Linguistic awareness and dyslexia beliefs among teachers of students who are blind or visually impaired.

Nosheen Gul  
*Northern Illinois University*

Lindsay N. Harris  
*Northern Illinois University*, A1757857@mail.niu.edu

Alicia LaRouech  
*Northern Illinois University*

Gracie Strohm  
*Northern Illinois University*

Follow this and additional works at: [https://huskiecommons.lib.niu.edu/ctrcisll-publications](https://huskiecommons.lib.niu.edu/ctrcisll-publications)

Part of the Applied Linguistics Commons, Disability and Equity in Education Commons, Language and Literacy Education Commons, Special Education and Teaching Commons, and the Teacher Education and Professional Development Commons

**Recommended Citation**

Gul, Nosheen; Harris, Lindsay N.; LaRouech, Alicia; and Strohm, Gracie, "Linguistic awareness and dyslexia beliefs among teachers of students who are blind or visually impaired." (2022). *CISLL Publications*. 4.  
[https://huskiecommons.lib.niu.edu/ctrcisll-publications/4](https://huskiecommons.lib.niu.edu/ctrcisll-publications/4)

This Article is brought to you for free and open access by the Center for the Interdisciplinary Study of Language and Literacy at Huskie Commons. It has been accepted for inclusion in CISLL Publications by an authorized administrator of Huskie Commons. For more information, please contact jschumacher@niu.edu.
Linguistic awareness and dyslexia beliefs among teachers of students who are blind or visually impaired

Nosheen Gul1,2 · Lindsay N. Harris1,2 · Alicia LaRouech3 · Gracie Strohm3

Accepted: 28 April 2022
© The Author(s), under exclusive licence to Springer Nature B.V. 2022

Abstract

US students who are blind or have visual impairments do not read at the level of a third-grader with typical sight until, on average, halfway through the seventh grade. As a first step toward narrowing that gap, we investigated levels of linguistic awareness among teachers of students who are blind or visually impaired (TSBVIs) because research with general education teachers has demonstrated a link between teacher linguistic awareness and student literacy outcomes. We also examined the accuracy of dyslexia beliefs among TSBVIs and whether TSBVI linguistic awareness and dyslexia beliefs are associated with training and experience variables. A survey of licensed or certified TSBVIs (N = 236) in the US revealed that TSBVIs’ understanding of linguistic concepts was comparable to that of educators in previous studies, and TSBVIs’ overall beliefs about dyslexia were more accurate than those of other educators. Linguistic awareness was not associated with training and experience variables, suggesting linguistic awareness is not a focus of reading courses offered to preservice TSBVIs and they do not acquire it in the field. Master’s degree attainment was significantly related to the overall accuracy of TSBVIs’ dyslexia beliefs and years of experience working as a TSBVI was marginally associated with the overall accuracy of TSBVIs’ dyslexia beliefs. Only years of experience diminished the misconception that dyslexia is a visual disorder. Because TSBVIs did not appear to know less about linguistic concepts and dyslexia than other educators, the reading achievement gap between students with visual impairments and students with typical sight is unlikely to be attributable to underdeveloped TSBVI knowledge.

Keywords Teacher knowledge · Teacher education · Literacy · Special education · Blindness and visual impairment
Introduction

In the United States and other countries, students with visual impairments (SVIs)—that is, those who are blind or have low vision—often read enlarged print or in braille. However, their need for reading instruction by teachers with high levels of linguistic awareness and accurate dyslexia beliefs is no different than that of students with typical sight. Braille is an alphabetic script in which each braille cell maps to a grapheme or letter string in printed English, and reading braille therefore requires the same awareness of sound-symbol connections and the morphological structure of English that reading print requires. Thus, braille reading development is aided by explicit instruction in phonological awareness (including phonemic awareness), morphological awareness, and phonics awareness just as print reading development is, and teachers charged with reading instruction of students who read braille or large print must possess these skills themselves.

Unfortunately, US SVIs underperform their peers with typical sight on measures of reading achievement (Boroson et al., 2017; Wagner et al., 2006) and, perhaps relatedly, exhibit lower rates of college attendance (Reed & Curtis, 2012) and higher rates of unemployment (McDonnall, 2009; Ryles, 1996) following high school. This underperformance persists despite working memory abilities equivalent or superior to that of students with typical sight (Hull & Mason, 1995; Rindermann et al., 2020; Withagen et al., 2013). Several factors have been suggested to explain this reading achievement gap, including SVIs’ lack of exposure to environmental print (Bosman et al., 2006; Greaney & Reason, 2000; Hatton et al., 2010); underdeveloped semantic representations and general knowledge deficits (Gillon & Young, 2002; James & Stojanovik, 2007; Pérez-Pereira & Conti-Ramsden, 1999); and the complexity of the braille code (Dodd & Conn, 2000; Greaney & Reason, 2000). Each of these factors likely contributes to the gap in reading achievement between SVIs and students with typical sight. One potential contributor that has not been considered is the quality of the explicit reading instruction received by SVIs. Researchers (Moats, 1994; Bos et al., 2001; McCutchen et al., 2002; Moats & Lyon, 1996; & Spear-Swerling & Brucker, 2003) have attributed poor classroom instruction to teachers’ lack of understanding of basic language concepts (i.e., linguistic awareness). Investigations have reported that linguistic awareness in general-education teachers is unexpectedly low (McCutchen, et al., 2002) and linked with students’ reading outcomes, such that higher teacher linguistic awareness is associated with more positive outcomes for students (e.g., McCutchen et al., 2009; Piasta et al., 2009). The apparent importance of teacher linguistic awareness for providing effective reading instruction, considered in light of the persistent reading delays of SVIs, motivated the present study.

A finding that levels of linguistic awareness in teachers of students who are blind or visually impaired (TSBVIs) lag behind the already-low levels of linguistic awareness in general-education teachers could partly account for the reading achievement gap between SVIs and students with typical sight.

In intensive TSBVI training programs that include coursework in ocular anatomy and pathology, orientation and mobility skills, assistive technologies and communication systems, and advanced braille (e.g., Northern Illinois University, 2020),
linguistic concepts such as phonological awareness, phonemic awareness, and morphological awareness may be overlooked. A firm grasp of these concepts is crucial for effective instruction in decoding, which is a fundamental step towards acquiring the word-specific orthographic information necessary for skilled reading. Research has produced inconsistent findings regarding the decoding skills of SVIs. Dodd and Conn (2000) found SVIs underperformed students with typical sight on measures of decoding (Dodd & Conn, 2000), whereas Greaney and Reason (2000) found no difference in the performance of SVIs and students with typical sight on decoding measures. An investigation of TSBVIs’ linguistic awareness is thus the first aim of this study.

The second aim of this study is an investigation of the dyslexia beliefs of TSBVIs. Many researchers (e.g., Wadlington & Wadlington, 2005; Washburn, et al., 2011a; Washburn et al., 2014) have stressed the need for an accurate understanding of dyslexia on the part of all teachers because, although teachers cannot diagnose dyslexia, they provide reading instruction to learners with difficulties and refer students for diagnosis. Students with reading difficulties who are identified early for intervention have the best outcomes (Foorman, 2003; Torgesen, 2002). A substantial body of research has indicated that teachers lack knowledge about dyslexia and that misconceptions regarding dyslexia and its correlates persist (e.g., Carvalhais & Da Silva, 2010; Furnham, 2013). Moreover, teacher participants in several studies reported their training and degree programs did not prepare them to teach reading to students with dyslexia (e.g., Carvalhais & Da Silva, 2010; Thorwarth, 2014; Worthy et al., 2016).

We were particularly curious whether TSBVIs subscribe to the common misconception that dyslexia involve seeing words or letters backwards, can be helped by using colored lenses, or otherwise results from a visual disorder. Dyslexia is a language-based disorder that arises from a phonological processing deficit and is unrelated to visual functioning (Moats, 1994). Reading disabilities may be underdiagnosed in SVIs because school districts are reluctant to saddle SVIs with an additional label or because the visual impairment appears to be the source of the reading difficulty (Erin & Koenig, 1997; Jones et al., 2015). If TSBVIs believe their students cannot have dyslexia because they hold the misconception that dyslexia is visual in nature, it could further prevent SVIs from receiving appropriate interventions.

**Reading instruction and TSBVIs**

U.S. children with visual impairments are typically eligible for early intervention services, provided by a state-licensed or -certified special education teacher specializing in the education of students with visual disabilities, from age three. Because such vision specialists in Illinois, where this study’s authors are based, receive a certificate designating them a “Teacher of Students who are Blind or Visually Impaired” (TSBVI), that is the term we adopt in this article. The licensure process for TSBVIs, including the minimum degree and exam(s) required, varies by state (The Early Childhood Personnel Center, 2020).
Once they begin formal schooling, the least restrictive environment for SVIs is often deemed to be a mainstream elementary school, particularly if they do not have secondary cognitive or physical impairments (Cameto & Nagle, 2007). In school, SVIs spend over half the school day learning alongside typically sighted peers (Hussar et al., 2020; U.S. Department of Education, 2020). Time outside the general classroom is often spent in a resource room or other one-on-one setting, led by a TSBVI. The TSBVI instructs students in concept development, daily living skills and, for tactual readers, the braille code (Texas School for the Blind and Visually Impaired, n.d.). Importantly, TSBVIs share responsibility for literacy instruction with the general-education teacher (Jones et al., 2015; Kamei-Hannan et al., 2012).

According to the American Printing House for the Blind (2017), the breakdown of SVIs in the U.S. by reader type is as follows: braille readers (7.8%), print readers (32.3%), pre-readers (16.4%), auditory readers (10.8%), and non-readers (32.7%). Auditory “readers” (who process text auditorily) and non-readers often have multiple disabilities and/or cognitive impairments that prevent them from pursuing written literacy, whereas pre-readers are preparing to learn to read braille and/or print. High levels of linguistic awareness and accurate dyslexia beliefs are of greatest importance for TSBVIs when they are teaching students who read braille or print; most TSBVIs will have some braille or print readers on their caseload at any given time.

**Teacher linguistic awareness and student literacy outcomes**

A concept crucial to literacy instruction is metalinguistic ability or *linguistic awareness*, “the ability to reflect consciously upon the nature and properties of language” (Van Kleeck, 1982, p. 237). Research in general-education teachers has demonstrated a link between teacher levels of phonological awareness, phonemic awareness (a subset of phonological awareness), morphological awareness, and phonics awareness, on the one hand, and student literacy outcomes, on the other. For example, McCutchen et al. (2002) conducted a study with kindergarten and first-grade teachers that investigated teachers’ knowledge of basic language constructs and the relation of growth in that knowledge to student outcomes. Teachers’ \( N = 44 \) initial linguistic awareness was low in comparison to expectations. Approximately half the teachers \( N = 24 \) then attended a two-week summer institute at which they were exposed to basic language concepts. During the following school year, students of teachers who attended the institute showed more overall reading gains relative to their peers whose teachers did not receive linguistic awareness training.

Piasta et al. (2009) identified an important mechanism of the effect of teacher linguistic awareness on student reading ability. Namely, teacher linguistic awareness in a study of first-grade teachers \( N = 42 \) and students \( N = 437 \) was not associated with student learning if it was not coupled with classroom time devoted to explicit instruction. The word-reading growth of students of more-knowledgeable teachers was moderated by the frequency with which the teachers engaged in explicit decoding instruction, such that more instruction was associated with greater gains. Interestingly, students of less-knowledgeable teachers experienced smaller gains.
with greater instruction time, reflecting the crucial role of accurate teacher knowledge in student learning. These and other studies that have examined the relation between teacher linguistic awareness and student literacy skills indicate that students of teachers with advanced linguistic knowledge have improved reading and writing skills relative to students of teachers without this knowledge (e.g., Bos et al., 2001; Lane et al., 2008; Moats, 1994). Hence, if TSBVIs exhibit relatively lower levels of linguistic awareness than has been observed in general-education teachers, this gap could partially account for the reading delays observed in SVIs.

Teacher dyslexia beliefs

Studies of the dyslexia beliefs of educators show they harbor many misconceptions and are prone to believing that dyslexia results from visual problems. For instance, in their study with elementary school teachers, Washburn et al. (2011a) found that teachers confused dyslexia with a visual processing deficit. Similarly, Washburn et al. (2014) reported that preservice teachers in the U.S. and United Kingdom shared the common misconception that the core deficit in dyslexia is visual. These findings and others (Moats, 1994; Williams & Lynch, 2010) show that, although educators exhibit some knowledge about dyslexia, myths about dyslexia as a visual disorder are persistent.

To our knowledge, no one has investigated whether TSBVIs also subscribe to these misconceptions. We undertook such an investigation because, if TSBVIs are unaware of the language-based nature of dyslexia, they may attribute to visual disability reading difficulties that in fact stem from a reading disability. Conversely, they may attribute to dyslexia reading problems that stem from vision problems or, in the case of braille readers, difficulty mastering the braille code.

Relation of teacher experience and training to linguistic awareness and dyslexia beliefs

Examining associations of teacher training and experience variables with levels of linguistic awareness has potential to illuminate the source of gaps in teacher knowledge and avenues for repairing these gaps. The extant literature paints a complicated picture of the association of years of teaching experience, number of reading courses, and highest degree earned with linguistic awareness and dyslexia beliefs in general-education teachers. For instance, some studies have reported a negative relation of years of teaching experience with linguistic awareness (e.g., Cunningham et al., 2004; Spear-Swerling & Zibulsky, 2014), although it is more common to find no relation (e.g., Fielding-Barnsley & Purdie, 2005) or a positive relation (e.g, Mather et al., 2001; Spear-Swerling & Cheesman, 2012) between these variables. Similarly, some studies have found no relation of number of reading courses with linguistic awareness (Fenty & Uliassi, 2018; Spear-Swerling & Zibulsky, 2014; Washburn et al., 2011b) whereas others have found linguistic awareness is positively associated with number of reading courses (Spear-Swerling & Brucker, 2003; Spear-Swerling
& Cheesman, 2012). As for the relation of highest degree to linguistic awareness, we are unaware of research addressing this specific question. The picture regarding the relation of teacher experience and training variables to dyslexia beliefs is likewise complicated (e.g., Knight, 2018; Soriano-Ferrer et al., 2016; Wadlington & Wadlington, 2005).

### Research questions

The study was framed according to the following research questions:

1. What level of linguistic awareness do TSBVIs possess, and how does this level compare to that reported in studies that measured other educators’ linguistic awareness?
2. Is TSBVIs’ linguistic awareness related to number of courses taken on reading and literacy skills instruction, highest degree obtained, or years of experience working as a TSBVI?
3. What level of accuracy of dyslexia beliefs do TSBVIs possess, and how does this level compare to that reported in studies that measured other educators’ dyslexia beliefs?
4. Is the accuracy of TSBVIs’ (a) overall dyslexia beliefs or (b) beliefs about the role of vision in dyslexia related to number of courses taken on reading and literacy skills instruction, highest degree obtained, or years of experience working as a TSBVI?

### Method

The survey used in this investigation comprised five sections: (1) background and demographic information (12 items); (2) self-perception of teaching abilities (2 items); (3) linguistic awareness (38 items); (4) dyslexia beliefs (16 items); and (5) open-ended questions designed to elicit responses about TSBVIs’ experiences as teachers of SVIs and their struggles to accommodate SVIs’ unique needs (2 items). We analyzed data from Sects. (1), (3), and (4) for this study.

### Participants and procedure

Data were collected over a five-week period in the spring of 2020. Licensed or certified TSBVIs who were currently employed or had been employed within the last 18 months as a TSBVI at institutions across the US and Puerto Rico were invited to participate in an online survey via email, listserv, or social media. Invitations included a brief description of the project and a link connecting respondents to the Qualtrics online survey platform, where informed consent was obtained before the presentation of survey questions. Nonrespondents were prompted via email or social media/listserv post to complete the survey one and two weeks after the initial email.
All consent forms, surveys, and related study materials were approved by a university ethics board. Of the 363 respondents who began the survey, 236 completed it through the Survey of Basic Language Constructs (SBLC), and all but four of those continued through the Dyslexia Beliefs Index (DBI). The sample size is therefore 236 for all analyses reported below except for those specific to the DBI, for which it is 232. There were two versions of the survey, which differed only in aspects of user interface. One was designed for respondents with typical sight and the other was designed for respondents with visual impairments. Of the 236 participants included in analyses, eight selected the accessible version of the survey. The mean time to complete the survey was 51 min.

**Measures**

**SBLC**

We assessed linguistic awareness using the 38 knowledge and ability items from the SBLC (Binks-Cantrell, Joshi, et al., 2012; Binks-Cantrell, Washburn, et al., 2012). This survey included 8 phonological awareness items, 13 phonemic awareness items, 8 morphological awareness items, and 9 phonics awareness items. Twelve of these items assessed TSBVIs’ knowledge (e.g., *A phoneme refers to ____?*), and 26 of them assessed ability (e.g., *How many phonemes are in the word “box”?*). In some instances, an item was modified for clarity (e.g., *spinster* was replaced with “unicycle” in the syllable- and morpheme-counting sections, because we suspected the etymology of the word would be too obscure for modern educators to parse). Cronbach’s alpha for the modified SBLC and its subscales were as follows: 0.88 (overall), 0.73 (knowledge), 0.85 (ability), 0.84 (phonological awareness), 0.80 (phonemic awareness), 0.89 (morphological awareness), and 0.80 (phonics awareness). These values indicate an acceptable level of internal consistency for the SBLC and its subscales (Cortina, 1993). Individual items on the survey were scored either right or wrong, and the total number of correct items was used to compute the percentage correct for analyses.

**DBI**

Our tool for assessing accuracy of dyslexia beliefs was a slightly modified version of the instrument used by Washburn et al. (2014), who in turn had adapted it from Wadlington and Wadlington’s (2005) DBI. Our changes to the Washburn et al. (2014) version involved the removal of three items because of ambiguity as to the correct response. Reading ability and intellectual ability are related was removed because, although reading disability does not necessarily entail intellectual disability, intellectual disability is often accompanied by reading difficulties. Dyslexia occurs more frequently in boys than in girls was removed because the research on this point is inconclusive (see, e.g., Liederman et al., 2005; Moll et al., 2014; Quinn & Wagner, 2015). Dyslexia affects a child’s performance exclusively in reading and language arts (literacy and English) subjects was removed because, although Washburn et al. (2014) gave the correct answer as
were “definitely false,” “probably false,” “probably true,” or “definitely true.” Four of the items formed a subscale that specifically addressed the misconception of dyslexia as a visual disorder. These included the statements, Seeing letters and words backwards is a characteristic of dyslexia; Dyslexia can be helped by using colored lenses and/or colored overlays; Eye tracking exercises are effective in remediating dyslexia-caused difficulties; and One of the major reasons for dyslexia-caused difficulties is visual problems. Cronbach’s alpha for the 16 items of the modified DBI was $\alpha = 0.584$, with $\alpha = 0.604$ for the visual-misconception subscale. These values indicate a relatively poor level of internal consistency for the DBI and for the visual-misconception subscale.

Responses of “definitely false,” “probably false,” “probably true,” and “definitely true” were coded with scores of 1 through 4. Each statement was either true or false, according to current literature, and participants were awarded 4 points for selecting “definitely true” or “definitely false” as appropriate. Partial points were awarded for “probably” responses, with 3 points awarded to “probably true” and 2 points awarded to “probably false” for a true item, and 3 points awarded to “probably false” and 2 points awarded to “probably true” to a false item. We summed the item scores to create the composite used in Table 1 and analyses, along with the percentage correct.

### Training and experience variables

TSBVIs responded to the question, “How many courses on teaching reading and literacy skills to students who are blind or visually impaired did you take during

### Table 1 Performance on the survey of basic language constructs (SBLC) and the Dyslexia Beliefs Index (DBI)

<table>
<thead>
<tr>
<th></th>
<th>M (Max)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall SBLC</td>
<td>24.71 (36)</td>
<td>5.79</td>
</tr>
<tr>
<td>Knowledge</td>
<td>6.42 (12)</td>
<td>2.69</td>
</tr>
<tr>
<td>Ability</td>
<td>18.28 (25)</td>
<td>3.99</td>
</tr>
<tr>
<td>Phonological Awareness</td>
<td>6.94 (8)</td>
<td>1.13</td>
</tr>
<tr>
<td>Phonemic awareness</td>
<td>8.36 (13)</td>
<td>2.42</td>
</tr>
<tr>
<td>Morphological awareness</td>
<td>4.59 (8)</td>
<td>2.24</td>
</tr>
<tr>
<td>Phonics awareness</td>
<td>4.81 (9)</td>
<td>2.11</td>
</tr>
<tr>
<td>Overall DBI</td>
<td>48.56 (64)</td>
<td>4.33</td>
</tr>
<tr>
<td>Visual misconception</td>
<td>9.98 (16)</td>
<td>2.08</td>
</tr>
</tbody>
</table>

$N=236$ for SBLC. Overall Linguistic Awareness comprises the entire SBLC. Ability and Knowledge items include a subset of items from each of the four linguistic categories. $N=232$ for DBI. Overall Dyslexia Belief Index comprises the entire DBI.
your teacher preparation?” by selecting one of six choices: 0, 1, 2, 3, 4, or 5+. To aggregate the data, four subgroups were identified: zero courses \( (n = 38) \), one course \( (n = 93) \), two courses \( (n = 65) \), and three or more courses \( (n = 40) \). Number of Reading Courses was treated as a categorical variable in analyses. TSBVIs responded to the question, “How many years of experience do you have working as a TVI?” by selecting an integer between 1 and 75+ or “less than one year.” Years of Experience ranged from 0 to 46 \( (M = 13.79, SD = 10.30) \) and was treated as a continuous variable in analyses. TSBVIs responded to the question, “What is your highest degree obtained?” by selecting “bachelors,” “master’s,” or “doctorate.” Thirty-five (14.9%) TSBVIs held a bachelor’s degree, 195 (81.9%) TSBVIs held a master’s degree, and 6 (2.5%) TSBVIs held a doctoral degree. Highest Degree was treated as a categorical variable in analyses.

Results

To address Research Question 1, we examined the mean, range, and standard deviation of scores on the SBLC and its individual subscales (Table 1). The mean overall percent accuracy on the SBLC was 68.64%. Performance on SBLC subscales was as follows: Knowledge: 53.5%; Ability: 73.12%; Phonological Awareness: 86.75%; Phonemic Awareness: 64.31%; Morphological Awareness: 53.38%; and Phonics Awareness: 53.44%.

We then graphed TSBVIs’ mean performance on the SBLC and 95% confidence intervals alongside the performance of educators in previous studies to get a sense of how TSBVIs’ performance on the SBLC compared to that of other educators (Fig. 1). In general, TSBVIs’ performance on the SBLC subscales was comparable to that observed in previous studies of preservice teachers, in-service teachers, and teacher educators. The 95% confidence intervals for TSBVIs’ Phonological Awareness and Phonemic Awareness, for instance, overlapped with that for all previous samples of educators save the undergraduate preservice teachers in Washburn et al. (2016). TSBVIs distinguished themselves on the SBLC overall: the 95% confidence interval for the overall SBLC in our sample was higher than that for undergraduate preservice teachers in all previous studies and overlapped only with that for teacher educators and in-service teachers. Of note, the confidence intervals around the means for our sample were often wide, reflecting the TSBVIs’ diversity of backgrounds and training.

To address Research Question 2, we performed a series of statistical tests. We used a one-way ANOVA to determine mean differences in number of reading courses and overall SBLC accuracy using Number of Reading Courses (0, 1, 2, 3+) as the grouping variable and overall score on the modified SBLC as the outcome variable. There were no statistically significant mean differences between the levels of the factor Number of Reading Courses and the overall score on the SBLC \( (F[5, 230]=0.45, p=0.812) \). The pairwise comparison, using Cohen’s \( d \), revealed that the participants who did not take any courses on teaching reading were not different from those who took one reading course, two reading courses, or three or more reading courses (Cohen’s \( d \) effect sizes of 0.02, 0.32, and 0.26, respectively).
Moreover, there was no statistically significant difference in overall SBLC performance between participants who took one reading course and participants who took two reading courses or three or more reading courses (Cohen’s $d$ effect sizes of 0.04 and 0.02, respectively). There was also no statistically significant difference between participants who took two reading courses and those who took three or more reading courses (Cohen’s $d$ effect size of 0.04). Descriptively, the highest-performing subgroup of TSBVIs on the SBLC was that comprising individuals who had never taken a course on teaching reading and literacy skills (Fig. 2).

We then used a one-way ANOVA to determine mean differences in highest degree and SBLC performance, using Highest Degree (bachelor’s, master’s, or doctorate) as the grouping variable and overall accuracy on the modified SBLC as the outcome variable. The analysis revealed no significant mean differences in SBLC accuracy between participants from different Highest Degree groups ($F[2, 233] = 0.05$, $p = 0.514$; Fig. 2). Cohen’s $d$ for the nonsignificant comparison between participants holding bachelor’s and master’s degrees was 0.02; for the nonsignificant comparison between participants holding bachelor’s and doctoral degrees was 0.56; and for the nonsignificant comparisons between participants holding master’s and doctoral degrees was 0.07. Finally, to determine whether SBLC performance was associated with number of years working as a TSBVI, we calculated Pearson’s correlation coefficient for the variables. The findings revealed a nonsignificant association between SBLC accuracy and Years of Experience ($r = -0.01$, $p = 0.901$). In sum, none of our training or experience variables was related to TSBVIs’ SBLC performance.

To address Research Question 3, we examined the mean, range, and standard deviation of the total accuracy on the DBI and the visual-misconception subscale.

![Comparison of accuracy of linguistic awareness of U.S. Educators in Prior Studies and U.S. TSBVIs in the present study. Linguistic awareness in the six samples was assessed using the Survey of Basic Language Constructs (Binks-Cantrell, Joshi, et al., 2012; Binks-Cantrell, Washburn, et al., 2012). Washburn et al. (2016) reported on the linguistic awareness of preservice teachers from four English-speaking countries; for ease of comparison, only the findings from US preservice teachers are presented here. The error bars represent the 95% confidence intervals around the mean](image-url)
Table 1). The mean overall percent accuracy on the DBI was 75.88%, and mean percent accuracy on the visual-misconception subscale was 62.38%.

We then graphed TSBVIs’ mean performance on the DBI and 95% confidence intervals around the mean alongside the performance of educators in previous studies (Fig. 3). Because our version of the DBI contains three fewer items than that of Washburn et al., (2011a, 2011b) and Washburn et al. (2014), in Fig. 3 we compared percentages rather than raw scores. The confidence intervals around TSBVIs’ mean performance on the overall DBI and two of the items from the visual-misconception subscale overlapped with those of other educators. However, the confidence intervals around TSBVIs’ mean performance on two of the visual-misconception items (“Eye-tracking exercises are effective in remediating dyslexia-caused difficulties” and “One of the major reasons for dyslexia-caused difficulties is due to visual problems”) were higher than those of other educators, suggesting that TSBVIs generally held more accurate beliefs about these topics than other educators.

To address Research Question 4, we performed a series of statistical tests. We conducted a one-way ANOVA with number of courses (0, 1, 2, or 3 +) as the grouping variable and overall accuracy on the DBI as the outcome variable. As in our analyses of SBLC performance, the findings revealed no statistically significant mean differences between the levels of the factor Number of Reading Courses and accuracy of TSBVIs’ dyslexia beliefs ($F$ [5, 226] = 0.61, $p = 0.624$). The pairwise comparison, using Cohen’s $d$, revealed no statistically significant difference in overall DBI performance between participants who did not take any courses on teaching reading and those who took one reading course, two reading courses, or three or more reading courses (Cohen’s $d$ effect sizes of 0.09, 0.26, and 0.45, respectively). Moreover, there was no statistically significant difference in overall SBLC performance between participants who took one reading course and participants who took two reading courses or three or more reading courses (Cohen’s $d$ effect sizes of 0.17 and 0.36, respectively). There was also no statistically significant difference between participants who took two reading courses
Descriptively, the highest-performing subgroup of TSBVIs was again that comprising individuals who had never taken a course on teaching reading and literacy skills (Fig. 4).

We then conducted a one-way ANOVA to determine whether there were significant mean differences in accuracy of dyslexia beliefs and highest degree attained, using Highest Degree (bachelor’s, master’s, or doctorate) as the grouping variable and overall accuracy on the DBI as the outcome variable. Our results showed a significant association of accuracy of beliefs about dyslexia with Highest Degree ($F[2, 229] = 3.69, p = 0.036$). Post hoc Bonferroni comparisons revealed a significant difference between the accuracy of dyslexia beliefs of bachelor’s- and master’s-degree holders only ($p = 0.046$; Cohen’s $d = 0.22$ for the bachelor’s-master’s comparison; Fig. 4).

Fig. 3 Comparison of Accuracy of Dyslexia Beliefs of U.S. Educators in Prior Studies and U.S. TSBVIs in the Present Study. Accuracy of dyslexia beliefs in the four samples was assessed using the modified Dyslexia Beliefs Index (Wadlington & Wadlington, 2005) or items from it. Washburn et al. (2016) reported on the dyslexia beliefs of preservice teachers from four English-speaking countries, and Washburn et al. (2014) reported on the dyslexia beliefs of preservice teachers from the US and UK; for ease of comparison, only the findings from U.S. preservice teachers are presented here. * Because items were added to or omitted from the index across studies, here we compare percentages rather than raw scores. Percentages were calculated from published data when accuracy percentages were not explicitly reported in an article. * We were unable to calculate CI’s for Washburn et al. (2011a) from the given data and those who took three or more reading courses (Cohen’s $d$ effect size of 0.19). Descriptively, the highest-performing subgroup of TSBVIs was again that comprising individuals who had never taken a course on teaching reading and literacy skills (Fig. 4).
To determine if Years of Experience was associated with accuracy of dyslexia beliefs, we calculated Pearson’s correlation coefficient for the variables. The findings revealed a marginally statistically significant association between years of experience working as a TSBVI and accuracy of dyslexia beliefs ($r = 0.13$, $p = 0.052$).

Finally, we reran the above statistical tests using overall accuracy on the visual-misconception subscale as the dependent variable. A one-way ANOVA using Number of Reading Courses as the independent variable indicated that no significant differences existed between levels of factors number of reading courses and misconceptions about dyslexia as a visual disorder ($F[2, 226] = 1.43$, $p = 0.212$), mirroring the finding for the overall DBI. Unlike findings for the overall DBI, however, an omnibus one-way ANOVA using Highest Degree as the independent variable revealed that there were no statistically significant mean differences among TSBVIs’ beliefs about dyslexia as visual disorder and Highest Degree ($F[2, 229] = 0.78$, $p = 0.462$). Cohen’s $d$ for the nonsignificant comparison between participants holding bachelor’s and master’s degrees was 0.06; for the nonsignificant comparison between participants holding bachelor’s and doctoral degrees was 0.42; and for the nonsignificant comparison between participants holding master’s and doctoral degrees was 0.36. Finally, we calculated Pearson’s correlation coefficient using Years of Experience and accuracy on the visual-misconception subscale. As for the overall DBI, the statistically significant coefficient ($r = 0.16$, $p = 0.017$) revealed that years of experience working as a TSBVI had a small positive association with accuracy of beliefs about the role of vision in dyslexia.

In sum, although number of reading courses was not associated with accuracy of dyslexia beliefs in our survey of TSBVIs, possession of a master’s degree and more years of experience working as a TSBVI were positively associated with accuracy of dyslexia beliefs. Years of experience working as a TSBVI was positively associated with accuracy of dyslexia beliefs among teachers...
with accuracy of TSBVIs’ beliefs surrounding dyslexia and vision, although possession of a master’s degree was not.

Discussion

In this study, we focused on identifying levels of linguistic awareness and accuracy of dyslexia beliefs among TSBVIs, and how TSBVIs’ knowledge in these areas compares to the knowledge of other educators surveyed in past studies. We also investigated what training and experience variables contribute to the linguistic awareness and dyslexia beliefs of TSBVIs. The findings present a picture of a population diverse in its experience and abilities, which shares many similarities and some important differences with other groups of educators. We found that, although TSBVIs have some knowledge of metalinguistic concepts and dyslexia, this knowledge is not uniformly high nor evenly distributed. Although we are not proposing performance on measures of linguistic awareness or dyslexia knowledge be the sole criterion in determining whether preservice teachers pass or fail courses, it is noteworthy that the mean accuracy of TSBVIs on the SBLC (68.64%) and the visual-misconception subscale (62.38%) were below the 70% required to pass most teacher-preparation courses, whereas their mean accuracy on the overall DBI (75.88%) was above this threshold. Thus, beliefs about dyslexia was an area of particular strength and linguistic awareness was an area of particular weakness for TSBVIs.

With regard to linguistic awareness, Phonological Awareness was an area of particular strength and Morphological Awareness and Phonics Awareness were areas of particular weakness. This pattern of greater awareness of English phonology than of English phonics and morphology is broadly consistent with that observed in studies of other samples of educators (e.g., Binks-Cantrell, Joshi, et al., 2012; Binks-Cantrell, Washburn, et al., 2012; Spear-Swerling et al., 2005; Washburn et al., 2011a, 2011b, 2016; Zhao et al., 2016).

With regard to accuracy of dyslexia beliefs, an apparent contradiction is evident in the pattern of results. Although the overall accuracy of TSBVIs’ dyslexia beliefs was 75.76% and 78.88% of TSBVIs accurately responded definitely false or probably false to the visual-misconception item, “One of the major reasons for dyslexia-caused difficulties is due to visual problems,” the answers to other vision-related questions betray some level of belief that dyslexia is a visually based disorder. Only half of respondents correctly answered “probably” or “definitely” false to the statement, “Eye-tracking exercises are effective in remediating dyslexia-caused difficulties,” and 64.22% and 85.78%, respectively, incorrectly believed that dyslexia can be alleviated with colored overlays and that dyslexia is characterized by seeing letters and words backwards. It appears TSBVIs conceptually differentiate between lower-level sensory processes and higher-level perceptual processes, thus viewing reversals as something other than visual. Belief in the misconception that colored lenses or overlays can be helpful in dyslexia could be related to the fact that these materials can increase the readability of text for individuals with certain visual impairments (Jones, et al., 2015).
We were uncertain whether TSBVIs would display more accurate knowledge and beliefs than other educators, particularly with regard to dyslexia beliefs. Apart from their superior performance on two visual-misconception items on the DBI, the 95% confidence intervals around the mean participant performance on the DBI in this and past studies suggest TSBVIs have comparable knowledge of dyslexia to other educators. With regard to linguistic awareness, on the overall SBLC TSBVIs outperformed undergraduate preservice teachers in all previous studies and overlapped only with teacher educators and in-service teachers. Because there may be reliable differences between TSBVIs and other educators that we did not measure, such as interest in and experience with students with developmental disabilities, we are limited in our ability to infer similarities and differences between populations. However, the general parity in literacy-related knowledge between TSBVIs and other educators appears to rule out a possibility that motivated this study: namely, that a gap in TSBVIs’ linguistic awareness relative to other teachers’ linguistic awareness is in part responsible for the reading achievement gap between SVIs and students with typical sight. Our results indicate that previously suggested reasons for the achievement gap, such as SVIs’ lack of exposure to environmental print, underdeveloped semantic representations, and the complexity of the braille code are the likely sources of the disparity.

Linguistic awareness was not associated with number of reading courses, highest degree, or years of experience working as a TSBVI in the present study. A nonsignificant association of linguistic awareness with years of experience (e.g., Fielding-Barnsley & Purdie, 2005) and number of reading courses (Fenty & Uliassi, 2018; Spear-Swerling & Zibulsky, 2014; Washburn et al., 2011b) has also been reported in past studies. Linguistic awareness does not appear to be a current focus of reading courses offered to preservice teachers, nor does it appear to be something teachers acquire through experience in the field. The specific question of whether highest degree is associated with linguistic awareness has not been addressed in past studies, but research by Kelcey (2011) may help to explain the non-association between these variables in our sample. Kelcey (2011) found that participants with a master’s degree in elementary education had significantly below average knowledge, whereas participants with a master’s degree in literacy education had significantly above average knowledge. Thus, the fact of having a master’s degree may be in itself uninformative with respect to providing insight into teachers’ literacy-related knowledge. The content area of the degree may have more explanatory power.

Possession of a master’s degree (as opposed to a bachelor’s degree only) was positively associated with overall accuracy of dyslexia beliefs, although the size of this effect was relatively small. Years of experience working as a TSBVI was only marginally associated with overall accuracy of dyslexia beliefs. Only years of experience working as a TSBVI was weakly but significantly associated with a lower likelihood of holding the misconception that dyslexia is a visual disorder. The finding of a nonsignificant association of number of reading courses with accuracy of dyslexia beliefs resembles a finding of Wadlington and Wadlington (2005), who reported students in a U.S. college of education who had completed at least three courses in their field scored no better on the original DBI than students who had not. Wadlington and Wadlington’s (2005) finding that graduate students performed no better than
undergraduate students on the DBI appears to contradict our finding that a master’s degree was associated with more accurate dyslexia beliefs; however, the association we observed was so small as to be of little practical significance. Our finding that years of experience was weakly associated with resistance to the misconception that dyslexia is visually based echoes the finding of Knight (2018), who reported that British teachers with more than 10 years of experience were less likely to mention visual factors when describing dyslexia than teachers with five or fewer years of experience. At this early stage of research, it seems that only direct experience with developing readers, and not coursework or degrees, is associated with fewer misconceptions about the role of vision in dyslexia.

Although the small effect size of the association of master’s degree attainment with accuracy of dyslexia beliefs limits its practical significance, it is interesting that possession of a master’s degree but not number of reading courses had any association with accuracy of dyslexia beliefs in our sample. It is not immediately obvious why reading courses in our sample would not be associated with knowledge of dyslexia whereas attainment of an additional degree would. Instructors may play a role: graduate-level courses are more likely to be taught by faculty with Ph.D.s or Ed.D.s than are undergraduate courses, whose instructors may have had less contact with original research literature. Although a master’s degree was positively associated with TSBVIs’ overall understanding of dyslexia, however, it did not disabuse them of the idea that dyslexia stems from a visual processing deficit. This dissociation, as well as why dyslexia beliefs are tied to education and experience whereas linguistic awareness is not, is a subject for future research.

Assumptions and limitations

The results of this study should be interpreted in light of some limitations. First, it is possible that the participants who completed the survey are not representative of U.S. TSBVIs as a whole. Demographic and background data on the larger population of TSBVIs is difficult to obtain, and so we cannot know if our sample is typical with respects to the characteristics that interested us (i.e., years of experience working as a TSBVI, highest degree, reading coursework, linguistic awareness, and dyslexia beliefs). Moreover, 35% of respondents who began the survey did not complete it, which could have biased our data. For instance, those who found the linguistic awareness items particularly challenging may not have persisted, which would have skewed the SBLC results in a positive direction.

Additionally, our level of analysis was relatively coarse: we did not collect information on the content of reading courses, for instance, or the percentage of respondents’ caseloads who were braille versus print readers, which would have allowed for further interpretation of our results. Future research could include questions about these factors to form a more fine-grained picture of the state of TSBVI knowledge. A significant limitation of our study is the relatively poor internal consistency for the modified DBI and the visual-misconception subscale. Cronbach’s alpha for the 16 items of the modified DBI was $\alpha=0.584$, which is lower than the $\alpha=0.737$ reported for the 19-item survey used by Washburn et al. (2014). Internal consistency
for the visual-misconception subscale was $\alpha = 0.604$. Values of Cronbach's alpha between 0.5 and 0.6 indicate “poor” internal consistency and values between 0.6 and 0.7 indicate “questionable” internal consistency (George & Mallery, 2003). The low internal consistency of the DBI in our sample compared to that reported by Washburn et al. (2014) may have resulted from the heterogeneity of our sample and means all findings regarding the accuracy of TSBVI dyslexia beliefs should be interpreted cautiously in this study. Finally, although we attempted to analyze our participants’ linguistic awareness and dyslexia beliefs in light of those of participants in previous studies, we were unable to use inferential statistics to compare the samples and can therefore make no definitive comparisons.

Conclusion

In this exploratory study, we showed that the linguistic awareness and dyslexia beliefs of TSBVIs, though lackluster, appear to parallel those documented in prior studies of teacher educators, inservice teachers, and preservice teachers of students in the general population. The linguistic awareness that has been achieved by TSBVIs apparently does not stem from reading coursework, degrees beyond the bachelor’s degree, or years of experience working as a TSBVI, because these variables were not associated with linguistic awareness. Advanced degrees and years in the field may, however, improve knowledge of dyslexia, because these variables were associated with accuracy of dyslexia beliefs. Future research might explore the direction of causality in this association (does education and experience lead to improved knowledge, or do knowledgeable teachers pursue additional education and accrue experience?). Moreover, given the non-association of number of reading courses with any aspect of teacher literacy-related knowledge in this study, the nature and content of reading courses TSBVIs take during their teacher preparation is an interesting topic for future work.

A broader contribution of this study to the body of research on practitioners’ knowledge to support reading and writing is its focus on a population of teachers of students with developmental disabilities that can occur independently of learning disabilities. Although researchers have investigated the reading-related knowledge of teachers of struggling readers in the past (e.g., Al Otaiba & Lake, 2007; Kennedy et al., 2013; Spear-Swerling, 2009), there has been very little investigation of the knowledge of teachers of students with other disabilities, particularly low-incidence disabilities. These students have the same need for (and right to) high-quality reading instruction as typically developing students and students with higher-incidence disabilities such as dyslexia. We hope this study inspires future work in that domain.

Acknowledgements We are grateful to Alexandria Mayer for assistance with survey creation and data collection; Chelsea Page for feedback on the accessibility of the survey; Stacy Kelly for information on TSBVI licensing procedures, and Emily Binks-Cantrell and Erin Washburn for guidance on survey scoring.
Declarations

Conflict of interest  We have no known conflict of interest to disclose.

References


Northern Illinois University Department of Special and Early Education. (2020, December 2). *Special education: Visual disabilities program (M.S.Ed.)*. Retrieved from https://www.cedu.niu.edu/seed/graduate-programs/masters-visual-disabilities.shtml


Linguistic awareness and dyslexia beliefs among teachers…


**Publisher’s Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Authors and Affiliations**

Nosheen Gul1,2 · Lindsay N. Harris1,2 · Alicia LaRouech3 · Gracie Strohm3

1 Department of Leadership, Educational Psychology, and Foundations, Northern Illinois University, 1425 W. Lincoln Hwy, DeKalb, IL 60115, USA

2 Center for the Interdisciplinary Study of Language and Literacy, Northern Illinois University, DeKalb, IL, USA

3 School of Allied Health and Communicative Disorders, Northern Illinois University, DeKalb, IL, USA