



Exploring writing products in students with language impairments and autism spectrum disorders



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ABSTRACT

Oral language skills scaffold written text production; students with oral language difficulties often experience writing problems. The current study examines the ways in which oral language problems experienced by students with language impairment (LI) and students with autism spectrum disorders (ASD) impact on their production of written text. One hundred and fifty seven participants ($M_{\text{age}} = 10;2$) with LI or ASD completed standardized measures of oral language, transcription, working memory, and nonverbal ability and produced a written narrative text assessed for productivity, grammatical accuracy, and quality. Measures of transcription, productivity, and grammatical accuracy, but not text quality, were poorer for students with LI. Transcription skills accounted for the majority of variance in the writing of the LI cohort. For the ASD cohort, handwriting, oral language and autism symptomatology were significant predictors. When students with ASD also experienced language problems, their performance was equivalent to that observed in the LI cohort.

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1. Introduction

Problems in the production of written text are arguably the most prevalent developmental disability of communication skills, a disability that limits communication, academic achievement and employment prospects. Many children struggle to write, and students with developmental and learning difficulties are particularly challenged by the writing process (Graham & Harris, 2009). There is increasing evidence that limitations in oral language skills impact on text production for students with and without learning disabilities (Berninger et al., 2006; Mackie, Dockrell, & Lindsay, 2013; Wagner et al., 2011). The ways in which different aspects of oral language impact on writing products are underspecified (Shanahan, 2006) and are likely to differ according to the way in which written text is examined. The current study explores written text production in students who present with different developmental disorders that impact on the oral language system: those

with language impairment (LI) and those with autism spectrum disorders (ASD).

ASD is a disorder characterized by impairment in social interaction and communication and by restricted, repetitive, and stereotyped patterns of behavior. Diagnosis is based on specific behaviors described in the Diagnostic and Statistical Manuals of Mental Disorders (DSM-V, APA, 2013 being the most recent). Communication difficulties of children with ASD have been well documented but little research has focused specifically on their production of written text. Oral language is heterogeneous in ASD, with some individuals showing extremely limited abilities (Ellis Weismer, 2013). While pragmatic impairments are characteristic of the group, syntax is often relatively spared (Kjelgaard & Tager-Flusberg, 2001). By contrast students with LI exhibit problems with expressive and receptive language without an associated diagnosis of ASD or general learning difficulties (Bishop, 2006), and are characterized by significant difficulties with syntax, and to a lesser extent lexical semantics. To address population differences in written text production, and identify the ways in which language difficulties present barriers to written text production, we compared written texts produced by students with LI and ASD in mainstream education and examined the extent to which language and cognitive factors impacted on text production. Given the

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reported overlap between the two populations in language profiles (Tomblin, 2011) but not cognitive profiles (Taylor, Maybery, & Whitehouse, 2012), we further considered whether participants with ASD who additionally experienced language impairments differed in written text performance compared to their LI peers.

Written text production is a complex process and the written product can reflect different underlying competencies. Early studies of composition in typically developing children identified two dimensions: text quality and productivity (Berninger & Swanson, 1994). These dimensions have been assessed in different ways. Global quality of the text is rated on a single ordinal scale and scales differ in their construction (Williams, Larkin, & Blaggan, 2013). Productivity refers to the amount of text that is produced and has been variously indexed using the total number of words, ideas, clauses, or T Units produced (Nelson & Van Meter, 2007). Recently, researchers have identified other dimensions which purportedly underpin written productions. Although these dimensions vary by age and population tested, they all capture dimensions of productivity, complexity and accuracy (Puranik, Lombardino, & Altmann, 2008; Wagner et al., 2011). In contrast to productivity, accuracy measures examine the correct use of grammatical features (Gillam & Johnston, 1992).

Productivity and quality are uniquely predicted by transcription skills (spelling, handwriting/typing) throughout the elementary grades for pupils learning to write in English (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997). The majority of cognitive resources are allocated to transcription until these skills become automatic (Berninger, 2000). Transcription demands a substantial amount of working memory (WM) resources in children, allowing few available resources for sentence construction and content generation (Graham et al., 1997; Olive, Favart, Beauvais, & Beauvais, 2009). As such, WM limitations may underlie children's difficulties in producing coherent and extended texts due to the competing demands of the transcription process (Adams, Simmons, Willis, & Porter, 2013). Nonetheless, analyses of the texts produced by young writers highlight processes beyond transcription and WM that relate to text generation.

Text generation is the ability to translate ideas into linguistic representations in working memory that can then be written down (Abbott & Berninger, 1993). This involves the selection of appropriate words for sentences and discourse and the production of grammatically correct sequences of words. Strengths in oral language skills support written text generation in typically developing children where transcription demands are no longer a constraint (Berninger & Swanson, 1994). Writing also involves an awareness of the context of the writing task and the reader and, as such, places demands on the writer's pragmatic skills (Kellogg, 2008). It is to be expected that students who experience difficulties with social communication will also experience difficulties with text production. However, studies of the role of pragmatic skills in students' written text production are limited (Troia, 2011).

Writing draws on aspects of oral language including phonological processes (Berninger, Abbott, Whitaker, Sylvester, & Nolen, 1995), vocabulary (Green et al., 2003), oral narration (Cragg & Nation, 2006), and receptive grammar (Mackie et al., 2013). Specifically, productivity, grammatical accuracy and quality are associated with different components of the oral language system. Productivity, the ability to produce words quickly and efficiently, is hypothesized to draw on transcription skills and a well-developed vocabulary (Graham, Harris, & Chorzempa, 2002). By contrast syntactic complexity is likely to be supported by structural language skills such as grammar and morphology (Mackie et al., 2013; Shanahan, 2006). Finally, text quality, it is argued, will be underpinned by transcription and structural language but will also be supported by higher level language skills captured by the pragmatic

dimensions of language (Troia, 2011). Further clarity is needed on the precise relationships between aspects of oral language and components of text production, at different developmental time points. Nonetheless, our review indicates strong theoretical and empirical reasons to predict that students who struggle with oral language will struggle with written text production (Dockrell, 2014).

Both students with LI and those with ASD are reported to experience difficulties in the production of written text but the underlying cognitive factors may be different. In relation to LI, difficulties in the production of written text have been reported for children with both transient and persistent impairments, and are present early in development (Puranik & AlOtaiba, 2012), continuing into adolescence (Dockrell, Lindsay, & Connelly, 2009). Spelling errors in LI are frequent, particularly phonological errors (Broc et al., 2013; Mackie & Dockrell, 2004), and studies have supported the view that writing difficulties in this group may reflect a particular vulnerability in using language structure, as evidenced by their grammatical errors (Windsor, Scott, & Street, 2000). Limitations with phonological short-term memory (STM) for children with LI may further compromise the writing process, and elevated error rates, both in spelling and grammar, in the writing of students with LI have been associated with phonological STM over and above their oral language skills (Mackie et al., 2013). In sum, the difficulties experienced in writing by students with language impairments reflect the difficulties they experience with structural language and the impact of WM.

Across studies, the writing performance of students with LI is typically at a level equivalent to either language age or reading age peers (Dockrell & Connelly, 2013; Williams et al., 2013). Processes such as transcription, which have been shown to exert more influence at earlier stages of the developmental process for typically developing writers, continue to exert a significant influence for students challenged by writing at later points in development (Dockrell et al., 2009). This suggests that the constraints experienced by students challenged by writing are consistent with typical developmental trajectories, but that the impact of skills that underpin text production are more pronounced, and their impact is evident for a longer period of time. It is predicted that the language difficulties experienced by students with LI will impact primarily on transcription skills and these difficulties will mar the quality of the text these students produce.

Compared to research on text writing in LI, studies of writing in ASD are fewer in number, include small numbers of older participants, and typically are not driven by models of the writing process; as a consequence, conclusions to date are speculative. Handwriting problems are commonly reported in students with ASD, specifically legibility and letter formation (Kushki, Chau, & Anagnostou, 2011) but these difficulties do not necessarily impact on the written text (Myles et al., 2003). Students with ASD produce briefer, less complex texts with fewer uses of mental state terms in comparison to matched peers (Barnes, Lombardo, Wheelwright, & Baron-Cohen, 2009; Brown & Klein, 2011). Texts are less focused on the main topic, including fewer smooth transitions between ideas (Brown & Klein, 2011). To date, studies of the writing of students with ASD and Asperger syndrome have highlighted limitations in text quality, rather than grammatical or spelling problems (Myles et al., 2003), but the impact of oral language skills on performance has not been explored. Despite the paucity of studies, these data help to further differentiate the barriers to successful text production. These difficulties appear to reflect higher order language skills, consistent with these students' problems in oral language, where significant difficulties in the ability to generate ideas relevant to the context are experienced (King, Dockrell, & Stuart, 2013; Norbury & Bishop, 2003).

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