



Examining the transcription-writing link: Effects of handwriting fluency and spelling accuracy on writing performance via planning and translating in middle grades



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ARTICLE INFO

Article history:

Received 4 May 2016

Received in revised form 6 October 2016

Accepted 13 November 2016

Keywords:

Handwriting

Spelling

Planning

Translating

Writing

ABSTRACT

This study examined the relationships between transcription, high-level writing processes, and writing performance in Grades 7–8 ($N = 196$). Structural equation modeling was used to test the direct effects of handwriting fluency and spelling accuracy on planning and translating, and of these latter on writing performance, as well as the indirect effects of handwriting fluency and spelling accuracy on writing performance, via planning and translating. Results showed that the proposed model fitted the data extremely well, explaining 46% of the variability in writing performance. We found that higher handwriting fluency was associated with better planning skills, higher spelling accuracy was associated with better translating skills, and better planning and translating skills were associated with greater writing performance. We found indirect effects of handwriting fluency and spelling accuracy on writing performance, respectively, via planning and translating. These results suggest that transcription continues to impact on writing during teenage school years, by constraining high-level writing processes.

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1. Introduction

Writing is a powerful tool in present-day literate societies (Bazerman, 2013). To master writing and use it effectively, writers need to manage several processes that can be characterized as either low- or high-level (Fayol, 1999; Olive, 2014). Whereas low-level processes operate fast, requiring minimal attentional resources, high-level processes are cognitively demanding and require conscious mental effort. Transcription is a low-level writing process that writers need to master from early on. 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). Despite being both considered transcription skills, spelling and handwriting tap into different processes (Abbott & Berninger, 1993). Spelling draws on multiple skills and knowledge sources such as letter-sound correspondence knowledge, or morphological, phonological, and orthographic awareness (Wood & Connelly, 2009). Though a fluency aspect can be measured in spelling (e.g., latencies; cf. Delattre, Bonin, & Barry, 2006), spelling is typically assessed in terms of accuracy, such as the number of correctly spelled words in isolation or in text (e.g., Graham,

Berninger, Abbott, Abbott, & Whitaker, 1997; Limpo & Alves, 2013a; Wagner et al., 2011). Handwriting draws on the integration between orthographic and motor skills (Christensen, 2004) and it can be assessed in terms of fluency or legibility (Graham, Weintraub, Berninger, & Schafer, 1998). Handwriting fluency – which is thought to impose more constraints on text production than legibility (Santangelo & Graham, 2015) – considers both accuracy and speed. This is measured through the number of legible letters or words produced accurately and quickly within a specified time (e.g., Berninger et al., 1992; Kim et al., 2011; Kim, Al Otaiba, & Wanzek, 2015). Therefore, in line with other influential writing research, the current study includes both spelling accuracy and handwriting fluency as part of the transcription process.

Mastering transcription is important because, once handwriting gets sufficiently fast and spelling gets sufficiently accurate, writers are able to simultaneously activate the high-level writing processes that underlie expert writing (Berninger & Winn, 2006; Kellogg, 1996; McCutchen, 2006; Olive & Kellogg, 2002). According to the influential writing processes view (Hayes & Flower, 1980), the two most important high-level writing processes are planning, which is the generation and organization of ideas along with the formulation of rhetorical goals, and translating, which is the conversion of generated ideas into well-formed strings of language (Chenoweth & Hayes, 2001).

Research findings have shown positive and direct relationships between transcription (i.e., handwriting fluency and spelling accuracy), the high-level writing processes (i.e., planning and translating), and

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writing performance. However, to the best of our knowledge, no study has yet modeled the relationship between these variables simultaneously using a multiple-indicator approach, particularly in middle school. This was the aim of the current study, in which we examined, first, the direct effects of handwriting fluency and spelling accuracy on planning and translating, and of these latter on writing performance, and, second, the indirect effects of handwriting fluency and spelling accuracy on writing performance, via planning and translating. Testing these effects is relevant in order to better understand the mechanisms through which transcription constrains the higher-order aspects of writing.

Remarkable advances have been made in understanding the relationships between transcription and high-level writing processes (for an overview, see Berninger, 2012). Even so, we are still far from having a complete picture of how individual differences in these processes relate to each other and predict writing performance. Since transcription receives little research attention beyond primary school (Medwell & Wray, 2008), this gap is even more noticeable in middle grades. Nevertheless, there is now evidence that transcription plays a non-negligible role in middle graders' writing that is worthy of scrutiny (Limpo & Alves, 2013a). It takes a long time to become proficient in transcription and there is evidence that this might only fully happen toward age 14 (Alves & Limpo, 2015a; Chartrel & Vinter, 2004, 2006; Graham et al., 1998; Pontart et al., 2013). More efficient transcription allows children to start coordinating other writing processes in parallel rather than in sequence (Olive & Kellogg, 2002). That is, once transcription stops depleting attentional resources, children are able to sustain transcription concurrently with planning and translating processes during text production, instead of activating one process at a time (for a review on parallel vs. sequential processing in writing, see Olive, 2014). Middle school seems therefore a particularly important period to examine the relationships between transcription, high-level writing processes, and writing performance.

1.1. Effects of transcription on writing

There is considerable research demonstrating that more proficient transcription skills, in particular, more fluent handwriting and more accurate spelling, are associated with better writing quality (for reviews, see Graham & Harris, 2000; Graham & Santangelo, 2014; Santangelo & Graham, 2015). The relationship between transcription and writing performance is mostly noticeable in novice writers, who still struggle with the process of putting language onto the page. Graham et al. (1997) investigated the shared and unique relations of handwriting fluency and spelling accuracy to writing in Grades 1–3 and Grades 4–6. They showed that, respectively, in primary and intermediate grades, these two transcription skills, together, accounted for 41% and 66% of the variance in writing fluency, and 25% and 42% of the variance in writing quality. Interestingly, in the junior high grades (Grades 7–9) the proportion of variance accounted for by transcription dropped substantially to 16% for writing fluency and 18% for writing quality (Berninger, 1999). However, since just direct effects were examined, no conclusions could be made about whether transcription accounted for indirect effects on writing performance. Intervention studies also supported the transcription–writing link by showing that promoting either handwriting fluency (e.g., Alves et al., 2015) or spelling accuracy (e.g., Berninger et al., 2002) improves overall writing performance (for a meta-analysis, see Graham, McKeown, Kiuahara, & Harris, 2012).

1.2. Effects of planning on writing

Planning, which involves setting goals, generating, and organizing ideas, may occur before or during writing (Berninger & Swanson, 1994). There is much evidence that devoting time and effort to plan ahead of writing is beneficial to writing. For example, Beauvais, Olive, and Passerault (2011) found that the longer the prewriting pause and

planning time of undergraduates, the better the quality of their argumentative texts. Additionally, Limpo, Alves, and Fidalgo (2014) showed that, in Grades 7–9, planning complexity predicted writing quality in opinion essays, above and beyond a set of well-known predictors of writing competence (viz., gender, school achievement, age, handwriting, spelling, and text structure). Even though the relationship between planning and writing quality is not evident in younger students (Whitaker, Berninger, Johnston, & Swanson, 1994) – probably due to their poorly developed planning skills (McCutchen, 2006) – there is strong evidence that planning instruction is an effective way to promote writing performance, from primary to high school grades (for meta-analyses, see Graham et al., 2012; Graham & Perin, 2007). Planning is important to produce good writing because it seems to help writers to generate content and to create an organized structure for their compositions. Also, the plan may function as an external memory where writers store ideas to develop in the text and outline action-plans to produce it (Graham & Harris, 2007).

1.3. Effects of translating on writing

As put by Fayol, Alamargot, and Berninger (2012), “translating is the fundamental cognitive process of writing” (p. 10). Indeed, a written text would not exist without writers' ability to translate their generated ideas into language forms. Translating involves several linguistic processes, from choosing appropriate words to encoding and selecting syntactic structures. Considerable research points to the construction of syntactically complex and acceptable sentences as a critical aspect of translating (Myhill, 2009a, 2009b). Many linguistic constructions appear to increase in length or complexity with age and ability (Berman & Verhoeven, 2002; Malvern, Richards, Chipere, & Durán, 2004). In addition, sentence-level translating skills seem to influence the quality of written texts (Beers & Nagy, 2009; Berninger, Nagy, & Beers, 2011). Intervention studies also support the relationship between sentence-level translating skills and writing performance. Specifically, sentence-combining instruction, which teaches students to combine kernel sentences into one syntactically complex sentence (Strong, 1986), is highly effective in raising students' overall writing performance (for reviews and meta-analyses, see Andrews et al., 2006; Graham & Perin, 2007). Superior translating skills may contribute to writing quality by giving writers access to an enlarged syntactic repertoire for creating sentences. This not only facilitates the clear and syntactically correct expression of ideas held in mind, but also sets the stage for revision (Saddler & Graham, 2005). Furthermore, the use of well-crafted sentences may result in interesting and readable texts.

1.4. Transcription constrains planning and translating

In contrast with the substantial amount of research examining the direct effects of handwriting fluency and spelling accuracy on writing performance, there is a paucity of research investigating the likely mechanisms underlying this relationship. It is generally assumed that in novice writers, handwriting and spelling drain attentional resources from high-level writing processes fundamental to produce good texts, such as planning ideas or translating them into language (Bourdin & Fayol, 1994; Fayol, 1999; Kellogg, 1996; McCutchen, 2006; Olive & Kellogg, 2002). Poor transcription skills may constrain planning and translating processes in several ways. For instance, if writers are concerned with how to produce letter forms or with how to spell a word, they may either forget already developed ideas or disregard basic rules in sequencing words within sentences (e.g., subject-verb agreement). The more often this occurs, the greater the likelihood of affecting the overall quality of the written product.

Different studies supported the association between transcription and planning, assessed in terms of either the complexity of the organization of the ideas, or the number of ideas generated. Limpo and Alves (2013a) used structural equation modeling to examine the relationship

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