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**The Contribution of Mindfulness Skills to Writing Achievement in Sixth Graders**

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## PREPRINT OF

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**Abstract**

Writing is a highly complex and demanding task, that requires the activation and coordination of several processes. In addition to the extensive research on the domain-specific factors that contribute to school achievement, there has been an increasing interest on general variables, such as mindfulness. This study aimed to test the contribution of middle-grade students' mindfulness skills to writing achievement, after controlling for well-known writing predictors. Participants were one hundred and eighty-seven Portuguese-native speakers in Grade 6 ( $M = 11.66$  years). They were assessed on transcription, text quality, executive functions, and self-reported mindfulness skills. A multiple hierarchical regression analysis was conducted. After controlling for demographic characteristics (Step 1), transcription skills (Step 2), executive functions (Step 3), we examined the effects of mindful acceptance (Step 4) to writing achievement. Findings indicated that mindful acceptance had a significant and unique contribution to writing achievement in Grade 6 ( $b = .18$ ). These are pioneering findings about the contribution of mindfulness to writing. The putative mechanism underlying the link between higher mindful acceptance and better texts is discussed, and indications for future research are proposed.

*Keywords:* mindfulness; mindful acceptance; writing achievement; transcription; executive functions.

### **The Contribution of Mindfulness Skills to Writing Achievement in Sixth Graders**

It is well established that writing is a complex and high-demanding task, requiring the activation and coordination of many processes. This is particularly evident in young writers, who are struggling to master those processes. In addition to the extensive research on the domain-specific factors that contribute to school achievement, there has been an increasing interest on general variables, such as mindfulness (Schonert-Reichl & Roeser, 2016). Here, we examined the relationship between mindfulness and writing achievement in Grade 6.

### **Cognitive Processes Involved in Writing**

Recently, the Writer(s)-Within-Community model (WWC; Graham, 2018) was proposed to explain the processes involved in writing. According to WWC, writing is shaped and constrained by the community where it takes place as well as by writers' long-term resources (knowledge and beliefs), control mechanisms (attention, working memory, and executive control), production processes (conceptualization, ideation, translation, transcription, and reconceptualization), and modulators (emotions, personality traits, and physical states). Among these processes, transcription and executive functions are particularly relevant in children's writing. Transcription is the externalization of language in the form of written text, which involves the retrieval, assembling, and selection of orthographic symbols (i.e., spelling); and the execution of motor movements required by a particular writing tool to produce those symbols (i.e., handwriting/typing; Abbott & Berninger, 1993). Handwriting and spelling have been found to be related with writing performance in primary and middle grades (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Limpo & Alves, 2013; Olive, Favart, Beauvais, & Beauvais, 2009). Recent evidence suggests that, even in middle-grade students (12-15 years), transcription skills seem to constrain text quality indirectly, by

influencing high-level production processes, such as ideation or translation (Limpo, Alves, & Connelly, 2017).

Executive functions involve top-down mental processes that coordinate cognitive, behavioral, and emotional functions, thereby enabling individuals to successfully engage in purposeful and self-directed behavior (Lezak, Howieson, Biegler, & Tranel, 2012). Three core executive functions are (Diamond, 2013): inhibitory control including selective attention (control of behavior, thoughts and emotions while ignoring irrelevant stimuli); working memory (holding and manipulation of information in mind); and cognitive flexibility (adjustment of perspectives to new requirements). These functions set the basis for other higher-order functions (Diamond, 2013; Lunt et al., 2012): reasoning (inference of patterns or relations among items) and planning (implementation and monitoring of strategies to achieve goals). Executive functions are fundamental for good writing. Prior studies showed that inhibition, working memory, and flexibility, as well as planning, were related to children's writing performance (Altemeier, Abbott, & Berninger; 2008; Cordeiro, Limpo, Olive, & Castro, 2019; Drijbooms, Groen, & Verhoeven, 2015, 2017).

Transcription skills and executive functions are important for younger writers' performance. However, these two sets of variables do not fully explain the different performances of beginning and developing writers (e.g., Cordeiro et al., 2019). Based on work showing that mindfulness skills are related to academic achievement (Schonert-Reichl & Roeser, 2016), we propose that mindfulness may also play a role in children's writing, above and beyond transcription and executive functions.

### **Mindfulness and Academic Achievement**

Mindfulness skills allow individuals to focus on the present moment with a nonjudgmental attitude and to accept the experience they are currently living (Bishop et

al., 2004; Hooker & Fodor, 2008; Kabat-Zinn, 2003). Though the link between mindfulness and writing has never been tested, there is accumulating evidence showing that children's mindfulness skills are associated with academic achievement (Maynard, Solis, Miller, & Brendel, 2017; Schonert-Reichl & Roeser, 2016; Shapiro et al., 2015). In a study with 2,000 students in Grades 5-8, self-reported mindfulness skills predicted performance in grade point average and standardized tests of mathematics and literacy (Caballero et al., 2019). Complementing these correlational findings, experimental research showed that mindfulness training improved science and reading scores in Grade 3 (Bakosh, Snow, Tobias, Houlihan, & Barbosa-Leiker, 2015) and math scores in Grades 4-5 (Schonert-Reichl et al., 2015).

It has been proposed that mindfulness skills are related to academic achievement because of the association of those skills with school-relevant abilities, such as executive functions (Hooker & Fodor, 2008; Napoli, Krech, & Holley, 2005; Raffone & Srinivasan, 2016; Takacs & Kassai, 2019). Additionally, mindfulness skills seem to help on the management of distress and anxiety that can interfere with students' ability to respond to academic tasks and achieve goals (Beauchemin, Hutchins, & Patterson, 2008; Semple, Lee, Rosa, & Miller, 2010). As suggested by Zelazo and Lyons (2012), mindfulness-based exercises are designed to address top-down (e.g., improving sustained attention and information manipulation) and bottom-up (e.g., reducing anxiety and ruminative thoughts) factors, which underlying school success.

The WWC model (Graham, 2018) acknowledged the role of these factors in writing. Executive functions are seen as important control mechanisms during text production, and emotions, such as anxiety, are assumed to interfere with the allocation of effort and cognitive resources to the task (Graham, 2018). In spite of that, the WWC did not explicitly recognize the putative contribution of mindfulness-related skills.

These skills seem important to produce good texts, by allowing writers to focus on the writing task, ignore distractors (e.g., anxiety-related thoughts and feelings), accept their mind can wander, and bring their mind back to the task.

### **Present Study**

This research aimed to test the unique contribution of mindfulness skills to writing achievement in Grade 6. Findings may contribute to refine current models of writing, by identifying the role of mindfulness skills, after controlling for a set of well-known writing predictors, namely, demographics, transcription, and executive functions. Demographic variables, such as gender as well as socioeconomic status, represent a source of differences in writing performance. Male students (Cordeiro, Castro, & Limpo, 2018; Midgette, Haria, & MacArthur, 2008) and students from low socioeconomic status (Kim, Al Otaiba, & Wanzek, 2015; Mo & Troia, 2017) seem to be at a great disadvantage. Moreover, as surveyed above, it is well-established that transcription (e.g., Limpo & Alves, 2013) and executive functions (e.g., Drijbooms et al., 2017) have a significant contribution to writing performance in primary and middle grades. Thus, we expected that demographics, transcription, and executive functions would predict writing performance. Additionally, we anticipated that mindfulness skills would explain additional variance in writing performance. Despite being the first study testing this mindfulness-writing link, this hypothesis relies on past findings suggesting that mindfulness is positively associated with achievement in literacy-related domains (Maynard et al., 2017), and that writing requires the control and management of cognitive and emotional processes (Graham, 2018), which are key mindfulness components.

## **Method**

### **Participants and Setting**

Participants were 187 typically developing Portuguese-native speakers in Grade 6 ( $M = 11.66$  years,  $SD = 0.44$ ; 104 girls) from 10 classes in two different schools. The educational level of students' mothers, which was used as a proxy to students' socioeconomic level, was assessed in five ordered levels, corresponding to the completion of Grade 4 (level 1), Grade 9 (level 2), high-school (level 3), college (level 4), and any post-graduation course (level 5). The distribution of the educational level of students' mothers was as follows: 4% for level 1, 39% for level 2, 25% for level 3, 25% for level 4, and 7% for level 5 (information provided by the School). The study was approved by the Ethics Committee of the authors' University.

### **Executive Function Measures**

**Reasoning.** We used the Raven's colored progressive matrices (Raven, Raven, & Court, 2004; Simões, 2000), which is a test that includes three sets of 12 items. In each item, children were asked to identify the missing element of a pattern among six options. The final score was the sum of correct answers. Higher scores indicate better reasoning. This task has a good internal consistency ( $.65 < \alpha < .88$ ; Simões, 2000).

**Attention.** We used the Cancellation task from the Coimbra Neuropsychological Assessment Battery (BANC), which lasts for 10 min (Simões et al., 2016). Children were given a sheet with squares organized in lines and were asked to cross out the squares that matched a previously presented model. The final score resulted from a formula that considers the squares correctly crossed, omitted, and incorrectly crossed. Higher scores indicate greater attention. This task has good stability coefficient measured through test-retest ( $r = .61$ ) and acceptable validity evidence ( $.24 < r < .58$ ; Simões et al., 2016).

**Working memory.** We assessed verbal and non-verbal working memory through the Backward-digit span task from the Wechsler Intelligence Scale for

Children-III (Simões, Rocha, & Ferreira, 2003) and the Corsi blocks from the BANC (Simões et al., 2016), respectively. In these tasks, children were asked to recall sequences of numbers or blocks with increasing length in backward order. The final scores were the number of sequences correctly recalled. Higher scores indicate higher working memory. The Backward-digit span task has a good stability coefficient ( $r = .80$ ; Simões et al., 2003) and the Corsi blocks also has good of stability coefficient through test-retest ( $r = .61$ ) and validity ( $.38 < r < .64$ ; Simões et al., 2016).

**Inhibitory control.** We used the inhibition score of the Inhibition subtest of the NEPSY-II, A Development Neuropsychological Assessment (Korkman, Kirk, & Kemp, 2007). Participants were given a sheet depicting black and white shapes (Part I) or arrows (Part II) and were asked to say the opposite form (i.e., saying square when circle and vice-versa) or arrow direction (i.e., saying up when pointing down and vice-versa). The final score is the total time of completion (max. 240 s), with shorter times indicating higher inhibition. This task has good test-retest reliability ( $r = .81$ , Brooks et al., 2009) and excellent internal consistency ( $\alpha = .92$ ; Korkman et al., 2007).

**Cognitive flexibility.** We used the flexibility score of the Inhibition subtest of the NEPSY-II (Korkman et al., 2007). Despite being provided with the same sheet of black/white shapes/arrows described above, in this task, children were asked to consider the color of the shape or arrow. They had to say the correct shape or arrow direction if it was colored black, or to say the opposite shape or arrow direction if it was colored white. The final score is the total time of completion (max. 240 s), with shorter times indicating higher flexibility. This task has good test-retest reliability ( $r = .82$ , Brooks et al., 2009) and excellent internal consistency ( $\alpha = .99$ ; Korkman et al., 2007).

**Planning.** We used the Tower task from the BANC (Simões et al., 2016), which includes a tray with three pins with different heights and three colorful balls. Children

were asked to copy increasingly complex models presented on cards. The final score was the number of models correctly completed at the first trial. Higher scores are indicative of better planning. This task has a moderate stability coefficient assessed through test-retest ( $r = .33$ ; Simões et al., 2016).

### **Writing Measures**

**Handwriting fluency.** Children were asked to copy a sentence with all letters of the alphabet during 90 s, as quickly and legibly as possible. The final score was the number of words copied. A second judge rescored 40% of the materials and inter-rater reliability, measured with the intraclass correlation coefficient (ICC) for single measures, was high (.98).

**Spelling.** Children performed a dictation task composed of 16 words that represent some of the complexities of the Portuguese spelling system (e.g., stress marks, silent letters, consonantal clusters, inconsistencies; Magalhães et al., 2020). The final score was the number of misspelled words. A second judge rescored 40% of the task and inter-rater reliability was high (ICC = .99).

**Writing achievement.** Two pairs of research assistants, blind to study purposes, assessed the quality of children's opinion essays with a holistic scale based on Cooper (1997). All judges were asked to evaluate each text with a single score ranging from 1 (*low quality*) to 7 (*high quality*). This score should consider to the same extent the following factors: creativity, coherence, syntax, and vocabulary. To avoid transcription biases on quality assessments, all texts were typed and corrected for misspellings (Berninger & Swanson, 1994). The validity of this procedure to assess text quality across different genres and grade levels is well documented (e.g., Harris, Graham, & Mason, 2006; Limpo & Alves, 2018). The inter-judge agreement was high, as indicated by the ICC for average measures: .91 for Text 1 and .92 Text 2. The final score for both

texts was the average across judges. In order to maximize the reliability of the writing achievement measure, we considered the average across both texts.

### **Mindfulness Questionnaire**

To assess students' mindfulness skills, we used the Child and Adolescent Mindfulness Measure – CAMM (Greco, Baer, & Smith, 2011), validated to Portuguese by Cunha, Galhardo, and Pinto-Gouveia (2013). Both versions of CAAM have adequate indexes of validity and reliability ( $\alpha = .81$  for original version, and  $\alpha = .80$  for the Portuguese version). This instrument is composed of 10 items that load on a single factor, even though it includes items related to the two main mindfulness components, namely, awareness (e.g., *At school, I walk from class to class without noticing what I'm doing*) and acceptance (e.g., *I tell myself that I shouldn't feel the way I'm feeling*). Because the Portuguese version was validated with adolescents with an average age of 15 years, we conducted a preliminary study to check the validity and reliability of the scale to 11-12-year-olds, including the adequacy of its factorial structure.

**CAMM validity and reliability – preliminary study.** In this study participated 140 sixth graders not involved in the main study (age 11-12), who were asked to fill in the 10-item CAMM. To determine the factor structure of the scale, we conducted an Exploratory Factor Analysis (EFA) with Varimax rotation, and the following stringent criteria were used to remove items based on each EFA results: (a) communalities below .45, (b) cross-loadings above .40, and (c) factors with less than three items (based on Brown, 2006; Tabachnick & Fidell, 2007). The first EFA ( $KMO = .80$ ; Bartlett's Test of Sphericity,  $p < .001$ ), which revealed a three-factor structure explaining 61% of the variance, showed that all communalities were above .45. However, item 7 loaded on two factors with loadings of .52 and .45, and item 5 and item 10 formed a single factor. Based on the previously defined criteria, these items were removed. The remaining

seven items were subject to a second EFA that showed communalities above .48. The analysis revealed two factors explaining 60% of the total variance. One factor included items 1, 4, 8 and 9 with factor loadings of .80, .71, .73, and .77, respectively; the other factor included items 2, 3, and 6 with factor loadings of .82, .66 and .67, respectively. After an examination of items content, the first factor was labeled “mindful acceptance” and the second factor was labeled “awareness” (cf. Bishop et al., 2004). Internal consistency, measured with the ordinal omega, was acceptable for both factors ( $\omega = .83$  for mindful acceptance, and  $\omega = .66$  for awareness). This 7-item scale was used in the main study.

**CAMM validity and reliability – main study.** The 7-item scale was administered to the participants of the main study ( $N = 187$ ). Confirmatory factor analyses (CFA) were conducted to examine the 2-factor structure of the instrument. Latent variables were scaled by imposing unit of loading identification constraints. Specifically, the variance of both latent factors was constrained to equal 1.0. To evaluate model fit we used the chi-square statistic ( $\chi^2$ ), the confirmatory fit index (CFI), and the root-mean-square error of approximation (RMSEA). CFI values  $> .95$  and RMSEA values  $< .06$  are considered good fits (Hu & Bentler, 1999). Results revealed a very good model fit,  $\chi^2(13, N = 187) = 6.65, p = .96, CFI = 1.00, RMSEA = 0, P(\text{rmsea} \leq .05) = .99$ , with factor loadings ranging from .69 to .80 in the mindful acceptance factor, and from .41 and .46 in the awareness factor (all  $ps < .001$ ). An examination of the ordinal omega for both factors showed a very good internal consistence for acceptance ( $\omega = .86$ ), but an unacceptable result for awareness ( $\omega = .46$ ). We therefore decided to remove the awareness factor and conduct a new CFA with the acceptance factor only. We found an excellent model fit,  $\chi^2(2, N = 187) = 2.33, p = .31, CFI = .99$ ,

RMSEA = .03,  $P(\text{rmsea} \leq .05) = .46$ , with good factor loadings ( $> .68$ ). Given these results, only the 4-item mindful acceptance factor was used in the subsequent analyses.

### **Procedure**

During the second term of the Portuguese academic year (January-February), all students were evaluated in two 40-min individual testing sessions plus two 25-min group testing sessions. The individual sessions were conducted in a quiet room by highly trained research assistants with a graduate degree in Psychology. Students performed the Raven's Colored Progressive Matrices, Backward-digit span task, Corsi blocks, and Inhibition tasks in one session; and the Tower and Canceling tasks in another session. Sessions order was counterbalanced.

The group sessions were conducted with the whole classroom (ca. 20 students) by the same research assistants. At the beginning of each session, students were asked to write by hand an opinion essay for 10 min. Opinion essays were chosen because, though sixth graders are expected to defend a reasoned opinion and to know how to share it in writing (Direção Geral da Educação, 2018), it is still a demanding task that may call for several key writing processes (Berman & Nir-Sagly, 2007). The prompts were “*Do you think teachers should give students homework every day?*” (Session 1) and “*Do you think it is good to have many brothers/sisters?*” (Session 2). Both prompts were judged by middle-grade teachers as appropriate to students' age. After writing the text, students did the copy task in Session 1 and filled in the CAMM in Session 2. Other questionnaires were administered at the end of both sessions. However, these are not relevant for the present study, and thus not further considered.

### **Results**

Table 1 presents the descriptive statistics for all variables along with the zero-order correlations between them. Concerning transcription variables, students copied an

average of 32 words in 90 s and produced an average of 5 errors out of 16 (34% of misspelled words). As expected, handwriting and spelling were moderately correlated with each other ( $r = -.21$ ). In regard to executive functions, students achieved 31 points in the Raven and a score of 14 in the attention task. As for working memory, they were able to recall 5 and 6 items in the verbal and non-verbal tasks, respectively. On average, the inhibition and flexibility tasks were finished in 65 s and 105 s, respectively. Students were able to correctly complete a total of 10 models at the first trial. Excepting verbal working memory and cognitive flexibility, all measures of executive functions were correlated among each other ( $.14 < |rs| < .41$ ). Spelling was correlated with all executive functions ( $.17 < |rs| < .32$ ), but handwriting was only correlated with working memory, inhibition, and cognitive flexibility ( $.17 < |rs| < .26$ ). Regarding mindfulness, students achieved an average score of 3 in the acceptance factor under test (ranging from 1 to 5, with higher scores indicating greater skills). This variable was found to be related only with gender ( $r = -.21$ ) and inhibitory control ( $r = -.19$ ). Finally, sixth graders reached an average score of 4 out of 7 in the writing achievement measure. With the exception of non-verbal working memory and mindful acceptance, students' writing achievement was found to be associated with all other variables ( $.17 < |rs| < .35$ ).

[Table 1 about here]

A multiple hierarchical regression was conducted. An examination of the correlation matrix showed no signs of multicollinearity ( $-.41 < |rs| < .57$ ), all predictors were included in the model as initially planned. After controlling for demographic characteristics (Step 1), we examined the effects of transcription (Step 2), executive functions (Step 3), and mindfulness (Step 4) to writing achievement. Coefficients of the final model with all predictors are detailed in Table 2.

[Table 2 about here]

Step 1 of the analysis included gender and socioeconomic status. Gender was introduced as a dummy variable (0 = boy, 1 = girl), and socioeconomic status was considered as an ordinal variable with five levels, with higher values indicating higher socioeconomic status. The two variables were found to explain 19% of the variance in writing achievement,  $R = .43$ ,  $F(2, 184) = 21.04$ ,  $p < .001$ . Both gender ( $b = .27$ ) and socioeconomic status ( $b = .32$ ) were found to be significant predictors.

On Step 2, handwriting fluency and spelling were entered. Results showed that transcription skills explained an additional 9% of the variance in writing achievement,  $R = .52$ ,  $F(4, 182) = 17.02$ ,  $p < .001$ . This increase in the amount of variance explained was statistically significant,  $F_{change}(2, 182) = 10.76$ ,  $p < .001$ . Besides gender ( $b = .29$ ) and socioeconomic status ( $b = .21$ ), both handwriting ( $b = .21$ ) and spelling ( $b = -.20$ ) had a unique and significant contribution to writing achievement.

The following variables were added on Step 3: reasoning, attention, verbal working memory, non-verbal working memory, inhibitory control, cognitive flexibility, and planning. These executive functions explained 8% of the variance in writing achievement, above and beyond the other variables,  $R = .59$ ,  $F(11, 175) = 8.57$ ,  $p < .001$ . This additional amount of variance explained achieved statistical significance,  $F_{change}(7, 175) = 10.76$ ,  $p = .005$ . Gender ( $b = .32$ ), socioeconomic status ( $b = .19$ ), handwriting ( $b = .20$ ), and spelling ( $b = -.16$ ) continued to be significant predictors. Moreover, reasoning ( $b = .16$ ) and attention ( $b = .23$ ) were also found to be unique contributors of writing achievement.

Finally, mindful acceptance was introduced in the regression model on Step 4. Results showed that there was an increase of 3% in the amount of variance explained, after controlling for demographics, transcription, and executive functions,  $R = .62$ ,  $F_{change}(1, 174) = 8.64$ ,  $p < .004$ . The full model explained a total of 38% of the variance

in writing achievement,  $F(12, 174) = 8.92, p < .001$ . Above and beyond gender ( $b = .36$ ), socioeconomic status ( $b = .19$ ), handwriting ( $b = .21$ ), spelling ( $b = -.14$ ), reasoning ( $b = .15$ ), and attention ( $b = .21$ ), we found that mindful acceptance ( $b = .18$ ) had a significant and unique contribution to writing achievement.

### Discussion

This study provided a stringent test of the effects of mindfulness skills on writing by examining this link after controlling for key writing variables. Findings indicated that the acceptance dimension of mindfulness had a significant and unique contribution to writing achievement in Grade 6, above and beyond control predictors.

#### Effects of Demographics, Transcription, and Executive Functions

In line with our hypotheses, the regression analysis showed that demographic characteristics and transcription skills were associated with writing achievement. We found that girls displayed better performance than boys, agreeing with past findings (Cordeiro et al., 2018; Midgette et al., 2008). We also found that students with more educated mothers showed higher writing achievement. A similar relationship was also found in prior research (Kim et al., 2015). Transcription was also a significant predictor of writing achievement. Students that copied more words and produced fewer misspellings produced better texts. These findings join past research showing that, even after primary grades, composing good texts relies on the production of fast handwriting and correct spellings (Alves & Limpo, 2015; Limpo & Alves, 2013; Limpo et al., 2017).

Supporting prior research (e.g., Cordeiro et al., 2019; Drijbooms et al., 2015), we observed a significant contribution of executive functions to writing achievement. However, a closer look into these findings revealed differences between studies. Significant writing predictors in this study were reasoning and attention. However, significant predictors in past studies were working memory and planning (Cordeiro et

al., 2019), and inhibition and working memory (Drijbooms et al., 2015). These mixed findings are likely explained by methodological differences among studies (e.g., grades studied, measures used, and research design). In spite of the consistent evidence on an overall link between executive functions and writing (Olive, 2014; St Clair-Thompson & Gathercole, 2006), more research is needed to unravel the specific executive components that influence writing at different developmental stages.

Together these findings support the WWC (Graham, 2018) model, highlighting the importance of transcription and executive functions in text production. However, as shown here, these processes may not suffice to explain achievement in writing.

### **Effects of Mindfulness Skills on Writing Achievement**

A major and pioneering finding of this study was that mindfulness had a unique and independent contribution to writing achievement, above and beyond the effects of demographics, transcription, and executive functions. Specifically, we found that higher levels of mindful acceptance were associated with the production of better texts. The non-judgmental acceptance of individuals' own experiences is one of the main characteristics of mindfulness (Bishop et al., 2004; Kabat-Zinn, 2003; Kropp & Sedlmeier, 2019). A key question arising from current findings is therefore: How is mindful acceptance related to writing performance? Though our study does not provide an empirical response to this question, we propose that students with higher levels of acceptance may be less influenced by negative feelings and thoughts during writing, which in turn may be associated with better performance. This may come from the fact that negative feelings reduce working memory capacity by automatically activating intrusive thoughts (Brewin & Smart, 2005; Ellis & Moore, 1999; Klein & Boals, 2001). Children with higher mindful acceptance may be less prone to intrusive thoughts and may have more cognitive resources at their disposal. The role of emotions, and how

they affect task engagement, was already acknowledged in the WWC model (Graham, 2018). The present findings may extend this model by proposing that there is another variable (i.e., mindfulness) that allows writers to deal with the emotions that appear during text production and may interfere with writing achievement.

Composing a text is highly complex from cognitive and social viewpoints. Writing requires the enactment of several and effortful cognitive processes that must be successfully juggled during text production (Olive, 2014). Also, the increasing strict demands and social perfectionism imposed by schools put high pressure on students concerning what is expected from them and what they should do to succeed (Short & Mazmanian, 2013). Consequently, many students may experience negative feelings and thoughts, leading to difficulties in composing. There is evidence associating low self-efficacy, avoidance behaviors, dislike for writing, or writing apprehension with poor writing performance (Bruning & Horn, 2000; Limpo, 2018; Limpo & Alves, 2017). These negative feelings and thoughts about writing can have a detrimental effect on performance by consuming attentional resources that are diverted from key processes needed for successful task completion, as well as by increasing the levels of stress and anxiety associated with the task (Short & Mazmanian, 2013). A potentially helpful factor for mitigating the harmful nature of these feelings and thoughts is mindful acceptance (Mrazek, Franklin, Phillips, Baird, & Schooler, 2013; Mrazek et al., 2017).

Rather than eliminating them, an acceptance attitude may reduce the extent to which unwanted thoughts and feelings interfere with task performance. Accepting means acknowledging the presence of intrusive thoughts and feelings and allowing them to pass over without analyzing them (Bishop et al., 2004). An acceptance attitude enables individuals to regain control over the task and experience an increase in attentional focus. This enhanced concentration, coupled with positive affect and

adaptative mindsets, is expected to positively reflect on task performance. Supporting this claim, mindfulness training was found to reduce the occurrence of distracting thoughts during task completion (i.e., mind-wandering), which in turn resulted in reading comprehension and working memory improvements (Mrazek et al., 2013).

In our study, it seems likely that (a) students with higher levels of acceptance were able to free themselves from eventual negative thoughts and feelings associated with writing; and (b) this reduced intrusiveness of thoughts and feelings allowed them to concentrate more on key writing processes, reflected on the production of better texts. In spite of being grounded on other studies, this putative mediating chain – from higher acceptance to better writing via reduction of negative feelings and thoughts – has never been examined before. Additional research is needed to test this hypothesis and provide empirical evidence on the mechanisms through which performance in core school domains (e.g., writing, reading, and math) may benefit from mindfulness skills.

### **Limitations and Future Directions**

When interpreting current findings at least two limitations should be kept in mind. First, this is a correlational study, where all variables were measured through single indicators at a single time point. Further research should replicate reported results, using experimental designs and/or multiple-indicator approaches. Second, we failed to find the original one-factor structure of the mindfulness questionnaire (Greco et al., 2011), and only one factor was found to be reliable in the main study. As mindfulness involves other dimensions besides acceptance (Kabat-Zinn, 2003), our findings provided a partial perspective on the mindfulness-writing link. Future studies are warranted to examine the contribution of other mindfulness components to writing achievement, and to test the extent to which this effect may be moderated by student's grade level and writing proficiency.

## Conclusion

This study showed that the successful enactment of a fundamental skill to succeed in school – writing – was predicted by students' ability to approach their own thoughts and feelings with an acceptance orientation. Although the amount of explained variance was reduced (3%), these findings open a new and promising research avenue research to the design and testing of writing interventions. The need for multicomponent programs targeting key writing processes was already acknowledged (Limpo & Alves, 2018). Still, for a comprehensive improvement of students' writing skills and ultimately school success, we believe that such programs should also target mindfulness skills.

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Table 1

*Descriptive Statistics for and Bivariate Correlations between All Measures*

Variables	Descriptive statistics		Bivariate correlations												
	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	
1. Gender (0 = boy, 1 = girl)	0.56	0.50													
2. Socioeconomic status	2.92	1.05	.06												
3. Handwriting fluency	32.31	6.56	-.14*	.16*											
4. Spelling	5.39	2.22	-.10	-.37***	-.21**										
5. Reasoning	31.33	3.48	-.04	.25***	.09	-.20**									
6. Attention	13.82	4.10	-.02	.08	.05	-.17*	.30***								
7. Verbal working memory	5.11	1.54	.01	.15*	.17**	-.32***	.28***	.14*							
8. Non-verbal working memory	6.15	2.08	.01	.18**	.12*	-.21**	.43***	.35***	.27***						
9. Inhibitory control	64.78	16.09	-.03	-.28***	-.16*	.26***	-.41***	-.36***	-.17*	-.29***					
10. Cognitive flexibility	104.71	33.30	.15*	-.20**	-.26***	.19**	-.30***	-.33***	-.12	-.23***	.57***				
11. Planning	10.01	1.81	.03	.24***	.09	-.25***	.26***	.20**	.17*	.17**	-.22**	-.15*			
12. Mindful acceptance	2.91	1.12	-.21**	-.04	-.04	.01	-.06	.02	-.04	-.08	.19**	.10	-.08		
13. Writing achievement	3.86	0.84	.29***	.33***	.24***	-.35***	.26***	.28***	.17**	.12	-.24***	-.19**	.18**	.09	

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

Table 2

*Coefficients of the Final Regression Model (Step 4) Predicting Writing Achievement ( $R^2 = .38$ )*

	<i>B</i>	<i>SE</i>	<i>b</i>	<i>t</i>	<i>p</i>
Gender (0 = boy, 1 = girl)	0.60	0.11	.36	5.61	< .001
Socioeconomic status	0.15	0.05	.19	2.80	.01
Handwriting	0.03	0.01	.21	3.28	.001
Spelling	-0.05	0.03	-.14	-2.04	.04
Reasoning	0.04	0.02	.15	2.10	.04
Attention	0.04	0.01	.21	3.07	.002
Verbal working memory	0.01	0.04	.02	0.32	.75
Non-verbal working memory	-0.05	0.03	-.12	-1.71	.09
Inhibitory control	0.00	0.00	.01	0.14	.89
Cognitive flexibility	0.00	0.00	-.06	-0.75	.45
Planning	0.00	0.03	.01	0.16	.87
Mindful acceptance	0.14	0.05	.18	2.94	.004