Longitudinal and reciprocal links between writing motivation and writing quality in grades 4–5: A cross-lagged panel analysis

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ARTICLE INFO

Keywords:
Writing motivation
Writing attitudes
Writing self-efficacy
Motives to write
Opinion essay quality
Longitudinal design

ABSTRACT

The relevance of writing motivation to the development of good writing skills throughout schooling is well-documented. However, the relationships between different motivational beliefs and the directionality of their links to writing performance have not been the focus of empirical research. Here, we conducted a longitudinal study examining the reciprocal associations between writing attitudes, writing self-efficacy in three domains (viz., conventions, ideation, and self-regulation), five writing motives (viz., curiosity, emotional regulation, boredom relief, grades, and competition), and writing quality. For that, we asked 532 fourth graders to complete three motivation-related questionnaires and to write two opinion essays. This procedure was repeated one year later. A cross-lagged panel analysis showed three main findings: (a) most motivational beliefs were associated with each other within and between Grades 4 and 5; (b) contrary to what happened in Grade 4, most beliefs in Grade 5 were concurrently associated with writing quality; (c) self-efficacy for writing conventions in Grade 4 longitudinally predicted text quality in Grade 5. These results not only reinforce the relevance of promoting students' writing motivation, but also inform teachers about where to start in order to achieve this goal.

1. Introduction

Writing provides a mechanism for self-understanding, communicating, thinking, and learning (S. Graham & Harris, 2019). In schools, it influences reading comprehension, facilitates the understanding of classroom content, and is essential to students' success (Bangert-Drowns et al., 2004; Camping et al., 2020; S. Graham et al., 2015). Notwithstanding the importance of writing, prior research repeatedly showed that elementary school students fail to develop adequate writing skills (De Smedt et al., 2017; S. Graham et al., 2015). In part, this occurs because writing is a complex and demanding activity, in which writers face challenges that are as much related to cognitive and linguistic factors as to affective and confidence factors (Bruning & Kauffman, 2016). Learning to write involves the coordination of several cognitive processes (e.g., spelling, handwriting, planning, translating, and revising). Also, it requires extended and deliberate practice over time, which depends largely on students' motivation (Camacho et al., 2020; De Smedt et al., 2017; Limpo et al., 2020).

Motivation comprises the internal processes (e.g., emotions, needs, beliefs, values, and goals) that energize and direct behavior, in terms of initiating, sustaining, intensifying, or stopping it (Reeve, 1996; Wentzel & Miele, 2016). In the writing field, the role of motivation has been acknowledged in most contemporary models (Boscolo, 2009; Bruning & Horn, 2000; S. Graham, 2018; Hayes, 1996; MacArthur et al., 2016). The Writers-Within-Community model (WWC; S. Graham, 2018) is a particularly strong framework for the study of writing motivation because it crafts the multidimensionality of this construct. According to the WWC model, writing encompasses the writing community where it takes place (viz., writers, collaborators, and audiences) as well as the cognitive, affective, and motivational resources of its members.

Within motivational resources, S. Graham (2018) included beliefs about writing communities, identity as writers, success attributions, expectancy-value beliefs, writing attitudes, writing self-efficacy, and motives to write. These motivational beliefs are proposed as an important component that impacts writing performance by influencing writers' engagement (e.g., their search for opportunities to write), effort (e.g., the time and cognitive resources they mobilize), and actions (e.g., their use of dictionaries or assistance). This theoretical proposition is in line with empirical research showing moderate positive associations between writing motivation and writing performance (for a systematic review, see Camacho et al., 2020). However, this evidence comes primarily from cross-sectional studies targeting general self-efficacy, while

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neglecting other motivational aspects, such as writing attitudes and motives to write. In addition, little is known about the links between different motivational beliefs and the direction of their associations with writing performance.

To overcome these gaps, we designed the present longitudinal study with the goal of examining the reciprocal effects between different writing motivational beliefs and writing quality in Grades 4 and 5. In what follows, we first review the constructs of writing attitudes, writing self-efficacy, and motives to write, along with their links to writing performance. Then, we discuss what prior research has shown about the associations between those motivational beliefs.

1.1. Writing attitudes

According to the Theory of Planned Behavior (Fishbein & Ajzen, 1975; Ajzen, 1991), the best predictor of behavior is intention, which serve as an indicator of one's disposition and effort to engage in the behavior. This intention is determined by three motivational factors, namely, subjective norm, perceived control (or self-efficacy), and attitudes toward the behavior. Attitudes is a meta-construct covering cognitive, motivational, and affective components (Maier et al., 2014). As a result, the writing domain is characterized by a disparity between conceptualizations (for a systematic review, see Ekholm et al., 2018). Some scholars defined writing attitudes as a cognitive characteristic concerning the extent to which individuals like to write (Erdoğan & Erdoğan, 2013). Others referred to it as a drive to write (Lee, 2013). In this study, we adopted a third conceptualization of writing attitudes, defined as an affective disposition of how individuals feel themselves while writing, in a continuum from happy to unhappy (S. Graham et al., 2007).

Prior cross-sectional research showed weak to moderate correlations between writing attitudes and writing performance from elementary to high school (Camacho et al., 2021; S. Graham et al., 2007; S. Graham et al., 2017; S. Graham et al., 2018; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019; Soylu et al., 2017). To examine the direction of this attitudes-performance link, S. Graham et al. (2007) tested three models relating both constructs in a sample of American first and third graders. Structural equation modelling revealed that the best model was the one assuming an influence of writing attitudes on writing performance, assessed via narrative texts. Writing attitudes were also found to predict opinion writing quality in a sample of Portuguese fourth graders (Rocha, Filipe, Magalhães, Graham, & Limpo, 2019) as well as narrative and opinion writing quality among Portuguese fourth-to-eighth graders (Camacho et al., 2021). Together, these studies suggest that the more students like to write, the better their texts. On the one hand, students who enjoy writing are more likely to look for opportunities to write and put more effort into it, which are essential ingredients to good writing (S. Graham & Harris, 2019; McKenna et al., 1995). On the other hand, experiencing positive emotions lead to better forms of engagement (Isen, 1999) and requires less cognitive resources, which may be then available for the writing tasks (Coffey, 2020; Pekrun et al., 2002). Although the contribution of writing attitudes to writing performance is well-stablished in the literature, most research is cross-sectional and does not account for the relation with other motivational beliefs, such as self-efficacy.

1.2. Writing self-efficacy

Social Cognitive Theory (Bandura, 1997; Bandura, 2006) postulates that human functioning results from a dynamic interplay of personal (e. g., attitudes), environmental (e.g., social norms), and behavioral influences (e.g., skills and self-efficacy). Central to this theory is the construct of self-efficacy, which is the most researched aspect of human motivation and refers to one's perception of their ability to successfully perform future tasks (Bandura, 1997). In the study of writing motivation, students' perceptions of their competence to successfully execute

writing tasks, such as composing a text, is also the most targeted variable (Pajares, 2003; Zimmerman & Bandura, 1994). Academics have adopted either unidimensional (Pajares et al., 2007; Shell et al., 1995) or multidimensional (Bruning et al., 2013; Sanders-Reio et al., 2014) approaches to self-efficacy. However, it is well-stablished that self-efficacy is a domain-specific construct (Bandura, 2006). As writing builds on several cognitive, procedural, and strategic resources, it is advantageous to assess self-efficacy in these different domains (Bruning et al., 2013). Accordingly, the current study relied on a framework that included perceptions about three core writing abilities: generating good ideas (ideation), transcribing them into words following the norms of written language (conventions), and managing the decisions and behaviors involved in the writing tasks (self-regulation) (Bruning et al., 2013). This triparted structure was proposed by Bruning et al. (2013) and received empirical support in middle and high school (De Smedt et al., 2017; 2016; Limpo & Alves, 2017; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019; Soylu et al., 2017). In addition, this multidimensional approach to self-efficacy provides more detailed information concerning its relations with performance.

When targeting general self-efficacy, the pattern seems clear: the more confident students feel about writing, the better their written products (Bruning & Kauffman, 2016; S. Graham et al., 2019; Pajares & Valiante, 1999). Writers' self-efficacy determines their choices, efforts to achieve goals, persistence, perseverance when things get difficult, and the way they think and emotionally react during the process of writing, which are key characteristics to successful writing performance (Pajares et al., 2007). Notwithstanding, mixed findings have been observed when assessing self-efficacy multidimensionally (cf., Zumbrunn et al., 2020).

Using equivalent fifth-to-sixth Grade Belgian samples, different findings have been reported. Whereas a multiple-group structural equation modelling study revealed no link between self-efficacy domains and writing performance (De Smedt et al., 2017), a multilevel modelling study found that self-efficacy for ideation contributed to better narrative and informational texts (De Smedt et al., 2016). Similar inconsistencies were also reported for the Portuguese context, using multiple regression analyses. Whilst one study showed that opinion essays quality in Grade 6 was predicted by self-efficacy for conventions (Rocha, Filipe, Magalhães, Graham, & Limpo, 2019), another found that opinion essays quality in Grade 7 was influenced by self-efficacy for self-regulation (Rasteiro & Limpo, 2022). This association between self-efficacy for self-regulation and writing quality in Grade 7 is consistent with findings of structural equation modeling analyses conducted with Portuguese students in Grades 7–8 using opinion essay tasks (Limpo & Alves, 2017) and in Grades 5–8 using narrative, but not opinion essay tasks (Camacho et al., 2021). It seems that, in Portuguese middle school, the quality of writing may depend mostly on self-efficacy for self-regulation. A similar conclusion is hard to extract from younger students, probably due to the different data analytic approaches used. More longitudinal studies using multidimensional measures of writing self-efficacy are warranted to uncover patterns concerning their links to writing quality and inform on the directionality of those associations.

1.3. Motives to write

Less studied than writing attitudes and self-efficacy are motives to write, which represent different reasons why one engages in writing (S. Graham, 2018). The concept of motives emerged from the Self-Determination Theory (SDT; Deci & Ryan, 2000; 2017), which focuses on the degree to which behavior is self-determined as well as on the basic psychological needs involved in self-determination (viz., autonomy, perceived competence, and relatedness). Through the lens of SDT, motives may be intrinsic if students write for inner satisfaction (e.g., to learn about things that interest them) or extrinsic if they write for what it brings (e.g., to be among the best students) (Deci & Ryan, 2000; Ryan & Deci, 2000; see also Ng et al., 2021a). In addition, extrinsic motives greatly vary depending on their level of self-determination. Accordingly,

students' motivation may range from autonomous when they write for satisfaction or personal value (e.g., becoming a better student), to controlled when they write for internal or external pressure (e.g., guilt or punishment) (De Smedt et al., 2017; De Smedt et al., 2016).

This conceptualization was further refined by S. Graham et al. (2021; 2023), who proposed a multidimensional model comprising seven motives to write. According to this model, an individual may write to know more about the composition topic (curiosity), to be absorbed in a story (involvement), to overcome negative emotions (emotional regulation), to fill in time (relief from boredom), to be better at school (grades), to surpass classmates in school (competition), or to be praised for good writing performance (social recognition). Curiosity, involvement, emotional regulation, and boredom relief are intrinsic motives as they mean writing for inner pleasure. The other three motives are extrinsic, with different degrees of self-determination. On the one hand, grades represent an autonomous extrinsic motive, because when students write to be better at school, they are writing to achieve a self-relevant outcome with which they identify. On the other hand, competition and social recognition are controlled extrinsic motives, because when students write to be better than others or to be recognized by peers and teachers as good writers, they are writing to achieve something externally delivered (Limpo et al., 2020; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). Here, we adopted the multidimensional conceptualization of S. Graham et al. (2021; Graham et al., 2023), which provides more detailed information about the motives that lead students to write, as it will be reviewed next.

A previous study found that intrinsic but not extrinsic motives to write contributed to writing quality in Grade 7 (Rasteiro & Limpo, 2022). However, the studies by De Smedt and colleagues (2017; 2016) clarified that the only motives that did not have a positive contribution to writing quality were the controlled ones. Indeed, autonomous motives (including both intrinsic and extrinsic) were associated with better writing performance. According to SDT, autonomous motivation, due to its effects on persistence, interest, and learning strategies, is more adaptative than controlled extrinsic motivation, which undermines students' sense of autonomy (Pintrich & Schrauben, 1992; Ryan et al., 1985; Ryan & Deci, 2017). However, confirming the usefulness of the multidimensional approach to motives to write, research revealed that different autonomous motives (e.g., curiosity vs. emotional regulation) as well as different controlled motives (e.g., competition vs. social recognition) played distinct roles predicting writing outcomes (Camping et al., 2020; Limpo et al., 2020; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019).

In a sample of Portuguese third graders, only grades and competition were positively and negatively associated with opinion essay quality, respectively (Limpo et al., 2020). In a sample of Portuguese six graders, the positive association of opinion essay quality was with curiosity and the negative association was with social recognition (Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). Social recognition was also found to be a negative predictor of informative essays among native English speakers enrolled in Grades 6–8 (Camping et al., 2020). However, the positive association was between writing performance and grades, instead of curiosity (Camping et al., 2020). In a recent study including Latin American sixth-to-seventh graders, Graham et al. (2023) found some different patterns. Whereas opinion essay quality was positively associated with involvement but negatively associated with emotion regulation, informative essay quality was positively associated with involvement and competition, but negatively associated with curiosity and social recognition. The motives of grades and boredom relief were not related to writing quality. These mixed findings might be due to differences in the educational levels or contexts, but it is difficult to set patterns based on such few studies. More research seems needed to unravel the association of different motives with writing performance and to test the directionality of these links, which is yet to be established.

1.4. Links between writing attitudes, writing self-efficacy, and motives to write

S. Graham (2018) argued that writing attitudes, writing self-efficacy, and motives to write belong to a set of motivational beliefs affecting writing, but he did not elaborate in what ways these beliefs are related to each other. Based on general theories of motivation (Bandura, 1997; Deci & Ryan, 2000; Fishbein & Ajzen, 1991) and writing (Graham, 2018; Graham et al., 2023), motivational beliefs are expected to form a constellation, in which all of them are connected and feed off each other. Attitudes and self-efficacy appear in Theory of Planned Behavior and in Social Cognitive Theory as two important components of a dynamic system composed of personal and contextual related factors that influence each other and behavior (Bandura, 1997; Fishbein & Ajzen, 1991). In turn, attitudes and self-efficacy are closely related to the basic psychological needs for autonomy and perceived competence underlying self-determination (Deci & Ryan, 2000). It is then reasonable to think that someone who likes to do something feels more competent and has more reasons to do it. Similarly, we might assume that someone who feel more confident doing something has more incentives and takes more pleasure doing it.

In the writing field, some interrelationships emerged from correlational analyses. Portuguese six graders who enjoyed writing displayed stronger motives to write and stronger self-efficacy for conventions, ideation, and self-regulation (Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). A positive association between writing enjoyment and self-efficacy was also found in research conducted with middle-grade (Rasteiro & Limpo, 2022) and undergraduate students (S. Graham et al., 2017; MacArthur et al., 2016; Sanders-Reio et al., 2014). In Portuguese seventh graders, although writing attitudes were related to all self-efficacy domains and all motives to write, these latter were not associated with self-efficacy for conventions (Rasteiro & Limpo, 2022).

The associations between writing motives and self-efficacy domains were also examined in two cross-sectional studies using mediation analyses with Chinese fourth-to-fifth graders (Ng et al., 2021a; Ng et al., 2021b). In one study, Ng et al. (2021a) found that social recognition was associated with self-efficacy for conventions and ideation through different paths: an intrinsic path involving curiosity, involvement, emotional regulation, and relief from boredom; and an extrinsic path involving competition and grades. In another study, Ng et al. (2021b) found that both curiosity and grades were associated with self-efficacy for ideation directly and indirectly via self-efficacy for conventions. The link between grades and self-efficacy for ideation was additionally mediated by a set of intrinsic motives. Despite the above-described results, the reciprocal and longitudinal relationships between different writing motivational beliefs remain uncovered, in part because these links are neither the main focus of empirical research nor explicitly modelled by theoretical approaches.

1.5. Writing instruction in the Portuguese curriculum

The curriculum of the Portuguese subject aims to provide students with skills that enable them to be autonomous in the multifunctional and cultural use of the Portuguese language (Buescu et al., 2015). To that end, the curriculum is organized in a hierarchical way throughout the three cycles of basic education (viz., Grades 1–4, Grades 5–6, and Grades 7–9) targeting five domains, namely, Orality, Grammar, Literacy Education, Reading, and Writing (General Direction for Education, 2018).

Within the Writing domain, Grade 4 students are expected to compose texts with a tri-parted structure (viz., introduction, body, and conclusion); formulate complex phrases expressing sequences, causality, and finality; organize them into cohesive and coherent paragraphs; and follow the orthography and punctuation norms. In addition, there is a strong effort from teachers in developing students' planning and revising skills by hierarchizing ideas before writing and by improving the text after it is written. In Grade 5, there is less emphasis on these

strategies since they are expected to be already acquired. Here, the focus is on adapting these strategies to the different text genres; integrating elements of time, localization, and action development in narrative texts; and using coherent arguments and conclusions to write opinion and argumentative texts.

1.6. Present study

Stemming from the above-noted limitations in the field of writing motivation, we conducted a longitudinal study to test the reciprocal links between writing attitudes, writing self-efficacy domains, motives to write, and writing quality in Grades 4 and 5. Based on the previously reviewed theories of motivation (Bandura, 1997; Fishbein & Ajzen, 1991; Deci & Ryan, 2000; Deci & Ryan, 2017) and writing (S. Graham, 2018) proposing that different motivational beliefs represent interrelated dynamic systems, as well as grounded on empirical evidence showing bivariate correlations between those beliefs (De Smedt et al., 2017; Ng et al., 2021b; Rasteiro & Limpo, 2022; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019), we expected that all motivational beliefs would be associated in Grade 4 as well as in Grade 5, and that all motivational beliefs in Grade 4 would predict beliefs in Grade 5.

Grounded on the WWC model (S. Graham, 2018) proposing that motivational beliefs influence writing via engagement, effort, and actions, as well as on the previous findings showing an overall association between writing motivation and writing performance (S. Graham et al., 2007; Graham et al., 2017; Graham et al., 2019; De Smedt et al., 2017; Rasteiro & Limpo, 2022; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019), we anticipated that motivational beliefs and writing quality would be associated in Grade 4 as well as in Grade 5. Despite the lack of longitudinal research, we also expected an association between Grade 4 writing beliefs and Grade 5 writing quality based on the same cross-sectional findings and theoretical claims. We should note that the only longitudinal study in the field revealed no longitudinal link, but it was conducted with older students in Grades 6–7 (Rasteiro & Limpo, 2022).

To test our hypotheses, we conducted a cross-lagged panel analysis including a sample of 532 Portuguese students in Grade 4, who were reassessed one year later, in Grade 5. In each grade, we asked students to complete three questionnaires measuring different motivational beliefs and to write two opinion essays. We targeted the transition from Grade 4 to 5 because, in Portugal, it corresponds to the transition between elementary and middle school (National Council of Education, 2020), in which students tackle several academic, contextual, and personal challenges. In this school transition, children face a completely different educational system, with a more demanding curriculum, organized in more specific subjects and more class hours (Iver & Epstein, 1991). In addition, students tend to move to a different school and go from having one to several teachers. This results in more distant teacher-student relationships and increases in students' stress, fear, and insecurity (Choi, 2012). Moreover, all of these challenges occur in a developmental stage characterized by significant personal changes in biological and psychological domains, which are associated with a decrease in self-esteem and self-concept (Coelho & Romão, 2017). These circumstances seem likely to turn the Grade 4–5 transition into a difficult moment in students' academic path, which may impose different motivational demands.

The present study sought to extend current knowledge in three ways. First, we used multidimensional approaches to writing self-efficacy and writing motives to provide a fine-grained focus on both constructs. Though infrequent, these approaches seem warranted to unravel specific patterns concerning writing performance correlates. Second, we explored the reciprocal and longitudinal relationships between different aspects of writing motivation as well as between these and writing quality. To the best of our knowledge, these links have never been addressed before. By doing this, our study clarifies the role of motivational beliefs in predicting writing performance and, therefore, contributes to the definition of priorities when drafting interventions to improve writing motivation. Third, this work focuses on a crucial developmental period (Grade 4–5 transition), expected to interfere with children's motivation and school outcomes. Scrutinizing students' motivation for writing and its association with writing quality in this transition may help in identifying the need for additional assistance to overcome emergent challenges and their potential detrimental effect in writing performance.

2. Method

2.1. Participants

The initial sample was composed of 559 Portuguese-speaking fourth graders from two clusters of public schools in the North of Portugal, who were reassessed one year later, in Grade 5. Due to the school change from Grade 4 to 5, we lost 4.83% of the sample in the second data collection. Thus, our final sample included 532 students ($M = 9.72$ years, $SD = 0.40$, range $= 9$–11; 47% girls), whose socioeconomic status was assessed through their mother/father's educational level. At the start of the first data collection point, this was as follows: 9.3/11.0% completed Grade 4 or below, 37.7/41.7% completed Grade 6–9, 32.1/30.7% completed high-school, 17.8/11.3% were graduated, and 1.9/1.0% completed a post-graduation course. Students' school achievement was measured via their latest marks in Portuguese, Mathematics, and Natural Sciences, ranging from 1 (*lowest mark*) to 5 (*highest mark*). In average, their school achievement was 3.63 ($SD = 0.78$) for Portuguese, 3.63 ($SD = 0.89$) for Mathematics, and 3.83 ($SD = 0.80$) for Natural Sciences. This study was conducted in accordance with the Declaration of Helsinki and integrated a project that was approved by the ethical committee of the authors' university. Both students and legal guardians provided active consents, with students agreeing to participate and legal guardians signing a document authorizing their participation.

2.2. Procedure

With the consent of teachers and the school principal, data collection occurred during school hours, in classroom groups of 20–25 students, across two sessions in January (i.e., beginning of the second school term). In Session 1, the researcher started by explaining the procedure for completing the writing motivation-related questionnaires. She also clarified that there were no right or wrong answers. Afterwards, she read aloud each item at a time and students marked their answers individually. All questionnaires were designed to be used across different text genres and, in line with previous research (Rasteiro & Limpo, 2022; Limpo et al., 2020), they were administered in order of increasing complexity of the targeted constructs: first, writing attitudes (unidimensional), then, writing self-efficacy (three dimensions), and, finally, writing motives (five dimensions). Then, participants wrote one opinion essay for 10 min about the topic "Do you think there should be more field trips at school?". Session 2 took place in the following week, where students were given another 10 min to write a second opinion essay about the topic "Do you think people should work out every day?". Exactly one year later, this procedure was repeated. Students were asked to fill in the same questionnaires and to produce two additional opinion essays about the topics "Do you think children should eat candies whenever they want?" and "Do you think school breaks should be longer?".

2.3. Measures

2.3.1. Writing attitudes

Students' writing attitudes were measured with the Attitudes Toward Writing scale, which was developed by S. Graham et al. (2019) and validated to Portuguese by Rocha, Filipe, Magalhães, Graham, & Limpo, 2019. This instrument comprises 5 items: *I enjoy writing*; *Writing is fun*; *I like to write at school*; *I like to write at home*; and *Writing is a good way to*

spend my time. Although answers are given in a 5-point Likert-type scale ranging from 1 (*always true*) to 5 (*never true*), the responses were reversed for convenience of interpretation. Thus, higher scores indicate more positive attitudes toward writing. In the current study, internal consistency measured through the Cronbach's alpha was 0.78 for Grade 4 and 0.87 for Grade 5.

2.3.2. Writing self-efficacy

Students' writing self-efficacy beliefs were assessed with the Self-Efficacy for Writing Scale, which was developed by Bruning et al. (2013) and validated to Portuguese by Limpo and Alves (2017). This measure includes 16 items, organized into three self-efficacy domains: conventions (e.g., *I can spell my words correctly*), ideation (e.g., *I can think of many ideas for my writing*), and self-regulation (e.g., *I can focus on my writing for at least 1 h*). For each item, students rate their confidence in their ability to accomplish specific writing processes from 0 (*no chance*) to 100 (*completely certain*), with higher scores indicating higher self-efficacy in the respective domain. In this study, Cronbach's alphas for Grade 4/5 were 0.79/0.73 for conventions, 0.86/0.82 for ideation, and 0.79/0.77 for self-regulation.

2.3.3. Motives to write

Students' motives to write were gauged with the Writing Motivation Questionnaire, which was developed by S. Graham et al. (2021; 2023) and validated to Portuguese by Limpo et al. (2020). This instrument consists of 21 items grouped into 7 factors (3 items per dimension): curiosity (e.g., *I write because I like to think about particular topics*), involvement (e.g., *I write because I like to create a character that I can identify with*), emotional regulation (e.g., *I write because it helps me calm down*), relief from boredom (e.g., *I write because it helps me pass the time*), grades (e.g., *I write because it helps me get better in school*), competition (e.g., *I write because it is important to me to write better than other students*), and social recognition (e.g., *I write because I like it when other people think I am a good writer*). However, because the involvement factor has proven to be problematic in previous studies within the writing and reading domains (Rasteiro & Limpo, 2022; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019; Schiefele, Schaffner, Möller, & Wigfield, 2012), this dimension was not examined in the present study. For each item, students indicate the extent to which they write for the presented reason using a 5-point scale ranging from 1 (*always true*) to 5 (*never true*). As for the Attitudes Toward Writing scale, responses were reversed for convenience of interpretation. Thus, higher scores indicate stronger motives to write. In the current study, internal consistency for Grade 4/5 was 0.78/0.81 for curiosity, 0.67/0.71 for involvement, 0.82/0.84 for emotional regulation, 0.77/0.78 for relief from boredom, 0.71/0.75 for grades, 0.83/0.78 for competition, and 0.69/0.70 for social recognition.

2.3.4. Writing quality

Writing quality was assessed via four opinion essay writing tasks: two in Grade 4 and other two in Grade 5. Initially, all texts were typed and corrected for spelling errors to avoid transcription biases (S. Graham et al., 2011). Then, two research assistants blind to study purposes evaluated the quality of students' essays with a single overall assessment ranging from 1 (*low quality*) to 7 (*high quality*), separately for each Grade. For that, they considered equally creativity (i.e., originality and relevance of the ideas), coherence (i.e., clarity and organization of the text), syntax (i.e., syntactic correctness and diversity of sentences), and vocabulary (i.e., diversity, interest, and proper words usage). This procedure was suggested by Cooper (1997) and its validity was demonstrated in previous studies with Portuguese school-age children (Cordeiro et al., 2019; Limpo et al., 2020). In addition to having past experience in using the holistic rating scale, both raters were retrained by the last author to apply it and received anchor texts representing low, average, and high quality for each Grade level. The agreement between judges for each batch of texts was high, with intraclass correlation coefficients ranging from 0.87 to 0.94. Thus, we computed the mean scores

across judges for each text, which were in turn averaged to create a more valid and reliable measure for text quality in Grade 4 and in Grade 5.

2.4. Data analyses

Before the main data analyses, we examined the descriptive statistics using the IBM SPSS Statistics 26. To check if the data followed a normal distribution, we inspected skewness and kurtosis. Respectively, values above |3| and |10| were considered as indicative of severe deviations from the normal distribution (Kline, 2016). After confirming the absence of distributional problems, we continued the data analysis in three steps with the lavaan package for the R system for statistical computing (R Development Core Team, 2005; Rosseel, 2012). The full information maximum likelihood method was used to calculate the parameter estimates without deleting or imputing missing values (Kline, 2016), which represented 27.55% of all data (with all variables as well as 71.05% of participants displaying at least one missing value). Research suggests that estimation methods like the diagonally weighted least square are more suitable to metric indicators with ordered categories, such as those used in this study (Li, 2016). However, this approach results in the loss of many observations and biased parameter estimates (J. W. Graham, 2009). Moreover, there is evidence showing an acceptable performance of continuous methodology to treat categorical data when indicators have five or more categories, as those here used (Rhemtulla et al., 2012). Based on this evidence, some researchers have mentioned that using a strong missing data estimation method is more important than correctly modeling the ordinal nature of data (see Fokkema et al., 2013). Accordingly, the subsequent three steps of our data analyses were performed using the full information maximuum likelihood method.

In Step 1, we conducted three confirmatory factor analyses (CFA), separately for each grade, to verify whether the proposed factorial structures of the questionnaires fit the data well. The first measurement model consisted of a unique latent variable of writing attitudes with five indicators, corresponding to the five items from the Attitudes Toward Writing scale. The second model comprised three latent variables reflecting the three self-efficacy domains: conventions (five indicators), ideation (five indicators), and self-regulation (six indicators). The third model included seven latent variables equivalent to the seven motives to write, with three indicators per motive. In each model, the observed variables had to load onto the analogous latent variables.

In Step 2, we tested the longitudinal measurement invariance of these three models across Grades 4 and 5 using multiple-group structural equation modelling. For the three questionnaires, we tested configural and metric invariance across grades. For configural invariance, we specified the same factor structure across both grades, with all parameters freely estimated (unconstrained model). For metric invariance, we constrained the factor loadings to be equal across grades (constrained model). Chi-square difference tests were used to compare the unconstrained and constrained models. No further invariance tests were conducted because the mean structure is not relevant when testing cross-lagged panel models, and the non-invariance in item residual variances has minimal effects on parameter estimates (Xu et al., 2020).

In Step 3, as a preliminary step to the cross-lagged panel analysis, we examined the bivariate correlations between writing beliefs and writing quality in Grade 4 and 5.

In Step 4, we carried out a cross-lagged panel analysis to longitudinally examine the reciprocal links between different writing motivational beliefs as well as between these and writing quality. Our model included the synchronous correlations between all variables in Grade 4 and between all variables in Grade 5, the autoregressive paths of each variable from Grades 4 to 5, and the cross-lagged paths from variables Grade 4 variables to Grade 5 variables. The correlations between measurement errors for the same indicators over time were also estimated (Newsom, 2020). Here, as in steps 1, 2, and 3 of our data analyses, we used the chi-square statistic (χ^2), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the

standardized root mean square residual (SRMR) to evaluate models' fit (Kline, 2016). χ^2/df values < 2 and 3, CFI values > 0.95 and 0.90, RMSEA values < 0.06 and 0.10, and SRMR values < 0.06 and 0.09 were considered good and adequate fits, respectively (Hu & Bentler, 1999). If fit indices were not adequate, the model was modified first through model trimming (i.e., eliminating free parameters by constraining them to equal zero) and then based on modification indices (Kline, 2016). For each path we estimated the beta coefficient and for each endogenous variable we calculated the R squared. R squared values near 0.02, 0.13, and 0.26 were considered weak, moderate, and substantial (Cohen, 1988).

3. Results

3.1. Preliminary analyses

Preliminary analyses of descriptive statistics revealed no distributional problems for all measures, as absolute values of skewness and kurtosis were below 1.49 and 2.33, respectively. These values are presented in Table 1, along with descriptive statistics.

3.2. Step 1: Confirmatory factor analyses

3.2.1. Writing attitudes

The CFA on the unifactorial Attitudes Toward Writing scale showed the following results for Grades 4 and 5, respectively: χ^2 (5, $N = 373$) = 22.80, p <.001; CFI = 0.97; RMSEA = 0.10, RMSEA 90% CI [0.06, 0.14], p =.02; SRMR = 0.03, with factor loadings above 0.49 ($ps < 0.001$); and χ^2 (5, $N = 409$) = 54.37, p <.001; CFI = 0.95; RMSEA = 0.16, RMSEA 90% CI [0.12, 0.19], p <.001, SRMR = 0.04, with factor loadings above 0.68 ($ps < 0.001$). The high values of RMSEA might be explained by the small degrees of freedom. In these models, RMSEA is problematic and potentially misleading, since it penalizes complex models by incorporating degrees of freedom in the denominator of its formula (Kenny et al., 2015; Shi et al., 2021). When assessing these models, it has been recommended to rely more in CFI and SRMR, which are less susceptible to the effects of degrees of freedom (Shi et al., 2021; Taasoobshirazi & Wang, 2016). Based on this, the above results suggest that the model fit of the Attitudes Toward Writing scale is adequate in both grades.

3.2.2. Writing self-efficacy

The CFA on the 3-factor Self-Efficacy for Writing Scale showed a good model fit in Grade 4: χ^2 (101, $N = 373$) = 216.43, p <.001; CFI = 0.95; RMSEA = 0.06, RMSEA 90% CI [0.05, 0.07], p =.19; SRMR = 0.04, with factor loadings above 0.32 ($ps < 0.001$). An adequate fit was also found in Grade 5: χ^2 (101, $N = 409$) = 293.85, p <.001; CFI = 0.92; RMSEA = 0.07, RMSEA 90% CI [0.06, 0.08], p =.04, with factor loadings above 0.32 ($ps < 0.001$).

3.2.3. Motives to write

The CFA on the Writing Motivation Questionnaire with six factors showed an adequate model fit in Grade 4: χ^2 (120, $N = 374$) = 310.48, p <.001; CFI = 0.93; RMSEA = 0.07, RMSEA 90% CI [0.06, 0.07], p =.003; SRMR = 0.05, with factor loadings above 0.59 ($ps < 0.001$). A good fit was also found in Grade 5: χ^2 (120, $N = 408$) = 291.12, p <.001; CFI = 0.95; RMSEA = 0.06, RMSEA 90% CI [0.05, 0.07], p =.06, with factor loadings above 0.49 ($ps < 0.001$).

3.3. Step 2: Longitudinal measurement invariance

3.3.1. Attitudes toward writing

Multiple-group analyses showed that the configural model, without equality constraints across grades, fit the data well: χ^2 (10, $N = 30$) = 78.37, CFI = 0.96, RMSEA = 0.13, SRMR = 0.04. Similarly, the model with factor loadings constrained to be equal across grades also fit the data well: χ^2 (14, $N = 26$) = 82.22, CFI = 0.96, RMSEA = 0.11, SRMR = 0.04. There was no decrement in model fit, $\Delta\chi^2$ (14) = 3.85, p =.43, indicating metric invariance across both grade levels. These results suggested that the measurement model of writing attitudes was equivalent at Grades 4 and 5.

3.3.2. Writing self-efficacy

Multiple group analyses showed that both the configural model and the model with equal factor loadings across grades fit the data well: χ^2 (202, $N = 102$) = 509.82, CFI = 0.93, RMSEA = 0.06, SRMR = 0.04; and χ^2 (215, $N = 89$) = 523.77, CFI = 0.93, RMSEA = 0.06, SRMR = 0.05. The absence of decrement in model fit, $\Delta\chi^2$ (13) = 13.94, p =.38, indicated that there was metric invariance. Thus, the measurement model of writing self-efficacy could also be treated as equivalent at Grades 4 and 5.

3.3.3. Motives to write

Multiple group analyses also showed that both the configural model and the model with equal factor loadings across grades fit the data well: χ^2 (240, $N = 138$) = 467.18, CFI = 0.94, RMSEA = 0.06, SRMR = 0.06, and χ^2 (252, $N = 126$) = 593.54, CFI = 0.94, RMSEA = 0.06, SRMR = 0.06. However, there was a decrement in model fit, $\Delta\chi^2$ (12) = 26.36, p =.01, indicating that metric invariance was not achieved and the measurement model of motives to write varied across Grades 4 and 5. To identify the source of invariance, we conducted additional analyses, constraining factor loadings for each latent variable at a time. Results revealed metric invariance for all factors, except for social recognition, $\Delta\chi^2$ (10) = 13.78, p =.18. In cross-lagged panel analysis, it is important that the factors are interpreted in the same way across waves (Xu et al., 2020). As this did not happen with social recognition, we removed this factor and conducted a new CFA, which showed even better model fits in Grades 4 and 5: χ^2 (80, $N = 374$) = 199.98, p <.001; CFI = 0.95; RMSEA

Table 1
Descriptive statistics of all latent variables by grade.

	Grade 4							Grade 5						
	N	*Min.*	*Max.*	*M*	*SD*	*Sk*	*Ku*	*N*	*Min.*	*Max.*	*M*	*SD*	*Sk*	*Ku*
Attitudes	369	1.00	5.00	3.71	0.82	−0.53	−0.10	404	1.00	5.00	3.27	0.96	−0.25	−0.49
Self-efficacy														
Conventions	373	5.20	100.00	75.36	18.19	−0.93	0.54	408	10.80	100.00	76.95	16.04	−1.35	2.08
Ideation	372	3.80	100.00	77.97	19.63	−1.49	2.33	409	21.40	100.00	78.63	15.80	−1.07	0.80
Self-regulation	372	0.00	100.00	72.53	20.28	−0.90	0.47	409	1.67	100.00	69.14	19.13	−0.97	0.87
Motives														
Curiosity	371	1.00	5.00	2.25	0.98	0.76	0.14	404	1.00	5.00	3.24	1.07	−0.38	−0.56
Emotional regulation	370	1.00	5.00	2.83	1.16	0.23	−0.88	399	1.00	5.00	2.44	1.10	0.45	−0.73
Relief from boredom	368	1.00	5.00	2.80	1.06	0.18	−0.66	400	1.00	5.00	2.60	1.06	0.32	−0.63
Grades	374	1.00	5.00	1.95	0.91	1.11	0.90	403	1.00	5.00	3.59	0.94	−0.44	−0.34
Competition	369	1.00	5.00	2.58	1.22	0.42	−0.87	402	1.00	5.00	2.81	1.12	0.09	−0.92
Social recognition	370	1.00	5.00	2.59	1.09	0.41	−0.62	401	1.00	5.00	2.62	1.01	0.07	−0.71
Writing quality	347	1.00	6.50	3.35	1.20	0.09	−0.48	347	1.00	6.50	3.31	1.17	0.18	−0.37

Note. The number of participants varies across measures due to missing data.

= 0.06, RMSEA 90% CI [0.05, 0.07], p =.02; SRMR = 0.05, with factor loadings above 0.58 ($ps < 0.001$), and χ^2 (80, N = 408) = 182.44, p <.001; CFI = 0.96; RMSEA = 0.06, RMSEA 90% CI [0.05, 0.07], p =.17; SRMR = 0.05, with factor loadings above 0.60 ($ps < 0.001$). We also repeated the multiple-group analysis for the 5-factor model. The configural model and the model with equal factor loadings across grades continued to fit the data well: χ^2 (240, N = 138) = 546.40, CFI = 0.95, RMSEA = 0.06, SRMR = 0.05, and χ^2 (252, N = 126) = 560.41, CFI = 0.95, RMSEA = 0.06, SRMR = 0.06. As expected, there was no decrement in model fit, $\Delta\chi^2$ (12) = 14.02, p =.38, suggesting that the 5-factor model was invariant across Grades 4 and 5. Thus, it was used in the subsequent analyses.

3.4. Step 3: Bivariate correlations

All bivariate correlations between writing motivational beliefs and opinion essay quality are displayed in Table 2. Three main findings are worth mentioning. First, all motivational variables in Grades 4 were correlated with each other ($0.15 < r < 0.91$). Similarly, all motivational variables in Grade 5 were correlated with each other ($0.14 < r < 0.91$). Second, each motivational variable in Grade 4 was correlated with itself in Grade 5 ($0.29 < r < 0.60$). Third, most motivational variables in Grade 4 were neither correlated with opinion essay quality in Grades 4 nor 5 ($r < 0.29$). Conversely, all motivation variables in Grade 5 were correlated with opinion essay quality in Grade 5 ($0.19 < r < 0.53$), except competition ($r = -0.02$).

3.5. Step 4: Cross-lagged panel analysis

Results of the first cross-lagged panel analysis showed a poor model fit: χ^2 (2402, N = 476) = 3868.20, p <.001; CFI = 0.88; RMSEA = 0.04, RMSEA 90% CI [0.03, 0.04], p = 1.00; SRMR = 0.05, with factor loadings above 0.32 ($ps < 0.001$). Based on these initial findings, we respecified the model. First, for the sake of parsimony, we trimmed the model by deleting the 50% weakest paths and conducted a new cross-lagged panel analysis. Results still showed a poor model fit: χ^2 (2402, N = 476) = 3868.20, p <.001; CFI = 0.89; RMSEA = 0.04, RMSEA 90% CI [0.03, 0.04], p = 1.00; SRMR = 0.05, with factor loadings above 0.33 ($ps < 0.001$).

We decided to continue with the model re-specification by inspecting the modification indices, which assumed values of 39.23 and 43.05 between the two same items of self-efficacy for ideation in Grade 4 and 5, respectively. In addition, a content analysis verified that these items are formulated in a quite similar way in terms of words and syntax, both referring to creating/putting ideas into text/writing ("I can think of many ideas for my writing"; "I can put my ideas into writing."). Based on these statistical and methodological arguments (Kline, 2016), we added a covariance between these two items in both Grade 4 and 5. Despite this change resulting in an adequate model, χ^2 (2457, N = 476) = 3722.07, p <.001; CFI = 0.90; RMSEA = 0.03, RMSEA 90% CI [0.03, 0.04], p = 1.00; SRMR = 0.05, with factor loadings above 0.33 ($ps < 0.001$), there was an autoregressive path coefficient slightly above 1 (β = 1.09, p =.04). After fixing this path to one, we achieved a final cross-lagged model (Fig. 1) with an adequate model fit: χ^2 (2604, N = 476) = 3963.96, p <.001; CFI = 0.90; RMSEA = 0.03, RMSEA 90% CI [0.03, 0.04], p = 1.00; SRMR = 0.05, and factor loadings above 0.32 ($ps < 0.001$). In what follows, we present only the significant paths. Complete results for synchronous correlations in Grades 4 and 5 can be found in Tables 3 and 4, respectively.

3.5.1. Synchronous correlations

All motivational beliefs in either Grade 4 ($0.17 < r < 92$, $ps < 0.01$) or Grade 5 ($0.15 < r < 92$, $ps < 0.03$) were correlated with each other. Regarding the motivation-quality links in Grade 4, writing attitudes (r = 0.17, p =.01), emotional regulation (β = 0.19, p =.03), and competition ($r = -0.23$, p <.001) were the only beliefs correlated with opinion essay

quality. In Grade 5, by contrast, all beliefs were correlated with opinion essay quality ($0.19 < r < 58$, p =.02), except competition ($\beta = -0.07$, p =.38).

3.5.2. Autoregressive paths

Grade 4 attitudes significantly predicted Grade 5 attitudes ($\beta = 0.32$, p =.002). Similarly, Grade 4 self-efficacy for conventions significantly predicted Grade 5 self-efficacy for conventions ($\beta = 0.74$, p =.002). Likewise, curiosity ($\beta = 0.20$, p =.04), relief from boredom ($\beta = 0.37$, p <.001), grades ($\beta = 0.30$, p =.01), and competition ($\beta = 0.30$, p =.001) in Grade 4 significantly predicted the corresponding motives to write in Grade 5.

3.5.3. Cross-lagged paths

Writing attitudes in Grade 4 contributed to self-efficacy for self-regulation ($\beta = -0.25$, p =.01), curiosity ($\beta = 0.38$, p =.01), emotional regulation ($\beta = 0.25$, p =.003), and relief from boredom in Grade 5 ($\beta = 0.29$, p =.001), which were moderately-to-substantially explained by Grade 4 variables ($0.23 < R^2 < 0.31$). Concerning self-efficacy domains, self-efficacy for self-regulation in Grade 4 contributed to grades in Grade 5 ($\beta = 0.45$, p =.04) and self-efficacy for conventions in Grade 4 contributed to opinion essay quality in Grade 5 ($\beta = 0.39$, p =.02), whose variance was moderately explained by Grade 4 variables ($R^2 = 0.21$ for grades and 0.17 for essay quality). Among motives to write, only relief from boredom in Grade 4 predicted curiosity ($\beta = 0.51$, p =.05) and emotional regulation ($\beta = 0.30$, p =.001) in Grade 5. Opinion essay quality in Grade 4 also had a contribution to self-efficacy for conventions in Grade 5 ($\beta = 0.12$, p =.05), whose variance was substantially explained by Grade 4 variables ($R^2 = 0.37$). No other significant cross-lagged paths were found. Significant results for autoregressive and cross-lagged paths can be consulted in Fig. 1, along with R squared values for each endogenous variables.

4. Discussion

The present study aimed to explore the longitudinal and reciprocal links between writing attitudes, writing self-efficacy domains, motives to write, and opinion essay quality in the transition from Grade 4 to 5. Before examining these links, we attested the quality of the instruments by analysing each scale's factorial structure and invariance across grades. All scales showed adequate-to-good model fits in Grades 4 and 5. Whereas the measurement model of writing attitudes and self-efficacy were equivalent across grades, that of motives to write was not. We identified the social recognition dimension as the one differing between Grades. This factor was removed and measurement invariance was then assured. After verifying that all variables were generally associated with each other, we moved forward with the cross-lagged panel analysis. We discuss results concerning the links between writing motivational beliefs first, followed by their associations with opinion essay quality.

4.1. Links between writing motivational beliefs

Confirming our first hypothesis and in line with previous findings (Ng et al., 2021a; 2021b; Rocha et al., 2019), all writers' motivational beliefs were associated in Grade 4 as well as in Grade 5. Thus, the more the students enjoyed writing, the more competent they reported to feel about different writing processes, the stronger their reasons to write, and vice-versa. These results accord with the theoretical claims of general motivation theories (Bandura, 1997; Fishbein & Ajzen, 1991; Deci & Ryan, 2017) and empirical evidence suggesting an interconnection between different motivational aspects (Rasteiro & Limpo, 2022; Rocha et al., 2019). In addition to these concurrent associations and extending current knowledge, we found some longitudinal links between writing motivational beliefs (viz., autoregressive and cross-lagged paths).

Concerning the autoregressive paths, almost all beliefs in Grade 4 predicted themselves in Grade 5, except self-efficacy for writing ideation

Table 2
Bivariate correlations between writing motivation and writing quality in grades 4 and 5.

|	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Grade 4																				
1. Attitudes																				
Self-efficacy																				
2. Conventions	0.33*																			
3. Ideation	0.21*	0.75*																		
4. Self-regulation	0.49*	0.87*	0.83*																	
Motives																				
5. Curiosity	0.61*	0.42*	0.42*	0.51*																
6. Emotional regulation	0.65*	0.20*	0.15*	0.35*	0.63*															
7. Relief from boredom	0.61*	0.19*	0.16*	0.36*	0.63*	0.91*														
8. Grades	0.50*	0.49*	0.38*	0.46*	0.60*	0.46*	0.46*													
9. Competition	0.23*	0.32*	0.25*	0.29*	0.34*	0.31*	0.39*	0.56*												
10. Writing quality	0.17*	−0.11	−0.08	−0.05	0.08	0.18*	0.12	−0.12	−0.24*											
Grade 5																				
11. Attitudes	0.50*	0.13*	0.16*	0.28*	0.38*	0.44*	0.48*	0.23*	0.12*	0.13										
Self-efficacy																				
12. Conventions	0.18*	0.60*	0.40*	0.47*	0.25*	0.07	0.02	0.32*	0.20*	0.04	0.24*									
13. Ideation	0.21*	0.45*	0.44*	0.44*	0.30*	0.12	0.06	0.22*	0.15*	−0.003	0.34*	0.79*								
14. Self-regulation	0.23*	0.45*	0.38*	0.56*	0.31*	0.18*	0.18*	0.30*	0.19*	0.04	0.50*	0.77*	0.86*							
Motives																				
15. Curiosity	0.46*	0.18*	0.20*	0.27*	0.42*	0.35*	0.40*	0.21*	0.13*	0.05	0.70*	0.27*	0.36*	0.41*						
16. Emotional regulation	0.42*	0.11	0.09	0.21*	0.31*	0.42*	0.42*	0.20*	0.08	0.10	0.66*	0.14*	0.22*	0.33*	0.77*					
17. Relief from boredom	0.48*	0.08	0.02	0.20*	0.30*	0.45*	0.48*	0.21*	0.07	0.05	0.68*	0.17*	0.23*	0.37*	0.74*	0.91*				
18. Grades	0.36*	0.23*	0.12	0.28*	0.22*	0.31*	0.27*	0.29*	0.08	0.002	0.57*	0.28*	0.30*	0.38*	0.59*	0.44*	0.52*			
19. Competition	0.29*	0.19*	0.08	0.21*	0.26*	0.23*	0.23*	0.24*	0.34*	−0.03	0.39*	0.25*	0.21*	0.31*	0.41*	0.38*	0.36*	0.54*		
20. Writing quality	0.17*	0.29*	0.15*	0.22*	0.07	0.03	−0.05	0.12	−0.04	−0.09	0.36*	0.48*	0.45*	0.53*	0.34*	0.19*	0.21*	0.25*	−0.02	

* $p < .05$.
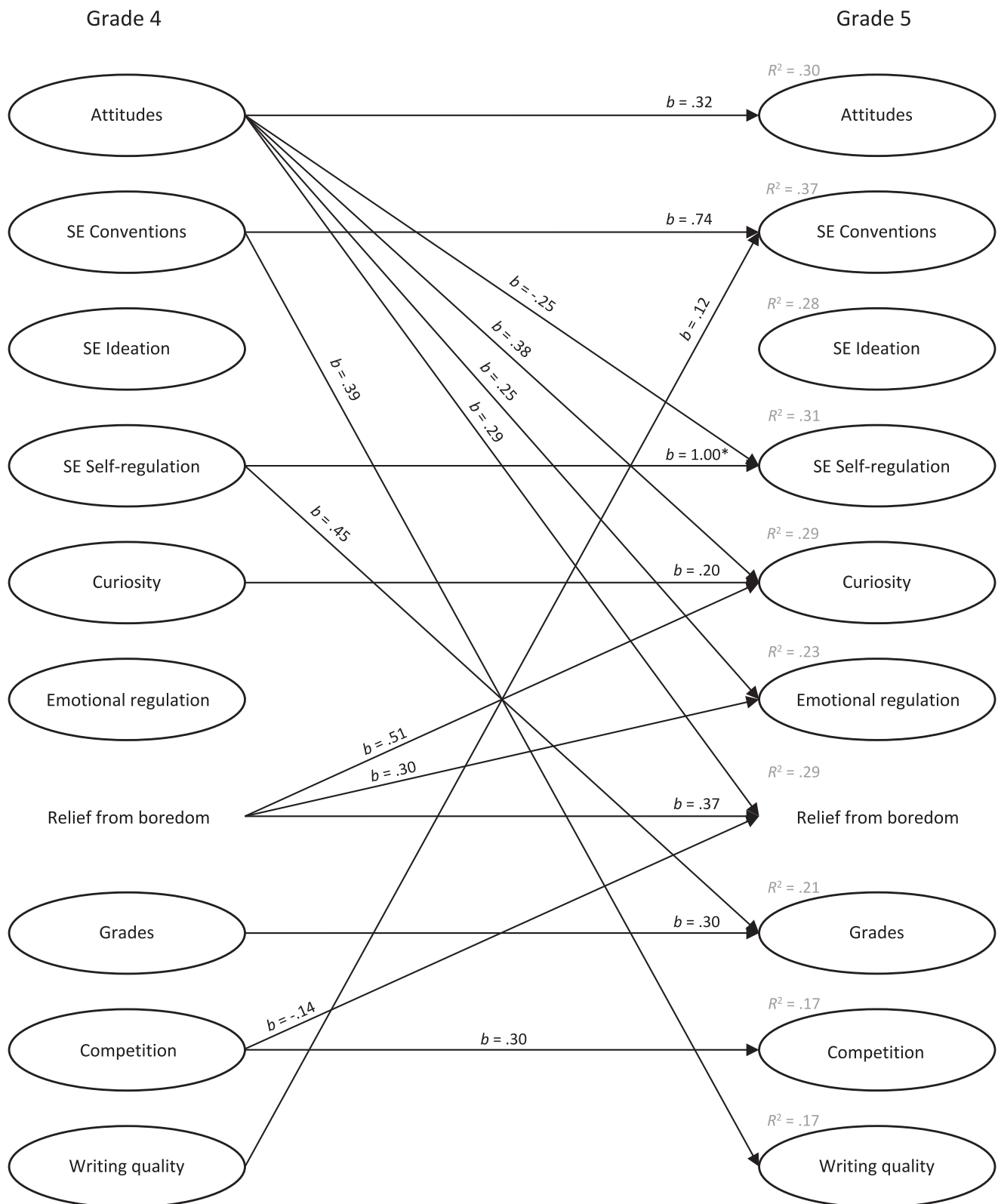
Fig. 1. Significant autoregressive and cross-lagged paths from cross-lagged panel analysis.

and the motive of emotional regulation. Previous research has already shown that writing skills in general and writing motivational aspects in particular tend to be associated with themselves between grades (Abbott et al., 2010; Rasteiro & Limpo, 2022), unless there is a large evolution that alters the pattern of individual differences (see Selig & Little, 2012). This may be the case of self-efficacy for ideation. The great focus of

Portuguese curriculum on planning strategies targeting ideation skills (General Direction for Education, 2018) may have helped all writers to feel more confident about these competences, reducing individual differences. It is however premature to advance the same explanation for the lack of association between writing to regulate emotions in Grades 4 and 5, since the use of writing as an emotional regulation strategy is not

Table 3
Grade 4 Synchronous Coefficients from the Cross-Lagged Panel Analysis.

Synchronous correlations in Grade 4	β	SE	p
Attitudes ↔ SE Conventions	0.34	0.06	< 0.001
Attitudes ↔ SE Ideation	0.24	0.06	< 0.001
Attitudes ↔ SE Self-regulation	0.49	0.05	< 0.001
Attitudes ↔ Curiosity	0.61	0.05	< 0.001
Attitudes ↔ Emotional regulation	0.65	0.04	< 0.001
Attitudes ↔ Relief from boredom	0.61	0.05	< 0.001
Attitudes ↔ Grades	0.50	0.06	< 0.001
Attitudes ↔ Competition	0.23	0.06	< 0.001
Attitudes ↔ Writing quality	0.17	0.06	0.01
SE Conventions ↔ SE Ideation	0.78	0.03	< 0.001
SE Conventions ↔ SE Self-regulation	0.88	0.03	< 0.001
SE Conventions ↔ Curiosity	0.42	0.06	< 0.001
SE Conventions ↔ Emotional regulation	0.20	0.06	0.001
SE Conventions ↔ Relief from boredom	0.18	0.06	0.01
SE Conventions ↔ Grades	0.50	0.05	< 0.001
SE Conventions ↔ Competition	0.32	0.06	< 0.001
SE Conventions ↔ Writing quality	−0.07	0.05	0.18
SE Ideation ↔ SE Self-regulation	0.85	0.03	< 0.001
SE Ideation ↔ Curiosity	0.44	0.05	< 0.001
SE Ideation ↔ Emotional regulation	0.17	0.06	0.004
SE Ideation ↔ Relief from boredom	0.18	0.06	0.003
SE Ideation ↔ Grades	0.39	0.06	< 0.001
SE Ideation ↔ Competition	0.25	0.06	< 0.001
SE Self-regulation ↔ Curiosity	0.51	0.05	< 0.001
SE Self-regulation ↔ Emotional regulation	0.35	0.06	< 0.001
SE Self-regulation ↔ Relief from boredom	0.36	0.06	< 0.001
SE Self-regulation ↔ Grades	0.45	0.06	< 0.001
SE Self-regulation ↔ Competition	0.29	0.06	< 0.001
Curiosity ↔ Emotional regulation	0.63	0.05	< 0.001
Curiosity ↔ Relief from boredom	0.62	0.05	< 0.001
Curiosity ↔ Grades	0.59	0.05	< 0.001
Curiosity ↔ Competition	0.34	0.06	< 0.001
Curiosity ↔ Writing quality	0.11	0.06	0.08
Emotional regulation ↔ Relief from boredom	0.92	0.03	< 0.001
Emotional regulation ↔ Grades	0.46	0.06	< 0.001
Emotional regulation ↔ Competition	0.32	0.06	< 0.001
Emotional regulation ↔ Writing quality	0.19	0.07	0.003
Relief from boredom ↔ Grades	0.45	0.06	< 0.001
Relief from boredom ↔ Competition	0.38	0.06	< 0.001
Relief from boredom ↔ Writing quality	0.12	0.07	0.08
Grades ↔ Competition	0.57	0.05	< 0.001
Grades ↔ Writing quality	−0.10	0.07	0.13
Competition ↔ Writing quality	−0.23	0.07	< 0.001

Table 4
Grade 5 synchronous coefficients from the cross-lagged panel analysis.

Synchronous correlations in Grade 5	β	SE	p
Attitudes ↔ SE Conventions	0.32	0.07	< 0.001
Attitudes ↔ SE Ideation	0.35	0.07	< 0.001
Attitudes ↔ SE Self-regulation	0.54	0.06	< 0.001
Attitudes ↔ Curiosity	0.61	0.05	< 0.001
Attitudes ↔ Emotional regulation	0.56	0.05	< 0.001
Attitudes ↔ Relief from boredom	0.57	0.05	< 0.001
Attitudes ↔ Grades	0.53	0.06	< 0.001
Attitudes ↔ Competition	0.34	0.06	< 0.001
Attitudes ↔ Writing quality	0.46	0.07	< 0.001
SE Conventions ↔ SE Ideation	0.79	0.05	< 0.001
SE Conventions ↔ SE Self-regulation	0.79	0.06	< 0.001
SE Conventions ↔ Curiosity	0.28	0.07	< 0.001
SE Conventions ↔ Emotional regulation	0.15	0.07	0.03
SE Conventions ↔ Relief from boredom	0.24	0.08	0.001
SE Conventions ↔ Grades	0.22	0.07	0.002
SE Conventions ↔ Competition	0.19	0.07	0.01
SE Conventions ↔ Writing quality	0.43	0.07	< 0.001
SE Ideation ↔ SE Self-regulation	0.90	0.05	< 0.001
SE Ideation ↔ Curiosity	0.34	0.07	< 0.001
SE Ideation ↔ Emotional regulation	0.22	0.07	0.001
SE Ideation ↔ Relief from boredom	0.28	0.07	< 0.001
SE Ideation ↔ Grades	0.28	0.07	< 0.001
SE Ideation ↔ Competition	0.15	0.07	0.03
SE Ideation ↔ Writing quality	0.40	0.07	< 0.001
SE Self-regulation ↔ Curiosity	0.43	0.08	< 0.001
SE Self-regulation ↔ Emotional regulation	0.33	0.07	< 0.001
SE Self-regulation ↔ Relief from boredom	0.41	0.07	< 0.001
SE Self-regulation ↔ Grades	0.29	0.07	< 0.001
SE Self-regulation ↔ Competition	0.25	0.07	0.001
SE Self-regulation ↔ Writing quality	0.57	0.07	< 0.001
Curiosity ↔ Emotional regulation	0.73	0.04	< 0.001
Curiosity ↔ Relief from boredom	0.70	0.05	< 0.001
Curiosity ↔ Grades	0.61	0.07	< 0.001
Curiosity ↔ Competition	0.36	0.07	< 0.001
Curiosity ↔ Writing quality	0.41	0.08	< 0.001
Emotional regulation ↔ Relief from boredom	0.89	0.03	< 0.001
Emotional regulation ↔ Grades	0.35	0.06	< 0.001
Emotional regulation ↔ Competition	0.33	0.06	< 0.001
Emotional regulation ↔ Writing quality	0.20	0.08	0.01
Relief from boredom ↔ Grades	0.45	0.06	< 0.001
Relief from boredom ↔ Competition	0.30	0.07	< 0.001
Relief from boredom ↔ Writing quality	0.23	0.08	0.004
Grades ↔ Competition	0.53	0.06	< 0.001
Grades ↔ Writing quality	0.19	0.08	0.01
Competition ↔ Writing quality	−0.07	0.08	0.39

a curricular content (General Direction for Education, 2018). The lack of an autoregressive path may be due to other factors, such as characteristics of our sample or instruction specificities. Uncovering these factors may require the exploration of writing as an emotion regulation strategy in children. For example, this can be done in the scope of expressive writing, which refers to the translation of feelings and emotions into words, without grammatic, punctuation, or orthography concerns (Maroney, 2020).

Regarding the cross-lagged paths, three results are worth discussing. First, writing attitudes in Grade 4 were a longitudinal predictor of all Grade 5 intrinsic motives to write (viz., curiosity, emotional regulation, and relief from boredom) as well as self-efficacy for writing self-regulation. Intrinsically motivated activities are those that individuals perform naturally and spontaneously because they experience positive feelings doing them (Deci & Ryan, 2000; Deci & Ryan, 2008). It is thus not surprising that writing for intrinsic reasons, such as to know more about interesting topics, to feel better, or to occupy free time, depends on the extent to which students had positive writing-related experiences in the past.

The longitudinal link between writing attitudes and self-efficacy was less clear, with Grade 4 attitudes predicting better Grade 5 self-efficacy for self-regulation but neither for ideation nor conventions. This finding suggests that the perceived competence for writing ideation and conventions may be less susceptible to emotional fluctuations than that for self-regulation. Self-regulated writing is a skill that accounts for the

management of several behaviors, including getting started, avoiding distractions, and evaluating progress (Bruning et al., 2013). In other fields, it was shown that positive affect boosts self-regulated behaviors by inhibiting distractions as well as by improving willingness to follow goals, persistence during challenges, and exertion of volition (Tice et al., 2007; Wenzel et al, 2014). Given that self-efficacy tends to work in tandem with real competence (Bandura, 2006), it seems likely that positive attitudes toward writing might be associated not only with writing self-regulation skills, but also with the respective self-efficacy beliefs.

A second finding was that self-efficacy for self-regulation in Grade 4 was a significant predictor of writing to achieve better grades in Grade 5. This finding may be explained by an enhanced knowledge about the role of writing for school success, which may emerge from a greater confidence in managing the writing process. Considering that (a) self-efficacy for writing self-regulation tends to be associated with real self-regulation skills (Bandura, 2006; Galbraith, 2014), and (b) more self-regulated students may have more knowledge about writing, including its role in understanding school contents (Harris et al., 2013; Harris et al., 2019), it seems plausible that students with higher self-efficacy for self-regulation may therefore be more likely to use writing as a means to succeed in school.

A third finding was that writing to relieve boredom in Grade 4

contributed to writing for two other intrinsic motives in Grade 5 (viz., curiosity and emotional regulation). The association between different intrinsic motives within and between grades was already captured by bivariate correlations presented in Portuguese studies (Rasteiro & Limpo, 2022; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). Yet, the observed longitudinal paths from boredom relief to curiosity and emotional regulation contrast with findings of two cross-sectional Chinese studies (Ng et al., 2021a; 2021b). In Grades 4–5, authors found the following chain of paths: curiosity → involvement → emotional regulation → boredom relief. Despite the inconsistencies concerning the direction of these paths, available data suggest that intrinsic incentives for writing feed off each other. The question still to be answered is what intrinsic motives are at the root of the others. In opposition to the cross-sectional findings of Ng et al. (2021a; 2021b), our longitudinal findings indicate that writing to relieve boredom may predict writing to know more about a composition topic and to overcome negative emotions, and not the reverse. This being true, enhancing students' intrinsic motivation to write should start not only by promoting a positive attitude toward writing, but also by incentivizing them to write in their free time.

Together, the synchronous correlations as well as the autoregressive and cross-lagged paths between different motivational beliefs extend current knowledge, including the WWC model (S. Graham, 2018). As shown here, the Grade 5 beliefs that depended more on Grade 4 beliefs were writing attitudes, self-efficacy for different writing dimensions (in particular, self-efficacy for conventions) as well as the motives of curiosity and boredom relief ($0.27 < R^2 < 0.37$). More important, writing attitudes play a key role predicting self-efficacy for writing self-regulation and intrinsic motivation to write. This information seems useful for developing interventions to increase writing motivation, which are especially relevant due to the observed associations between motivational beliefs and writing quality.

4.1.1. Links between writing motivational beliefs and writing quality

In line with past findings from Grades 1–6 (S. Graham et al., 2007; S. Graham et al., 2018; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019), we found cross-sectional, but not longitudinal, associations between writing enjoyment and opinion essay quality. However, it is worth mentioning that among older students in Grades 6–7, not even concurrent links were found (Rasteiro & Limpo, 2022). It seems that attitudes toward writing may be a more prominent factor in elementary school, which is a well-stablished result in the reading domain (for a *meta*-analysis, see Petscher, 2010). However, more research is needed to understand if the distinct role played by attitudes from elementary to middle school is replicated in the writing domain.

The results concerning the associations between writing self-efficacy domains and opinion essay quality perpetuate the mixed findings in the field (cf. Zumbrunn et al., 2020). Whereas in Grade 4 there was no association between any self-efficacy domain and opinion essay quality, in Grade 5 all self-efficacy domains were associated with opinion essay quality. These findings are not consistent with past studies in elementary school, which showed that writing quality was either predicted by self-efficacy for writing ideation (De Smedt et al., 2016) or by no self-efficacy domain at all (De Smedt et al., 2017). New to the field is that, in our study, we found evidence for a longitudinal path from self-efficacy for conventions in Grade 4 to opinion quality in Grade 5. A similar path did not emerge in Grades 6–7 (Rasteiro & Limpo, 2022), which (again) highlights the relevance of motivation in elementary school. Interestingly, although self-efficacy for writing conventions was not relevant to students' performance in the current Grade, it seemed useful at the long-term. More studies examining self-efficacy for writing domains across schooling are needed to stimulate meta-analyses exploring self-efficacy's short and long-term contributions to writing performance.

Concerning motives to write, Grade 4 essay quality was positively associated with writing to regulate emotions and negatively associated with writing for competing with classmates. In Grade 5, all motives to write positively predicted essays quality, except the only controlled

extrinsic motive of competition. This is in line with previous findings showing that autonomous motives, such as curiosity and grades, in opposition to controlled motives, such as competition and social recognition, are associated with better writing outcomes (De Smedt et al., 2017; De Smedt et al., 2016; Limpo et al., 2020; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). It seems that Grade 5 opinion essay quality was positively related to several autonomous writing incentives besides emotional regulation, contrary to what happened one year before. In addition, despite not favouring opinion essay quality in any grade, competition motives were harmful only in Grade 4. This pattern of results reproduces previous findings in two ways. On the one hand, it has been showed that text quality benefits from autonomous motives to write (De Smedt et al., 2016; De Smedt et al., 2017; Limpo et al., 2020; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). On the other hand, writing for competition was related to weaker opinion texts in Portuguese elementary but not middle graders (Limpo et al., 2020; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019). This evidence suggests a positive trend concerning students' motives to write in the transition from elementary to middle school. In middle grades, opinion essay quality seems associated with a wider range of autonomous motives and less susceptible to the detrimental relationship with controlled motives.

Notwithstanding, it is worth noting that the associations between incentives for writing and opinion essay quality emerged only when assessed in the same grade, as already reported by Rasteiro and Limpo (2022) in older students. These results suggest that motives to write are concurrently, but not longitudinally, linked to opinion essay quality. The practical implication of this finding is twofold. First, researchers should abstain from implying causality from correlational data. Second, teachers should promote students' autonomous motivation to write in each Grade, independently of the most and least preferred reasons to write in previous Grades. To do so, teachers may devote efforts to satisfy students' basic psychological needs for autonomy, perceived competence, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2017). Strategies to do this in everyday classes may include, respectively, being responsive to students' interests when proposing writing topings and tasks; support them with writing strategies while providing informative feedback and effort praise; and asking for writing tasks in which students may help each other (Assor & Kaplan, 2001; Cecchini et al., 2019; Gnambs & Hanfstingl, 2016; Ryan & Deci, 2017).

A final note concerning the links to writing quality is that, despite the significant associations above discussed, the set of Grade 4 variables (including motivational beliefs and opinion essay quality) explained only a moderate part of variance in Grade 5 opinion essay quality. This moderate contribution may be explained in two ways. On the one hand, motivational beliefs are one but not the unique relevant component of writing. As well described in the WWC model, writing depends on other factors (not here assessed), such as objective knowledge, production processes, control mechanisms, and writing community (S. Graham, 2018). On the other hand, according to the Portuguese curriculum, from the first to the second moments of data collection, students received argumentative writing instruction on how to use planning and revising strategies as well as coherent arguments and appropriate conclusions (General Direction for Education, 2018). This knowledge may have increased students' opinion essay quality in Grade 5, independently of their motivation.

4.2. Limitations and future directions

Findings of the current study should be interpreted in view of at least six limitations that might provide avenues for future research. First, writing motivational beliefs were assessed using non-genre-specific questionnaires, designed to assess motivation across different texts genres. However, it might be the case that attitudes, self-efficacy, and motives to write differ depending on the text genre (McGeown et al., 2020; Tate & Warschauer, 2018). We recommend that future studies evaluate participants' motivational beliefs with questionnaires specific

to the text genre being targeted.

Second, we used a 5-factor model to assess motives to write. In addition to not including the involvement factor, shown problematic in previous research (Rasteiro & Limpo, 2022; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019; Schiefele, Schaffner, Möller, & Wigfield, 2012), we removed the social recognition factor, which lacked invariance across Grades 4–5. In the future, it would be relevant to examine this latter dimension, as it represents the most controlled reason to write and was the only negative predictor of writing quality in the study by Rocha, Filipe, Magalhães, Graham, & Limpo, 2019.

Third, this work approached grades as an autonomous extrinsic motive. This was done because, first, most items of this factor refer to write to achieve something personally valued rather than externally delivered; second, research showed that the motive of grades relates positively to writing performance, similarly to autonomous motives (Camping et al., 2020; Wijsman et al., 2018; Limpo et al., 2020; Liu et al., 2020). Nevertheless, it should be noted that other works (e.g., Schiefele et al., 2012) have defined grades as a controlled extrinsic motive, mainly when it captures the intention of writing to achieve better grades. Future studies should aim at better understanding the autonomous vs. controlled role of grades as a motive to write.

Fourth, students' writing quality was evaluated only via 10-minute opinion essays, which are not only among the most demanding text genres but also frequently targeted in final Portuguese exams (General Direction for Education, 2018). Nonetheless, due to their specific demands (Beauvais et al., 2011; Berman & Nir-Savig, 2007), different text genres may be distinctly associated with writing motivation, which limits the generalization of our findings. Moreover, despite the 10-minute duration followed that of most standardized essay tests (Lovett et al., 2010), it may have prevented students from engaging in all writing processes (viz., planning, writing, revising, and rewriting), thus providing less-than-optimal writing samples (Ahmad et al., 2021; Lee et al., 2021). It should however be noted that while some authors showed that additional time may help ideas brainstorming and organization (Lee et al., 2021), others argued that, due to cost-benefit estimates, extra time may not reflect in writing quality. More studies are warranted to test the likely moderating role of text genre on the motivation-writing and unravel the optimal writing time for each genre.

Fifth, we targeted the transition from Grades 4 to 5 because it corresponds to the Portuguese challenging transition between elementary and middle school, characterized by several academic, contextual, and personal changes (Choi, 2012; Coelho & Romão, 2017; Iver & Epstein, 1991). However, the links found here may not be replicated in other school transitions. Longitudinal studies targeting transitions between other education cycles (e.g., from basic to secondary education) as well as between Grades within the same education cycle (e.g., from Grade 3 to 4) would help to understand the most prominent aspects of writing motivation throughout schooling.

Finally, we were not able to collect information about participants' immigration background or about the involved schools (e.g., socioeconomic context, school climate, safety, or teaching–learning practices). Future studies should gather further information on students and schools' characteristics given past evidence showing their associations with academic motivation and performance (Camping et al., 2020; Garrett et al., 2019; Stack & Dever, 2021).

4.3. Practical implications

This study joins an increasing body of research arguing that motivational beliefs should not be overlooked in the teaching of writing. The longitudinal link between writing motivation and text quality indicated that, at the end of elementary school, teachers should focus on developing students' confidence to transcribe ideas into words following written language norms. Because self-efficacy goes hand-in-hand with real competence (Bandura, 2006), teachers should devote more time to writing conventions, including spelling, punctuation, and sentence's

structure (see S. Graham et al., 2015; Graham et al., 2022; Koster et al., 2015 for meta-analyses of evidence-based writing practices on strategy instruction). This enhancement of conventions skills should be attended by optimal challenges, scaffolded teaching, informative feedback, and effort praise, which may allow students to feel competent and successful during this acquisition process (Cecchini et al., 2019; Ryan & Deci, 2017).

The present study also expands the field by providing teachers with clues about where to start when aiming to nurture students' positive beliefs about writing. Results concerning the longitudinal links between motivational beliefs showed that Grade 4 seems an important period to promote students' positive writing attitudes. This would be relevant given current and past findings showing that positive writing attitudes are not only related to better writing performance but also to enhanced self-efficacy and intrinsic motivation, which are key ingredients of good writing (S. Graham et al., 2017; 2019; De Smedt et al., 2017; Rocha, Filipe, Magalhães, Graham, & Limpo, 2019).

To create more enjoyable experiences for writers and, hence, positive writing attitudes, teachers should be enthusiastic about writing, so that their positive feelings toward this skill can be transferred to students (S. Graham & Perin, 2007; S. Graham et al., 2022; Zumbrunn et al., 2019). Moreover, teachers might want to nurture warmth and positive class climates in which students collaborate with peers, seek help, and receive individual feedback (Gnambs & Hanfstingl, 2016; Zumbrunn et al., 2019). Furthermore, writers may be given autonomy to pick a text gender or topic as well as to be creative and write expressively. The alignment between preferences and tasks seems an important factor for positive writing experiences (Zumbrunn et al., 2019; Reeve & Jang, 2006; Ryan & Deci, 2000). Finally, teachers and school psychologists may provide students with relaxing strategies. For example, they can use guided meditations to increase writing enjoyment by enhancing children's calmness and decreasing their frustration (Zumbruun et al., 2019; Magalhães et al., 2022).

5. Conclusions

This is the first study revealing longitudinal associations between different writing motivational beliefs as well as between them and writing quality, which contributes to a more complete picture of writing motivation. We hope these findings will stimulate researchers to adopt longitudinal designs when studying the development of writing motivation and its links to writing performance. Furthermore, we encourage teachers to afford the opportunity of creating increasingly better writers by applying effective instructional strategies to promote positive motivational beliefs in elementary school.

Funding

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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