

READING COMPREHENSION AND PHONICS RESEARCH ON DEAF STUDENTS: WHY REPORTED RELATIONSHIPS MAY BE SPURIOUS

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ABSTRACT

Statistical correlations of phonics (acquired quickly) with reading comprehension (acquired gradually) create potential violations of statistical assumptions of variance (Paris, 2005). Maximum variability occurs after initiating phonics instruction but prior to achieving high accuracy. This occurs early in reading instruction and before students have mastered the reading code at levels necessary for comprehension. The assessment of these skills should not be contemporaneous yet, studies rarely indicate an appropriate time interval. Correlations are used to suggest phonics as a necessary precursor of reading comprehension. For deaf and hard-of-hearing (DHH), many of whom have reduced or minimal access to hearing these sounds, the requirement for phonics is less clear. This study examines 23 correlational studies of DHH student reading for potential statistical concerns and reinterpretations of reported outcomes.

INTRODUCTION

Early and substantial hearing loss impacts not only children's language development but presents significant barriers to achieving commensurate levels of reading (Qi & Mitchell, 2012; Traxler, 2000). Consistently low achievement has remained unchanged in the United States despite placement in inclusion (general education) classrooms, increasing use of cochlear implants, powerful personal and group amplification systems, and other assistive technologies and accommodations including sign language interpreters. (Gallaudet Research Institute, 2001, 2013).

One concern has been the ability of children with hearing losses to access phonemic information. The importance of phonics instruction was supported by the U.S. National Reading Panel (National Institute of Child Health and Human Development, 2000a, 2000b). Their conclusion used correlational studies indicating phonemic awareness and letter knowledge as the two best school-entry predictors children's learning to read during the first two years of instruction (Cunningham, 2001; Ehri, Nunes, Willows, Shuster, Yaghouh-Zadeh, & Shanahan, 2001).

Researchers in deaf education also have identified a significant role for phonemic awareness, despite the presence of significant hearing loss (Easterbrooks, Lederberg, Miller, Bergeron, & Connor, 2008; Paul, Wang, Trezek, & Luckner, 2009; Trezek, Wang, Woods, Gamp, & Paul, 2007). However, other studies have indicated mixed, low, or nonsignificant correlations between phonemic awareness and reading comprehension (Alvarado, Puente, & Herrera, 2012; Bélanger, Baum, & Mayberry, 2011; Clark, Gilbert, & Anderson, 2011; Izzo, 2002; Kyle & Harris, 2006; Miller, 2009). These correlational studies may have examined children at times of minimal variability in either of these skills, or used concurrent assessments suggesting that reported correlations may have been spurious and indicate little about the genuine relationship between these skills.

PURPOSE

This manuscript re-examines 23 correlational studies of DHH students' reading abilities regarding age of assessment impacts regarding assumptions of variability.

Paris (2005) reviewed research on phonemic (PA) awareness and reading comprehension (RC) for students with normal hearing, finding that these variables did not demonstrate properties of equal variability that impacted subsequent correlational analyses. PA had substantially limited variability compared with RC, for many of the studies raising questions regarding the predicted relationships.

Paris (2005) characterized PA as a constrained skill with a limited number of elements that are typically learned quickly. For English readers, PA includes approximately 43 letter-sound relationships and combinations (NICHD2000a, 2000b; Paris, 2005). Learning letter names (orthographic awareness, OA) is another constrained skill consisting of 26 letters. Unconstrained skills are those for which acquisition, development, and refinement proceed over long periods of time. Examples include reading comprehension (RC) with readers generating meaning from text using various strategies such as background knowledge, narrative and thematic context, and personal experiences. Unconstrained skills comprise a range of components that are variously utilized and applied.

PA as a constrained skill, is acquired over 18 months during first grade and early second grade with rapid growth moving from near 0 levels to approaching 100% (Paris, 2005). RC development as an unconstrained skill shows variability that extends from kindergarten through adulthood. Optimal predictive accuracy occurs when both variables demonstrate high levels of variability across an extended range. Many studies use correlations to determine predictive strength between PA and RC, despite contrasting characteristics of skill variability and range. In order for PA to exhibit maximal variability, subjects must be tested after instruction begins but before acquiring proficiency. In contrast, the testing of RC could occur any time beyond achieving early comprehension proficiency, which often occurs after achieving phonics proficiency.

The challenge is that timing of assessments for optimal PA and RC variability does not coincide. The greatest development of PA is when RC levels remain near 0, with minimal variability across the pool (Paris, 2005). Phonics skills are most important for new readers who have not yet achieved reading fluency, while experienced readers are not. For them, phonics has a limited role in comparison with the range of metacognitive and text-based psycholinguistic skills that support reading comprehension (Kyle & Harris, 2010; Miller, 2009; Paris, 2005). The greatest variability in RC skills is with mature readers, which is after the point when phonics skills are most needed.

Another concern in correlating PA and RC is the issue of developmental trajectories. Reading skills are acquired at unequal rates which impacts statistical assumptions of variability. Certain letters, concepts, and phonemes are learned more quickly and thoroughly than others; yet many early reading skills are instructed and evaluated assuming a uniform rate of acquisition. Mastery of unconstrained skills may require unrestricted or unlimited periods of time, including skills of vocabulary and inferencing which often are not entirely mastered.

Skill content of constrained skills consists of identical content mastery, with the 26 letters of the alphabet learned with zero or minimal variance between individuals. In contrast, unconstrained skills are not characterized by identical content that is universally acquired, but is distributed on a norm-referenced continuum over the life span (Paris, 2005). Learning sequence is another potentially confounding factor with

precursor skills constrained by relations to other skills. Many constrained reading skills are dependent on cognitive and linguistic development acquired during childhood at similar times. Parallel and simultaneous development of language and literacy skills results in multicollinearity that often is difficult to separate, particularly during periods of rapid development. This codependency may invalidate correlations due to asymmetrical relationships and in particular, when one skill enables another. In such cases, positive correlations might only be observed for novice skill users, struggling readers, or readers with specific skill deficits.

These statistical confounds have been recognized by a number of test developers. The Comprehensive Test of Phonological Processing (CTOPP) includes 13 subtests with wide developmental variation in growth rates that are neither linear nor uniform, leading to their creation of composite test scores (Paris, 2005). The Woodcock-Johnson Reading subtest also experienced similar problems and created composite scores of letter naming and word identification to avoid skewed data. Although psychometric normality of distribution is resolved, these measures confound what is being evaluated (Paris, 2005). These concerns apply to other tests as well and the presence of these constraints appear well known to commercial businesses, but less well known to researchers and teachers.

METHOD

Research articles were identified through a search of electronic research databases including Academic Research Complete and Education Research Complete. Articles studied reading of DHH children, were published in 2000 or later, and used correlational analyses to examine early reading skills and reading comprehension. Twenty-three articles were identified and each was examined for subject age with regard to early and later-acquired reading skills, identified relationships, and how these relationships may be impacted by variability concerns. The target age for early skills was defined between ages six and seven, but given the sometimes late acquisition and development of DHH students, this was extended to age eight.

RESULTS

Of the 11 studies finding significant correlations between PA with RC one used students below the target age group; four used students within the target age group; two included mixed ages; and four used children beyond the target age group. Only 4 of the 11 studies (36.4%) used the appropriate age range. Of the four studies finding significant correlations between orthographic awareness(OA) and RC, one used the target age group; one used mixed ages; and two were within the target age group. Of these four studies, one (25%) was within the target age group.

Ten studies found non-significant correlations between PA and RC with three within the target age group; three used mixed ages; and four were beyond the target age group. Of these 10, 3 (30%) used the target age group. One study examined correlations of OA with RC and included only those beyond the targeted age group, or 0% for this category.

Several studies reported significant relationships between unconstrained skills. Four found significant relationships between vocabulary and reading with three using students within the target age group, and one beyond the target age group. Two studies examined correlations between language and reading with one using mixed ages and one beyond the target age group. However, in that these studies all examined

unconstrained skills that continue to develop across one's lifetime, adhering to the defined target age is of less importance and instead, their significant correlations support development across extended time.

DISCUSSION

Across these 23 studies, 8 (44%) were conducted using participants within the target age group for acquiring PA or OA. Three of the 11 studies (27.3%) reporting significant relationships between PA and RC were within the target age group. Three of the nine studies (33.3%) finding non-significant correlations also were within the target age group. These mixed results do not suggest a single conclusion, except that a majority of studies do not use participants within the target age group.

Across the four studies finding significant relationships between OA and RC, one (25%) was within the target age group. One study finding a non-significant correlation between OA and RC used participants beyond the target age group. Overall, a majority of correlational studies between constrained and unconstrained reading skills use participants that are not within the target age group.

Those studies reporting significant relationships between sets of unconstrained skills are perhaps more informative and reliable, with skills developing across a lifetime. As has been found with hearing students, vocabulary and reading comprehension skills are significantly correlated for DHH students (Connor & Zwolan, 2004; Kyle & Harris, 2006; Kyle & Harris, 2010; Miller & Achmed, 2009). However, unlike outcomes with hearing children, language and reading skills are correlated for DHH children (Izzo, 2002; Miller, 2009).

This examination indicates that a majority of studies correlating early-developing constrained skills with reading comprehension do not meet age-based and developmental constraints for ensuring optimal variability and therefore, statistical legitimacy. This suggests greater caution for both researchers and teachers in accurately understanding these skills, and the timing necessary to best assess and predict development of reading comprehension of DHH students. Research needs to carefully examine the types of reading skills and acquisition trajectories of study participants, to ensure optimal variability for both valid and reliable results, and accurate interpretation of the predicted relationships.

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