



Learning different allographs through handwriting: The impact on letter knowledge and reading acquisition



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ABSTRACT

Reading and writing are major interrelated skills that partly determine academic achievement. The question of how to teach these abilities is an important issue for researchers and practitioners alike. In the present study, we explored the impact of handwriting learning on letter knowledge and reading. We compared three groups of schoolchildren from Quebec and France, who differed in the handwriting style they learned in first grade. In the *manuscript* group, pupils were exposed to only one type of allograph in reading and writing. In the *cursive* group, pupils learned to write in cursive, but encountered printed letters in books. In the *mixed* group, pupils learned to write in both cursive and manuscript. The results showed that the *manuscript* and *mixed* groups performed better than the *cursive* group on measurements of letter knowledge. The *mixed* group achieved the highest reading scores.

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1. Introduction

Reading and writing are important skills that are needed for almost all learning activities and assignments across the curriculum at school. Exactly how to teach these skills is a fundamental issue in the educational field. For example, the question of handwriting teaching is the subject of widespread debate among researchers and practitioners alike (Stevenson & Just, 2014). Letter production can be achieved through a variety of media – pen or keyboard – and using a variety of handwriting styles (uppercase or lowercase letters, manuscript or cursive). In some states in the USA, the debate has led to the conclusion that keyboarding is more likely to help students succeed in their professional lives and at school than handwriting. Similarly, Finland recently decided to increase the time allocated to keyboarding in primary school and to decrease the time allocated to cursive handwriting instruction. This kind of decision raises several questions about the integration of new writing technologies in schools, as these can include different tools on different platforms (e.g., keyboarding, digital screen or tablet; Alamargot & Morin, 2015; Caporossi & Alamargot, 2014), as well as the type of allograph (manuscript vs. cursive writing) that should be taught at school in handwriting activities (Ediger, 2002; Morin, Lavoie, & Montésinos-Gelet, 2012; Schweltnus, Cameron, & Carnahan, 2012).

The main focus of our study was the impact of the type of allograph learned for handwriting on letter knowledge and reading.

Letter knowledge refers to children's familiarity with letter shapes, letter names and corresponding sounds (Foulin, 2005). It is an important issue in children's literacy development, and numerous studies have shown that it can help children bridge the gap between print and speech. As such, it is the strongest predictor of later reading and spelling abilities (Bowman & Treiman, 2002; Hammill, 2004; Levin, Shatil-Carmon, & Asif-Rave, 2006; McBride-Chang, 1999; Pennington & Lefly, 2001; Piasta & Wagner, 2010; Scarborough, 1998; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Treiman, 2006; Treiman & Kessler, 2003; Treiman & Rodriguez, 1999; Treiman, Sotak, & Bowman, 2001; Wagner, Torgesen, & Rashotte, 1994). The relationship between letter knowledge and reading has been well established in both consistent and inconsistent orthographies (Caravolas, Lervåg, Defior, Seidlová Málková, & Hulme, 2013; Gallagher, Frith, & Snowling, 2000; Leppänen, Aunola, Niemi, & Nurmi, 2010; Manolitsis, Georgiou, Stephenson, & Parrila, 2009; Piquard-Kipffer & Sprenger-Charolles, 2013). Knowledge of letter names and letter sounds is essential for acquiring the alphabetic principle and being able to match graphemes and phonemes (Byrne, 1998; Stuart, Dixon, Masterson, & Quinlan, 1998), while letter recognition is one of the main processing stages in visual word recognition (Adams, 1990; McClelland & Rumelhart, 1981). Studies using letter knowledge as a predictor of reading or spelling acquisition measure it by asking children either to name the letters (Bruck, Genesee, & Caravolas, 1997) or to name the letters and provide their sounds (Caravolas, Hulme, & Snowling, 2001). Piasta and Wagner (2010) identified five, interrelated

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letter knowledge outcomes that might affect the course of literacy acquisition: letter-name knowledge, letter-sound knowledge, letter-name fluency, letter-sound fluency and letter writing. According to [Drouin, Horner, and Sondergeld \(2012\)](#), these outcomes are indicators of a single ability. They claim that all the components of alphabet knowledge work together as a unidimensional construct and reflect the same underlying skill. Numerous studies have indeed shown that letter names and letter sounds are strongly linked, and suggested that instruction in letter names may facilitate letter-sound learning ([Evans, Bell, Shaw, Moretti, & Page, 2006](#); [Justice, Pence, Bowles, & Wiggins, 2006](#); [Piasta, Purpura, & Wagner, 2010](#); [Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998](#); [Treiman, Weatherston, & Berch, 1994](#)).

Letter-name knowledge and letter writing are complementary, inter-related skills, and children with high letter-naming scores also score highly on letter writing ([Molfese, Beswick, Molnar, & Jacobi-Vessels, 2006](#)). A growing body of behavioral, neuropsychological and neuroimaging research has shown that the movements needed to handwrite a letter interact with the visual recognition of that same letter ([Anderson, Damasio, & Damasio, 1990](#); [Bartolomeo, Bachoud-Lévi, Chokron, & Degos, 2002](#); [James & Engelhardt, 2012](#); [James & Gauthier, 2006](#); [Longcamp, Anton, Roth, & Velay, 2003](#); [Longcamp et al., 2008](#)). Mental representations of letters may therefore not be strictly visual, but instead based on a complex neural network that includes a sensorimotor component acquired while learning to read and write concomitantly. In other words, letters afford a multisensory experience, as they can be seen, handwritten, read, heard, or typed, so learning reinforces both their motor and visual representations. The strong relationship between visual and motor representations of letters during learning has been highlighted in several training studies ([Bara & Gentaz, 2011](#); [Bara, Gentaz, & Colé, 2007](#); [Bara, Gentaz, Colé, & Sprenger-Charolles, 2004](#); [Longcamp, Zerbato-Poudou, & Velay, 2005](#)). These studies showed that teaching children in kindergarten to learn letters by drawing their shapes with a finger or pen promotes their visual recognition in comparison with strictly visual learning or typing on a computer.

Taken together, these studies highlight the role of action over perception, and indicate that there are strong connections between the visual-perceptual and motor components of reading and writing. A question that has not yet been directly addressed concerns the influence of the allographic aspect on this connection between reading and writing. We know that the movement produced to draw the shape of a letter helps individuals to memorize and recognize it, but what process is involved if the handwriting movement does not strictly match the shape that has been visually learned? In some cases, where children learn to write manuscript allographs, the handwritten and visual forms totally match. However, when children learn to write cursive allographs, the shape produced by the motor act can be very different from the visually learned shape. The nature of the allographic letter forms learned at school depends on the curriculum. Usually, letters are first introduced in manuscript uppercase, then in manuscript lowercase and, depending on the education system, in cursive. In manuscript, letters are disconnected and correspond to the letter forms that are classically encountered in printed books. Conversely, cursive is characterized by joined-up letters, continuous movement and few pen lifts. Some (quite old) studies support the idea that manuscript handwriting should be taught in lower grades, because it is supposed to be more easily learned, more legible, and just as fast to produce as cursive handwriting ([Gates & Brown, 1929](#); [Gray, 1956](#); [Houston, 1938](#); [Turner, 1930](#)). One major argument in favor of teaching manuscript in first grade concerns the link between reading and writing. It suggests that manuscript letters are more easily produced and recognized than cursive letters because they look more like the typeset letters found in books ([Myers, 1983](#)). In a recent study, [Morin et al. \(2012\)](#) explored the relationship between different profiles of handwriting teaching practices (cursive or manuscript, or both cursive and manuscript) and the development of writing skills among second graders in Quebec. Results showed different effects of allograph type on children's writing development. Concerning writing

speed, students who had learned cursive were slower than those who had learned manuscript. The learning of a single allograph (be it manuscript or cursive) led to better spelling performances than the learning of both allographic forms. The authors hypothesized that the second graders who learned both types of allograph used more cognitive resources to choose which allograph they were supposed to employ when writing words, which reduced spelling quality. Another study with second graders investigated the impact of the type of allograph learned during handwriting on both reading and writing ([Bara & Morin, 2009](#)). Pupils who were taught cursive were compared to pupils who were taught manuscript, to test the hypothesis that learning the same allograph in both reading and writing situations facilitates the acquisition of these abilities and the transfers between them. However, the results failed to reveal any difference in reading and writing between those pupils who had learned different allographic forms for handwriting. Moreover, the proportion of the variance in reading performance explained by writing performance was higher for pupils who wrote in cursive. These results suggest that learning different allographic forms during handwriting and reading activities at school does not disturb the reading process or the establishment of connections between reading and writing. Only the learning of both types of allograph at the same time in handwriting seems to disturb the writing process. These studies were conducted with second graders thus information is missing about what happens at the early beginning of the reading and writing acquisition processes.

The present study assessed the effect of the different allographic forms learned during handwriting on letter knowledge and reading, at the beginning of reading and writing acquisition in first grade. We hypothesized that the degree of allographic variability to which children are exposed influences their learning of letters and their reading acquisition. In some circumstances, children are used to allographic variability (cursive letters in handwriting and manuscript letters in reading), whereas in others they encounter the same allographic form (manuscript both in handwriting and in reading). We compared letter knowledge and word reading in first graders in France and Quebec who were exposed to different handwriting allographs at school. These two populations were chosen because they learn the same written language (French), but are taught different allographic forms in handwriting activities. In France, the different allographic forms of the letters (upper- and lowercase manuscript and cursive) are introduced simultaneously, but cursive must be used when handwriting (2008 French school program). In kindergarten, French pupils learn to master the movements required to write, and begin to write cursive letters and short words. They are never trained to use manuscript letters when they handwrite. In the first years of elementary school, they only practice and use cursive handwriting. In Quebec, no clear recommendations exist as to either the allographic form to be used in handwriting or the point at which a transition is made between manuscript and cursive. Official texts state that “depending on the situation, pupils write in manuscript or in cursive script so that their texts can be read easily” (2001 Quebec official instruction). Consequently, there are a variety of teaching methods: most schools introduce cursive handwriting in second grade, but some choose to teach cursive from the very outset in first grade, while others teach only manuscript writing throughout the elementary years. These two populations allowed us to compare children who were learning only cursive handwriting with children who were learning only manuscript handwriting, as well as with children who were learning both scripts. We predicted that first graders who were only learning the manuscript allograph would perform better on letter knowledge and, consequently, on reading, than pupils who were learning cursive, as the same allographic form of letters would be encountered during print exposure and produced during writing activities. By contrast, being exposed to both allographic forms while reading and handwriting might help the pupils build an abstract category of letters, which has been shown to be an important factor in reading acquisition ([Coltheart, 1981](#); [Shallice, 1981](#)).

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