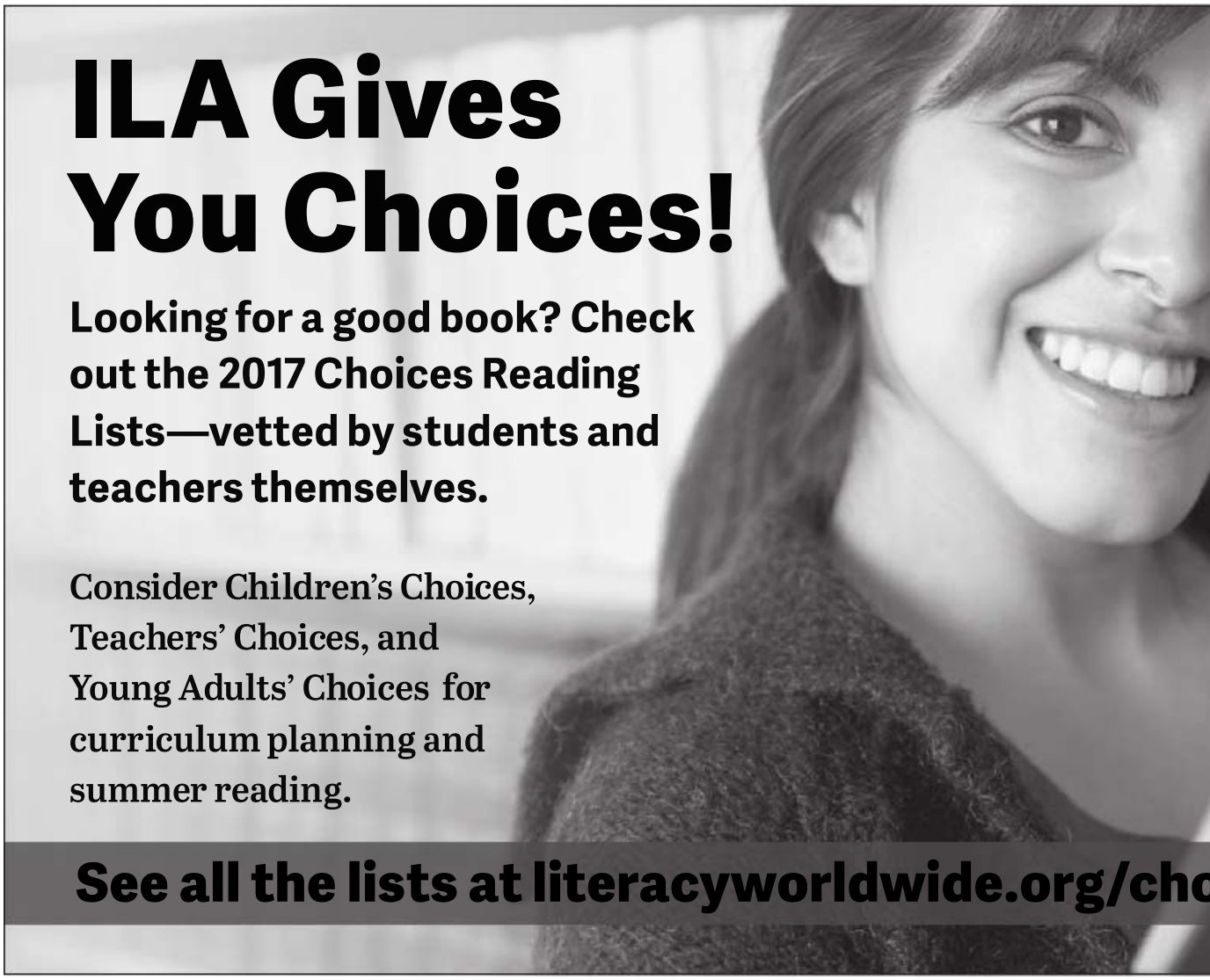
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