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Learner-generated drawing for phonological and orthographic dyslexic readers

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ABSTRACT

This study presents an examination of learner-generated drawing for different reading comprehension subtypes of dyslexic students and control students. The participants were 22 phonological dyslexic students, 20 orthographic dyslexic students, 21 double-deficit dyslexic students, and 45 age-, gender-, and IQ-matched control students. The major evaluation tools included word recognition task, orthographic task, phonological awareness task, and scenery texts and questions. Comparisons of the four groups of students showed differences among phonological dyslexia, orthographic dyslexia, double-deficit dyslexia, and the chronological age control groups in pre- and posttest performance of scenery texts. Differences also existed in relevant questions and the effect of the learner-generated drawing method. The pretest performance showed problems in the dyslexic samples in reading the scenery texts and answering relevant questions. The posttest performance revealed certain differences among phonological dyslexia, orthographic dyslexia, double-deficit dyslexia, and the chronological age control group. Finally, all dyslexic groups obtained a great effect from using the learner-generated drawing, particularly orthographic dyslexia. These results suggest that the learner-generated drawing was also useful for dyslexic students, with the potential for use in the classroom for teaching text reading to dyslexic students.

1. Introduction

The current most popular dyslexia hypothesis is deficit phonological awareness, and considerable evidence supports this viewpoint (Olson, Wise, Conners, Rack, & Fulker, 1989; Shankweiler & Liberman, 1989; Siegel & Ryan, 1988; Snowling, 1991; Torgesen, Wagner, & Rashotte, 1994; Vellutino & Scanlon, 1987; Wagner & Torgesen, 1987).

Liberman, Shankweiler, and Liberman (1990) and Stanovich (1988, 1991) are the most important scholars in this area. Liberman et al. (1990) mentioned the "phonological limitation hypothesis," and claimed phonological awareness to be the most important to reading and learning. Therefore, readers with a phonological awareness problem would have problems reading. Stanovich (1988, 1991) referred to the "phonological-core variable-differences model" and supposed that children with dyslexia had a common deficit in phonological abilities that differed from other linguistic and cognitive abilities.

According to linguistry, however, basic orthographic knowledge is important for novice readers, and the required phonological to orthographic links are both important to reading development (Gustafson, Ferreira, & Ronnberg, 2007). Word decoding strategies develop from a basic logographic strategy (visual), through an alphabetic–phonological stage, to a

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more advanced, visual–orthographic strategy (Frith, 1985); however, the speed of this development varies considerably between children (Gustafson et al., 2007).

Therefore, certain scholars believe the orthographic deficit to be another core deficit of dyslexia. Badian (1997) addressed some of the major deficits. Her study found only 18% dyslexia in the traditional double-deficit hypothesis (deficit of phonological awareness and rapid automatized naming), 18% in another double-deficit hypothesis (deficit of rapid automatized naming and orthography), and 50% dyslexia in the deficits of phonological awareness, rapid automatized naming, and orthography. He therefore believed that phonological awareness and rapid automatized naming could not explain all dyslexia deficits, and added orthographic deficit to the double-deficit hypothesis to become the triple-deficit hypothesis. Considerable evidence supports this hypothesis (Burt, 2006; Castles & Coltheart, 1993; Hultquist, 1997; Manis et al., 1999; Roberts & Mather, 1997).

Gustafson et al. (2007) studied the effect of phonological and orthographic training programs for children with decoding deficits. They considered that phonological and orthographic dyslexia were the basic subtypes of dyslexia from information-processing theory. Certain types of dyslexia performed worse in visual information, whereas others had problems processing auditory information. However, similar to the traditional double-deficit by Wolf and Bowers (1999), two other subtypes of dyslexia should be included from information-processing theory: dyslexia with both phonological and orthographic decoding deficits (double-deficit).

The training programs of the Gustafson et al. (2007) study were not sufficiently pure, and attempted to compare the pure effect of different dyslexia subtypes. The inconsistent procedures produced vague results. Therefore, this study did not focus on pure training programs, such as orthographic or phonological training, but on a practical method to improve different subtypes of dyslexic students.

Learner-generated drawing is an effective strategy by which readers may construct drawings to represent to-be-learned content for improving learning from expository text (Hall, Bailey, & Tillman, 1997; Van Meter, Aleksic, Schwartz, & Garner, 2006). The requirement for the final drawings is that they are representational (Van Meter & Garner, 2005). A large body of empirical evidence supporting drawing as a means to improve learning on higher- but not lower-order assessments is consistent with theoretical assumptions that drawing leads to the construction of a mental model (Van Meter & Garner, 2005).

The theoretical background of learner-generated drawing is the Generative Theory of Textbook Design, proposed by Richard Mayer, to explain learning from illustrated text (Mayer & Sims, 1994). In his model, readers select key elements from text and illustrations and organize them to form coherent verbal and nonverbal representations. These two representations are then integrated to form a mental model that supports conceptual transfer (Van Meter & Garner, 2005). This model provides readers with explanative illustrations and increases performance on free recall, but not verbatim recognition (Mayer & Gallini, 1990).

Other researchers have discussed problems regarding this theory (e.g., learners may struggle with the task of translating between, and integrating varying external formats), although relevant research still shows the significant effect for participants (Van Meter et al., 2006). However, the evidence for learner-generated drawing for dyslexic students is lacking, and this practical method improves dyslexic student performance.

Similar to the Gustafson et al. (2007) study the problem is raised on the comparison between phonological dyslexia and orthographic dyslexia. Investigating the different effects of students with phonological and orthographic decoding deficits using learner-generated drawing may be worthwhile because the different deficits influence learner visual and auditory functions.

Therefore, this study examines two questions: (a) is using learner-generated drawing useful for dyslexic students? (b) what is the efficiency difference between dyslexic students using learner-generated drawing by phonological dyslexic and rapid automatized naming?

2. Methods

2.1. Design

The main research question was analyzed using a factorial 2×2 split-plot design with the independent variable type of problem (phonological deficits or orthographic deficits or double-deficit) as between-subjects variables and the test session (pretest/posttest) as a within-subjects variable. The most important dependent variable was the measure most directly related to reading: scenery text reading.

2.2. Participants

Four dyslexic groups were included in this study. Twenty-two students were grouped into phonological dyslexia, 20 students were grouped into orthographic dyslexia, and 21 students were grouped into double-deficit dyslexia. To compare the abilities and the effect of learner-generated drawing of typical developmental students, 22 normal students were included in the same chronological age range as the three other dyslexic groups.

The first sampling procedure of participants identified students with dyslexia. All participants in this study were selected from fifth graders in four elementary schools in Taiwan. Two criteria were used in dyslexia sampling. The first criterion was