



Paired associate learning tasks and their contribution to reading skills[☆]



Catalina Mourgues^a, Mei Tan^a, Sascha Hein^a, Emma Ojanen^b, Jodi Reich^{a,c},
Heikki Lyytinen^e, Elena L. Grigorenko^{a,d,*}

^a Yale University, USA

^b University of Jyväskylä, Department of Psychology, P.O. Box 35, FI-40014 University of Jyväskylä, Finland

^c Temple University, USA

^d Moscow State University, Russia

^e University of Jyväskylä, Agora Center, P.O. Box 35, FI-40014 University of Jyväskylä, Finland

ARTICLE INFO

Article history:

Received 22 July 2014

Received in revised form 20 November 2014

Accepted 5 December 2014

Keywords:

Paired associate learning task

Phonological awareness

Word-reading

ABSTRACT

Associative learning has been identified as one of several non-linguistic processes involved in reading acquisition. However, it has not been established whether it is an independent process that contributes to reading performance on its own or whether it is a process that is embedded in other linguistic skills (e.g., phonological awareness or phonological memory) and, therefore, contributing to reading performance indirectly. Research has shown that performance on tasks assessing associative learning, e.g., paired-associate learning (PAL) tasks, is lower in children with specific reading difficulties compared to typical readers. We explored the differential associations of two distinct verbal–visual PAL tasks (the Bala Bbala Graphogame, BBG, and a Foreign Language Learning Task, FLLT) with reading skills (word reading and pseudo-word decoding), controlling for phonological awareness, rapid naming, and letter and digit span in children at risk for reading disabilities and their typically developing peers. Our study sample consisted of 110 children living in rural Zambia, ranging in age from 7 to 18 years old (48.1% female). Multivariate analyses of covariance were used to explore the group differences in reading performance. Repeated-measures ANCOVA was used to examine children's learning across the PAL tasks. The differential relationships between both PAL tasks and reading performance were explored via structural equation modeling. The main result was that the children at risk for reading difficulties had lower performance on both PAL tasks. The BBG was a significant predictor for both word reading and pseudo-word decoding, whereas the FLLT—only for word reading. Performance on the FLLT partially mediated the association between phonological awareness and word reading. These results illustrate the partial independence of associative learning from other reading-related skills; the specifics of this relationship vary based on the type of PAL task administered.

© 2014 Elsevier Inc. All rights reserved.

1. Introduction

Phonological awareness, rapid sequential naming and letter knowledge have been acknowledged as the most important predictors of reading skills across different orthographies (Kirby, Parrila, & Pfeiffer, 2003; Lyytinen et al., 2004; Swanson, Trainin, Necochea, & Hammill, 2003; Ziegler et al., 2010). Yet, along with these skills, cognitive learning

[☆] This paper was supported by funding from R01 TW008274 from the Fogarty International Center, US National Institutes of Health. Grantees undertaking such projects are encouraged to express their professional judgment freely. Therefore, this article does not necessarily represent the policies or position of the NIH. No official endorsement should be inferred. We would like to thank to Ulla Richardson, Sarah Marks, Ville Mönkkönen, Miika Pekkarinen, Airi Kilpeläinen, Janne Kujala and Anne Puolakanaho, for their invaluable contributions to this article and their efforts in to develop the Bala Bbala Game as a dynamic assessment. We also would like to acknowledge the hard work of the data collection team at Macha and the children and their families; all gave their time and effort to this study.

* Corresponding author at: 230 South Frontage Road, New Haven, CT 06520, USA.
E-mail address: elena.grigorenko@yale.edu (E.L. Grigorenko).

mechanisms not specifically related to linguistic processing appear to mediate reading acquisition (Hulme, Goetz, Gooch, Adams, & Snowling, 2007; Windfuhr & Snowling, 2001). Specifically, non-linguistic mechanisms of associative learning may explain how reading is learned both implicitly and explicitly (Nicolson & Fawcett, 1999). Establishing the connections between written (grapheme) and spoken (phoneme) units is in fact the core learning activity of reading acquisition (Richardson & Lyytinen, 2014). In transparent writing systems, such as Chitonga, the language of the children in our sample, these units are learned explicitly in the school context, however they may also be learned implicitly through exposure to written language in the immediate environment. In the present study, we sought to elucidate the role of associative learning in understanding the development of children's reading-related skills.

In the process of learning to read, two general types of learning are involved— implicit and explicit. Explicit (or acquisition-conscious) learning is what generally occurs in the classroom when children start learning to read, such as when teachers directly match featured letters

to their corresponding sounds. However, passive exposure to corresponding sound and letter sequences may also occur, resulting in associated orthographical and phonological representations that have been implicitly acquired and become part of an automatized procedure in the decoding process (Snowling, 1980). Children with reading difficulties exhibit lower performance on certain types of implicit learning tasks (Folia et al., 2008; Laasonen et al., 2014; Vicari et al., 2005). Thus, associative learning has been studied as a predictor of reading skills (Muter, Hulme, Snowling, & Stevenson, 2004).

Specifically, paired associate learning (PAL) tasks have been used to explore the types of learning involved in reading acquisition. PAL tasks involve learning and remembering the associations between stimuli that are artificially associated (e.g., abstract figures with pseudowords). Findings from recent studies suggest that associative learning may predict reading skills independently from other linguistic processes, especially in children with specific reading disabilities (Li, Shu, McBride-Chang, Liu, & Xue, 2009; Warmington & Hulme, 2012). This implies that associative learning supports reading acquisition by building on the associations between symbols and sounds independently from other language skills. However, other studies claim that the poor performance on PAL tasks of children with specific reading disabilities is more related to phonological deficits or the verbal demands of the PAL tasks than associative learning itself (Litt & Nation, 2014; Litt, de Jong, van Bergen, & Nation, 2013).

The stimuli used in PAL tasks can be uni-modal (e.g., visual stimulus–visual paired associate, verbal stimulus–verbal paired associate) or cross-modal (e.g., visual stimulus–verbal paired associate, and vice versa) in nature (Litt et al., 2013). The process of learning to read can be defined as a form of cross-modal associative learning, involving the association of phonemes (verbal stimuli) with graphemes (visual paired associate). In contrast to processes of implicit learning, PAL tasks involve systematically pairing printed letters of the alphabet with verbally expressed sounds (a cross-modal, visual–verbal pair). Learning these cross-modal associations fosters the development of the alphabetic principle (i.e., the systematic correspondences of sounds and letters), which is a strong predictor of reading skills (Hulme et al., 2007; Muter et al., 2004; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004).

Several studies have shown that associative learning is significantly correlated with specific reading difficulties (Messbauer & de Jong, 2003; Wimmer, Mayringer, & Landerl, 1998; Windfuhr & Snowling, 2001), particularly when the PAL tasks involve verbal stimuli (Hulme, 1981). Poor performance on verbal PAL tasks by children with reading difficulties has been reported across several languages that vary in their orthographic, phonological and morphological complexity (Li et al., 2009; Litt & Nation, 2014; Mayringer & Wimmer, 2000; Messbauer & de Jong, 2003). In studies utilizing both uni-modal (verbal–verbal; visual–visual) and cross-modal stimuli (verbal–visual; visual–verbal), Hulme et al. (2007) and Litt et al. (2013) attempted to determine which aspects of associative learning are more related to reading skills. Hulme et al. (2007) reported that the correlations between PAL tasks and reading were strongest for visual–verbal tasks. Specifically, only the visual–verbal mappings were significant predictors of word reading and irregular word reading; however, when the visual–verbal mappings were abstract figures and non-words, they did not predict non-word reading. Similarly, Litt et al. (2013) explored four PAL mapping conditions—visual–verbal, verbal–verbal, visual–visual, and verbal visual—across reading skills. They found that only the tasks requiring verbal output (visual–verbal and verbal–verbal) were significantly correlated with reading skills. Several studies have used a variety of stimuli, for example, animal pictures with nonsense words (Wimmer et al., 1998), and complex names and pseudo-names with pictures of children (Mayringer & Wimmer, 2000). Results have been consistent with the view that learning visual (orthography) to phonological mappings is important for developing word recognition skills in reading, and that individual differences in this ability can be

tapped experimentally by a PAL task (Windfuhr & Snowling, 2001). These results have also indicated that different stimuli may modulate the relationships between these tasks and reading skills, and account for the differences in performance between children with and without reading difficulties.

1.1. Using PAL tasks in rural Zambia

Children growing up in rural Zambia generally learn to speak one or more native languages, depending upon their home region (Sousa, Greenop, & Fry, 2010). Once they reach school, however, they become English language learners through the Zambian school system. Children generally begin school in Zambia when they are around seven years of age. However, they may start school at a younger or older age and/or experience grade repetition or time away from their studies (e.g., because of chores at home, care of younger siblings). Also, many children will not have experienced preschool education as it is not required by law (in 2005, 19.2% of Zambian first-graders in Southern Province had preschool experience, and this included children from urban and sub-urban areas; Republic of Zambia Ministry of Education, 2006). Thus, children in rural Zambia show large variability in their language skills in both their mother tongue and in English.

Understanding children's low performance on reading tasks is challenging due to the various ages at which children may start school, the continuity of their time in school, and the varied quality of Zambia's public schools. In such a context, PAL tasks may help to identify some of the sources of underperformance on reading-related tasks. Moreover, PAL tasks may differentiate children who could be at risk for specific reading disabilities (henceforth “+SRD”) as identified by reading assessments, from those who may simply be experiencing poor learning environments (i.e., indicated by average performance on PAL tasks).

The use of distinct PAL tasks may provide different types of information on the nature of children's learning processes. The two PAL tasks used in this study differed in their stimuli: one presented Braille letters and graphemes, the other familiar objects and foreign words (essentially pseudowords). Given the nature of the two PAL tasks (abstract vs. concrete visuals, phonemes vs. pseudowords) we expected the tasks to show different associations with the reading outcomes in this study (word reading and pseudoword decoding). Specifically, four aspects were explored in this study: 1) differences in performance on the PAL tasks between children identified as being at risk and children not at risk for SRD; 2) the learning process as captured by children's change in performance across the two PAL tasks (BBG and FLLT); 3) the role of the two PAL tasks in predicting skills in word reading (WR) and pseudo-word decoding (PW); and 4) the mediating role of the PAL tasks in the relationships between PA and PW and WR. Given previously conducted studies, we expected to find individual differences in performance across the BBG and the FLLT. We also expected to find group differences between the children who were at risk for SRD and typically developing children in their performance on WR and PW.

2. Method

2.1. Participants

The participants of this study were drawn from a larger research endeavor, the Bala Bbala Project, a large-scale epidemiological study of the risk factors for SRD conducted in a rural farming community of Southern Province, Zambia (Reich, Tan, Hart, Thuma, & Grigorenko, 2013; Tan, Reich, Hart, Thuma, & Grigorenko, 2014). Participating schools were located in a selected district and at each school, a random sample of students in grades 3 to 7 was chosen to be screened for SRD using measures of alphabet knowledge/reading recognition (RR; Stemler et al., 2009) and phonological awareness (PA; Reich et al., 2013). Subsequently, the children were identified as being without risk for specific reading disabilities (–SRD) when their performance

Download English Version:

<https://daneshyari.com/en/article/364493>

Download Persian Version:

<https://daneshyari.com/article/364493>

[Daneshyari.com](https://daneshyari.com)