Phonics Based Reading Interventions for Students with Intellectual Disability: A Systematic Literature Review

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Abstract

Teachers require interventions for students with intellectual disability (ID) that are simple, efficient, and can be implemented in the classroom versus interventions requiring isolation. The purpose of this review was to update the prior review by Joseph & Seery (2004) and to serve as a resource for parents, practitioners and researchers interested in the reading education of students with ID. Studies that focused on implementation of phonics based reading interventions to students with ID occurring over the subsequent 12-year period since the last review by Joseph & Seery (2004) were examined to determine which types of settings are typically used, what type of interventions are being implemented, outcomes for each intervention, Results indicate students with ID continue to respond to phonics based reading interventions and indicate an increase in published studies involving phonics based reading interventions for students with ID. Implications for future research and practice are also discussed.

Keywords: special education, intellectual disability, reading, literature review, phonics

1. Introduction

The emphasis and methods of reading instruction for students with intellectual disability (ID) have changed over the past several years. The initial focus was on teaching functional sight words to enhance daily living skills for students with ID (Conners, 1992; Houston and Torgensen, 2004). Furthermore, this mode of instruction primarily involved drill and practice exercises that only targeted word identification and other isolated reading skills (Browder 2001). Thus, students were learning to identify words but had great difficulty when it came to reading connected text. To address these issues, researchers have started to examine how students with ID respond to evidence based reading strategies that have been successful for struggling students and students with milder disabilities (i.e. learning disabilities). One such strategy is phonics-based reading instruction.

Using phonics-based reading instruction for students with ID is a fairly new concept (Katims, 2000) and whether it is a viable method of reading instruction for students with ID has yet to be determined. Currently, research focusing on phonics-based reading interventions for students with ID is increasing and two reviews examining the use of phonetic analysis with students with ID have been written over the last 25 years. Findings from both reviews are encouraging and provide support for the use of phonics-based instruction for students with ID.

Conners (1992) authored the first review of studies evaluating the effect of phonics-based instruction for students with ID. She reviewed seven studies conducted in the 1970s through the 1980s that examined the efficacy of phonetic approaches to teaching reading to children with ID. Based on these seven studies, Conners concluded that children with moderate ID do respond to various forms of phonics instruction. For example, two of the seven reviewed studies (Hoogeveen, Smeets, & Lancioni, 1989; Hoogeveen, Smeets, van der Houven, 1987) reported positive outcomes on letter-sound acquisition by students with ID when a stimulus-connected prompt fading technique was implemented. Results from two other studies (Singh & Singh, 1985; N.N. Singh & Singh, 1988) in Conners' review highlighted the benefits of using phonetic analysis with error correction to help students with ID reduce word recognition errors over time. Two additional studies (Bracey, Maggs, & Morath, 1975; Gersten & Maggs, 1982) reported the efficacy of DISTAR (Engelmann, & Bruner, 1984) for students with ID sounding out words and blending sounds. The final study (Nietupski, Williams, & York, 1979) examined a comprehensive program that included a phonetic-analysis component and positive results were reported on students' word analysis skills.

The most recent review of the literature pertaining to phonics-based reading interventions for students with ID was published in 2004 (Joseph & Seery, 2004). The review included studies implemented between 1990 and 2002 with a

focus on phonetic-analysis strategies and/or phonics instruction. Of the seven studies reviewed by Joseph and Seery, researchers implemented a variety of interventions that included, but were not limited to, a comprehensive literacy program that used embedded phonics instruction (Hendrick, Katims, & Carr, 1999); computer-assisted instructional approaches (Lane & Critchfield, 1998; Kabrich & McCutchen, 1996); and phonics instruction through error-correction procedures (Barbetta, Heward, & Bradley, 1993). Specific reading skills were also examined by the researchers such as letter-sound correspondence (Barudin & Hourcade, 1990) and analysis of student performance on various reading skills (Calhoon, 2001; Gottardo & Rubin, 1991).

The purpose of the Joseph and Seery review was to update Conners' 1992 review. Joseph and Seery (2004) examined seven studies over a 12-year period consisting of the use of phonetic analysis with individuals with ID and concluded that some students with ID are capable of generalizing acquired phonetic analysis skills. More than ten years have passed since the Joseph and Seery review was published. Thus, the purpose of this review was to update the prior review by Joseph & Seery and examine studies over the succeeding 12 year period that have implemented phonics-based reading interventions to students with ID to answer the following questions:

1. With whom and in which types of education settings has phonics instruction been evaluated?

2. Which approaches to phonics instruction have been examined since the last review?

3. How effective are explored phonics interventions for students with ID?

4. Is there evidence for an increased focus on phonics instruction for students with ID since the previous reviews?

2. Method

Search procedures consisted of three steps. First, a literature search using three online databases (i.e., PsycINFO, PsyArticles, and ERIC) was conducted using all truncations of the following descriptors *intellectual disability, mental retardation, developmental disabilities, cognitive disabilities, educable handicapped, trainable handicap, profound handicap, phonics, phonics instruction, phonic strategies, word identification, word recognition, letter-sound association, basic reading skills, reading, and reading instruction*. Second, an ancestral search was conducted on all identified articles and reviews (i.e., Conners, 1992; Joseph & Seery, 2004). Third, the following journals identified in the previous review by Joseph and Seery were hand searched: *American Journal on Intellectual and Developmental Disabilities, Focus on Autism and Other Developmental Disabilities, and Journal of Applied Behavior Analysis.* To meet criteria, all articles had to:

(a) Use an empirical design (i.e., a single subject, experimental or quasi-experimental design). Qualitative and descriptive studies were excluded (e.g., Wise, et al. 2010).

(b) Be published in an English-language, peer-reviewed journal between 2001, end-date for the most recent review (Joseph & Seery, 2004), and 2013.

(c) Include participants between the ages of 6 and 21 years who were identified as having ID.

(d) Evaluate the effectiveness of a reading intervention that consisted of printed text in the form of phonics or letter-sound correspondence. Sight word and descriptive studies were excluded (Mechling, Gast, & Krupa, 2007; Joseph and McCachran, 2003).

The initial computerized search produced 805 articles of which 8 met criteria. An ancestral search of all articles meeting the inclusion criteria produced three additional studies for a total of 11.

Table 1. Studies reviewed

Study	*n*	Age	Setting
Allor et al. (2010)	34	8-10	DNR
Allor et al. (2010)	16	8-10	DNR
Bradford et al. (2006)	3	12-15	SPED Class
Browder et al. (2012)	93	K -5th	SPED Class
Cohen et al. (2008)	5	9-14	Pull-Out Class
Conners et al. (2006)	20	7-12	DNR
Finnegan, E. G. (2012)	52	5-12	SPED Class
Flores et al. (2004)	6	8-13	SPED Class
Fredrick et al. (2013)	55	7-14	SPED Class
Joseph, L. M. (2002)	3	9-10	Pull-Out Class
Waugh et al. (2009)	3	9-11	DNR

Note:

DNR = did not report, SPED = special education/self-contained

The hand search of the *American Journal on Intellectual and Developmental Disabilities, Focus on Autism and Other*

Developmental Disabilities, and Journal of Applied Behavior Analysis failed to identify additional articles that met criteria. The resulting 11 articles meeting criteria were found in eight journals.

3. Results

The results for this review are organized into four sections. The first section contains the number of participants in the studies and the settings in which the interventions were evaluated (i.e., self-contained classroom, pullout classroom, other setting, or unknown). The independent variable used in each study is identified in the second section. The third section focuses on the type of experimental design used for each study and the fourth section contains descriptions of the dependent variables.

3.1 Participants and Settings

A total of 240 participants with ID participated in the 11 studies. The ages of the participants in single subject designs ranged from 7 to 14 years ($M = 10.3$, $SD = 3.79$). A mean age for participants in the control trials was unavailable because ages of the participants in each study were presented in an age range (i.e., 6-15). Participation in the studies reviewed had a range of 3 to 93 participants ($M = 8.6$, $SD = 9.37$). The high standard deviation is a product of the variation in experimental designs that were implemented throughout the 11 studies.

Settings varied across studies with five groups of researchers (Bradford et al., 2006; Browder et al., 2012; Finnegan, 2012; Flores et al., 2004; Fredrick et al., 2013) evaluating interventions within the participants' classroom (i.e., self-contained classroom). Two studies (Joseph, 2002; Cohen et al., 2008) reported providing interventions to participants outside of their special education classroom in alternate classrooms away from peers. Researchers for the remaining four studies (Allor, Mathes, Roberts, Cheatham, et al., 2010; Allor, Mathes, Roberts, Jones, et al., 2010; Conners et al., 2006; Waugh et al., 2009) did not explicitly report the location of intervention delivery.

3.2 Interventions

For this review, an attempt was made to group the interventions based on common characteristics. Based on similar characteristics, interventions for each study were classified into two groupings that included (a) researcher-designed approaches that incorporated various aspects of systematic, explicit instruction, and the use of published reading curricula (e.g., *Corrective Reading*); and, (b) interventions consisting of evidence based response-prompting procedures (e.g., simultaneous prompting).

3.2.1 Researcher-Designed Interventions

Examining the 11 studies, six reported the use of systematic explicit instruction intervention targeting multiple reading skills (Allor, Mathes, Roberts, Jones, et al., 2010; Allor, Mathes, Roberts, Cheatham, et al., 2010; Bradford et al., 2006; Browder et al., 2012; Conners et al., 2006; Flores et al., 2004). In two of the studies, (Allor, Mathes, Roberts, Jones, et al., 2010; Allor, Mathes, Roberts, Cheatham, et al., 2010) researchers constructed a systematic explicit reading program based on instructional delivery methods associated with direct instruction (DI). The intervention targeted concepts of print, phonological and phonemic awareness, oral language, letter knowledge, word recognition, vocabulary, fluency, and comprehension. The treatment group received 40-50 minutes of daily small group (1-4 students per group) instruction from special education teachers hired specifically for the study. The duration of the first study (Allor, Mathes, Roberts, Jones, et al., 2010) was a year and a half and the second study (Allor, Mathes, Roberts, Cheatham, et al., 2010) lasted for three years.

Browder and colleagues also conducted a large-scale study to evaluate the effectiveness of a multicomponent early literacy curriculum (Browder et al., 2012). The treatment group received the *Early Literacy Skills Builder* (ELSB) intervention targeting vocabulary, comprehension, phonemic awareness and early phonics skills. Instructional interventions were implemented to participating students for an entire school year but the amount of daily minutes and number of treatment sessions were not reported by the authors. However, all reading interventions were implemented by the classroom teacher and monitored for fidelity.

In two studies (Bradford et al., 2006; Flores et al., 2004), the effectiveness of *Corrective Reading Program Decoding A* (Engelmann, Carnine, & Johnson, 1998) was examined. This curriculum is an established systematic explicit reading program with a focus on decoding skills. Bradford et al., (2006), conducted lessons three days a week for 45-55 minutes per session and the intervention was delivered by the first author for six months. Flores et al. (2004) modified the corrective reading program by removing the letter *e* due to its aesthetic similarity to the letter *a* and also introduced the letter *m* before the letter *a* because the participants had learned the letter *a* prior to the study. The classroom teacher was trained and implemented the intervention with six participants in a small group setting three times a week for approximately three months. A third study conducted by Finnegan, (2012), implemented two interventions within her experimental design, (a) synthetic phonics, and (b) analogy phonics. The synthetic phonics intervention consisted of participants learning individual letter sounds and how to blend them to make words. The analogy phonics consisted of

participants learning sounds of common consonants and common "rimes" and combining both to read words. Each treatment group received 12 phonics instruction sessions for 15-20 minutes that consisted of letter sounds and words being presented on printed cards. Participants were asked to practice reading the words and saying the letter sounds before attempting to match pictures with the sounds/words.

Conners and colleagues (2006) evaluated the Edmark (Austin & Boekman, 1990) reading program. A program that combines systematic computer based lessons with scripted paper and pencil exercises. The intervention targeted sound blending, letter-sound association, and sounding out skills. Instructional sessions ranged from six to nine lessons per reading skill and were administered by the researcher one to one with each participant. Sessions typically lasted for 10-20 minutes three times a week for approximately 8-11 weeks.

3.2.2 Prompting Procedures

The remaining four studies (Frederick et al., 2013; Joseph, 2002; Cohen et al., 2008; Waugh et al., 2009) in this review consisted of trained personnel implementing systematic explicit instruction. However, in three of the four studies (Joseph, 2002; Cohen et al., 2008; Waugh et al., 2009), the authors also incorporated simultaneous prompting within their respective interventions. Simultaneous prompting is an instructional strategy frequently used to teach students with ID various discrete skills in more traditional instructional formats (Riesen, et al., 2003). The strategy involves the simultaneous delivery of the controlling prompt and the instructional cue (Wolery, Ault, & Doyle, 1992). Three examples are Frederick et al, (2013) who implemented an intervention consisting of *Initial Phonics* and simultaneous prompting, Cohen et al., (2008) and Waugh et al., (2009), who also incorporated simultaneous prompting as an intervention. Additionally, Waugh et al., (2009) extended on the research conducted by Cohen et al., (2008) by increasing the duration of the simultaneous prompting intervention on acquisition of letter-sound correspondences and blending skills of previously taught words over the span of two school semesters.

Lastly, Joseph, (2012) examined the use of a word box method of reading instruction that consisted of three steps. First, a rectangle on magnetic boards separated into three connected boxes was constructed prior to intervention. The instructor slowly read a single word to the student and placed a counter under each box as each sound of the word was said. The student was then prompted to place the counters under the correct boxes as the word was spoken. Next, the student was presented with individual letters of the word and was prompted to say the sound of each letter as he or she placed the letters in the appropriate boxes. The final step in the intervention consisted of the student writing the appropriate letter in the each box as he or she said the sound.

3.3 Experimental Design

Researchers implemented group designs (i.e., Randomized Control Trial [RCT] or quasi-experimental designs) in six studies. Four of the 10 studies involved a RCT (Allor, Mathes, Roberts, Cheatham, et al., 2010; Allor, Mathes, Roberts, Jones, et al., 2010; Browder et al., 2012; Finnegan, 2012). Two studies (Bradford et al., 2006; Conner et al., 2006) used of a quasi-experimental design and finally, five studies (Cohen et al., 2008; Flores et al., 2004; Frederick et al., 2013; Joseph, 2002; Waugh et al., 2009) used single-subject designs in an attempt to identify a functional relation between the intervention and the dependent variable.

3.4 Intervention Outcomes

All studies included in this review reported varying levels of successful reading outcomes with participants. Studies with the longest durations tended to report the higher reading gains (Allor et al., 2010). However, the impact of each intervention on the dependent variables varied from study to study.

3.4.1 Reading Progress

The first of the two studies (Allor, Mathes, Roberts, Jones, et al., 2010), in which researchers implemented a systematic explicit reading program with a group of students with ID, reported reading gains for the intervention group. Students in the intervention group made statistically significant progress across every standardized measured (e.g. phonemic awareness, oral language and vocabulary, phonemic decoding, word identification, and reading comprehension) compared to the students in the control group. Additionally, the authors reported the largest effect sizes were for measures of phonemic awareness (blending words, $d = 0.53$; blending nonwords, $d = 0.66$; segmenting words, $d = 0.66$). Effect sizes on four subtests of The Comprehensive Test of Phonological Processing (CTOPP), ranged from 0.57 to 0.88. The authors in the second study containing a systematic explicit reading program (Allor, Mathes, Roberts, Cheatham, et al., 2010) also reported that on average, students in the intervention group made statistically significant progress across every standardized measured (e.g. phonemic awareness, oral language and vocabulary, phonemic decoding, word identification, and reading comprehension) compared to the control group.

The other study consisting of a multicomponent approach to reading instruction, Browder et al. (2012) reported that the treatment group had a higher posttest mean score than the control group for all dependent measures. Effect sizes for the

three dependent variables indicated small effects (0.30) for the Peabody Picture Vocabulary and moderate effects for Conventions of Reading (0.49) and Phonics (0.44).

3.4.2 Letter Sounds and Decoding

Three studies (Cohen et al., 2008; Fredrick et al., 2013; Waugh et al., 2009) in which experimenters implemented a simultaneous prompting intervention reported all participants met criteria and a functional relation between the dependent variable (DV) and independent variable (IV) was demonstrated across all participants. However, Waugh et al., (2009) reported the participants were unable to retain the skills they learned over the summer break. Implementing a study around summer break highlighted the importance of continuous instruction throughout the year and also the importance of designing one's study properly. A functional relation between the IV and DV was established in the third single subject design with Joseph (2002) reporting increased word reading and spelling performance during treatment phase (i.e., when the combined word study phonics procedures were implemented) for all three participants.

Conners et al. (2012) implemented a systematic explicit instruction intervention and reported higher scores for the intervention group on the sounding out measure compared to the control group, $F(1, 19) = 7.20$, $M.S.E. = 1809.00$. On the measure for predicting sounding out, the instructional group as a whole performed significantly better than the control group on post-instruction sounding out tests even though a high level of variability within the measure was also reported. Despite the success of the intervention, a second measure of nonword and sight word reading resulted in no advantage for the intervention group over the control group.

Investigators (Bradford et al., 2006; Flores et al., 2004) implementing the *Corrective Reading Program Decoding A* in two studies reported student reading success. All six participants in Flores et al. (2004), met criterion across the *m, a, and m/a* conditions but only five of the six participants continued this trend through the next three conditions. One participant was unable to meet criterion for the *t* condition. With the exception of one participant, the other five decreased the number of trials needed to meet criterion for each successive letter. Bradford et al. (2006) reported that all three participants completed level A of *Corrective Reading*. Based on an error analysis, all students performed 97% correct or better on posttests for the following three measures (a) oral letter-sound correspondence, (b) written letter-sound correspondence, (c) word recognition. All three participants reached mastery on two of the four fluency performance mastery tests.

Finnegan (2012) also reported varied reading outcome results for the two interventions implemented in her experimental study. Significant effects, $F(2,48) =16.353$, p < .01, were reported on the measure of training word identification for both treatment groups compared to the control group but no significant effects were found between the synthetic phonics treatment group and the analogy treatment group. This suggests the synthetic phonics instruction provides no additive effect to increasing the number of words read correctly when compared to analogy phonics. Overall, the treatment group demonstrated that synthetic phonics was more effective compared to the control group in teaching generalized decoding skills to students with ID.

A comparison of studies included in this review to the reviews conducted by Joseph and Seery (2004) and Conners (1992) reveals an increase in phonics based reading intervention studies for students with ID. Authors of the two previous reviews reported the same number of studies meeting criteria (n = 7) creating a stable trend of studies conducted every 10 years. Nonetheless, over the last 10 years there has been an increase in phonics-based reading intervention for this population of learners. Ten studies were identified for this current review – an estimated 40% increase.

4. Discussion

Reported results from the 11 studies reviewed had varying degrees of reading gains as a result of their respective reading interventions. The results of the studies in this review are similar to the results of the studies included in both previous reviews by Conner (1992) and Joseph & Seery (2004) and add to the literature base by providing more evidence supporting the efficacy of phonics-based reading interventions with students with ID. Interventions varied across studies but one commonality among all studies was the use of a systematic and explicit approach to instruction. Similar to the interventions, a variety of experimental designs were used across the 11 studies but group design was the preferred experimental design method for six of the studies. The use of group design by the majority of researchers represents a new trend in the research base compared to the studies included in the last review conducted by Joseph (2002). In that review, the authors reported one experimental group design out of the seven total studies that met criteria.

The purpose of this review was to serve as a resource for parents, practitioners and researchers interested in the reading education of students with ID and to examine studies conducted during a 12 year span immediately following the last published review that focused on the implementation of phonics based reading interventions to students with ID and to

report on the following: (a) with whom and in which types of education settings have these explorations occurred, (b) approaches to phonics instruction that have been empirically explored since the last review, (c) the effectiveness of phonics interventions for students with ID, (d) evidence of an increased focus on phonics instruction for students with ID since the previous reviews.

An examination of the selection criteria for participants highlights a bias towards selecting the highest performing students with ID and does not accurately represent all students with ID because of the exclusion of students with <40 IQ scores (Allor, Mathes, Roberts, Jones, et al., 2010) and/or behavioral concerns. The lone exception is the study conducted by Browder et al., (2012). Across nine of the 11 reviewed studies (Browder excluded), all participants had expressive and receptive language skills and all participants possessed some reading abilities. That being said, one possible justification for researchers requiring a minimum reading ability was to focus on targeted reading skills within the study and not have to worry about remediating extraneous reading skills.

In addition to a cognitive criterion, some researchers selected participants based on behavioral competencies. For example, students with a history of maladaptive behaviors were excluded from two studies (Conners et al., 2006; Waugh et al., 2009), while others (Flores et al., 2004; Browder et al., 2012) simply did not address behavioral stipulations and chose to include any student with ID. That said, the choice by some researchers to exclude students with behavioral issues without explanation warrants additional attention

Without an explanation, the reader is left to speculate on why the exclusion has occurred. There are acceptable justifications such as, limited amount of time afforded to implement interventions and the inability to concurrently modify maladaptive behaviors within the limited timeframe. However, in the absence of an explanation, a more cynical assumption may manifest into the idea that excluding students with maladaptive behaviors is a method of increasing the probability of successful student reading outcomes.

Settings varied across the studies in this review but no studies were conducted in an inclusive setting, even though there has been a concerted effort by school districts to move towards full inclusion for students with disabilities (Scruggs, Mastropieri, & McDuffie, 2007). Not surprisingly, five of the 11 studies occurred within the participants' self-contained classroom and all remaining interventions were implemented in a separate empty classroom free of peer distractions. The use of a separate room is most concerning when thinking about the possible use of theses interventions by the classroom teacher. More specifically, due to his or her limited resources and time needed to implement interventions to students in isolation, many practitioners may not consider these interventions as viable options.

As evidenced by this review of the literature, researchers implemented a variety of interventions but two variables consistent across interventions were the use of systematic explicit instruction and the delivery model. Interventions were either implemented one-to-one or in a small group. The prevalence of small group instruction across studies makes sense because experts agree that it is the most effective mode of instruction for students with ID (Gast & Winterling, 1992; Hall, Schuster, Wolery, Ault, & Doyle, 1992; Werts, Wolery, Holcombe, & Gast, 1995). That said, if more students with ID are to be fully included in general education settings, it would be helpful to practitioners and other educational personnel to have more studies conducted within an inclusion setting that focus on reading interventions for students with ID.

In addition to delivery model, consistency in the number of minutes that each intervention was implemented (M=32.5) was evident in five of the 11 studies (Allor, Mathes, Roberts, Cheatham, & Champlin, 2010; Allor, Mathes, Roberts, Jones, & Champlin, 2010; Bradford, Shippen, Alberto, Houchins, & Flores, 2006; Finnegan, 2012; Joseph, 2002). The mean of 32.5 minutes of reading instruction may serve as a starting point for practitioners as they prepare future reading lesson for their students. Unfortunately, five studies (Browder, et al., 2012; Cohen, et al., 2008; Conners, et al., 2006; Flores, et al., 2004; Waugh, Frederick, & Alberto, 2009) were inconsistent with reporting the duration of reading interventions. More specifically, Browder et al., (2012) did not indicate the amount of time daily reading interventions were implemented and other authors did not predetermine a fixed amount of reading intervention time for each participant, possibly due to the experimental design (i.e., changing criterion design) being implemented (Fredrick et al., 2013; Waugh et al., 2009)

The researchers of the studies in this review went beyond the typical sight word approach to reading instruction so widely used for years with this group of learners (Browder et al., 2009) and implemented phonics-based reading interventions. All authors in this review, reported varying degrees of successful reading outcomes and their results should provide encouragement for fellow researchers to further examine the effects of letter-sound correspondence, letter groups, and syllables on reading instruction with students with ID. For example, authors of the study with the second largest sample of participants (Allor, et al., 2010) reported that students receiving phonics based reading interventions made educationally meaningful, statistically significant progress on standardized measures of reading and language after 2-3 years of intensive small group instruction. Another encouraging result was the reading gains made by

older students in middle school (Bradford et al., 2006; Cohen et al., 2008; & Fredrick et al., 2013). Results of reading gains for older participants in these studies should motivate teachers, parents and other stakeholders to not only continue reading instruction to individuals with ID but to also consider using a phonic-based approach.

4.1 Implications for Practice

Schools are chaotic environments filled with individuals who are in a constant state of flux, and with educational funding shrinking every year, school personnel are expected to do more with less (Katz, 2015). Therefore, teachers who will be responsible for the implementation of reading interventions should be a priority in educational research. Across the majority of the studies, there was limited implementation of reading interventions by teachers. Practioners were trained to implement the reading intervention in four (Browder et al., 2006; Flores et al., 2004; Fredrick et al., 2013; Waugh et al., 2009) of the 11 studies. In fairness to researchers (Allor, et al., 2010) funded through federal grants, restrictions and adherence to specific guidelines may limit practitioner's roles within the study. However, if federal guidelines are impeding teacher involvement then federal funding sources should reexamine their guidelines and allow more flexibility in the role practitioners play in future studies.

The absence of teacher implemented interventions is concerning because the classroom teacher intuitively has a greater familiarity of the students' ability academically and behaviorally than the researcher. This knowledge of the student could be beneficial to reducing performance anxiety or maladaptive behaviors manifested from working with unknown adults (i.e., researchers). As stated previously, constraints put on researchers by federal funding sources may be an obstacle to more practitioner involvement in studies. This is a concern because the classroom teacher will always be responsible for delivering effective reading instruction. Thus, guidelines should be abated to allow for more collaboration between researchers and practitioners on effective reading instruction so the gap between practice and research will not continue to widen.

4.2 Implications for Further Research

One suggestion for future research is to develop and implement reading interventions that are infused with behavioral supports because students with ID who demonstrate maladaptive behaviors also need effective reading interventions. Unfortunately, many times, researchers are left with little choice but to purposely exclude students with maladaptive behavior from reading intervention studies due to time constraints. By adding behavioral supports, more students with ID regardless of behavioral issues, may be included in future studies.

Another consideration is experimental design selection, which requires great thought before future studies are implemented. A subtle change occurred in the preferred experimental design used in research involving students with ID since the last review was published. Prior to 2001, single case design was the most used experimental design for research involving students with ID but recently, more group design studies have been published. Both experimental designs have advantages but careful consideration is needed before deciding which to use. Group design is considered the "gold standard" (Mackenzie & Grossman, 2005) of research methodology but these large-scale intervention studies similar to the one conducted by Allor and colleagues (2010) require substantial resources including but not limited to ongoing trainings, large sample sizes, and additional support personnel.

In contrast, single case designs offer a rigorous methodology, documents experimental control and each participant serves as their own control. Thus, reducing the number of participants needed (i.e. 3-5 participants) for the study. An additional benefit of single case design is the selection of dependent variables (DV) that have high social importance such as, reading letters or connected text (Horner, et al., 2005). The social significance of being able to read, single case design's rigorous methodology, and a single digit participant requirement, makes single case design an appealing option for future researchers planning on conducting reading intervention studies with students with ID.

4.3 Conclusion

Reading interventions for students with ID not only need to be effective but also practical. Limited time during the school day and an increase in teaching responsibilities require academic interventions used by teachers to be simple, efficient, and implemented in the classroom versus multi-faceted interventions requiring isolation. In the last several years, there has been a push for full inclusion for students with ID (Feldman, Carter, Asmus, & Brock, 2016). Therefore, if full inclusion for students with ID is going to be realized, more research needs to be conducted in the inclusion setting.

With the passage of No Child Left Behind (NCLB, 2002) and now Every Student Succeeds Act (ESSA, 2015), the focus on functional skills for students with ID has shifted to a more academic/standards based curriculum (Wehmeyer et al., 2006). Extant research supports the claim that students with ID can learn reading skills (Browder et al., 2004) so it makes little sense that reading instruction for this population of students be underemphasized (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006). Additionally, many of the studies in this review focused on beginning

reading skills for adolescent aged participants. This may be an indication that reading instruction is either not being sufficiently implemented to students with ID during the primary grades or different reading interventions are needed.

Between the years 2001 and 2013, 11 empirical studies on phonics based reading interventions for students with ID have been published. This is a positive trend for the field but improvement of effective reading instruction for this group of learners relies on more research. One possible solution to increase the number of studies is for researchers to continue identifying successful elements of interventions for students with milder disabilities (i.e. LD) and incorporate these elements into new interventions for students with ID.

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