Education and Training in Autism and Developmental Disabilities
The Journal of the Division on Autism and Developmental Disabilities,
The Council for Exceptional Children

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EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES (ISSN 2154-1647) (USPS 0016-8500) is published quarterly, by The Council for Exceptional Children, Division on Autism and Developmental Disabilities, 2900 Crystal Drive, Suite 100, Arlington, Virginia 22202-3556. Members’ dues to The Council for Exceptional Children Division on Developmental Disabilities include $9.00 for subscription to EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES. Subscription to EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES is available without membership. Individual—U.S. $100.00 per year; Canada, PUAS, and all other countries $104.00; Institutions—U.S. $249.00 per year; Canada, PUAS, and all other countries $254.00; single copy price is $40.00. U.S. Periodicals postage is paid at Arlington, Virginia 22204 and additional mailing offices.

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Manuscripts Accepted for Future Publication in Education and Training in Autism and Developmental Disabilities

June 2019


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Abstract: Although promoting inclusive education for students with disabilities has received significant attention internationally, reviews of the international intervention literature have not been conducted. This paper describes the results of a literature review of the past 15 years of peer-reviewed, empirical articles published in English- and Spanish-language journals to identify trends in research on supports implemented to enhance student-level outcomes in inclusive K-12 settings with students with disabilities. Intervention methods, findings, and trends were compared across the English and Spanish literature. Only 98 articles were identified that implemented and assessed outcomes in inclusive settings in the English-language literature, and the total number of participating students with disabilities was 12,896. Students with more extensive support needs were more frequently represented in the research than students with less extensive support needs. About one half of the studies targeted interventions to enhance instructional supports to improve students’ general education curriculum-related skills and knowledge. The four intervention studies identified in the Spanish-language literature totaled 219 participants, and all four studies investigated participation supports. Implications for future research to advance inclusive practices internationally are discussed.

Inclusion of students with disabilities in general education contexts has emerged as a major issue throughout the world. This necessitates evidence-based practices that can be implemented across contexts to support student access to and progress in the general education curriculum. In 2006, the Convention on the Rights of Persons with Disabilities (CRPD) was adopted by the U.N. General Assembly. Article 24 asserts the right of people with disabilities to education and states that part of this right includes that children with disabilities “can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live” (UN, 2006, p. 17). Approximately 160 countries are signatories to the CRPD, and the US, while not a signatory, has laws and policies that address the rights of children with disabilities to a free, appropriate public education and access to and progress in the general education curriculum, consistent with Article 24.

Despite these laws and policies, progress toward inclusive education that promotes meaningful access to and progress in the general education curriculum has proceeded slowly, particularly for students with more extensive support needs. For example, in the United States while almost 95% of students with disabilities are included in general education classes for at least some portion of the school day, it becomes evident that severity of disability impacts access to inclusive environ-
ments when the numbers are broken down by disability label. Forty-nine percent of students with intellectual disability and 46% of students with multiple disabilities are included for less than 40% of the day, while 68% of students with learning disabilities are included for 80% or more of the day (National Center for Education Statistics, 2015). Further, students with extensive support needs tend to lag significantly behind their peers academically, and the degree to which students with extensive support needs have meaningful access to the general education curriculum remains limited (Ryndak, Jackson, & White, 2013).

In other countries, data are often collected and reported in different ways. Within the data that are available, trends are generally similar to those in the US. For example, in many Spanish speaking countries, such as Spain, a separate education system for students with extensive support needs, including students with intellectual disability, exists and remains the model of service delivery, although efforts are underway to change this model. Of students that are included in general education schools in Spain (which tend to be students with less extensive support needs), 80% of students with disabilities are in regular classrooms with their peers without disabilities although very few supports are provided in the general education curriculum (Navas, Gómez, & Verdugo, 2017).

Given the emphasis on inclusive education in policy around the world, it is critical that effective supports for inclusive education that are aligned with students’ support needs are developed and disseminated across contexts to enable students with disabilities, particularly those with extensive support needs, to access and make progress in general education contexts. To enable this outcome, research teams from the US and Spain collaborated to undertake a systematic review of the literature on inclusive education in the English- and Spanish-language literature. The goal of this collaboration was to analyze trends in the literature to guide future research. In another analysis, we examined the general trends in the types of articles published (Amor et al., 2017), and one of the categories of research that emerged was empirical research on interventions implemented in inclusive classrooms. This category represented a minority of scholarship in both the English- and Spanish-language literature (5% and 2% of total articles, respectively). There was a greater focus in the English- and Spanish-language literature on theoretical and conceptual justifications for the inclusion of students with disabilities as well as descriptive articles, which provided case examples of ways that inclusive practices could be implemented or descriptive data on the numbers of students included and the factors that impacted access to inclusive environments. Another large subset of the literature (25%) examined stakeholder perspectives of inclusion. The smallest amount of literature focused on empirical evaluation of strategies designed, implemented, and evaluated in inclusive settings in both the English- and Spanish-language literature. This suggests an ongoing need to focus on research establishing effective practices, moving beyond simply describing the importance, current status, and need for inclusion.

The purpose of this review was to conduct a more in-depth review of the subset of literature focusing on empirical evaluations of the implementation of interventions to promote access to and progress in general education contexts that was identified, but not directly analyzed, in the Amor et al. (2018) review. We focused on reviewing this subset of the literature to identify the categories of supports that were typically focused on in interventions to promote access to and progress in inclusive environments. We excluded any literature that did not implement or evaluate interventions in inclusive contexts, consistent with a social-ecological approach to understanding disability and utilizing individualized supports to enhance outcomes. As such, a social-ecological perspective and the supports model that emerges from this perspective guided our review of this body of literature. The social-ecological perspective of disability defines disability as a mismatch between personal competencies and environmental demands (Schalock et al., 2010; World Health Organization, 2007). It also highlights the role that individualized supports play in addressing these mismatches (Schalock, 2013). From such a perspective, in the education context, supports become critical to the success of students with disabilities in general education settings as they can be used to address mismatches be-
tween student competencies and the demands of inclusive environments.

Supports are defined as “resources and strategies that aim to promote the development, education, interests, and personal well-being of a person and that enhance individual functioning” (Schalock et al., 2010, p. 18). With regard to inclusive education, supports can be any strategies, materials, or actions that are delivered with the intent of improving access to and progress in the general education context. The key consideration is that the intervention is delivered with the purpose of improving access and progress in the general education context by addressing mismatches between a student’s competencies and the demands of the general education context. A growing body of research has shown that students with disabilities, including students with more extensive support needs, can learn general education content when appropriate instructional and participation supports and effective curricular adaptations are made (Ryndak et al., 2013); however, a large subset of this research, particularly articles on curricular adaptations, has taken place outside of the general education context where data have been collected in segregated settings for students with disabilities. Such research does not fully address the issues related to systematically understanding mismatches experienced through support needs assessment and the supports model described above. For this reason, the purpose of this review was to specifically identify and analyze the literature published in English- and Spanish-language journals that focused on empirically evaluating supports for students with disabilities implemented in inclusive settings to improve access to and progress in those settings. The supports investigated in the interventions studies were organized according to the support categories introduced by Thompson, Walker, Shogren, and Wehmeyer (2018). The supports typology by Thompson et al. focused on support function (i.e., the purpose that supports serve in general education classrooms) as opposed to types (i.e., forms) of supports. Not only are types of support seemingly innumerable (e.g., consider the sheer number of apps available for mobile phones that could serve as supports), but many types of support can serve multiple purposes depending on how people use them. The authors assert that there are three broad categories of supports relevant to general education contexts, including curricular adaptations, instructional supports, and participation supports. Table 1 provides definitions for the categories and subcategories of supports introduced by Thompson et al. (2018).

Based on the rationale for this literature review described above, our overarching research questions were as follows:

1. What were the participants’ characteristics (e.g., age ranges, gender, disability categories) in studies examining the efficacy of supports in inclusive contexts?
2. What research methods were used in the studies examining supports for inclusion implemented with students with disabilities in inclusive settings?
3. What categories of supports have been investigated with regard to their impact on student access to general education curriculum and settings, as well as on student learning?
4. How did participants and teachers rate the social validity of the supports in terms of feasibility and usefulness?

Method

Literature Search Procedure

As described previously, the present analysis was conducted using a subset of articles that were identified but not analyzed in a broader review of the literature on inclusive education in the English- and Spanish-language literature (Amor et al. 2018). Amor et al. (2018) reviewed all articles published between 2002 and 2016 on inclusive education and adopted a definition of inclusion that was used to guide the overall search: inclusion is when students with disabilities “are present, participate, learn, and receive instruction in the general education context with the same chronological age peers for all or part of a school day” (Amor et al., 2018). Based on the literature, Amor et al. used a systematic coding procedure to group the articles and examine trends; one of the categories was empirical interventions studies. This is the subset of articles that is the focus of this review. To be
included in this category, data had to be reported on the impact of a defined practice, intervention, or environmental arrangement on student-level outcomes in an inclusive, K-12 setting. Articles were excluded if they (a) targeted only postsecondary transition outcomes, (b) did not report in-school outcomes, (c) did not focus on students receiving special education services (e.g., mental health or medical conditions, but no stated eligibility for special education), and (d) did not implement the intervention and collect data in inclusive settings.

The specific procedures used to obtain the subset of articles utilized in this review are shown in Figure 1. Using the search terms identified in Figure 1, a total of 5,661 English-language articles and 5,041 Spanish-language articles were initially identified in the overall Amor et al. (2018) search. After removing duplications and screening each title and abstract based on inclusion and exclusion criteria described above, the corpus of literature was narrowed to 2,078 English-language articles and 302 Spanish-language articles. These articles were classified into the broad categories defined by Armor et al. (2017): attitudinal, descriptive, theoretical, literature review, and intervention. As shown in Figure 1, the subset of articles in the intervention category after the search and classification procedures were applied was 98 articles in the English-language literature and four articles in the Spanish-language literature. These articles are the focus of this review as they were not analyzed in the Amor et al. (2018) review.

**Study Coding**

Each intervention article was coded for participant characteristics and study characteristics. Participant characteristics included: (a) total number of participants with disabilities, (b) disability categories, (c) number of male and female students, (d) age ranges, (e) race/ethnicity, and (f) inclusion of participants.

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**TABLE 1**

Categories and Subcategories of Support Based on Function/Purpose of Support

<table>
<thead>
<tr>
<th>Categories of Support</th>
<th>Subcategories of Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curricular Adaptations</td>
<td>Supplementary goal adaptations function to provide additional content that is related to and complements the gen ed. curriculum</td>
</tr>
<tr>
<td></td>
<td>Modified goal adaptations function to change gen ed. curricular content so that the difficulty level is aligned with a student’s present level of achievement</td>
</tr>
<tr>
<td></td>
<td>Alternative goal adaptations function to provide additional content that is unrelated to what is taught in the gen ed. curriculum, but can be taught alongside gen ed. curricular content</td>
</tr>
<tr>
<td>Instructional Supports</td>
<td>Instructional adaptations function to individualize how the teacher teaches and/or how the student demonstrates learning</td>
</tr>
<tr>
<td></td>
<td>Alternative adaptations function to coordinate classroom teaching and learning activities with individualized teaching and learning activities related to individualized learning outcomes</td>
</tr>
<tr>
<td>Participation Supports</td>
<td>Accommodations function to provide alternative ways to access gen ed. instruction but do not change the difficulty level</td>
</tr>
<tr>
<td></td>
<td>Modifications function to provide alternative ways to access gen ed. instruction but change the difficulty level</td>
</tr>
<tr>
<td></td>
<td>Personalized assistance function to enable a student to more fully participate in learning activities by providing support from another person or through use of technologies</td>
</tr>
</tbody>
</table>

*Note.* Adopted from Thompson et al. (2018).
without disabilities. When coding disability categories, we used the 13 disability categories recognized under the Individuals with Disabilities Education Act (IDEA, 2004), as well as "developmental delay." Further, when a study reported more than one disability category per student we coded all the disability categories; therefore, in reporting the findings, the total number of students' disability categories exceeded the total number of participating students. We also attempted to capture, based on study descriptions or disability classification, the intensity of the support needs of the participants in the studies. Based on the literature (e.g., Gage, Lierheimer, & Goran, 2012; Ryndack et al., 2014) and discussions among the research team, we categorized students into a less extensive or more extensive support need group. Students with intellectual disability, autism spectrum disorders, multiple disabilities, orthopedic impairment, visual impairment, and hearing impairment were categorized as students with more extensive support needs. Students with learning disabilities, emotional disturbance, other health impairment, and speech and language impairment were categorized as students with less extensive support needs. In terms of study characteristics, we coded the research design, purpose of study, independent variable, dependent variable, intervention setting (elementary, middle, junior high, high school), location (i.e., country), results, and social validity information. If a study was implemented in more than one setting, all settings were coded. Finally, using the definitions of support categories shown in Table 1, we coded the independent variables according to their support function.

**Interrater Reliability**

To determine interrater reliability of coding procedures, 25% of the 98 English-language intervention studies (n = 25) were coded by two coders. Because of the small number of articles identified in the Spanish-language search (n = 4), all were coded for reliability. Agreement was established when the two coders agreed across all dimensions on the coding
sheets. When there were disagreements, the coders reanalyzed the disagreed upon dimensions by reviewing the studies again and coming to consensus about the appropriate coding. To calculate interrater reliability, the number of agreements was divided by the sum of the number of agreements and disagreements, then multiplied by 100. There was 98% agreement for the English-language literature, and 100% agreement for the Spanish-language literature.

Results

In the English-language literature, the range of the number of inclusive intervention studies implemented in inclusive contexts published each year between 2002 and 2016 ranged from one in 2010 to 12 in 2002. There was an average of six intervention studies published each year. In the Spanish-language literature, the four intervention studies were published between 2007 and 2014.

Participant Characteristics

The total number of participating students with disabilities across all English-language studies was 12,896. There were almost twice as many male students \((n = 7,922)\) as female students \((n = 4,626)\), and 17 articles did not specify the numbers of participants by gender. Students’ racial and ethnic background information was reported in 50 studies; 548 (60%) of the participants were Caucasian, 193 (21%) were African American, and 105 (12%) were Hispanic. There were 41 (5%) Asian students, and 22 students (2%) were identified as being from other racial and ethnic backgrounds. Frequently, the articles that were conducted in English-speaking countries other than the United States did not provide participants’ racial and ethnic background information.

Among the English-language studies, 42 included students with learning disabilities \((n = 793\) participants across studies), followed by 38 studies that included students with intellectual disability \((n = 287)\), and 36 with students with autism spectrum disorders \((n = 540)\). Students with other health impairments \((n = 659)\) participated in 13 studies, and students with emotional disturbance \((n = 2,126)\) participated in 19 studies. Moreover, one study (Barlow, Humphrey, Lendrum, Wigelsworth, & Squires, 2015), conducted in the UK reported that some of the participants had learning difficulties \((n = 6,481)\), and this was left as a separate category given its non-congruence with the IDEA categories. Over 3,700 students without disabilities were included in studies in some fashion, with 857 participating in 25 studies that examined peer supports. Table 2 provides more specific demographic information across the studies.

Across the studies, a larger number of students were classified into the extensive support needs (e.g., intellectual disability, autism spectrum disorders) group. Students with more extensive support needs participated in 47 studies, and student with less extensive support needs participated in 40 studies. Students in both groups were included in 10 studies. When examining the trend of publications, there were more studies that included students with more extensive supports needs in 2002, 2007, 2008, 2013, and 2016. However, there were an equal number of publications which included either students with more extensive support needs or less extensive support needs in 2003, 2005, 2009, 2012, and 2014, suggesting no clear trends overall.

Within the Spanish-language sample, a total of 219 students participated, although one study (Yupanqui, Aranda, Vásquez-Oyarzun, & Verdugo, 2014) reported that students from 15 educational centers, including students with disabilities, participated without reporting specific numbers of participants in each center. Regarding demographic characteristics, the studies written in Spanish that met the inclusion criteria did not provide as much information as the English-language studies. In regard to the gender of participants, only one study (Lozano-Martínez, Alcaraz-García, & Colás, 2010) stated the gender of participants (four female students and eight male students). Only one study targeted students with autism spectrum disorders (Lozano-Martínez et al., 2010), another targeted students with behavioral disabilities (Escribano & González, 2014), and two studies did not report specific disability categories just that students received education services for a disability.
TABLE 2

Participant Demographics in English-Language and Spanish-Language Literature

<table>
<thead>
<tr>
<th></th>
<th>English (n = 12,896)</th>
<th>Spanish (n = 219)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4,626</td>
<td>4</td>
</tr>
<tr>
<td>Male</td>
<td>7,922</td>
<td>8</td>
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<tr>
<td>Not reported</td>
<td>435</td>
<td>207</td>
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<tr>
<td>School Setting&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
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<tr>
<td>Elementary School</td>
<td>5,627</td>
<td>NA</td>
</tr>
<tr>
<td>Middle School</td>
<td>645</td>
<td>NA</td>
</tr>
<tr>
<td>Junior High School</td>
<td>3,123</td>
<td>NA</td>
</tr>
<tr>
<td>High School</td>
<td>3,516</td>
<td>NA</td>
</tr>
<tr>
<td>Not reported</td>
<td>30</td>
<td>NA</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
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<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>548</td>
<td>NA</td>
</tr>
<tr>
<td>African American</td>
<td>193</td>
<td>NA</td>
</tr>
<tr>
<td>Hispanic or Latino/a</td>
<td>105</td>
<td>NA</td>
</tr>
<tr>
<td>Asian</td>
<td>41</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>22</td>
<td>NA</td>
</tr>
<tr>
<td>Not reported</td>
<td>12,679</td>
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<tr>
<td>Disability Category&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>Autism Spectrum Disorder</td>
<td>540</td>
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<tr>
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<td>Learning Disabilities</td>
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<td>Emotional Disturbance</td>
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<tr>
<td>Other Health Impairments</td>
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<td>Developmental Disability</td>
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<tr>
<td>Speech or Language Impairment</td>
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<tr>
<td>Visual Impairment</td>
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<td>Hearing Impairment</td>
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<td>0</td>
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<tr>
<td>Learning Difficulties&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>Unclassified</td>
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<td>0</td>
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<tr>
<td>Not reported</td>
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<td>197</td>
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<tr>
<td>Country&lt;sup&gt;d&lt;/sup&gt;</td>
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</tr>
<tr>
<td>United States (n = 86)</td>
<td></td>
<td>Spain (n = 2)</td>
</tr>
<tr>
<td>Ireland (n = 3)</td>
<td></td>
<td>Chile (n = 2)</td>
</tr>
<tr>
<td>Canada (n = 2)</td>
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<td>Israel (n = 1)</td>
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<td>Sweden (n = 1)</td>
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Note.  
<sup>a</sup> The number of participants at each intervention setting.  
<sup>b</sup> Since some participants had more than one disability category, disability categories were simply tallied; therefore, the number represented may add up to more than the total number of the participants.  
<sup>c</sup> It is a disability category used in the United Kingdom.  
<sup>d</sup> The number reported is the number of studies conducted in a country. NA = Not available.

**Study Characteristics**

As shown in Table 2, the United States was the location for 86 of the 98 English-language studies (88%). Ireland was the location for three studies, and Canada, the United Kingdom, and South Korea were the locations for two additional studies. Spain and Chile were
the locations for the Spanish-language investigations. Table 2 shows that studies in the both English and Spanish-language literature represented students with disabilities at all grade levels although the information on specific number of participating students per school level was not available for the Spanish-language studies. Almost one half of the studies \((n = 44)\) in the English-language literature conducted interventions in an elementary setting, and several studies were dually coded as they included elementary and middle school students. The second most common setting was middle schools \((n = 32)\). In the Spanish-language literature, elementary schools were the setting for two studies (Dávila & Velásquez, 2007; Escribano & González, 2014), while two studies targeted students in elementary through high school levels (Lozano-Martínez et al, 2010; Yupanqui et al., 2014).

Single-case design was the most common research method in the English-language studies \((n = 64)\), while in the Spanish-language literature there were no single-case design studies. In the English-language sample, 27 additional studies used a group experimental design. The total number of the students included across the single-subject-design studies was 232, and in the experimental-design studies was 905. Several studies \((n = 3)\) used a mixed method design and a quasi-experimental design. One of the quasi-experimental studies (Barlow et al., 2015) included 11,391 participating students with disabilities. In the Spanish-language literature, there were three quasi-experimental, pre/post-test without control group designs, and one quasi-experimental, pre/post-test with control group designs.

Overall, the purpose of the intervention studies was to examine the efficacy or effectiveness of an intervention strategy to improve student learning and performance in inclusive settings. Most of the studies targeted academic content knowledge, skills, and outcomes by implementing strategies to support student learning (e.g., Jameson, Walker, Utley, & Maughan, 2012). Other studies investigated the efficacy or effectiveness of an intervention to improve social outcomes, including social skills and social interaction with peers without disabilities (e.g., Hartzell, Liaupsin, Gann, & Clem, 2015). A small group of the studies aimed to increase student task/academic engagement in an inclusive setting by introducing behavior support strategies (e.g., Strain, Wilson, & Dunlap, 2011). Additionally, another group of studies focused on promoting student self-determination. For example, Shogren and colleagues (2012) examined the impact of a self-determination intervention on students’ academic and transition goal attainment as well as on access to the general education curriculum. Generally, the studies reported positive outcomes across dependent variables. Interventions targeted a variety of dependent variables, including academic progress and outcomes measured by a test or curriculum-based assessment. Other studies included observational recordings to monitor students’ social interactions or task/academic engagement. Lastly, some studies explored student perceptions of change based on interventions in inclusive settings. For example, Meyer and Ostrosky (2016) used a protocol examining the number of best friends that students reported as the dependent variable in the study.

**Categories of Supports**

In order to identify the categories of supports investigated in the studies, the independent variable(s) for each study was coded based on the three categories of support (curricular adaptations, instructional supports, and participation supports) defined in Table 1. As shown in Figure 2 in the English-language studies, the most frequently examined category of supports was instructional supports \((n = 47)\). However, 14 of these studies implemented instructional supports in combination with another category of support. Figure 3 shows the 26 specific types (i.e., forms) of instructional supports investigated across the studies. The form of instructional support most frequently examined as an independent variable in an inclusive setting was teaching self-motioning skills \((n = 8; 13\%)\), followed by teaching skills to promote self-determination \((n = 7; 11\%)\) and teaching math skills \((n = 7; 11\%)\). Out of the 61 studies using instructional supports alone or in combination with other support categories, 25 (41\%) implemented interventions with students with more extensive support needs, 29 (48\%) implemented interven-
tions with students with less extensive support needs, and 6 studies (10%) implemented interventions with a combination of students with less and more extensive support needs. Only one study did not specify the participants’ disability characteristics.

The next most frequently investigated support category was participation supports (n = 34) or participation supports in combination with supports from other categories (n = 13). As Figure 4 shows, peer support was the most frequently investigated form of participation support (n = 21; 43%), followed by technology (n = 8; 16%). Interestingly, 11 studies investigated interventions involving both instructional supports and participation supports. For example, Hundert and colleagues (2014) combined social script training (instructional support) and peer support (participation support) to increase peer interaction skills for children with autism spectrum disorders attending kindergarten. Additionally, Jimenez and colleagues (2012) implemented peer-mediated embedded instruction which functioned to engage students in small group learning (participation support) while providing students with opportunities to work on inquiry science lessons (instructional support) in an inclusive setting. Out of the 47 English-language studies documenting the implementation of participation supports, 25 (53%) included students with more extensive support needs.
needs and 20 (43%) included students with less extensive support needs. In the Spanish-language sample, all four studies used participation supports.

Social Validity

Among the English-language literature, 57 studies examined the social validity of the interventions. Most commonly, studies asked teachers, including special and general education teachers, about usefulness and effectiveness of the interventions \((n = 37;\) e.g., Prater, Redman, Anderson, & Gibb, 2014; Reeves, Umbreit, Ferro, & Liaupsin, 2013). Across all studies, teachers rated the interventions as acceptable, appropriate, or not intrusive. Some articles also included suggestions made by the teachers. For example, Dore, Dion, Wagner, and Brunet (2002) found that teachers wanted more information on how to engage paraprofessionals in implementing supports. Students provided their feedback on the intervention in 22 studies. Generally, students reported satisfaction with the intervention process and outcomes; however, some made suggestions on the content or procedures of the interventions such as using animation rather than an instructor talking in a video-based intervention and to make the program shorter (Lancaster, Lancaster, Schumaker, & Deshler, 2006). Additionally, in 10 studies peers without disabilities provided data on their experiences and perspectives during the intervention. Findings showed peers perceived their experience positively, reporting it was enjoyable to learn an instructional strategy and support students with disabilities (e.g., Brock, Biggs, Carter, Cattey, & Raley, 2016; Klavina, Jerlinder, Kristén, Hammar, & Soulie, 2014). Many peers also said they were willing to continue providing peer support to students with disabilities after a study was completed (e.g., Brock et al., 2016). Further, paraprofessionals who were trained as intervention agents or participated in the interventions perceived them to be favorable and effective (e.g., Robinson, 2011). Finally, three studies obtained social validity information from parents of student participants with disabilities. Overall, parents thought their children gained effective skills and knowledge to improve their school performance. For example, Bui and colleagues (2006) implemented an intervention to improve students’ writing performance, and parents rated their satisfaction about writing outcomes based on writing samples students brought home. At the end of the intervention, parents saw an improvement in their children’s writing performance.

All the Spanish-written studies solicited information on perceptions of the participating teachers, families, peers, and/or students with disabilities toward usefulness and effectiveness of the interventions. Overall, the participants
reported being satisfied with the interventions and student outcomes.

Discussion

The purpose of this literature review was to explore the characteristics of empirical research that examined the impact of interventions implemented with students with disabilities in inclusive settings in the English- and Spanish-language literature. The goal was to better understand the categories of supports being researched to provide directions for the field, particularly to promote greater international-collaborative research (Lau et al., 2014) that advances the values of inclusive education set forth in Article 24 of CRPD, notably student access to and progress in the general education curriculum.

Limitations

Before exploring the implications of the outcomes of the review, several limitations must be acknowledged. First, it is possible different research teams may have identified other articles if they used different inclusion and exclusion criteria or conducted ancestral search and manual searches. However, we identified and adopted clear and consistent procedures across research team members across the different language literature. Second, in conducting research across international contexts, there are country- and language-specific issues that emerge, particularly in classifications used for personal factors that may impact the outcomes of inclusive practices. For example, differing disability categories and definitions are used across countries. Further, different contexts consider differing demographic variables, and some studies do not provide person-level demographic information. This limits the degree to which comparisons based on personal factors can be analyzed and used to provide guidance on individualizing interventions based on varying student characteristics. Third, our intention was to review inclusive intervention studies to capture the international trends in inclusive practices; however, we reviewed literature from only two languages as English and Spanish were the languages and contexts represented in our research groups. Expanding this collaboration to look at trends in additional contexts will be an important direction for future research. Finally, our main focus in this review was to explore descriptively the categories of supports examined and the application of these supports to students with more and less severe disabilities. We did not specifically evaluate the quality of the research or systematically review the impact on outcomes across studies. Future research can address these issues; however, this review provides a starting point for considering how to expand the use of the supports model and the integration of supports for instruction, participation, and curriculum access into research and practice.

Implications for Future Research

As the findings of this literature review suggest, researchers in the United States have conducted more intervention research aimed at understanding instructional supports and student access to inclusive settings than in other English-language countries. The history of inclusive education in the United States and the passage of P.L. 94–142 in 1975, now the Individuals with Disabilities Education Act (IDEA, 2004), may have influenced the emphasis on research in inclusive settings in the US. However, the relatively small number of articles that examined interventions fully implemented and evaluated in inclusive contexts even within the US reflects the ongoing tendency, as discussed in the introduction, to separate students with disabilities for some portion of their instructional day (National Center for Education Statistics, 2015), particularly students with more extensive support needs (Feldman, Carter, Asmus, & Brock, 2016; Kurth, Morningstar, & Kozleski, 2014). Further, the lack of studies implementing curricular adaptations in inclusive settings likely reflects that fact that when research is conducted in inclusive settings, the greater focus is on building student skills (through instructional supports) or enhancing participation supports rather than on adapting the curriculum to meet the individualized learning needs of students with disabilities (Janney & Snell, 2013). A strong area of focus continues to be remediating deficits and modifying the environment. Turnbull, Turnbull, Wehmeyer, and...
Shogren (2016) suggest there have been three generations of inclusive practices. The first wave focused on getting students access to general education contexts, the second focused on promoting participation in those contexts, and the third focused on promoting progress in general education contexts through curricular adaptations and other supports that promote a match between the demands of the general education environment and student needs. Third generation practices are only now emerging and have yet to be systematically tested when applied in general education environments, particularly as issues with access and participation remain ongoing challenges (Kurth & Mastergeorge, 2012).

This review suggests the need for thinking about access and progress concurrently, and ensuring that efforts to promote general education curricular outcomes, including outcomes related to academic, social, and other skills, are designed, tested, and evaluated in integrated contexts. Research on supports that are not implemented in the context that they are meant to be used is not consistent with the supports model, which asserts that the general education context must be the reference environment when designing and implementing effective supports to enhance student outcomes (Copeland & Cosbey, 2008/2009). The fact that there were so few studies in the Spanish-language literature suggests the relative newness of this consideration in Spanish contexts given the ongoing segregation of students with disabilities, particularly with extensive support needs. Further work is needed across contexts, given the growing recognition of the fundamental right of students with disabilities to access inclusive, community-based environments for their education and socialization established in CRPD. There have also been calls to increase the focus on international-collaborative work to ensure countries work together to address these issues and do not duplicate work across contexts. For example, the Salamanca World Conference on Special Needs Education called for the importance of exchanging knowledge among countries which have experience with inclusion (UNESCO, 1994). However, the actualization of such international research has not advanced (Amor et al., 2018). International-collaborative research is multifaceted, but should serve as a starting point for exchanging knowledge, strategies and evidence on inclusive education as it has the possibility of providing multiple advantages for all stakeholders involved (Lau et al., 2014).

One promising finding is that relatively equivalent numbers of studies targeted supports for students with more and less extensive support needs, particularly in the English-language literature. This likely reflects the ongoing push in the severe disabilities field to promote meaningful access to inclusive opportunities. However, as discussed previously, the strong focus on instructional and, to a lesser degree, participation supports rather than curricular adaptations reflects an ongoing need to move beyond simple considerations of placement and participation in general education setting and to progress in the general education curriculum. It is also critical to ensure that researchers focus not only on academic outcomes, as this is not the only domain targeted in the general education curriculum, but also social, behavioral, and self-determination skills. As such, it is imperative that ongoing work explore all forms of support, while specifically targeting curricular adaptations. Additionally, there is a need for work to examine the most effective combination of supports (e.g., providing instructional supports + participation supports more effective than instructional supports alone) as well as the most effective strategies to individualize support plans for students in general education settings and align them to support needs. Research that links support needs assessment, using tools such as the Supports Intensity Scale – Children’s Version (SIS-C; Thompson et al., 2016), with the planning, implementation and evaluation of supports plans is also a pressing need (Thompson & Viriyangkura, 2014).

Implications for Practice

Jackson, Ryndak, and Wehmeyer (2009) suggest three essential characteristics of access to general education: curriculum, context, and learning. Access to general education occurs only when students with disabilities have opportunities to be in general education contexts, access the general education curriculum, and learn grade-level general education
content with appropriate supports. Considering all of these factors when planning and implementing supports is critical in practice, along with assessing support needs and using the data to plan for and evaluate supports aligned with the categories introduced by Thompson et al. (2018) and a social ecological model of disability (Schalock et al., 2010). Teacher education programs should introduce pre-service teachers to the concept of a social ecological model of disability and ways to assess students’ support needs with tools such as the SIS-C. This knowledge will ensure teachers are able to assess, plan for, and implement instructional and participation supports along with adapting existing general education curriculum to be used in inclusive settings. Moreover, teachers need to make ongoing efforts to assess student support needs and use a variety of supports which match individual students’ strengths and needs so that students with extensive support needs can successfully make progress in general education contexts. Existing research suggests effective instructional supports and, to a lesser degree, participation supports that teachers can utilize in general education context. The role of self-directed learning and supports for autonomy appears to be particularly important in the general education contexts (Browder et al., 2014), perhaps as these strategies have been found to better enable students with disabilities to engage with curricular content (Shogren et al., 2012). Teachers must also consider how to ensure that they are not only focusing on instructional and participation supports for students with extensive support needs, but also curricular adaptations and ways to deliver these supports in general education contexts through effective partnerships between general and special education teachers to enhance outcomes for all students (Ryndak et al., 2013).

Conclusion

The findings from this international literature review suggest there is a need to continue to focus, across language and culture contexts, on comprehensive research-based supports that enable students to access and progress in general education settings. This includes accessing curricular content and building skills and social relationships that are critical to development and quality of life. Ongoing work is needed to explore how to access inclusive settings and promote meaningful progress, with advance recognition that the adoption of a supports model necessitates empirical examination of interventions in inclusive settings. Teaching skills in segregated settings and assuming students will generalize the skills in the general education context does not recognize the critical intersection of personal characteristics and environmental demands in shaping the implementation and efficacy of supports that lead to positive outcomes. As such, interventions must target access to general education curriculum and progress in inclusive settings through curricular adaptations, instructional supports and participation supports, aligned with understanding of student support needs.

References


Involvement and progress in the general curriculum for students with extensive support needs: K–12 inclusive education research and implications for the future. *Inclusion, 1*, 28–49.


Received: 8 November 2017
Initial Acceptance: 9 January 2018
Final Acceptance: 18 February 2018
Implementing Evidence-Based Practices to Promote Self-Determination: Lessons Learned from a State-Wide Implementation of the Self-Determined Learning Model of Instruction

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Abstract: Implementation science examines the process of how programs are put into action to produce outcomes and represents an emerging approach for analyzing the utilization of evidence-based practices (EBPs) in school settings. When EBPs are implemented effectively, they result in positive student outcomes. The Self-Determined Learning Model of Instruction (SDLMI) is an EBP shown to promote positive educational and postschool outcomes for students with disabilities; however, the process of implementing the SDLMI on a large scale poses significant challenges. We describe efforts to implement the SDLMI state-wide with transition-age students with intellectual and developmental disabilities through the lens of implementation science. Key factors and issues that need to be addressed in ongoing research and practice to further advance student outcomes are highlighted.

Evidence-based practices (EBPs) are instructional methods for enhancing student outcomes that have been proven effective through quality scientific research (Cook & Cook, 2011; Cook & Odom, 2013). In the transition field, efforts have been made to identify EBPs that enhance school and post-school outcomes for adolescents and young adults with disabilities (National Technical Assistance Center on Transition, 2016; Test, Fowler, et al., 2009; Test, Mazzotti, et al., 2009). Identifying EBPs, however, has little impact on student outcomes unless they are utilized in schools, and making this link between research and practice successfully has posed significant challenges (Cook & Odom, 2013). As Wang and Lam (2017) note, focus within educational research has shifted from defining and identifying EBPs to studying implementation. The field of implementation science (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Odom, 2009) has provided guidance for enhancing utilization of EBPs in natural contexts, such as school systems. However, there are acknowledged issues in transitioning from small, tightly-controlled efficacy trials used to establish EBPs to large-scale implementation of EBPs (Fixsen, Blase, Friedman, & Wallace, 2005; Odom, 2009) has provided guidance for enhancing utilization of EBPs in natural contexts, such as school systems. However, there are acknowledged issues in transitioning from small, tightly-controlled efficacy trials used to establish EBPs to large-scale implementation of EBPs (Fixsen, Blase, Friedman, & Wallace, 2005; Odom, 2009). The complexity of school systems, the diversity of students served, and the need to develop buy-in across system levels remain major issues that must be addressed.

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R324L160002 to the University of Kansas. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education. This work was funded in part by the Borchardt Family Fund through the University of Kansas. Correspondence concerning this article should be addressed to Kathryn M. Burke, University of Kansas, Department of Special Education, Joseph R. Pearson Hall, Room 517, 1122 West Campus Road, Lawrence, KS 66045. E-mail: kathryn.burke@ku.edu

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transition outcomes for adolescents and young adults with intellectual and developmental disabilities. To accomplish this goal, we discuss (a) EBPs and the SDLMI, (b) implementation science and considerations related to the SDLMI, and (c) issues encountered in state-level implementation of the SDLMI, including issues that need to be addressed in ongoing research and practice to further advance teacher and student outcomes.

**Evidence-Based Practices and the SDLMI**

The utilization of EBPs in educational contexts is assumed to be a factor that can contribute to positive student outcomes by enabling teachers to systematically and regularly use effective models of instruction (Cook & Odom, 2013). Significant efforts have been undertaken in education to establish guidelines for how to systematically identify EBPs (Council for Exceptional Children, 2014; What Works Clearinghouse, 2017), including in the field of transition (National Technical Assistance Center on Transition, 2016). Such work has created formal processes for identifying EBPs and distinguishing EBPs from similar labels, like “best practices” or “research-based practices” (Cook & Cook, 2011, p. 72). Criteria include meeting specific standards of research design, quality, and quantity (Cook & Odom, 2013). The focus of this inquiry is on one specific EBP in transition, the **Self-Determined Learning Model of Instruction** (SDLMI; Shogren et al., 2017; Wehmeyer et al., 2000). The SDLMI is an established EBP (National Technical Assistance Center on Transition, 2017), as evidenced by over a dozen quasi-experimental or single-subject design studies (Lee, Wehmeyer, & Shogren, 2015) and large-scale, randomized controlled trial studies (RCTs; Shogren, Palmer, Wehmeyer, Williams-Diehm, & Little, 2012; Wehmeyer, Palmer, Shogren, Williams-Diehm, & Soukup, 2013; Wehmeyer et al., 2012) supporting its efficacy (Hagiwara, Shogren, & Leko, 2017).

The SDLMI is a model of instruction designed to enable teachers to teach students self-regulated problem solving in service of educational goals (Shogren et al., 2017), and was first introduced in the early 2000s (Wehmeyer et al., 2000). Its current development and implementation is grounded in Causal Agency Theory (Shogren, Wehmeyer, Palmer, Forber-Pratt, et al., 2015), a theoretical framework for understanding the development of the self-determination of people with and without disabilities. Causal Agency Theory defines self-determination as a “dispositional characteristic manifested as acting as the causal agent in one’s life” (p. 258). Causal Agency Theory emphasizes the role of supportive contexts that enable the development of self-regulated and goal-directed action (Little, Hawley, Henrich, & Marsland, 2002) leading to causal agency and self-determination.

To create a supportive context for students to learn to self-regulate educational goal setting and attainment, the SDLMI focuses on enabling teachers to create multiple opportunities for students to engage in goal-directed action. When implementing the SDLMI, teachers support students to set their own goal, to develop action plans to work toward the goal, to self-monitor and evaluate progress toward the goal, and to revise the action plan or goal as needed. As such, the SDLMI is not a specific curriculum to teach skills associated with self-determination, but a model of instruction used by teachers to support student self-directed and self-determined learning. The SDLMI can be used by teachers to support student progress across a broad array of educational activities, including those related to academic content areas and study or self-management skills, as well as transition and vocational activities. Thus, the SDLMI has the potential to serve as a critical support for promoting access to the general education curriculum (Shogren et al., 2012) and for improving transition outcomes (Shogren, Wehmeyer, Palmer, Forber-Pratt, et al., 2015). Implementation of the model consists of three phases: setting self-identified and written goals (“What is My Goal?”), creating action plans to achieve those goals and self-monitoring processes to track progress (“What is My Plan?”), and self-evaluating progress and adjusting the action plan or goal itself as necessary (“What Have I Learned?”). Each phase includes four Student Questions, which are stated in first-person voice and serve as a guide for the student to progress through the problem-solving sequence. Linked with each Student Question are Teacher Objectives, which provide a roadmap for teacher activities that support...
students to answer the Student Questions (and, thus, go through the steps in the problem-solving process). Educational Supports are embedded within each Teacher Objective to support instruction as students answer each Student Question.

Evidence of the impact of the SDLMI on student school and postschool outcomes has been established through a number of studies, including multiple large RCTs. Wehmeyer et al. (2012) conducted a group-randomized modified equivalent control group time series design study over two years examining the impact of the SDLMI on the self-determination of 312 high school students. Results showed significant differences in latent means across time and treatment and control group conditions, with students in the SDLMI group showing significantly more positive growth in self-determination over two years compared to the control group. An important finding was that it took two years of implementation to detect significant changes in self-determination scores between the treatment and control group, suggesting the importance of long-term exposure to goal-setting opportunities. Shogren et al. (2012) examined the impact of the SDLMI on academic and transition goal attainment as well as access to the general education curriculum in the same RCT, finding that students exposed to the SDLMI showed greater access to the general education curriculum and goal attainment after one year of intervention. Wehmeyer et al. (2013) conducted another RCT of multiple self-determination interventions, including the SDLMI, with students over three years, and found significant gains in self-determination for those in the treatment group. Shogren, Wehmeyer, Palmer, Rifenbark, et al. (2015) followed up with the participants from Wehmeyer et al. (2013) and found self-determination status at the time of school completion predicted more positive employment and community access outcomes one and two years postschool, linking enhanced self-determination as a function of exposure to interventions while in school with more positive postschool outcomes. As demonstrated by this body of research, the SDLMI has been shown to have efficacy in tightly controlled RCT studies, positively impacting the academic, transition, and postschool outcomes of students with disabilities (National Technical Assistance Center on Transition, 2017). This work provides a foundation for further considering the implementation of the SDLMI in natural contexts, exploring the role of implementation supports for scaling-up the use of the SDLMI, and improving secondary transition outcomes for students with disabilities, an area identified as in need of improved practices and implementation (Test, Mazzotti, et al., 2009).

Implementation Science and the SDLMI

Implementation science is a term broadly used across a number of fields to describe how programs are put into action to produce outcomes (Fixsen et al., 2005). Implementation science has been defined as “the study of factors that influence the full and effective use of innovations in practice” (NIRN, 2013a). Other common terms include implementation research (Bhattacharyya, Reeves, & Zwarenstein, 2009), knowledge translation (Graham et al., 2006), and diffusion and dissemination (Fixsen et al., 2005). When knowledge is slow to transfer to practice, students with disabilities are denied the opportunity to receive a proven benefit (Graham et al., 2006). The lack of implementation of EBPs may be a reason for persistent, disparate outcomes for students with disabilities, particularly for students with intellectual and developmental disabilities (Grigal, Hart, & Migliore, 2011; Test, Mazzotti, et al., 2009). For example, without access to opportunities to develop self-determination and learn and apply skills associated with self-regulation, problem solving, and goal setting and attainment, students with intellectual and developmental disabilities may not develop skills necessary for postschool success (Shogren, Wehmeyer, Palmer, Rifenbark, et al., 2015). As an EBP, the SDLMI has the potential to support development of the skills leading to enhanced self-determination, resulting in improved outcomes in the adult world for adolescents and young adults with disabilities (National Technical Assistance on Transition, 2017). Once a practice has been identified as an EBP, the challenge shifts to supporting sustained implementation on a large scale (Singer, Agran, & Spooner, 2017). Improving postschool transition outcomes, particularly integrated employment outcomes for youth with intellectual and developmental
disabilities, is an area of great need. Recent actions by the U.S. Department of Justice to enforce Title II of the Americans with Disabilities Act as interpreted by the U.S. Supreme Court in *Olmstead vs. L.C.* suggest that the all-too-frequent outcome of transitioning to segregated employment for young adults is unacceptable (Department of Justice, 2015). In Rhode Island (RI), the state entered into a Consent Decree to address the “unnecessary over-reliance upon segregated sheltered workshops and facility-based day programs” (U.S. District Court District of Rhode Island, 2014) for adults with disabilities. The Consent Decree identified transition-age youth with intellectual and developmental disabilities as a target population under the decree, recognizing the role of transition services and supports in creating the context for postschool integrated employment outcomes. As such, the SDLMI is being implemented as part of state-wide reform efforts to improve secondary transition services for students with intellectual and developmental disabilities given the established relationship between enhanced self-determination and postschool integrated employment outcomes (Shogren, Wehmeyer, Palmer, Rifenbark, et al., 2015). A collaboration emerged between researchers from the University of Kansas (KU) and the Conversion Institute in Rhode Island, administered by the Paul V. Sherlock Center at Rhode Island College (RIC), which was established to provide training and technical assistance to organizations affected by the Consent Decree. The goal was to train teachers to implement the SDLMI in all participating secondary schools in the state serving transition-age students with intellectual and developmental disabilities to enhance efforts to change transition services so as to lead to more positive postschool employment outcomes, beginning in the 2015–2016 school year.

**Implementation Framework**

The National Implementation Research Network (NIRN) conducted a meta-analysis of over 800 articles related to implementation practices in various fields to devise a model of implementation science. As Fixsen et al. (2013) describe it, “effective interventions X effective implementation = improved outcomes” (p. 214). In the sections that follow, we describe the framework devised by NIRN through their large-scale meta-analysis of implementation practices that is beginning to be applied to special education (Fixsen et al., 2013; Fixsen et al., 2005), and highlight how this model was applied in our scaling-up of the SDLMI (see Figure 1). Just as an intervention and its outcomes must be planned carefully and documented, so too must implementation. Thus, our goal in the remainder of this inquiry is to capture the facilitators and barriers of scaling-up implementation of the SDLMI, providing directions for ongoing research and scaling-up efforts.

**Essential components of implementation.** Five essential components comprise implementation: (1) a source, (2) a destination, (3) a communication link, (4) a feedback mechanism, and (5) a sphere of influence (Fixsen et al., 2005; see Figure 1). The source is the best example of a program or practice to be implemented at a destination, the organization using the innovation. In our example, the SDLMI is the source and RI participating schools serving transition-age students with intellectual and developmental disabilities are the destination. The communication link is the group of individuals working to implement the program or practice with fidelity and positive impacts, and the feedback mechanism is the flow of information about implementation shared between relevant players. In the scaled-up implementation of the SDLMI, the communication link is the University of Kansas (KU), the Conversion Institute at the Sherlock Center in Rhode Island, and the RI Department of Education, and the feedback mechanism is the communication between the aforementioned organizations, and the teachers and coaches implementing this model. These processes occur within, and are directly impacted by, contextual factors, known as the sphere of influence. The sphere of influence is comprised of the unique factors associated with transition education of students with intellectual and developmental disabilities in Rhode Island. For example, there are a number of facilitators in the Rhode Island context, including the size of the state, the strong, pre-existing relationship between the Conversion Institute at the Sherlock Center and school districts, and the commitment of a number of school districts to making change. However, there are also a
number of barriers, including the history of segregated education for students with intellectual and developmental disabilities at the secondary level (particularly students with extensive to pervasive support needs), the pre-Consent Decree utilization of sheltered workshops as the primary placement for postsecondary employment and the influence this had on transition goals for students with intellectual and developmental disabilities, limited resources and time for professional development, and limited opportunities for implementation of evidence-based practices related to self-determination.

**Stages of implementation.** Beyond the essential components of implementation, there are four distinct stages that frame the specific actions that must take place during implementation: (1) exploration, (2) installation, (3) initial implementation, and (4) full implementation (NIRN, 2013b, 2015; See Figure 1). When action planning for each stage, team members ask (a) how they can strengthen the process, (b) what activities should be revisited, and (c) what next steps to take. At the exploration phase, an implementation team is established to assess potential fit and create a plan for implementation, if appropriate (Fixsen et al., 2005). In Rhode Island, Sherlock Center leadership reached out to content experts in the area of promoting self-determination at KU for support in implementing the SDLMI to improve outcomes for transition-age students with intellectual and developmental disabilities. However, this process occurred rapidly given the circumstances (e.g., issuance of the Consent Decree) and the need for immediate action. Thus, there was not a strong emphasis on developing a systematic implementation plan. Instead, after a short period of planning, the team immediately delivered in-service training to teachers and devised implementation supports concurrently with teachers beginning implementation during the 2015–2016 school year. More time to develop a strong implementation plan would

![Figure 1. Large-scale implementation of the SDLMI.](image-url)
likely have led to more effective supports and roll out of the intervention. During installation, the team organizes resources, strategies, and funds to support implementation. As mentioned, in many ways the installation phase occurred concurrently with exploration, wherein members of the communication link (see essential components above) fully developed strategies as implementation was occurring. However, steps were also taken during this phase to secure additional funding to support and evaluate implementation, which provided more structure and a context for ongoing implementation. Initial implementation signifies the plan being put into action, followed by full implementation, or when the program is comprehensively integrated and operational. The state-wide implementation of the SDLMI in RI is currently in full implementation, as the majority of districts in the state have agreed to supporting teachers of transition-age students with intellectual and developmental disabilities to use the SDLMI. Specifically, the majority of districts have allowed teachers to participate in in-service training, have identified a district SDLMI coach (or partnered with other districts to identify a multi-district SDLMI coach), and have provided ongoing time and resources for coaches to engage in professional development themselves and to provide supports to teachers. Districts have also supported data collection activities to document student self-determination and transition outcomes, as well as teacher fidelity of implementation.

Drivers of implementation. The success of an innovation (e.g., the SDLMI) is highly contingent on three critical drivers: (1) competency, (2) organization, and (3) leadership (NIRN, 2015; see Figure 1). Each of these factors is examined below in connection to the implementation of the SDLMI in RI.

Competency. The competency driver encompasses issues related to building a competent team of implementers that have the knowledge, skills, and abilities to use EBPs (NIRN, 2015). The recruitment and selection of staff and training, coaching, and performance assessment (i.e., fidelity) for the staff are the primary components that determine the competency of implementation. Activities associated with competency include: (a) specifying the skills and abilities required and preferred of ideal team members, (b) providing opportunities to practice new skills and receive feedback during training, (c) embedding staff coaching as a medium for advice, (d) providing encouragement, (e) creating opportunities to extend skills in practice, and (f) assessing the use and outcomes of skills taught and reinforced through training and coaching. Because the implementation of the SDLMI is part of a state-wide systems change initiative, there is less control over the training, recruitment, and selection of staff given the complexity of the state school system. Instead, identifying and developing the knowledge, skills, and abilities of the already established staff (e.g., teachers and coaches) was the focus. Specifically, in the 2015–2016 school year, only general information was given to coaches regarding their duties to support teachers. During the 2016–2017 school year, the research team began regularly communicating with coaches about supports and data collection via e-mail. The goal for the 2017–2018 school year is for research team members to regularly share resources and participate in monthly coaches’ meetings to enhance their impact with teachers. Future research is needed to explore key competencies for SDLMI implementation and how to build these competencies into training teachers and selecting coaches. Further, the need for customized implementation supports based on teacher and coach backgrounds, mindsets, and training is needed.

As emphasized by NIRN (2015), training and coaching are crucial in eliciting behavior change as selection and recruitment influence the beginning stages of implementation. Special education directors and the RIC research team members selected coaches, and there were no explicit criteria used to identify coaches other than availability and perceived competency in serving as a coach. Further, none of the coaches had previous experience with the SDLMI, and because of the rapid implementation, as described previously, coaches were often learning alongside teachers while also serving in a coaching role. Prior to implementation, all teachers, including coaches, received a one-day training on the intervention from the KU research scientists and content experts, which included behavior rehearsals of the SDLMI. Coaches then re-
ceived ongoing monthly professional development, but more systematic training and selection protocols could have further enhanced implementation, particularly of the coaching model, and this planning will be critical to future implementation plans in scaling up projects. During the 2017–2018 school year, coaches will participate in a two-week online training module to enhance their knowledge of and skills in implementing the SDLMI. Further development of screening and training protocols will be important as performance assessment is a key mechanism for monitoring performance and making adjustments to selection, training, and coaching.

Organization. The organization driver is associated with mechanisms administrators employ to change practices and support systems (NIRN, 2013b). The organization driver is arguably the most important as it relates to measures that assess key aspects of the overall performance of the organization and benefits of implementing the EBP. Further, the organization driver includes the internal use of feedback and data (e.g., various measures, information from stakeholders) by facilitative administrators (e.g., district administrators, teachers) to improve implementation. As it relates to external support for the organizational structure, strategies that leaders and staff can utilize to work and collaborate with resources outside of the organization to ensure the need for support of team members is part of the organization driver (NIRN, 2015).

A timeline for implementing the SDLMI and reporting data was collaboratively created by the team concurrent with delivering training and planning for implementation. The timeline was distributed to teachers and coaches at the beginning of the school year. Beginning in the 2016–2017 school year, the KU project manager regularly communicated data collection periods to teachers and coaches, and followed-up if information was not submitted by the deadlines. The data are relevant to measure intermediate outcomes (i.e., enhancements in self-determination and transition planning) and longer-term outcomes (i.e., longitudinal data of postschool outcomes). A challenge during the first two years of implementation was quickly turning around data to share progress with key stakeholders, including administrators, teachers, students, and families. Moving forward, the leadership team plans to share progress reports with stakeholders on an annual basis. Measuring and reporting are particularly important in establishing social importance as the major goal of implementing the SDLMI in this setting was to improve students’ postschool outcomes across domains, including employment, independent living, and community participation. Further, such data can be leveraged to document changes in the state, evaluate the impact of the implementation supports, and promote student, teacher, and community buy-in by documenting changes that are seen as a result of intervention.

In addition to clear timelines, the leadership and implementation team facilitated administrative supports. Both the KU and the RIC on-site project managers communicated regularly with teachers and coaches to address teachers’ support needs. Teachers and coaches also received timeline reminders, instructional resources, and data collection information from the leadership and implementation teams. Members of the KU research team visited several times per year to conduct trainings, observe classrooms, and meet with coaches and principal investigators. Feedback was used to make immediate changes and plan improvements for the next year of implementation. Throughout implementation, systematic documentation of communication, planning, resources, and data collection has occurred. Over time, this structure has become stronger with a clearer, more developed plan for implementation. As noted, the initial roll out of the project was rapid, with a limited plan developed. However, because of the strong partnership between and shared mission amongst the leadership and implementation teams, lessons learned and barriers encountered during initial activities were used to further enhance ongoing implementation and systematize implementation supports. For example, a formal coaching model with roles and responsibilities, systematized training, and stronger supports for providing feedback was developed and implemented. Also, more systematic supports for teachers were developed, with resources designed that could be delivered on a regular basis to provide teach-
ers with implementation resources and to keep them engaged with implementation of the SDLMI.

Leadership. Finally, the leadership driver addresses the need to problem-solve over the course of implementation. Issues related to adaptability require the leadership team to "champion change" at the beginning of implementation, while technical leadership is required to support ongoing implementation and address problems as they arise (NIRN, 2015). Recent research demonstrates that actual leadership does not reside within a given individual; rather, it is the aggregation of leadership behavior across individuals to enact change (Day, 2001; Komives, Owen, Longerbeam, Mainella, & Osteen, 2005). Within any given organization, the dispersion of leadership responsibilities varies as the same people can provide both adaptive and technical leadership or these duties can be more evenly distributed amongst implementation team members (NIRN, 2015).

With regard to implementing the SDLMI state-wide, technical leadership was possible by establishing a team of leaders with diverse skillsets. The KU research team supported implementation through biweekly meetings with project staff to review progress and make changes as needed. A data collection specialist attended team meetings and provided updates on data systems. The KU project manager was responsible for monthly meetings with the RIC project manager, and these conversations were used to share updates and address issues that arose. Adaptive leadership was demonstrated through the interactions between leadership and project staff. The KU researchers were responsible for teacher and coach training, and the RIC project manager supported coaches during monthly meetings held throughout the academic years. In turn, the coaches provided on-site support to teachers. This leadership and management structure has emerged over time, and is currently being documented to support knowledge translation across different contexts. Ongoing research is needed to explore the development of strong implementation plans and the role of leadership teams in establishing and implementing these plans.

Lessons Learned and Future Directions

The sections above described how the SDLMI has been implemented at a state-wide level for transition-age students with intellectual and developmental disabilities. The information presented allows us to examine strengths and challenges of implementation, and share this information to advance research and practice. Strengths and areas of needed improvement within each implementation driver, along with implications and recommendations for the future are described below.

Competency

Utilizing coaches as a medium for support is a major strength of this project. Notably, coaches were selected without input from most of the leadership team, demonstrating the challenges of working within an established school system and a rapid implementation schedule without time allotted for screening and training coaches. A master coach, the RIC project manager, was responsible for ensuring coaches had the necessary training and support and were held accountable for supporting teachers. This master coach led coaches in monthly meetings to discuss the intervention, troubleshoot issues, and report progress and feedback. Over the course of implementation, coaches grew in their knowledge and roles; however, in an ideal situation, much of this professional development would have occurred prior to implementation to enable coaches to provide maximal support to teachers. Further research is needed to identify the best ways to enhance pre-implementation training and professional development in the context of instruction to promote self-determination.

In this state-wide implementation, coaches supported teachers by observing implementation of the intervention in their classrooms, completing fidelity checklists, and meeting to discuss strengths and areas for improvement. Coach observations of teacher implementation and subsequent feedback occurred at least three times during the year, although coaches also met with teachers informally as needed. A recommendation for future implementation is to establish a more formalized written coaching service delivery plan to
ensure coaching is standardized across coaches and their assigned teachers. To further improve the coaching system, soliciting feedback from teachers about their experiences with the coaching supports would demonstrate the benefits to the intervention as a result of the coaching system.

Performance assessment, or fidelity, was another strong point of the implementation. Teachers self-reported on intervention fidelity at three time points during the year, and coaches conducted the same fidelity assessment after observing each teacher. Furthermore, performance assessment was viewed as a positive, reflective process of improvement because it was designed to improve quality, rather than judge or criticize teachers. After each observation, coaches met with teachers to discuss strengths and areas for improvement they noted. Performance assessment within this study was effective in meeting its goals of imparting encouragement and offering opportunities to extend skills in practice. Fidelity data from the first year of implementation showed teachers’ self-reported fidelity of implementation ranging between 75.1% and 94.1% (Shogren et al., 2018). Teachers reported highest fidelity during implementation of the first of three phases of the SDLMI, while coaches tended to rate teachers’ fidelity of implementation lowest during the initial phase and increasing over time. These findings indicate potential differences in the perception of fidelity between teachers and coaches, indicating the need for further investigation to understand this discrepancy and differential training implications.

Notably, teachers and coaches completed the same fidelity form, with the exception of items worded in first-person or third-person language. And yet, the differences in fidelity ratings may suggest the need for fidelity measures aligned with roles. Such a nuanced approach aligns with the implementation fidelity literature, in which the five elements of fidelity include adherence to an intervention, exposure or dosage, quality of delivery, participant responsiveness, and program differentiation (Carroll et al., 2007). For example, it may be that teachers felt more comfortable with the initial phases of the model as this was strongly emphasized in training, and immediately implemented by teachers after training. Thus, a teacher self-report fidelity form would focus more on adherence to the intervention. However, coaches may have perceived the importance of repeated opportunities to work through the model, noting increases in quality over time. For coaches, the fidelity observation would focus more on quality of delivery. Future research should explore the differences in teacher self-report versus coach observation fidelity, as well as solutions with training, coaching, and supports. Part of this solution likely needs to involve a more rigorous process for measuring teacher-level outcomes resulting from training and coaching, to determine the learning that is occurring and if a certain level of expertise in all phases of the model is needed prior to implementation, or to continue with implementation.

Leadership

Another facilitator of the current project was the strong and adaptive leadership that focused on leveraging the Consent Decree to “champion change” as implementation began. These contextual factors (Shogren, Luckasson, & Schalock, 2014) created conditions that drove a need for immediate changes. This impacted the exploration and implementation phases, as during the initial year of implementation many issues related to the implementation plan were designed concurrently with implementation. Over time, the processes were able to become more systematized; however, maintaining the same level of motivation or “buy-in” with regard to the SDLMI and tracking progress demonstrated a challenge, as frequently occurs in scaling-up efforts (NIRN, 2015). Coaches and teachers seemed excited to use the SDLMI after trainings in the first year of implementation, but over time buy-in appeared to diminish, based on informal conversations with leadership, coaches, and teachers. This may have been influenced by the challenges with the implementation plan, however, it may also reflect the need to identify effective strategies to continually promote engagement of all stakeholders. Establishing ways to both develop and maintain buy-in for all relevant parties is essential. Data systems hold the potential to foster motivation if results are shared with key stakeholders (e.g., students, practitioners,
families) regularly. A potential strategy to continue long-term buy-in would involve using the most efficient (i.e., least time consuming) system possible for measuring outcomes and assessing fidelity. Future implementations would be enhanced by establishing a system and timeline for sharing progress and results, although the need for problem-solving (i.e., technical leadership) will likely arise during implementation and the appropriate balance of implementation and adaptability in implementation needs to be further considered.

Organization

Administrative supports by way of communication represented both a strength and a challenge for leadership in scaling-up the SDLMI. Because of the clear communication systems and regular opportunities for discourse, leadership and staff were generally well connected. Both teachers and coaches had contact information for leadership, which many used to inquire about supports for students and recording progress. Teachers and coaches also received timeline reminders, instructional resources, and data collection information, although it was unclear whether more support would have been helpful or overwhelming. Despite regular reminders, almost half of teachers and coaches did not report progress and goals overall. Informal feedback about the content and frequency of communication from leadership was assessed throughout the year with coaches, but a more formal method of seeking regular feedback and input from teachers and coaches with regard to leadership is a recommendation for future implementation. Further, there is a need to better understand and adaptively address challenges to implementation at the teacher, coach, and school level. For example, the SDLMI is a model of instruction, not a standardized curriculum. As such, it requires teachers to not only teach problem-solving skills, but also use them personally as they are integrating the SDLMI into ongoing instruction. Further determining how to troubleshoot problems that teachers encounter initially and over time to problem solve around the use and integration of the SDLMI into ongoing instruction is important, particularly in the context of the use of a coaching model.

For example, is troubleshooting with coaches the most effective route for teachers, or should there also be online troubleshooting tools developed and made available? Further research is critically needed that compares and decomposes the most effective supports for implementing the SDLMI, as these are issues that have not been addressed in efficacy trials, and must be systematically examined in the context of larger-scale implementation in natural contexts.

Conclusion

Research has established that the SDLMI, an evidence-based practice, can be a source of powerful change, especially for students with disabilities (Shogren et al., 2012; Wehmeyer et al., 2012). However, we are only beginning to explore how to effectively implement the SDLMI on a large scale. In the state-wide implementation described in this paper, Shogren et al. (2018) reported positive findings from the first year of implementation; teachers implemented the SDLMI with fidelity, students attained educationally relevant goals, and teachers reported changes in student self-determination. For example, the majority of students were able to work through two self-directed goals over the course of the 2015–2016 school year, and generally achieved these goals at close to expected levels of attainment when rated by teachers. Teachers reported significant changes in two aspects of student self-determination, volitional action and agentic action, which connects to research showing the impact of implementing the SDLMI on teacher perceptions of student capacity (Shogren, Plotner, Palmer, Wehmeyer, & Paek, 2014). Furthermore, when implementing the SDLMI, significant changes in teacher perceptions of student self-determination have been shown to precede changes in student perceptions of their own self-determination and outcomes (Wehmeyer et al., 2012).

Data from subsequent years of implementation hold the potential to document ongoing changes in student self-determination and postschool outcomes, from both the teacher and student perspective. As described above, reaching the full implementation stage while continually addressing implementation drivers and essential components presents signif-
icant challenges. And yet, these challenges hold the potential to drive the field forward by advancing research and practice. The recommendations above, including those for training, communication, and motivation, represent the next step in enhancing self-determination and postschool outcomes for substantial numbers of students through the implementation of the SDLMI.

References


Received: 4 January 2018
Initial Acceptance: 26 February 2018
Final Acceptance: 12 May 2018
Educational Programs for Students with Intellectual Disability: Demographic Patterns

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Abstract: This study analyzes national demographic data in the field of intellectual disability (ID). The data derive from the recent reports to Congress on IDEA by the US Department of Education (USDOE, 2015, 2016, 2017, 2018). The findings include data on school prevalence, ethnicity, educational environments, school exit patterns (i.e., diploma completion, dropout rates), and school disciplinary actions. Discussion focuses on these respective demographic areas and highlights information as related to participation in educational programs of students identified as ID. Particular emphasis is placed on the apparent status of mild intellectual disability in contemporary educational programs.

States have provided special education for many decades to students identified as having intellectual disability (ID). It may be argued that this category of exceptionality is associated with the origins of special education and was once the disability group with the highest prevalence rate in the public schools (Polloway, 2006). While the term mental retardation was most often used for decades to refer to this population, ID is clearly now the most commonly used referent (Polloway, Auguste, Smith, & Peters, 2017).

By definition, students are identified as having an intellectual disability in schools through the Individuals with Disabilities Education Act (2004) if they have below average intellectual functioning (typically as measured by an IQ test), challenges relative to adaptive behavior (i.e., in conceptual, practical, and social skills), and their educational attainment is negatively impacted (Schalock et al., 2010). Yet, the category of ID is a heterogeneous one, including students with a wide range of IQ scores, technically of below about 70, concomitant with limitations in adaptive behavior.

In recent years, the population of students identified as ID has changed in terms of the nature of students being served in special education (e.g., reduced school prevalence) and in terms of the nature of the services being provided to the students (e.g., increased school inclusion). As a consequence of changes in the population, traditional portraits of students with ID in special education have lost validity. Therefore, this paper seeks to identify the key demographic considerations of students with intellectual disability (ID) that frame the educational programs in which they participate.

The specific purpose of this research is to analyze relevant data from the most recent annual reports to Congress on IDEA (USDOE, 2015, 2016, 2017, 2018), as these data specifically addressed considerations relevant to students with ID. These analyses are based on the assumption that the data will provide a profile of current educational programs for students with intellectual disability.

Method

The most recent USDOE reports provided specific demographic data relevant to students with ID. Although data from the 40th Annual Report (USDOE, 2018) constituted the most current information available, the
37th, 38th, and 39th Reports (USDOE, 2015, 2016, 2017) provided further data that were not included in the 2017 report. These data on school prevalence, ethnic variance, placement, school exit patterns, and disciplinary action highlight observations concerning students who are categorized as intellectually disabled. These data have been culled from respective annual reports in order to be summarized and further analyzed herein.

**Results**

The annual reports to Congress on IDEA provide a significant database of demographic information related to students with disabilities including intellectual disability. The annual reports to Congress on the implementation of IDEA were released in December of their respective publication years (2015, 2016, 2017, 2018). Data on school prevalence, ethnic patterns, educational environments, school exit reasons including both graduation and dropout rates and disciplinary action are provided below.

**Prevalence** data for decade of 2005–2014 indicate that students ages 6–21 were identified as ID at a rate of 0.8% in 2004 and 2005. Subsequently, the rate of 0.7% was reported in 2007 through 2009. Since 2010, the rate has been reported as 0.6% or approximately 25% less than a decade earlier (USDOE, 2015, 2018). Across the 50 states and the District of Columbia, there is however significant variance in prevalence. State prevalence data range from 0.22% to 1.95% (see Table 1 for prevalence data and state terminology used) (USDOE, 2016). When considering all individuals with disabilities receiving special education, 6.9% of all students with disabilities were identified specifically as having ID (USDOE, 2018).

**Ethnic variance** data offer another demographic view of this population of students. Federal risk ratios provide a comparison between the percentages of a specific ethnic group served under IDEA to the proportion served among all other ethnic groups combined. Consequently, if a specific group has a risk ratio of two for receiving special education, then that group is identified at a rate two times as great as that for the other ethnic groups combined. A risk value of 1.00 indicates

<table>
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Note: Terminology: intellectual disability (ID), mental retardation (MR), cognitive disability (CD), intellectual impairment (II), developmental cognitive disability (DCD).

icates an exact match of proportions, while a ratio of less than 1.00 indicates under-representation compared to the other groups. The risk ratios by ethnicity for students with ID are as follows: American Indian (1.6), Asian (0.5), African-American (2.2), Hispanic (1.0), Native Hawaiian or Pacific Islander (1.8%), White (0.7), and two or more ethnic groups (0.8%) (USDOE, 2017). Three of the seven respective ethnic groups are over-represented by this metric while data on three of the seven groups suggest possible under-representation.

Ethnicity data can be further analyzed by considering the relative percentages of students with ID as a percentage of the overall number of students identified as having a disability, which can be compared to the overall rate (as noted above, students with ID constituted 6.9% of all students with disabilities).

The comparative data are as follows: American Indian (6.6%), Asian (7.2%), African-American (9.8%), Hispanic (6.6%), Native Hawaiian or Pacific Islander (6.7%), White (6.1%), and two or more ethnic groups (5.6%) (USDOE, 2017).

Educational environments relate to school placement. Overall, 17.0% of students with ID were reported to have spent 80% or more of their day in the general education classroom, 26.3% spent between 40%–79% of the day in regular classes, 49.4% spent less than 40% in such settings (but in the regular school), and 7.4% were in other environments (i.e., special schools, residential schools, homebound/hospital settings, correctional facilities, private facilities) (USDOE, 2018).

Typically, such placement data have reflected significant state variation regarding the educational environments in which students are served. These data are provided in Table 2 according to the eight standard categories used in federal reporting (USDOE, 2016). The percentage figures refer to the amount of time students spent in the general education classroom. In 23 states, the percentage of students served the USDOE (2018) report in special classrooms (formally defined in this case as spending less than 40% of the day in the regular class) exceeded 50%. Further, three states exceeded 70% of students placed in such settings (i.e., Nevada 75.4%, Arizona 72.6%, New Mexico, 70.4%). On the other hand, in five states, at least 40% or more of the students are placed in general education-based programs 80% or more of the day (i.e., Iowa 66.1%, Vermont 47.1%, Kentucky 43.8%, Alabama 42.1%).

The prevalence data (USDOE, 2016) were further analyzed to determine the possible relationships between prevalence rate and four placement options (for purposes of analysis, all five non-regular school placements were combined into one category). Pearson product-moment correlation coefficients indicated moderate relationships between prevalence and placement where students were placed in regular class greater than 80% of the time (r = .46) and between prevalence and placement where students were placed in regular classes less than 40% of the time (r = .42). There were only weak relationships between prevalence and placement where students were placed in regular classes between 40%–79% of the time (r = .16) and between prevalence and non-regular school placement (r = .09).

Federal data also provide a portrait of trends concerning the reasons for students exiting secondary school. These annual data reported nationally focus on those who completed a high school diploma as well as those who dropped out. Shown in Table 3 are 12 years of these exit data. In general, the percentages of students receiving a high school diploma have generally increased over this decade while the number of students dropping out of school have reflected a general decrease.

The fifth area reviewed was school disciplinary actions. The most recent federal data available identify the percentage of students with ID (ages 3–21) who have been removed, suspended, or expelled in the 2015-16 school year. The four status categories include: removed unilaterally by school personnel for drugs, weapons, or serious bodily injury (0.09%), removed by hearing officer for likely injury (5/10,000), received out-of-school suspensions or expulsions (0.62%), and received in-school suspensions (0.33%) (USDOE, 2017). Although the possibility exists for duplication in counts, collectively, these data indicate that approximately 1% of all students with intellectual disability have received some such disciplinary action. This overall figure
## TABLE 2

Educational Environments Percentage of students with ID, ages 6–21, by State (2015-16)

<table>
<thead>
<tr>
<th>State</th>
<th>Regular class &gt;80% of day</th>
<th>Regular class 40% –79% of day</th>
<th>Regular class &lt;40% of day</th>
<th>Separate school</th>
<th>Residential facility</th>
<th>Homebound / hospital</th>
<th>Corrections facility</th>
<th>Parental placed private schools</th>
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</table>

Source: USDOE (2016).
compares to over 5% of students of students with emotional disturbance being so disciplined and 1.25% across all categories of students with disabilities (USDOE, 2018).

Discussion

This review of demographic data provides a comprehensive picture of participation in educational programs for students with ID. The sections below highlight each of the foci in this analysis, placing them in the context of trends in the field.

Prevalence

While a common predictor of school prevalence (ages 6–21) for students with ID in the 1970s was approximately 2% (Polloway, Lubin, Smith, & Patton, 2010), after the passage of PL 94–142 (IDEA) in 1975, there was a steady and significant decline for over four decades in the number of individuals so-identified. Most recently, since 2005, federal data have indicated that the prevalence rate for students with ID consistently has ranged from 0.8% to the most recent rate of 0.6%. Given these prevalence rates reported under IDEA, students with ID are currently the fifth highest prevalence category of disability, exceeded by learning disabilities (3.5%), speech and language impairment (1.5%), other health impairment (1.4%), and autism (0.8%) (USDOE, 2018).

A most consistent finding related to prevalence has been the significant variance in prevalence across states (Bouck & Satsangi, 2015) (as noted in Table 1). In comparison to the overall figure of 0.6%, the rates for individual states (USDOE, 2015) include 27 states with rates below the national average. Of special note is that 11 of these 27 states are at or under 0.4% (and thus below 33% of the the national average). Four states reported rates under 0.3% (i.e., Colorado, Montana, New Jersey, New Hampshire). On the other hand, three states reported prevalence rates of 1.0% or greater (i.e., West Virginia, Iowa, Kentucky) (ranging from about 230%–315% of the national average of 0.6%).

Given the high degree of variance noted in prevalence across states, it seems to be a reasonable conclusion that there is likely to be a parallel degree of variance in the actual nature of the students who are identified and served across states (Smith, Polloway, Doughty, & Patton, in press). Polloway, Bouck, Patton, and Lubin (2017, p. 269) noted in reference to state variance that it would be unlikely that similar populations of individuals with intellectual disability would be found across the states given that prevalence data vary significantly. In states with higher prevalence rates, the population may not be dissimilar to that served decades earlier as ID and would include a substantial number of students with mild ID. However, in states serving a much smaller number of students under this label (0.4% or less) the population may include primarily students with more significant disabilities, given that about 0.4% (four in 1000) has traditionally been cited as the approximate prevalence of severe disabilities (e.g., Abramowicz & Richardson, 1975; Institute of Medicine, 2001; MacMillan, 2007; McDonald, 1973; McLaren, & Bryson, 1987).

With 11 states under the 0.4% threshold and four under 0.3%, it would seem that several questions should be considered. First, are individuals with an intellectual disability being served under another disability category? Second, are they not receiving special education at all?

With reference to these two questions, Gar-
giulo (2012) and Gargiulo and Bouck (2017) noted an aversion among professionals to label a student as having an intellectual disability, especially if that student is from an historically considered ethnic minority group. Early intervention efforts and changing educational policies (e.g., response to intervention) and definitions may also change who is being served in special education, particularly students with mild intellectual disability (Gargiulo & Bouck, 2017).

Third, it should be considered if the ‘category’ of exceptionality of mild intellectual disability exists to any significant extent in a number of states in this country (as discussed further below). As a point of reference, according to the USDOE (2006) data just 10 years earlier, the overall reported prevalence rate for ID was 0.84% while the rates for individual states included only 20 states with rates below 0.6% and seven states at or under 0.4%, while 17 states reported rates of 1.0% or greater, including two greater than 2.0%.

Status of mild intellectual disability: The 1992 edition of the manual on mental retardation (now intellectual disability) (Luckasson et al., 1992) removed the levels of disability, which heretofore had identified individuals as having mild (i.e., IQ between about 55 and 70), moderate (i.e., IQ between about 40 and 55), and severe or profound (i.e., IQ less than about 40) levels of disability, although such IQ scores needed to be concomitant with limitations in adaptive functioning (Grossman, 1983). To some extent the elimination of such levels delegitimized the use of the term mild intellectual disability (then mild mental retardation). Nevertheless, the term has continued to be used at least informally over the last 25 years. More recently, this sub-classification of persons with intellectual disability has been referred to as being at the upper end of the spectrum of intellectual disability (e.g., Siperstein & Collins, 2015) or as persons with intellectual disability who have higher IQs (Snell et al., 2009). Regardless of terminology, the group is those individuals whose functioning level is at the upper end of the broad population of persons identified as intellectually disabled.

By definition, intellectual disability includes the two major prongs of intellectual functioning and adaptive behavior (Schalock et al., 2010). Consequently, it must be acknowledged that it is problematic to discuss classification in ID based solely on measures of intellectual functioning (i.e., IQ). Further precise scores must always be placed in the context of the standard error of measurement (typically +/− 5 points). Nevertheless, considering IQ provides an opportunity to consider the population currently being served across the United States as further discussed below.

The traditional observation (noted above) has been that 0.4% of the population might be seen as those individuals with “severe disability”, which had been defined typically as an IQ score of 50 or less. If those observations continue to be valid, and if those scores are compared with current prevalence data reported above, the conclusion that might be drawn would be that for 11 states that indicate a prevalence of less than 0.4%, there may be no students identified as having mild ID. On the other hand, based simply on the normal distribution of intelligence, it would be estimated that 0.13% of all persons would have a score of approximately 55 or below. In either case, it is not an unreasonable conclusion to draw that the population that may be referred to as mild intellectual disability, intellectual disability with higher IQ, or the upper end of the spectrum of intellectual disability essentially may be a very small percentage of the school population (an estimated percentage of under 0.27% or less of the school population) for approximately half of all states.

It also could be considered as to whether there is a relationship between the terminology used within a given state and prevalence rates cited. In terms of terminology, Polloway, Auguste, Smith, and Peters (2017) reported that the term of intellectual disability (consistent with Schalock et al., 2010) was used in 42 state guidelines, mental retardation still in three states, and cognitive disability in three states while one state each cited intellectual impairment, developmental cognitive disability, and cognitive impairment. A review of prevalence data in comparison to terminology (see Table 1) however provides no basis for concluding that terminology and prevalence are correlated.
Ethnicity

The second demographic consideration focused on ethnicity patterns. As noted by the USDOE (2018), the key area of disproportionality apparently continued to be African American students, who are reported to be more than twice as likely to be labeled ID (2.2) as might be otherwise predicted. These data can be compared to those reported by Jasper and Bouck (2013), who reviewed the National Longitudinal Transition Study-2 (Newman, Wagner, Cameto, & Knokey, 2009) data set and reported that African-American students were 3.15 times more likely to be identified as having mild ID than were Caucasian students. Possible overrepresentation as noted in these data is consistent with Skiba et al. (2006), who noted a decade ago that in almost all states African-American students were the most overrepresented group in special education and especially within the category of ID.

In spite of the data on the apparent increased risk ratio for African-American students identified as having ID, further reviews of data applying alternative forms of analysis appear to substantiate possible claims of under-identification of African-American students for special education. Research by Sullivan and Bal (2013) suggested that while African-American children were over-identified for the category of learning disabilities, they were actually under-identified for the category of intellectual disability. Morgan et al. (2015) also reported that, as compared to White children, African-American children were less likely to be identified as having an intellectual disability. Morgan, Farkas, and Hillemeier (2017) concluded students who were members of a racial or ethnic minority group were less likely to be served in special education than students who were White when student characteristics (e.g., family income and achievement) are taken into account.

The interpretation of over- or under-identification of African-American students in the category of intellectual disability is left still to debate. As suggested by the USDOE data, the risk ratio was 2.2, suggesting an over-identification. Yet, research by Morgan et al. (2015) and others (e.g., Sullivan & Bal, 2013) suggested an under-identification. These differences may be simply due to a comparison of reality (i.e., USDOE) and the ideal (e.g., Morgan et al., 2015), by which Morgan et al. (2015) was able to control for variables that are uncontrollable in the real world, including the societal and educational implications of being from a minority group in the United States (Cohen, Burns, Riley-Tillman, & Hosp, 2015).

Placement

Based on USDOE (2018) data, 83% of students with ID are placed in settings primarily outside of the general education classroom (that is, in general education less than 80% of the day), including what might be considered resource rooms (26.3%), special education classes (49.4%), and outside of the regular school setting including separate schools, residential programs and correctional facilities (7.3%). These data on placement are also notable when compared to other disability groups. For example, 70.8% of students with learning disabilities are placed in general education classes 80% or more of the time while only 1.8% are educated outside of regular schools. The parallel numbers for students with emotional and behavioral disorders are, respectively, 47.2% in general education classes (80% of the time) and 17.1% outside of regular schools (USDOE, 2018). Students with intellectual disability were the second least likely (higher only than students with multiple disabilities, 13.7%) of the 13 groups of students with disabilities to be served in primarily general education-based programs placements 80% or more of the time in general education (USDOE, 2018).

Most significant is the variance across states in terms of placement practices. In terms of students with ID spending 80% or greater of their time in general education, the range was from Iowa (66.1%) to Montana (4.1%). On the other hand, the rates for placement in general education less than 40% of the time (essentially self-contained classes) range from a low of 8.4% in Iowa to a high of 75.4% in Nevada (USDOE, 2018). More specifically, the USDOE (2018) concluded that four states accounted for the largest percentage of students served in general education-based classes (80% of the day or more). In juxtaposition, 17 states served less than 10% of the students
with intellectual disability in such placements. A total of 22 states served the majority of students in special education-based classes (that is, less than 40% of the day in general education) while only three states served less than 20% of their students with intellectual disability in such settings (i.e., Connecticut, Iowa, Vermont).

In an earlier analysis of federal data, Polloway, Lubin, Smith, and Patton (2010) considered two assumptions as related to state variance in educational environments and school prevalence rates for students with intellectual disabilities. The first assumption was that individual states with lower prevalence rates were more likely to be enrolling a population of students that were more significantly disabled and therefore may be more likely to report a higher percentage of students being placed in less inclusive settings. A related assumption was that states who were serving a larger number of students with ID (that is, higher prevalence rates) might be more likely to provide such services to a greater extent in general education-based programs (i.e., more than 80% of the day). Polloway and colleagues (2010) found only a weak relationship between a state’s prevalence data and the likelihood of placement in more inclusive settings.

In the current study, the correlational analyses indicated moderate relationships for two of the four comparisons including between state prevalence rate and placement in general education more than 80% of the time and between state prevalence rate and placement in general education less than 40% of the time. To conclude, higher prevalence rates were associated with increased likelihood of placement in general education classes most of the time while lower prevalence rates were associated with increased likelihood of placement in special class-based programs.

**School Exit**

The percentage of students identified as ID who completed a high school diploma increased from 35.1% to 42.2% over the 12 years of data presented in Table 3 with the highest datum of 42.7% coming in the 2012-13 school year. In parallel fashion, the number of students who dropped out of secondary school decreased in 10 of the 12 years of data to the lowest point in 2015-16 (USDOE, 2015, 2018); the overall decrease was from 24.5% to 15.5% (or a 9% difference). These trends indicate that students with ID are increasingly likely to complete high school with a diploma and decreasingly likely to drop out. Nevertheless, students with ID still remain least likely of all groups of students with disabilities to earn a high school diploma (Polloway, Bouck, et al., 2017).

Another perspective on school exit patterns was derived from data from the National Longitudinal Study-2 (Newman et al., 2009). Bouck (2014) reported that of individuals with mild intellectual disability, 82.2% graduate or complete high school, whereas 11.8% drop out. Of those completing high school, the majority reported earning a diploma as opposed to a certificate of attendance (e.g., 84.2% vs. 15.8%, respectively). Although not captured in the USDOE data, earning a certificate of attendance – or completion – has vastly different consequences as opposed to earning a diploma (deFur, 2002; Hartwig & Sitlington, 2008). Given the potential implications of these two means of exiting school and a desire to improve the postschool outcomes of students with intellectual disability, schools must be deliberate and planful in the educational programming of this population, particularly students with mild intellectual disability (Bouck, 2017). Decisions about what to teach (i.e., curriculum) and where to teach it (i.e., educational environment) can pull from the subsequent environment philosophy, by focusing on the postschool goals of students with mild intellectual disability and making their school content relevant to their desired adult life, and therefore perhaps increasing the rate of exiting via diploma and decreasing that of dropping out and/or earning a certificate (Bouck, 2017).

**Disciplinary Action**

The data on school disciplinary action suggest that approximately 1% of all students with intellectual disabilities have received some form of such action including removal to an alternative, interim educational setting, suspension or expulsion. While these numbers are modest, particularly when compared with students with emotional disturbance who have
received such action approximately five times greater, nevertheless, some concern is worth noting. While these data do not allow a fine-grained analysis and comparisons between school disciplinary problems and problems in the criminal justice system are quite speculative, it may be worthy of note that the historic over-representation of persons with ID within the criminal justice system may have occurred because they may “face special challenges . . . because of deficits that they may have related to reasoning, thinking, learning, and social interactions” (Polloway, Patton, & Smith, 2015, p. 4). Green- span (2015), in positing that gullibility was a core characteristic of persons with ID, indicated they may be vulnerable to social manipulation, which certainly has legal implications and may, though speculative, be related to the data found on school disciplinary action.

Limitations

There are several limitations to this study. The data from the federal government are valid only to the extent that the reports from individual states are current and accurate. Further, the IDEA Annual Reports experience a typical delay of about 1–2 years from data reporting to publication. Consequently, the 2017 report, for example, primarily included data from 2015 and 2016. Third, because state-specific prevalence data (from the state static tables) were not available for the USDOE (2018) report, we used the data presented with the prior reports. Finally, the data for the 2019 USDOE report had not been published at the time of the development of this manuscript. Those data will provide more current information about school practices.

Implications

A number of important implications may be derived from this demographic study. The data as presented herein confirm the trend for more than a decade of the decreasing prevalence of students being identified as intellectually disabled and served in special education in the public schools. Given the fact that the most recent national prevalence rate is 0.6%, the common reference to ID as a “high incidence disability” must be re-considered. The state data presented underscore the fact that in virtually half the states the number of students who might be considered mildly intellectually disabled is very limited. Apparently, students identified as having a mild intellectual disability do not exist to any significant extent in many states in this country.

Second, ethnicity patterns continue to suggest disproportionality in this area but the data require attention to context in order to confirm that there is a bias in identification patterns. It is likely that over-identification does exist in real school situations, despite recent research suggesting that when all else is controlled for, African-American students are actually under-identified. The challenge, of course, is that schools and the educational system cannot control for variables as one can in a dataset (Cohen et al., 2015).

Third, students with ID continue to be among the most likely groups to be educated in settings removed from full-time placement in general education. Further, there does appear to be at least a limited relationship between state prevalence rates and placement in general education classes (80% of the time or more) and in special education-based programs as defined by placement less than 40% of the time in general education.

Fourth, there is a positive trend regarding earning a school diploma and not dropping out of school although students with intellectual disability remain the least likely group of students with disabilities to receive a high school diploma fact continued over the last decade. Finally, disciplinary data indicate in the area for attention in terms of a small number of students with ID receiving action that may interrupt their educational programs.

In conclusion, participation in educational programs for students with intellectual disability has significantly decreased for the last several decades and has continued to do so within the last several years. An important question remains as to whether a significant number of students who are no longer being identified consequently no longer may benefit from potential special education services and supports.
References


ucation and Training in Developmental Disabilities, 45, 54–68.
Received: 4 January 2018
Initial Acceptance: 26 February 2018
Final Acceptance: 26 March 2018
Teaching Soft Skills to Students with Disabilities with UPGRADE Your Performance

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Abstract: Post-school employment outcomes for individuals with disabilities continue to be inadequate when compared to their peers without disabilities (Newman et al., 2011). One barrier to employment for individuals with disabilities is a lack of employment "soft skills" (Riesen, Morgan, Schutlz, & Kapferman, 2014), such as punctuality and work completion. This study investigated the effects of UPGRADE Your Performance on soft skills of secondary students with disabilities at both in-school and community-based job sites. UPGRADE Your Performance instruction included self-monitoring, goal setting, self-graphing, and technology-aided instruction. Results demonstrated all students improved in a self-selected soft skill area, made gains in their overall performance, were able to self-monitor their own performance using a handheld device, and generalized their skills to a second setting. Implications for practice and suggestions for future research are included.

Employment has been identified as a post-school outcome associated with quality of life for individuals with disabilities (Shogren, Shaw, & Little, 2016). However, post-school employment outcomes for individuals with disabilities have continued to lag behind their peers without disabilities (Newman et al., 2011). For instance, the United States Department of Labor Bureau of Labor Statistics (2017) reported only 17.5% of individuals with a disability were employed compared to 65% of individuals without a disability. Additionally, unemployment rates were higher for individuals with disabilities compared to those without disabilities, and individuals with disabilities were more likely than those without disabilities to work part-time.

Researchers have worked to identify what barriers impede individuals with disabilities from gaining employment. Luecking and Luecking (2015) identified limited support during career preparation and work experiences as one explanation for poorer outcomes for students with disabilities. Another major employment barrier for students with disabilities includes inadequate employment soft skills (e.g., work completion, task accuracy, punctuality, social skills, self-regulation; Riesen et al., 2014), which, according to Elksnin and Elksnin (2001), may account for almost 90% of job loss. In addition, Lindsay et al. (2014) found employers perceived youth with disabilities to be at a disadvantage compared to youth without disabilities and recommended focusing on soft skill instruction could be a way to assist youth with disabilities in obtaining employment.

Employers have also reported they value soft skills. For example, Casner-Lotto and Barrington (2006) found business leaders valued soft skills over academic skills considered fundamental for employees. They also indicated younger employees often lacked soft skills in the areas of communication, teamwork, cooperation, problem solving, and work ethic. Lastly, Ju, Zhang, and Pacha (2012) found employers felt soft skills such as integrity, honesty, following instructions, showing respect for others, cooperation, and being on time were more important than technical skills. Even though soft skills have been recognized...
as important for students with disabilities in gaining and maintaining employment, over the past 20 years few studies have been conducted on how to provide soft skill instruction to students with disabilities (Agran, Hughes, Thoma, & Scott, 2016).

Recently, Clark, Konrad, and Test (2018) provided a potential method for teaching soft skills to students with disabilities: upgrading Your Performance. UPGRADE Your Performance is a curriculum that uses research-based practices to teach soft skills. Specifically, the curriculum uses a job performance rubric to evaluate students’ soft skills in the areas of attitude and cooperation, reliability, productivity and on-task, quality of work, and teamwork and communication. Students are introduced to and scored on the Job Performance Rubric (JPR) while working at an in-school and/or community job site. Then, students participate in two days of Goal Setting Instruction (GSI). The first day instruction focuses on (a) information about soft skills measured by the JPR, (b) why these are important skills, and (c) an opportunity for students to view their current scores on the JPR and choose one soft skill area in which they want to improve. The second day of instruction includes specific instruction on the soft skill area of the JPR they have chosen. The lesson includes (a) vocabulary instruction, (b) explicit instruction with examples and non-examples, (c) role-play, (d) an opportunity to view a video of someone working and grade them on the chosen soft skill area, and (e) an opportunity to set a goal for themselves on the area of the rubric they have chosen.

After GSI is complete students are introduced to UPGRADE Your Performance and a mnemonic to help them remember the steps of the intervention (i.e., U = You evaluate yourself, P = Professional evaluates you, G = Graph your scores, R = Restate your goal and determine if you met it, A = Acknowledge what you did well, D = Decide what you need to improve on, and E = Execute improvements tomorrow to meet your goal). Each day after working on an in-school or community job site, students (a) evaluate themselves, (b) are provided with the interventionist’s scores, (c) graph both scores on a graphing worksheet to compare the scores, (c) review their goal to determine if they met it, (d) state what they did well and what they need to work on, and (e) develop a plan to get closer to meeting their goal the next day. Students continue to follow these steps every day until they reach mastery criteria (i.e., 3 or 4 in each subcomponent of the JPR for four consecutive days).

Clark et al. (2018) used a multiple probe across participants design to measure students’ performance in a self-selected soft skill area and their ability to generalize those skills across two in-school job sites, as well as to non-targeted soft skill areas. Results indicated all students (a) increased their performance in a chosen soft skill area, (b) were able to generalize those skills across soft skill areas and job sites, and (c) maintained skills over time. Findings from this preliminary study demonstrated the potential for UPGRADE Your Performance to be one way teach students with disabilities soft skills for employment.

Despite positive results from this study, students did not maintain their skills at their highest performance level over time and did not immediately generalize their skills to a second in-school job site. To address these limitations, this study was conducted as a conceptual replication of Clark et al. (2018). A conceptual replication is a study investigating the effects of the same intervention where one or more features differ from the original study (Coyne, Cook, & Therrien, 2016). In this study, we changed several features to try to improve maintenance and generalization outcomes by increasing mastery criteria and a implementing a fading procedure called U-GRADE. Also, due to the lack of research on using technology to self-monitor and self-graph data (Bruhn, McDaniel, & Kreigh, 2015), this study also incorporated a digital element for recording and graphing data. Table 1 provides information on features changed in this study; those not listed were the same as the initial study. Therefore, the purpose of this study was to conduct a conceptual replication of Clark et al. (2018) to investigate the effects of UPGRADE Your Performance on the acquisition of soft skills (e.g., attitude, cooperation, reliability, productivity, on-task behavior, quality of work, and teamwork) of secondary students with disabilities across school and community job sites and to other non-targeted soft skill areas.
Method

Participants

Four high school students with disabilities participated in this study. To be included, students had to have a disability, an individualized education program (IEP) goal of gaining employment, and in-school and community job training as a part of their curriculum. All students were enrolled in an occupational course of study for instruction in academic, self-determination, and vocational skills. However, students had not received instruction on soft skills.

Lindsay. Lindsay was a 16-year-old, White female with a mild intellectual disability (full-scale IQ: 68; Wechsler Intelligence Scale for Children IV, WISC-IV). Her academic skills were in the low average range in reading, mathematics, and written expression (Woodcock Johnson Test of Achievement III, WJ-III). She did not have any physical limitations and her attendance records indicated good attendance. Her in-school job included cleaning the cafeteria each morning (e.g., washing tables, picking up trash) and her community-based job was at a grocery store (e.g., stocking, organization tasks).

Brendan. Brendan was a 17-year-old White male with autism and a mild intellectual disability (full-scale IQ: 63; WISC-IV). His academic skills were in the low average range in reading, mathematics, and written expression (WJ-III). He did not have physical limitations, but had limitations with social interaction skills (Adaptive Behavior Assessment System-
Second Edition, ABAS-II; Childhood Autism Rating Scale). His attendance records indicated good attendance. His in-school job included cleaning the cafeteria each morning (e.g., washing tables, picking up trash) and his community-based job was at a mechanic garage (e.g., working with others to service and repair different city vehicles).

Ayana. Ayana was an 18-year-old multi-racial (i.e., Latina, Black) female identified as having other health impairment for attention-deficit/hyperactivity disorder (ADHD), heart disease, and hemiplegic migraines (physician’s report). Her academic skills were in the low average range in reading, mathematics, and written expression (WJ-III). Attendance records indicated Ayana struggled with attendance and tardiness. Her in-school job included cleaning the cafeteria each morning (e.g., washing tables, picking up trash), and her community-based job was at a bowling alley (e.g., organization tasks, customer service).

Antwoine. Antwoine was a 19-year-old Black male with a mild intellectual disability (full-scale IQ: 65; WISC-IV) and an emotional and behavioral disorder (Behavior Assessment for Children, 3rd Edition). His academic skills were in the low average range in reading, mathematics, and written expression (Kaufman Test of Educational Achievement, 3rd Edition). His IEP indicated he had behaviors that impeded his learning and that of others by being disruptive and using inappropriate language. Attendance records indicated Antwoine had difficulty with attendance and tardiness. His in-school job included cleaning the cafeteria each morning (e.g., washing tables, picking up trash), and his community-based job was at a pet supply store (e.g., stocking, customer service).

Settings

School. Students attended a suburban public high school in the southeastern United States with a total enrollment of 1,898 students. Instructional lessons during goal setting instruction, **UPGRADE I**, and **U-GRADE I** occurred in a small room located within the school building. The room contained two student desks, a table, and two chairs. The experimenter sat next to the student during intervention sessions. Data collection during baseline, **UPGRADE I**, **U-GRADE I**, and maintenance phases took place in the school cafeteria where students worked during their morning in-school job site.

Community. Community job sites were attended daily. Instruction during **UPGRADE II** and **U-GRADE II** took place in a small area located within their community job site. The experimenter sat next to the student at a table during intervention sessions. Data collection during baseline, **UPGRADE II**, **U-GRADE II**, and maintenance took place at community job sites (i.e., bowling alley, grocery store, large chain pet supply store, mechanic garage).

Experimenter

The first author served as the experimenter. She had a master’s degree in school administration and was in her second year of a doctoral program in special education. She had eight years of experience teaching high school students with autism, intellectual disabilities, and emotional and behavioral disabilities. Another doctoral student in special education collected interobserver reliability and treatment fidelity data.

Dependent Variables

Job performance rubric (JPR). To assess student acquisition of soft skills, a JPR was created based on a survey of employers’ perceptions of needed soft skills and how they were defined. The JPR included the following soft skills: (a) attitude and cooperation, (b) reliability, (c) productivity and on-task behavior, (d) quality of work, and (e) teamwork and communication. Each soft skill had three or four subcomponent areas (Table 2). The rating scale included a 4-point rating for each subcomponent area as follows: (a) 4 = consistently meeting the standards and expectations of a regular employee, (b) 3 = inconsistently meeting the standards of a regular employee, (c) 2 = not quite up to the standards of a regular employee, and (d) 1 = not meeting expectations or well below the standards of a regular employee. For each soft skill, the JPR provided further details regarding skills and behaviors comprised each score. The overall total score across all soft skills of the JPR could range from 17 to 68. For each individual soft
skill area the scores could range from 3 to 12 points (3 subcomponents) or 4 to 16 (4 subcomponents).

Individual soft skill component. The primary dependent variable was the attainment of one self-selected soft skill area of the JPR. As part of Goal Setting Instruction (GSI), each student reviewed his or her baseline I scores and chose one soft skill area measured by the JPR. In this study, Lindsay chose quality of work, Brendan chose teamwork and communication, Ayana chose productivity and on-task, and Antwoine chose reliability (See Tables 2 and 3). Data collection occurred daily on each self-selected soft skill area of the JPR on an in-school job site (i.e., UPGRADE I; U-GRADE I) and on a community job site (i.e., UPGRADE II; U-GRADE II).

Total job performance rubric. Data were also collected on each student’s performance on an in-school job task and community job site using the entire JPR as a way to measure generalization to non-targeted soft skills. The overall total score could range from 17 to 68.

Interobserver Agreement. To determine interobserver agreement, a second scorer independently scored 38% of all sessions during all phases (e.g., baseline, intervention, maintenance). The second scorer was trained during the Clark et al. (2018) study over two days and conducted interobserver agreement for this study as well. An item-by-item analysis was used to determine agreement for all dependent variables during and intervention. Agreement was calculated for each individual component of the JPR, as well as the whole JPR. Each scorer assigned points for items, and the number of agreements was divided by the total number of items (i.e., 4 subcomponents for two component areas plus 3 subcomponents for 3 component areas plus 17 subcomponents for 5 component areas of the JPR). The same process was followed for each individual area and results across four subcomponents of attitude and cooperation were 91% (range: 75–100%), three subcomponents of reliability were 94% (range: 67–100%), three subcomponents of productivity and on-task were 90% (range: 67–100%), three subcomponents of quality of work were 92% (range: 67–100%), and four subcomponents of teamwork and communication were 90% (range: 75–100%). Across all five areas the quotient points (3 subcomponents) on 4 to 16 (4 subcomponents) or 3 to 12 skill area the scores could range from 3 to 12 points (3 subcomponents) or 4 to 16 (4 subcomponents). The primary dependent variable was the attainment of one self-selected soft skill area of the JPR. As part of Goal Setting Instruction (GSI), each student chose one soft skill area measured by the JPR. In this study, Lindsay chose quality of work, Brendan chose teamwork and communication, Ayana chose productivity and on-task, and Antwoine chose reliability (see Tables 2 and 3). Data collection occurred daily on each self-selected soft skill area of the JPR on an in-school job site (i.e., UPGRADE I) and on a community job site (i.e., UPGRADE II).
TABLE 3
An Example of Scoring Criteria for Each Soft Skill on the JPR Chosen by Students

<table>
<thead>
<tr>
<th>Soft Skill</th>
<th>Level Four</th>
<th>Level Three</th>
<th>Level Two</th>
<th>Level One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>On time and begins promptly upon arrival</td>
<td>On time and begins with 1 or less prompts, arrives and leaves work on time</td>
<td>Needs to improve getting started, being on time for work and leaving on time (i.e., 2 or less prompts to get started, late more 2 days a week)</td>
<td>Needs to improve getting started, being on time, leaving on time, (i.e., 3 or more prompts to get started; late 3 or more days a week)</td>
</tr>
<tr>
<td>Productivity and On-Task</td>
<td>Works at a pace comparable to other employees</td>
<td>Stays steady (i.e., only stops for schedule breaks, works comparable pace to other employees)</td>
<td>Average pace (i.e., stops 1 time outside of a scheduled break)</td>
<td>Inconsistent pace (i.e., stops 2 times outside of a scheduled break)</td>
</tr>
<tr>
<td>Quality of Work</td>
<td>Works is completed to job specifications</td>
<td>Completes work to job specifications (i.e., 0 prompts)</td>
<td>Completes work to job specifications (i.e., 1 prompt)</td>
<td>Needs to improve completing work to job specifications (i.e., 2 prompts)</td>
</tr>
<tr>
<td>Teamwork and Communication</td>
<td>Asks for or offers help/advice as needed</td>
<td>Always asks for help and/or offers to help others when needed without prompting (i.e., 0 prompts)</td>
<td>Usually asks for help and/or offers to help others when needed with prompting or assistance (i.e., 1 prompt)</td>
<td>Needs to improve asking for help and/or offering to help others when needed with prompting or assistance (i.e., 2 prompts or reminders)</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>
was multiplied by 100 to yield a percentage of 91.4% (range: 82–100%).

Social Validity

In order to measure each student’s satisfaction of the procedures and outcomes of the intervention, each student completed an 8-item questionnaire modified from the Student Intervention Rating Profile (SIRP; Snyder, 2002) on the last day of the final phase of intervention (i.e., U-Grade II). The questionnaire used a 4-point rating scale (1 = I strongly disagree; 2 = I disagree, 3 = I agree; 4 = I strongly agree) to assess each student’s level of agreement or disagreement with each statement. Higher scores indicated greater treatment acceptability. Directions and statements were read aloud to the students and students were instructed not to put their names on the survey and to be truthful in their answers.

To measure their special education teacher’s perception of the procedures, goals, and impact of the intervention she completed two different questionnaires. First, at the completion of all intervention sessions, she completed an 8-item questionnaire to provide feedback on the goals and procedures of the intervention. The questionnaire used the same 4-point rating scale as the student’s survey. Also, she completed a second survey for each student after they completed intervention. This survey measured her perception of the effect of U-GRADE Your Performance on each student’s performance during and after participating in the intervention. This survey included six items that asked specific questions to determine the teacher’s perception of the student’s performance on each soft skill on the JPR. The second survey used a 5-point rating scale (1 = I strongly disagree; 2 = I disagree; 3 = Neutral; 4 = I agree; 5 = I strongly agree).

Lastly, three employers from the community who were unfamiliar with the study were given rubric scores from baseline and maintenance sessions. They were asked to indicate which employee they would hire for their company with a blue sticker or would not hire with a red sticker. In addition, they completed a 5-question survey on their perception of the skills measured on the rubric using the same 4-point rating scale as the students’ and teacher’s survey.

Experimental Design

The experimental design was a modified multiple probe across participants design (Cooper, Heron, & Heward, 2007). All students received three initial baseline probes on their in-school job site and one baseline probe on their community job site. These probes were followed by two sessions of GSI. On the first day of GSI students reviewed their baseline scores and chose one soft skill area to focus on. On the second day they received instruction on that soft skill area.

After GSI, students received additional baseline probes to determine if GSI had an effect on their skills. The student with the most stable baseline scores began intervention first and the other students were probed every four days. When participants reached mastery (i.e., three or four on each subcomponent area for their self-selected soft skill area of the JPR for four consecutive days), they moved to the first maintenance phase (i.e., U-GRADE I) and followed the steps of instruction independently daily and a probe was collected every three days. After three probes, the participant entered the next phase of intervention (i.e., U-GRADE II) at their community job site. Students participated in U-GRADE instruction until they met the mastery criteria on their community job. After participants reached mastery criteria they entered the next phase (i.e., U-GRADE II) identical to U-GRADE I, only located at the community setting. Once a participant entered U-GRADE I, the next participant entered the first phase of intervention and followed the same procedures. The same rules were used to begin intervention with each subsequent student.

Procedure

Baseline 1. During baseline 1, students were asked to perform job tasks in an in-school job site and on a community job site. While working, they were evaluated on the JPR. Their teacher provided instructions on what was required to complete the job tasks; however, students did not receive any feedback or instruction in the soft skill areas measured by the JPR. Baseline 1 probes occurred for a minimum of three days for the in-school job site and one day for the community job site.
For each student in this study the in-school job site was located in the school cafeteria where they were required to clean tables, seats, collect trash, and wipe down any other surfaces. Each student worked on a different community job.

Goal setting instruction (GSI). GSI was comprised of two lessons conducted in a one-to-one setting. The first day included an introduction to the JPR, an explanation of the importance of soft skills for employment, and a description of each component of the JPR. At the end of the lesson, students viewed their baseline scores and selected one soft skill area (i.e., one of their lowest areas). The second day of GSI focused on the soft skill area they selected (e.g., productivity and on-task). Instruction during this lesson included defining key terms, role-playing, and video instruction where they were able to practice evaluating someone using the JPR. Finally, at the end of the second lesson, students set a goal for themselves to improve in the soft skill area they chose. Lindsay’s goal was to improve her quality of work to a level four by completing her job the right way and working to fix her own mistakes on the job. Brendan’s goal was to improve his teamwork and communication to a level four by asking for help if he needed it and be polite to others. Antwoine’s goal was to improve her productivity and on-task to a level three by staying focused and working at a faster pace. Ayana’s goal was to improve her reliability to a level three by coming to school on time and having better attendance.

Baseline 2. A second baseline session was conducted to determine any effect of GSI and to ensure stability before introducing UPGRADE Your Performance. The procedures were the same as the first baseline sessions. The student with the most stable baseline on the JPR was selected to begin intervention first. Baseline probes occurred for a minimum of three days.

Overview of UPGRADE Your Performance. During intervention students were asked to perform a job task and were evaluated by the interventionist on the JPR. Then, students participated in UPGRADE Your Performance, which utilized McEwen’s (2010) framework for soft skill building: (a) introduce, (b) explain, (c) practice, and (d) reinforce. Intervention also included goal setting, self-monitoring, self-graphing, and self-evaluation.

During UPGRADE Your Performance students were taught a mnemonic to help them remember the steps of the intervention (i.e., U = You evaluate yourself, P = Professional evaluates you, G = Graph your scores, R = Restate your goal and determine if you met it, A = Acknowledge what you did well, D = Decide what you need to improve on, and E = Execute improvements tomorrow to meet your goal). Each day after performing a job, students evaluated themselves, were provided with the interventionist’s scores, graphed both scores to compare them, reviewed their goal to determine if they met it, and finally, developed a plan to get closer to meeting their goal the next day.

UPGRADE I. UPGRADE I instruction occurred for a minimum of four sessions in this order: (a) the student went to work on their job site in the school (i.e., cafeteria) and the interventionist evaluated the students on their performance using the JPR; (b) once the student completed the job task, the interventionist and student went to a room located within the school for UPGRADE Your Performance; (c) the interventionist provided the student with the daily worksheet and asked the student to follow the first step in UPGRADE Your Performance: U = You evaluate yourself; (d) then, the interventionist showed the student his or her score of their performance only on the section of the JPR the student selected (e.g., quality of work) and the student listed the scores on their worksheet (i.e., P = Professional evaluates you); (e) next, the student calculated and graphed both scores on a graphing worksheet and compared the scores (i.e., G = Graph both scores on the graphing worksheet); (f) then, the student restated the goal and determined if they met it (i.e., R = Restate your goal and determine if you met it); (g) next, the student listed two or three things they did well (i.e., A = Acknowledge what you did well); (h) then, the student listed two or three things they needed to improve on in order to meet their goal (i.e., D = Decide what you need to do better in order to meet your goal); and (i) lastly, the student chose one thing they wanted to focus on to get closer to meeting their goal the next day (i.e., E = Execute improvements tomorrow
to meet my goal). Instruction continued daily until the student reached mastery criteria. Once a student reached mastery criteria, they began the next phase, U-GRADE I, to fade the interventionist’s presence and determine maintenance.

**U-Grade I.** On their final day of UGRADE I students were instructed how to download the Google sheets app onto their device, and a spreadsheet created by the interventionist was shared with them using Google sheets. During this instruction, the interventionist demonstrated how students would follow U-GRADE steps each day after working and modeled how to access the spreadsheet to input their data. Then, students were given time to practice accessing, following U-GRADE steps, and inputting data into the shared spreadsheet with their device. They practiced until they were able to input data correctly and independently.

During UGRADE instruction, the student went to work on their in-school job site and once they completed their job, they accessed the shared Google spreadsheet with their device (e.g., smart phone, iPod, iPad, laptop computer) and followed the U-GRADE steps including (a) U-You evaluate yourself, (b) G-graph your scores, (c) R-restate your goal and determine if you met it, (d) A-acknowledge what you did well, (e) D-decide what you need to do better, and (f) E-execute improvements tomorrow to meet your goal. Every third day the interventionist observed the student and entered her scores into spreadsheet so the student could see her scores. The interventionist collected data every third day and input her data into a shared Google spreadsheet the students accessed from their device.

**U-Grade II.** Procedures for this phase of the intervention were identical to U-GRADE I, only it occurred after students worked at their community job site. The interventionist collected data every third day and input her data into a shared Google spreadsheet the students accessed from their device.

**Maintenance.** Once a student maintained mastery criteria during U-GRADE II, they entered maintenance. Maintenance conditions were identical to baseline conditions. Data were collected on all areas of the JPR once a week for three consecutive weeks on in-school and community job sites and students did not rate themselves.

**Procedural fidelity.** Another doctoral student was trained to collect procedural fidelity data and observed 38% of all sessions. Observations were distributed across the intervention phases in order to have procedural fidelity checks on all parts of the intervention. In order to document adherence to the intervention, the observer had a checklist of steps for the observation period of the intervention and a lesson plan of the session to use as a checklist. Both the observation checklist and the lesson plan were divided into steps, and the observer marked each section as present or not. The number of completed correct steps was divided by the total number of steps and multiplied by 100 to obtain a procedural fidelity mean score. Fidelity scores ranged from 99% to 100% with a mean of 99.8%.

**Results**

Figure 1 illustrates each student’s score on the individual’s selected soft skill area.

**Individual Soft Skill Area**

**Lindsay.** Lindsay focused on quality of work. During baseline 1, Lindsay’s scores were 3 for all school and community data points; during baseline 2 her scores were all 3 for the school
Figure 1. Score on Individual Soft Skill Components (● = interventionist score on in-school job; ○ = student score on in-school job and community job; □ = interventionist score on community job).
job site and a 4 for the community data point. During UGRADE I her scores ranged from 6 to 11, with a mean of 8.7. She reached the mastery criteria after seven sessions. During UGRADE I, her scores were all 10. During UGRADE II, her scores ranged from 9 to 11, with a mean of 10. During UGRADE II, her scores were all 11. During maintenance, her scores were all 10 for school probes and 11 for community probes.

**Brendan.** Brendan focused on teamwork and communication. During baseline 1, Brendan’s scores ranged from 5 to 6, with a mean of 5.6 for his in-school job site and a 5 for his community job site; during baseline 2, his scores ranged from 6 to 7 with a mean of 6.1 on his school job site and ranged from 5 to 7 with a mean of 6 for his community job site. During UGRADE I his scores ranged from 8 to 14, with a mean of 12. It took six sessions for him to reach mastery criteria. During UGRADE I, his scores ranged from 13 to 14 with a mean of 13.6. During UGRADE II, his scores ranged from 12 to 15, with a mean of 14. During UGRADE II, his scores ranged from 14 to 15 with a mean of 14.3. During maintenance, his scores on his in-school job site ranged from 12 to 14, with a mean of 13.3; his scores on his community job site ranged from 13 to 14, with a mean of 13.3.

**Ayana.** Ayana focused on productivity and on-task. During baseline 1, Ayana’s scores were all 3 for both school and community job sites; during baseline 2, her scores were all 3 for her school job site and ranged from 3 to 4 with a mean of 3.75 in the community. During UGRADE I her scores ranged from 5 to 11, with a mean of 8.3. She reached mastery criteria after seven days. During UGRADE I her scores were all 10. During UGRADE II, her scores ranged from 10 to 11, with a mean of 10.5. During UGRADE II, her scores ranged from 10 to 11, with a mean of 10.6. During maintenance, she was only able to complete one probe due to the end of the school year and her score was 10 for her in-school job site and 11 for her community job site.

**Antwoine.** Antwoine chose to work on reliability. During baseline 1, Antwoine’s scores ranged from 3 to 6, with a mean score of 4.3 for his in school job site and 4 for his community job site; during baseline 2, his scores ranged from 3 to 5, with a mean of 3.8 for his school job site and ranged from 4 to 5, with a mean of 4.2 on his community job site. During UGRADE I his scores ranged from 7 to 10, with a mean of 8.7. He reached mastery criteria in seven days. During UGRADE I his scores were all 10. During UGRADE II, his scores ranged from 10 to 12, with a mean of 10.75. Due to the end of the school year, Antwoine was unable to complete UGRADE II. He had one data point collected by the interventionist during that phase and his score was a 10.

**Generalization to Non-Targeted Soft Skills on JPR**

Table 4 shows students’ scores from baseline, intervention, and maintenance in each soft skill area measured by the JPR.

**Lindsay.** Although Lindsay chose to focus on quality of work, she made at least a 4-point increase in all non-targeted soft skills, and a 7-point gain in both attitude and cooperation and teamwork and communication. Lindsay’s final scores for attitude and cooperation ranged from 7 to 14, with a mean of 11.6. Her reliability final scores, ranged from 6 to 10, with a mean of 8.8. Productivity and on-task final scores ranged from 4 to 10, with a mean of 8. Teamwork and communication final scores ranged from 7 to 14, with a mean of 12. These data indicate Lindsay was able to generalize her skills to other areas of the JPR.

**Brendan.** Although Brendan chose to focus on teamwork and communication, he made at least a 3-point gain in all non-targeted soft skills, including a 6-point gain in quality of work. Brendan’s final scores for attitude and cooperation ranged from 8 to 12, with a mean of 10.4. His reliability final scores ranged from 6 to 10, with a mean of 8.8. Productivity and on-task final scores ranged from 7 to 10, with a mean of 8.8. Quality of work final scores ranged from 3 to 9, with a mean of 7.4. Brendan was able to generalize his skills to the other areas of the JPR.

**Ayana.** Although Ayana chose to focus on productivity and on-task, she was able to increase her final scores in all non-targeted soft skill areas, including an 8-point increase in one area, a 6-point increase in another area, and a 4-point increase in two of the non-targeted soft skills. In the area of attitude and cooperation Ayana’s final scores ranged from 7 to 13, with a mean of 11. Her reliability final
scores ranged 5 to 9, with a mean of 8. Quality of work final scores ranged from 3 to 11, with a mean of 8.6. Teamwork and communication final scores ranged from 7 to 12, with a mean of 10.4. Ayana was able to generalize her skills to other areas of the JPR.

Antwoine. Although Antwoine chose to focus on reliability, he made a 6-point increase in attitude and cooperation, as well as a 5-point increase in both quality of work and teamwork and communication. Antwoine’s attitude and cooperation ranged from 8 to 14, with a mean of 11.3. Productivity and on-task final scores ranged from 6 to 10, with a mean of 8.3. Quality of work final scores ranged from 4 to 9, with a mean of 7. Teamwork and communication scores ranged from 7 to 12, with a mean of 10. Data indicated Antwoine’s performance generalized to other areas of the JPR.

Social Validity

The mean score on the modified SIRP was 3.7 (range: 1–4), indicating generally high levels of student satisfaction with the intervention. In addition, students made comments adding support to the social significance of the intervention: (a) “I can’t believe how much I am improving!” (Lindsay); (b) “I do not want to talk more, but I am making myself and I can see I am improving and almost meeting my goal.” (Brendan); (c) “I know I get distracted now and I have come up with a plan to make sure I stay focused while working so I don’t miss anything.” (Ayana); and (d) “I like being

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TABLE 4
Participant Scores on the Final Data Point in Each Phase for Each Soft Skill

<table>
<thead>
<tr>
<th>Area</th>
<th>Mastery</th>
<th>Baseline</th>
<th>UPGRADE I</th>
<th>UPGRADE II</th>
<th>Maintenance S/C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lindsay</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude &amp; Cooperation</td>
<td>12–16</td>
<td>7</td>
<td>12</td>
<td>12</td>
<td>13/14</td>
</tr>
<tr>
<td>Reliability</td>
<td>9–12</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>10/10</td>
</tr>
<tr>
<td>Productivity &amp; On-Task</td>
<td>9–12</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>10/10</td>
</tr>
<tr>
<td>Quality of Work</td>
<td><strong>9–12</strong></td>
<td><strong>3</strong></td>
<td><strong>11</strong></td>
<td><strong>11</strong></td>
<td><strong>10/11</strong></td>
</tr>
<tr>
<td>Teamwork &amp; Communication</td>
<td>12–16</td>
<td>7</td>
<td>11</td>
<td>14</td>
<td>14/14</td>
</tr>
<tr>
<td>Total Rubric Score</td>
<td>51–68</td>
<td>29</td>
<td>51</td>
<td>54</td>
<td>57/59</td>
</tr>
<tr>
<td><strong>Brendan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude &amp; Cooperation</td>
<td>12–16</td>
<td>8</td>
<td>11</td>
<td>12</td>
<td>10/11</td>
</tr>
<tr>
<td>Reliability</td>
<td>9–12</td>
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<td>9</td>
<td>10</td>
<td>9/10</td>
</tr>
<tr>
<td>Productivity &amp; On-Task</td>
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<td>7</td>
<td>10</td>
<td>9</td>
<td>9/9</td>
</tr>
<tr>
<td>Quality of Work</td>
<td>9–12</td>
<td>3</td>
<td>8</td>
<td>7</td>
<td>8/9</td>
</tr>
<tr>
<td>Teamwork &amp; Communication</td>
<td><strong>12–16</strong></td>
<td><strong>6</strong></td>
<td><strong>14</strong></td>
<td><strong>15</strong></td>
<td><strong>13/13</strong></td>
</tr>
<tr>
<td>Total Rubric Score</td>
<td>51–68</td>
<td>33</td>
<td>52</td>
<td>54</td>
<td>51/52</td>
</tr>
<tr>
<td><strong>Ayana</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude &amp; Cooperation</td>
<td>12–16</td>
<td>7</td>
<td>12</td>
<td>13</td>
<td>11/12</td>
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<tr>
<td>Reliability</td>
<td>9–12</td>
<td>5</td>
<td>8</td>
<td>9</td>
<td>9/9</td>
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<tr>
<td>Productivity &amp; On-Task</td>
<td><strong>9–12</strong></td>
<td><strong>3</strong></td>
<td><strong>11</strong></td>
<td><strong>11</strong></td>
<td><strong>10/11</strong></td>
</tr>
<tr>
<td>Quality of Work</td>
<td>9–12</td>
<td>3</td>
<td>8</td>
<td>11</td>
<td>10/11</td>
</tr>
<tr>
<td>Teamwork &amp; Communication</td>
<td>12–16</td>
<td>7</td>
<td>12</td>
<td>11</td>
<td>11/11</td>
</tr>
<tr>
<td>Total Rubric Score</td>
<td>51–68</td>
<td>27</td>
<td>51</td>
<td>55</td>
<td>52/53</td>
</tr>
<tr>
<td><strong>Antwoine</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude &amp; Cooperation</td>
<td>12–16</td>
<td>8</td>
<td>12</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
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<td><strong>10</strong></td>
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<td>52</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>

Note. Participants’ targeted soft skill areas are shown in boldface.
able to use my phone to graph myself, it’s so easy and fast!” (Antwoine).

The special education teacher’s scores on her perception of goals of the intervention were all 4, indicating she believed it was important for students to learn soft skills for employment, set their own goals, and have an intervention combining soft skill instruction with goal-setting and self-monitoring. Her scores on the acceptability of outcomes were all 4 indicating she thought UPGRADE Your Performance assisted her students in improving their soft skills, evaluating their own behavior, and improving their behavior in the classroom. She also indicated UPGRADE Your Performance was helpful and she would like to use it in the future. On the second questionnaire, the teacher’s scores ranged from 3 to 5 for two students with a mean of 4.2 and her scores ranged from 4 to 5 for two student’s with a mean of 4.6. Her overall mean score was 4.4. For all students she indicated she strongly agreed they improved their overall job performance after participating in UPGRADE Your Performance.

Three employers from the community (i.e., bank, sporting goods store, computer technology service company) evaluated JPR scores from baseline, the final day of intervention, and maintenance. One employer (i.e., bank) marked 100% of the rubrics from baseline as employees he would not hire and 70% of the rubrics from after intervention as those he would hire. On the rubrics from maintenance he indicated he might hire them, but would need to have an interview with them to determine their true skill set for his company because at the bank they highly value teamwork, reliability, and attitude and cooperation. These rubrics had lower scores in those areas and that made him feel as if would need to talk with them further. The other two employers (i.e., sporting goods store, computer technology service company) marked 100% of the rubrics from baseline as those they would not hire and 100% of the rubrics from the final day of intervention and maintenance as those they would hire. Lastly, each employer indicated they agreed soft skills were important for students to learn and the JPR was a good way to assess soft skills. They also indicated skills measured by the JPR were important and could help students obtain employment.

Discussion

The purpose of this study was to investigate the effects of UPGRADE Your Performance on the acquisition of soft skills of secondary students with disabilities across school and community job sites, as well as generalization to other non-targeted soft skill areas. Results indicated all students improved in their selected soft skill area and generalized improvements to other non-targeted soft skills measured by the JPR. In addition, students generalized their soft skills to a job site in the community and after participating in U-GRADE, were able to maintain their performance over time.

The previous study investigating the effects of UPGRADE Your Performance instruction found similar results; however, students in that study did not immediately generalize their skills across two different in-school job sites and also were unable to maintain at their highest performance level over time (Clark et al., 2018). In the current study, we conducted a conceptual replication by making changes to features of the initial study conducted by Clark et al. (2018; see Table 1). The purpose of this study was to improve generalization outcomes by incorporating a maintenance phase between settings wherein the interventionist’s presence was faded and students continued to self-monitor, self-evaluate, and self-graph their performance using hand-held technology during both U-GRADE phases. Results indicated students were able to maintain at higher levels during those phases and in some cases continued to improve their performance. In addition, all students generalized skills to their community job site, and three of the students were able to maintain within one or two points of their highest performance level during maintenance. These results extend findings from Gulchak (2008) where a student was able to use a hand-held device to self-monitor and improve his on-task behavior. Students in this study were also able to self-monitor and improve their performance in multiple areas.

In addition, U-GRADE phases reduced the need for the interventionist to support each student in improving his or her job performance. Students were able to independently monitor their performance, reflect on what they needed to improve on, and make
changes the next day to improve or maintain their performance. When the interventionist collected data during these phases, it was done in the same way as baseline and maintenance probes. Although she observed them and entered her scores into the spreadsheet, she did not provide verbal feedback. Even so, students were able to continue to perform well. This is consistent with findings from Gentry, Krimer, Sima, McDonough, and Wehmen (2015) that found adults with autism spectrum disorder used an Apple iPod Touch as a vocational support and were able to improve their work performance and reduce their support needs on the job.

Another interesting outcome was by the conclusion of the study, three of the four participants had gained competitive employment in their community. All three were working for wages slightly higher than state’s $7.25/hour minimum wage. Antwoine obtained a job working at a restaurant 16–20 hours per week, Lindsay obtained a part-time job at her community job site, a grocery store, working 10–15 hours per week, and Brendan obtained a job at a bowling alley working 10–15 hours per week. This study did not measure competitive employment as a dependent variable, and it cannot be determined if they gained employment due to their participation in UPGRADE; however, it is important to note three participants gained competitive employment in their community.

Lastly, results from employer surveys were consistent with the previous study indicating that some employers may value some soft skills over others. Clark et al. (2018) found an employer who worked in a service industry chose a few rubrics from baseline as employees he would possibly hire because they had higher scores in skill areas he felt were very important in his profession (i.e., attitude and cooperation, reliability, teamwork and communication). He felt he might be willing to work with someone who possesses those skills, even if they were low in productivity and on-task or quality of work. In this study, one employer who worked in the banking industry indicated his profession also highly valued having a good attitude, being cooperative, being reliable, communication skills, and teamwork. He felt the ones he marked, as those he “might hire” did not have high enough skills in those areas compared to the other rubrics. Across both studies conducted on UPGRADE, those three skills have been identified as more valuable in two career fields (i.e., service, banking).

Limitations and Recommendations for Future Research

Although results from this study indicated a functional relation between UPGRADE and improved soft skills, there were some limitations. First, students were able to generalize their skills to other non-targeted soft skills measured by the JPR, but they did not always reach or maintain at mastery criteria in all non-targeted soft skills areas. If specific soft skills could be targeted that would improve all areas to mastery, this could assist a teacher in determining which areas to prioritize. Future researchers should utilize a multiple baseline across behaviors design across three soft skills areas, and they may want to focus on the three soft skill areas identified by two employers as more important than the others for their profession (i.e., attitude and cooperation, reliability, teamwork and communication). Students can begin with their first selected soft skill area and once they reach mastery and maintain through UPGRADE instruction, they could select a second skill to focus on and finally a third skill to determine if targeting multiple skill areas will allow students to reach mastery in all soft skills areas.

Next, students were able to remember to fill in their scores on the Google spreadsheet; however, one participant mentioned that her teacher had to remind her a couple times. This could have impacted our understanding of how well students were able to self-monitor independently. Future research might include a reminder system through the student’s device that provides a prompt reminding them to grade themselves when they finish with their job site. It could be added to the UGRADE phase utilizing either the alarm system on a student’s device or reminder within a Google calendar event as a way for students to prompt or remind themselves to complete their self-monitoring spreadsheet.

In addition, two employers over the past two studies have indicated that they preferred the same three soft skill areas (i.e., attitude and
cooperation, reliability, teamwork and communication) over the other soft skill areas. Future studies should consider asking employers to rank skills important to their profession as part of a social validity survey. This may assist in understanding what skills specific careers value most.

Lastly, since this was a conceptual replication focused on replicating the results from the initial study to increase generalization; as well as, add to the evidence base of UPGRADE Your Performance, additional replications are needed across different participants, settings, and other variations to extend findings from these studies. Replications of studies can assist in determining the efficacy of an intervention across different participants, settings, and other dimensions of the study and assist in establishing the validity and generalizability of the intervention (Coyne et al., 2016).

Implications for Practice

Findings from this study indicated UPGRADE Your Performance could be a potentially effective way to teach students essential soft skills for employment. In addition, results from this study demonstrated that student performance did not increase until UPGRADE Your Performance was implemented. During GSI students learned about the JPR and set a goal, but did not receive UPGRADE Your Performance. Their performance did not show an increase during the second baseline session following GSI, indicating goal setting instruction alone was not enough. Additionally, this study implemented a maintenance phase where students used a hand held device (i.e., iPod, iPhone, iPad) to self-monitor their own performance and fade the presence of the interventionist. Lastly, this study was conducted across an in-school and community job site providing implications for secondary teachers, transition specialists, vocational rehabilitation counselors, and job coaches to be able to implement this intervention for across both school and community work-based learning experiences.

Additionally, practitioners could use this intervention as a way to collect data, monitor student progress on their IEP goals, and have students collect and graph their own data. By utilizing technology and allowing students to track their performance on their own hand-held device, students could track their own performance to share at their IEP meetings and gain independence while working. Using a shared Google spreadsheet could also provide a practical way for data sharing among teachers, job coaches, outside agencies (e.g., Vocational Rehabilitation), families, and other members of the IEP team.

Also, findings indicated students were able to increase their skills in other non-targeted soft skill areas; teachers may be able to connect skill areas demonstrating the most generalization and maximize instructional time. Lastly, recently Workforce Innovations Opportunity Act (WIOA; 2014) included guidance on providing pre-employment transition services to students with disabilities. These services can be provided either in the school or community. Vocational rehabilitation counselors could use UPGRADE Your Performance with students when they are working with them at school and community settings.

In conclusion, although it is clear that soft skills are essential for employment (Casner-Lotto & Barrington, 2006; Ju et al., 2012), currently, there are not many instructional strategies for teaching these skills to students with disabilities (Agran et al., 2016). This study extended results from Clark et al. (2018) and added to the evidence base for UPGRADE Your Performance as a promising way to teach and assess soft skills of individuals with disabilities.

References


Snyder, E. P. (2002). Teaching students with combined behavioral disorders and mental retardation to lead their own IEP meetings. *Behavioral Disorders*, 27, 340–357.


Received: 21 December 2017
Initial Acceptance: 22 February 2018
Final Acceptance: 28 March 2018
Abstract: The purpose of this manuscript was to systematically review the literature on the use of portable smart devices in teaching students with intellectual disability functional skills. Eighteen empirical studies were identified and summarized. This review especially focused on which devices were included and how these devices were used to teach home-, school-, community-, and job-related skills to this population. Percentage of non-overlapping data (PND) was calculated to quantify the effects of using portable smart devices.

The acquisition of functional skills, such as food preparation, money management, and pedestrian navigation, is essential for students with intellectual disability (ID) to live independently. Confidence in these skills also increases their quality of life (Cannella-Malone, Brooks, & Tullis, 2013; Kelley, Test, & Cooke, 2013). For these reasons, researchers have investigated the effects of various instructional methods, such as community-based instruction (Bates, Cuvo, Miner, & Korabek, 2001), classroom simulation (Morse & Schuster, 2000), and computer-based video instruction (CBVI; Ivey, Mechling, & Spencer, 2015; Mechling & O’Brien, 2010), for teaching these skills to students with ID.

One method considered promising in the past decade is CBVI (Goo, Therrien, & Hua, 2016). CBVI refers to utilizing the computer as a tool to provide auditory and visual prompts, or instruction, for students. For instance, Ivey and colleagues (2015) conducted a study on the effects of computer-based video prompting. They used video prompting (VP) presented through a laptop with a proximity sensor switch to teach three young adults with moderate ID completion of craft activities. The participants watched a video prompt before beginning each step of the activities and then completed the steps. Results indicated that overall using VP with the switch was an effective means for teaching the completion of craft activities. All students showed improvement in completing the crafts. Another study (Goo et al., 2016) examined whether CBVI was effective in teaching the location of grocery items to students with ID. Four high school students with mild to moderate ID participated in the study. The first author created an instructional program including video prompts and review questions to teach the students how to locate grocery items. The students watched a video prompt depicting one step in locating three target grocery items and then were asked to answer a review question for that step. This procedure was repeated for the remaining steps. The findings demonstrated that CBVI was effective in teaching grocery purchasing skills to students with ID. All students acquired and generalized the skills to an actual grocery store that had been depicted in the video prompts, and also to another actual grocery store that had not been depicted in the prompts.

In recent years, CBVI has been adopted to portable smart devices (PSDs), such as tablet computers and smart phones, as presentation tools that have taken the place of desktop, laptop, and personal digital assistant (PDA) computers. PSDs brought several benefits to people with intellectual and developmental disabilities (IDD): (a) accessibility (Johnson, Blood, Freeman, & Simmons, 2013; Mechling, 2011; Spooner, Kemp-Inman, Ahlgrim-Delzell,
Wood, & Davis, 2015); (b) portability (Cihak, Kessler, & Alberto, 2008; Kagohara et al., 2013; Laarhoven, Johnson, Laarhoven-Myers, Grider, & Grider, 2009; Taber-Doughty, Miller, Shurr, & Wiles, 2013); (c) social acceptance (Kim, Blair, & Lim, 2014; Laarhoven et al., 2009; McMahon, Smith, Cihak, Wright, & Gibbons, 2015; Scott, Collins, Knight, & Kleinert, 2013; Taber-Doughty et al., 2011); and (d) entertainment (Chan, Lambdin, Graham, Fragale, & Davis, 2014; Hammond, Whatley, Ayres, & Gast, 2010; Kagohara, Sigafoos, van der Meer, O’Reilly, & Lancioni, 2011). These benefits may facilitate the acquisition of functional skills for individuals with IDD and increase confidence in these skills, thus leading to greater independent functioning in the home, school, community and workplace.

Research has also reported positive effects of using PSDs in teaching students with various disabilities, such as emotional and behavioral disorders (EBD; Blood, Johnson, Rideour, Simmons, & Crouch, 2011; McKeown, Kimball, & Ledford, 2015; Xin & Leonard, 2015); autism spectrum disorders (ASD; Bouck, Savage, Meyer, Taber-Doughty, & Hunley, 2014; Burkley, Tincani, & Fisher, 2015; Kagohara et al., 2010; Macpherson, Chatlop, & Miltenberger, 2015), and ID (Gardner & Wolfe, 2015; Smith, Cihak, Kim, McMahon, & Wright, 2017; Wu, Cannella-Malone, Wheaton, & Tullis, 2016). In addition, PSDs can be used as effective tools to teach these students a variety of functional skills. For instance, Flower (2014) compared instruction using an iPad with traditional instruction (no iPad) to examine which was more effective in increasing on-task behaviors of students with EBD in reading and math instruction. No iPad was used during traditional instruction condition, but an iPad with instructional applications was used during intervention condition. Results of the study indicated that the students exhibited more on-task behavior during intervention condition than during the traditional instruction condition. Also, Cihak, Fahrenkrog, Ayers, and Smith (2010) investigated the effects of using the iPod to teach students with ASD a functional skill. Four elementary-age students with ASD took part in the study and were taught independent transition during school time (e.g., classroom to cafeteria). The researchers created videos for self-modeling by video-recording each student’s independent transition with assistance. During baseline condition, if needed, assistance was given to the students to transition, but no self-video model was provided. During intervention condition, the students watched their self-video models and then transitioned. If the students needed assistance to transition, they were asked to watch the self-video models again and then transitioned. If needed, a system of least-to-most prompt was used until they completed transitioning independently to target places.

Additionally, PSDs have been used to teach various functional skills specifically to students with ID, and empirical evidence supports the effectiveness of using these devices (Cannella-Malone et al., 2013; Douglas, Ayres, & Langone, 2015; Gardner & Wolfe, 2015; Laarhoven et al., 2009; Payne, Cannella-Malone, Tullis, & Sabielyn, 2012; Smith et al., 2017; Taber-Doughty et al., 2013). Although there have been some systemic reviews of using such devices to teach students with developmental disabilities (see Kagohara et al., 2013; Stephenson & Limbrick, 2015), there has been no systemic review solely focusing on the effects of using PSDs for students with ID. Therefore, the purpose of the current article was to systematically review empirical studies examining the effects of using PSDs to teach functional skills to students with ID. In particular, this review focused on: (a) which PSDs were used, (b) what skills were taught through PSDs, (c) how PSDs were used to teach those skills, and (d) whether using PSDs is overall an effective method for teaching functional skills to students with ID by meta-analytically analyzing existing experimental data.

**Method**

Before the initial search, the first author established four criteria by which to include studies in this review. The inclusion criteria were as follows: (a) study used a single-case design; (b) study used participants primarily or secondarily diagnosed as ID who attended elementary, secondary, or post-secondary schools; (c) study used a PSD as an instructional tool (independent variable); and (d) study published in a peer-reviewed journal specifically targeting special education, disabilities, and/or behavior intervention. These criteria
were stringently applied to all searches. For example, studies not clearly stating that participants were diagnosed as ID (see Cihak et al., 2010) or using more than one participant not diagnosed as ID (see Burton, Anderson, Prater, & Dyches, 2013) were excluded. Also, studies using PSDs but not as independent variables were excluded (see Creech-Galloway, Collins, Knight, & Bausch, 2013; Spooner et al., 2015). In addition, studies teaching how to use PSDs (see Kagohara, 2011; Walser, Ayres, & Foote, 2012) were excluded. Given the criteria, the initial search was electronically conducted by first two authors using Psycinfo and EBSCOhost. For this search, the authors used the following keywords: (a) intellectual disability, (b) mental retardation, (c) iPod, (d) iPad, (e) iPhone, (f) tablet computer, and (g) technology. These keywords were used both independently and also in combination with other keywords (e.g., intellectual disability and tablet computer). A total of 46 relevant studies were found through the initial search. The authors then read these studies closely, and an ancestral search was also conducted with these articles to locate final articles to review.

The authors chose six components for coding: (a) experimental design, (b) participant (disability, age, and school level), (c) independent variable (type of device), (d) functional skills taught, (e) instructional setting, and (f) results. Each author coded information independently to ensure obtaining precise information from the studies. Moreover, percentages of non-overlapping (PND) for each study and the overall effects of using PSDs were calculated for quantitative analysis. In order to calculate the PND, the number of data points in the intervention condition above the highest data point in the baseline condition were divided by the total number of data points in the intervention condition, and then multiplied by 100 (Scruggs, Mastropieri, & Casto, 1987). In the interpretation of the PND, if PND was 90% or greater, it was considered highly effective. If PND was 70% to 90%, it was considered fairly effective. If PND was 50% to 70%, it was considered questionably effective, and if PND was less than 50%, it was considered ineffective.

Results

A total of 18 studies were identified and included in this review. Table 1 presents a summary of the studies. In addition to the summary, the authors used four functional skill domains to categorize the studies based on functional skills taught. The domains were as follows: (a) home-related skills; (b) school-related skills; (c) community-related skills; and (d) job-related skills.

Regarding PND, the overall effectiveness of using PSDs was 89.74% (48.48% - 100.00%), which was fairly effective. The PND of 13 studies indicated that this method was highly effective (96.76% - 100.00%); the PND of one study indicated that this was fairly effective (88.16%); the PND of two studies indicated that this was questionably effective (67.76% - 69.10%); and the PND of two studies indicated that this was ineffective (48.48% - 49.25%).

Teaching Home-Related Skills

Four studies taught home-related skills (i.e., food preparation and dish washing) to students with ID using PSDs. Taber-Doughty and colleagues (2011) compared the effects of using video modeling (VM) and VP using the iPod Nano with three middle school students with ID. Students learned to prepare food following recipes by viewing videos on an iPod Nano. A paper version of the recipe was used during baseline condition. All students improved their independent completion of cooking using the iPod to learn the recipes, though using VM was slightly more effective than using VP.

In another study on food preparation skills, Payne et al. (2012) taught two secondary-age students with ID and ASD two tasks (making microwave popcorn, preparing soup) using self-video prompting (SVP) presented via an iPod Nano. A paper version of the recipe was used during baseline condition. All students improved their independent completion of cooking using the iPod to learn the recipes, though using VM was slightly more effective than using VP.

In another study on food preparation skills, Payne et al. (2012) taught two secondary-age students with ID and ASD two tasks (making microwave popcorn, preparing soup) using self-video prompting (SVP) presented via an iPod Nano. A paper version of the recipe was used during baseline condition. All students completed tasks with only verbal prompts (e.g., “Make the popcorn.”). During intervention condition, video prompts were given through an application (inPromptu) on an iPod Touch. An error correction procedure or a system of most-to-least prompt was used with the iPod Touch for instruction.
<table>
<thead>
<tr>
<th>Authors (year); Skill Domain</th>
<th>Participants</th>
<th>Device Used; Application Used (IV)</th>
<th>Research Design; Functional Skills Taught (DV)</th>
<th>Results; PND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taber-Doughty et al. (2008); Community-related skills</td>
<td>3 male middle school students with moderate ID</td>
<td>1 Apple iPod Classic; no application</td>
<td>Alternating treatment; Using a computer to find call numbers and locating books and DVDs at the public library</td>
<td>Both DVM and SVM were effective, but SMV using iPod Classic was slightly more effective. All students acquired the skills, and their independence increased; 68.10%</td>
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<tr>
<td>Laarthoven et al. (2009); Job-related skills</td>
<td>1 male high school student with severe ID</td>
<td>1 Apple iPod Classic (5th generation); no application</td>
<td>Multiple probe across tasks; Cleaning bathrooms, mopping floors/taking out garbage, and cleaning kennels</td>
<td>Using the iPod Classic was effective. Student's independent performance dramatically improved and met a mastery criterion; 100.00%</td>
</tr>
<tr>
<td>Taber-Doughty et al. (2011); Home-related skills</td>
<td>1 male &amp; 2 female middle school students with mild ID</td>
<td>3 Apple 6G iPod Nanos; no application</td>
<td>Alternating treatment; Cooking 12 recipes</td>
<td>Both VM and VP were effective, but VM was slightly more effective. All students increased the number of steps completed independently; 48.76%</td>
</tr>
<tr>
<td>Cannella-Malone et al. (2012); Job-related skills</td>
<td>2 male &amp; 1 female secondary school students with moderate to profound ID</td>
<td>1 Apple iPod Touch; no application</td>
<td>Adapted alternating treatment; Sweeping and washing tables</td>
<td>VP with error correction across two tasks was effective. All students improved their performance over the baseline conditions; 98.76%</td>
</tr>
<tr>
<td>Hart &amp; Whalon (2012); School-related skills</td>
<td>1 male high school student with moderate ID and ASD</td>
<td>1 Apple iPad; no application</td>
<td>ABAB reversal; Increasing student responses during science instruction</td>
<td>VSM was effective. Student's spontaneous responses during science class increased; 49.25%</td>
</tr>
<tr>
<td>Payne et al. (2012); Home-related skills</td>
<td>1 male secondary school student with ASD &amp; 1 male secondary school student with ASD/mild to moderate ID</td>
<td>1 Apple iPod Touch; inPromptu</td>
<td>Multiple probe across participants; Making microwave popcorn and noodle soup</td>
<td>VP using an iPod Touch was effective. Both students' performance increased with both moving into the iPod Touch training phase, and one student learning to self-operate the VP; 98.75%</td>
</tr>
<tr>
<td>Cannella-Malone et al. (2013); Job-related skills</td>
<td>3 male &amp; 1 female students with moderate to severe ID</td>
<td>1 Apple iPod Touch; inPromptu</td>
<td>Multiple probe across participants; Washing tables and vacuuming</td>
<td>Self-directed VP using an iPod Touch was effective. All students made progress learning to use the inPromptu application independently; 96.83%</td>
</tr>
<tr>
<td>Kelley et al. (2013); Community-related skills</td>
<td>2 male &amp; 2 female college students with mild to moderate ID</td>
<td>1 Apple iPod Classic &amp; 1 iPod Touch; no application</td>
<td>Multiple probe across participants; Navigating to destinations on the college campus</td>
<td>Using the iPod Classic and iPod Touch was effective. All students traveled independently to untrained destinations, with only one participant needing a prompt before beginning; 100.00%</td>
</tr>
<tr>
<td>Johnson et al. (2013); Home-related skills</td>
<td>2 male high school students with moderate ID and ASD</td>
<td>1 Apple iPod Touch; Picture Scheduler</td>
<td>Multiple probe across behaviors; Making fruit smoothies, macaroni and cheese, and frozen pizza</td>
<td>Using the iPod Touch was effective. Both students showed an immediate increase in independent performance; 100.00%</td>
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<tr>
<td>Scott et al. (2013); Community-related skills</td>
<td>1 male &amp; 2 female students with ID in a transition program</td>
<td>1 Apple iPod Classic; no application</td>
<td>Multiple probe across participants; Withdrawing $20 bills from an ATM</td>
<td>VM and auditory prompts using an iPod Classic were effective. All students performed and maintained the skill successfully; 100.00%</td>
</tr>
<tr>
<td>Taber-Doughty et al. (2013); Job-related skills</td>
<td>2 male &amp; 2 female high school students with moderate ID</td>
<td>2 Apple iPads; Keynote</td>
<td>Multiple baseline across settings; Skills needed in the school workroom, bowling alley, and the grocery store</td>
<td>VM delivered through an iPad was effective. All students increased in independent task performance and task transitioning; 67.76%</td>
</tr>
<tr>
<td>Authors (year); Skill Domain</td>
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<td>Douglas et al. (2014); School-related skills</td>
<td>2 male &amp; 3 female high school students with mild to moderate ID</td>
<td>1 Apple iPad II &amp; 1 Apple iPod Touch (4th generation); First Then Visual Schedule</td>
<td>ABAB reversal; Scheduling school activities</td>
<td>VM using an iPad 2 and iPod Touch were effective. All students learned to create their own schedule and increased their percentage of correct responses; 100.00%</td>
</tr>
<tr>
<td>Kim et al. (2014); School-related skills</td>
<td>4 male &amp; 4 female private special school students with severe ID</td>
<td>1 Samsung Galaxy Tablet; no application</td>
<td>Multiple probe across participants; Reducing disruptive behaviors and increasing academic behaviors</td>
<td>Using the Samsung Galaxy Tablet was effective. All students' disruptive behaviors decreased immediately, and academic engagement increased; 98.15%</td>
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<tr>
<td>Douglas et al. (2015); Community-related skills</td>
<td>2 male &amp; 2 female high school students with moderate ID</td>
<td>1 Apple iPhone; Notes &amp; Photos</td>
<td>Alternating treatment; Creating grocery lists</td>
<td>Using the iPhone was effective. All students assisted with the creation of their grocery lists independently; 100.00%</td>
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<tr>
<td>Gardner &amp; Wolfe (2015); Home-related skills</td>
<td>2 male &amp; 2 female middle school students with mild to moderate ID</td>
<td>1 Apple iPad; no application</td>
<td>Multiple probe across participants &amp; AB; Washing dishes</td>
<td>VP with error correction using an iPad was effective. All students demonstrated rapid increases in the number of steps completed independently and reached mastery criterion; 100.00%</td>
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<tr>
<td>McMahon et al. (2015); Community-related skills</td>
<td>3 male &amp; 3 female college students with ID</td>
<td>Apple iPads &amp; iPhones; Google Map &amp; Navigator Heads Up Display</td>
<td>Adapted alternating treatment; Navigating to locations on the college campus</td>
<td>AR was more effective than digital map or paper map. Students needed less assistance when using PSDs with the applications; 100.00%</td>
</tr>
<tr>
<td>Wu et al. (2016); Job-related skills</td>
<td>2 male middle school students with mild to profound ID</td>
<td>1 Apple iPod Touch; no application</td>
<td>Multiple probe across participants; Washing tables and windows</td>
<td>VP with error correction using an iPod Touch was effective. Both students demonstrated success and generalized these daily living skills; 88.16%</td>
</tr>
<tr>
<td>Smith et al. (2017); Community-related skills</td>
<td>2 male &amp; 1 female college students with mild to moderate ID</td>
<td>1 Apple iPhone 4S; Heads Up Navigator: 3D</td>
<td>ABAB reversal; Navigating to locations on the college campus</td>
<td>VP using the iPhone 4S was effective. All students successfully navigated independently and effectively, accessing mobile assistance when needed; 100.00%</td>
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</table>

*Note: PSD = portable smart device; ID = intellectual disabilities; IV = independent variable; DV = dependent variable; DVM = delayed video modeling; SVM = simultaneous video modeling; VM = video modeling; VP = video prompting; ASD = autism spectrum disorders; VSM = video self-modeling.*
Both students made progress in performing these skills.

Johnson et al. (2013) evaluated the use of the iPod Touch to teach food preparation skills to two high school students with ID and ASD. Participants were taught to prepare three foods (fruit smoothie, macaroni and cheese, and frozen pizza) using video prompting through an iPod Touch. During baseline condition, only verbal prompts were given to students to perform each step in the process. During intervention condition, video prompts were presented through an application (Picture Scheduler) on the iPod Touch. Findings demonstrated that participants were able to complete the three cooking tasks independently with the iPod Touch.

Finally, Gardner and Wolfe (2015) taught four secondary students with ID how to wash dishes using VM and VP via an iPad. In baseline sessions, students were verbally prompted to perform the skill, but no instructions were provided. In intervention condition, the students performed each step of the skill immediately after watching a video prompt. Results indicated that students with ID were able to acquire dish washing skills through VP and VM via the iPad.

Teaching School-Related Skills

Three studies investigated the effects of PSD use in teaching school-related skills. Hart and Whalon (2012) examined the effectiveness of self-video modeling (SVM) delivered via an iPad on answering questions about science content with an adolescent with moderate ID and ASD. During baseline condition, the student was observed in a regular science class with no prompting. During intervention, the student watched the SVM at least three times before the science class. Results showed that when the student viewed the self-video model, the occurrence of the target behavior increased, but when the SVM was removed, the occurrence of the target behavior decreased.

Kim et al. (2014) evaluated the effects of using a tablet computer in decreasing disruptive behaviors and increasing academic behaviors with three secondary school students with ID. The intervention involved a social story using Prezi that was presented on a tablet computer (i.e., Samsung Galaxy Tab). During baseline condition, verbal and physical prompts were given to students to reduce disruptive and enhance academic behaviors. When desired behaviors occurred, they were reinforced using a token system. During intervention condition, the teacher modeled reading the social story for a student and then the student read the social story aloud. After reading the story, the student was asked to answer four questions. Incorrect responses to the questions were followed by corrective feedback. These procedures were repeated for the remaining students. Results of the study demonstrated that the tablet-assisted intervention was effective in decreasing disruptive behaviors and increasing academic engagement.

Douglas and Uphold (2014) investigated the use of iPod Touch or iPad to teach five high school students with ID how to schedule school activities using electronic photographic activity schedules (ePAS) (First Then Visual Schedule app). Students were taught how to take photos using the devices. In the baseline condition, the students were instructed to complete three to five school-related tasks each session, but no other prompt was given. In the intervention condition, the students (who had created their own visual schedule for five school-related tasks) completed the tasks using the ePAS. When the students used the iPads or iPods for their task schedules, their completion of the tasks in the intervention sessions was significantly higher than in the baseline condition.

Teaching Community-Related Skills

Six studies have been conducted on using PSDs to teach community-related skills. Taberdoughty, Patton, and Brennan (2008) compared the effectiveness of simultaneous VM with delayed VM on iPod Classic in teaching three middle school students with ID to use a computer to find call numbers and locate books or DVDs. In the simultaneous-time VM sessions, an iPod Classic was given to the students at a local library and used to help them perform the tasks. In the delayed-time VM sessions, VM was viewed by the students in their classroom using a DVD player, and then the students were taken to the local library to perform the tasks in the same day that the VM was delivered. Results demonstrated that both methods were effective in teaching the tasks.
However, simultaneous-time VM, which was preferred by the students, was slightly more effective.

Scott et al. (2013) investigated the effects of the iPod Classic on teaching money management skills to three college age students with ID. A video podcast presented on an iPod Classic depicted how to withdraw $20 bills from an ATM. During baseline condition, students used an ATM card and a laminated PIN card and were asked to withdraw $20 bills from an ATM with only verbal prompts. During intervention condition, students used the iPod Classic with a video podcast (VM) to complete the steps. All students mastered or significantly improved in withdrawing money from the ATM in the iPod Classic condition.

Kelley et al. (2013) investigated the use of real picture prompts (photos of landmarks to use to navigate to destinations) on iPods to teach pedestrian navigation skills to four college students with ID. Students navigated to destinations using a campus map during baseline condition. During intervention condition, students used the iPods with photo-navigation to get to three destinations. All students' performance improved using the iPods when compared to a campus map, and three students were able use the iPod to travel to novel destinations.

McMahon et al. (2015) compared the effects of three different methods (i.e., augmented reality (AR) application, the Google Maps application, and a paper map) on the capacity of six college students with ID to navigate to novel locations on a campus. During baseline condition, students used a paper campus map to locate destinations. During the comparison condition, Google Maps and an AR application, the Navigator Heads Up Display, on iPads and/or iPhones were used. One of the three methods was randomly assigned to each student to navigate to novel destinations. Findings indicated that using AR was the most effective method. When using AR or Google Maps, the students did not need assistance to locate unknown locations in about half of the trials; however when using a paper campus map, they needed assistance most of the time.

Douglas and colleagues (2015) compared the effects of three visual supports (i.e., text only, audio + text, and picture + text) presented on an iPhone to promote shopping skills of four high school students with ID. Before the study began, students were taught how to locate shopping lists (visual supports) on an iPhone and to match grocery items on the lists with actual items. Each session was comprised of the three visual support conditions at the grocery store. A list of five items pre-selected from 90 items was given to the students for each condition, and they were asked to locate the items. Only 10 minutes were given for each condition, and the duration of each session was limited to 40 minutes. The findings indicated that the "picture + text" condition was the most effective visual support across all students, and the students also preferred this support.

Finally, Smith et al. (2017) examined whether AR was effective for teaching pedestrian navigation skills to three young adults with ID using an iPhone 4 and an AR application (Heads Up Navigator: 3D). In each baseline session, students were asked to independently navigate to an unfamiliar location using only a paper-based map. Before the intervention condition, students received training to use the application to navigate to destinations. During intervention condition, the students navigated to pre-determined destinations receiving virtual prompts from the app. Results indicated that when the iPhone and the app were used, all students were able to reach novel destinations successfully.

Teaching Job-Related Skills

Five studies examined the effectiveness of PSDs to teach job-related skills. Laarhoven et al. (2009) examined the use of the iPod as a VP device with a high school student with ID. The researchers selected three tasks (i.e., cleaning bathroom, mopping floors/taking out garbage, and cleaning kennels) and created video segments for each step of each task to use as video prompts. During intervention condition, video prompts were delivered through an iPod. The student's independent performance dramatically improved in a short period of time. Cannella-Malone et al. (2012) compared the effects of video prompts using the iPod Touch to video prompts using the iPod Touch with error correction. Two job skills (sweeping, washing tables) were taught to three adolescents with ID. Video clips were
created for each step of each skill. Students watched a video clip depicting the first step of one skill and then performed the step during intervention condition. This procedure was then repeated for all steps of both skills. Sweeping was taught with video prompts without error correction, and washing tables was taught with video prompts with error correction. All students showed improvement in their performance over the baseline condition, and two students showed slightly better performance when adding error correction. One student demonstrated only minimal progress when adding error correction.

Cannella-Malone et al. (2013) also evaluated the use of the iPod touch running a prompting app (inPromptu) to teach four adolescents with ID to wash tables and vacuum. During baseline condition, verbal prompts were given to complete each step of table washing. During the VP intervention condition, video prompts were shown to students via the iPod Touch. Results indicated that overall, VPs delivered through the iPod Touch was effective in teaching job-related skills to students with ID as all students acquired the skills, and two of them maintained the skills. Taber-Doughty et al. (2013) examined the effectiveness of VM via iPads to teach four students with ID job-related and leisure skills. During baseline condition, students received printed instructions of steps of several tasks (in a school workroom, a bowling alley, and a grocery store) and were verbally prompted to begin each task. During intervention condition, students viewed an entire VM for each task and then completed the task. Three students improved their performance across all the settings over the baseline condition. The last student also improved performance except for in the school workroom setting.

Finally, Wu and colleagues (2016) evaluated the effectiveness of using VP presented on an iPod Touch to teach two middle school students with ID to complete window and table washing tasks. During baseline condition, a verbal prompt for initiating the skills was provided. During intervention condition, VP presented through an iPod Touch was incorporated with error correction. Results of the study showed that VP on the iPod Touch was effective for helping students with ID to acquire window washing and table washing skills. The students acquired the skills with VP and then maintained them without VP.

Discussion
A number of researchers have investigated the potential of various technologies for use by students with disabilities over the past decades, and one of the technologies that has received growing attention is PSDs. These devices have been used to teach various skills to students with disabilities, especially to teach functional skills to students with ID. Therefore, the purpose of this paper was twofold: first, to review the ways in which PSDs have been used with students with intellectual disability and to analyze the extent to which PSDs have been deemed effective in the published literature; second, to make suggestions for future research in using PSDs to teach functional skills to students with ID.

This review yielded several meaningful findings for researchers and practitioners. First, using PSDs appears, overall, to be an effective method for teaching various functional skills to students with ID. All studies (N = 11005) reported positive effects of using PSDs, and all students (n = 51) who participated in the studies improved or mastered target skills. Additionally, the PND of the overall effect of using PSDs indicates that this method was fairly positive (89.74%).

Second, it is clear that various functional skills can be taught to students with ID via PSDs. These devices were used to teach over 20 different functional skills in four domains: (a) home-related, (b) school-related, (c) community-related, and (d) job-related skills.

Third, using PSDs can facilitate the independent functioning of students with ID (Laarhoven et al., 2009; Taber-Doughty et al., 2011). Research indicates that the use of PSDs increases the independence of students with disabilities, since PSDs can reduce the external stimuli needed for behaviors (Johnson et al., 2013; Taber-Doughty et al., 2013). For instance, Laarhoven and colleagues (2009) indicated that videos delivered via the iPod Classic increased the independence of responses and reduced dependence on external prompts. Also, Taber-Doughty and colleagues (2013) demonstrated that self-operated
VM via the iPad facilitated students’ independent transitions. Consequently, it is evident that using PSDs increases the independent performance of functional skills of students with ID and may lead to greater success in independent living.

Fourth, it is important to note that pre-training on the operation of PSDs may also positively affect increased independent performance. Laarhoven et al. (2009) pointed out that the independent operation of PSDs is vital for the practical and meaningful use of these devices. The pre-training was not intended to teach target skills (dependent variables) but was solely intended to teach how to use applications (e.g., Keynote) or devices (e.g., running an application or swiping a screen). Several of the studies reviewed provided training for participants on operating PSDs before the study or intervention condition (see Douglas et al., 2015; Gardner & Wolfe, 2015; Payne et al., 2012; Smith et al., 2017).

Fifth, PSDs provide flexibility in processes used (e.g. VM, VP, picture, text, and applications) and who implements those processes (e.g. teacher-operated or student-operated use). Twelve studies of the studies reviewed used PSDs as tools to provide students with video technology (e.g., VM, VP, or VM and VP); two studies used AR; two studies presented pictures, audio, and text on the PSD using applications (e.g., inPromptu); one study used an application for students to create and manage their school schedules (i.e., First Then Visual Schedule); and one study used a website (i.e., Prezi) to present social stories. With regard to implementation, researchers either held or showed VM or VP to students (see Wu et al., 2016), or students independently operated PSDs after device operation training (see Kelley et al., 2013; Taber-Doughty et al., 2008). Such flexibility may allow practitioners to easily use PSDs to teach students with ID various skills across different settings.

Finally, it is evident that the use of PSDs is effective; however, prompting system or error correction procedures may need to be incorporated with PSDs to maximize effects (Cannella-Malone et al., 2012; Smith et al., 2017). 13 studies reviewed used various prompting procedures including verbal prompting (Kelley et al., 2013), system of least prompting (Laarhoven et al., 2009; Taber-Doughty et al. 2008), error correction (Gardner & Wolfe, 2015), system of most-to-least prompting (Cannella-Malone et al., 2013), constant time delay (CTD; Douglas & Uphold, 2014; Johnson et al., 2013), and corrective feedback (Kim et al., 2014).

Limitations
Although this review analyzed existing data closely and carefully, there are two limitations that must be noted. The first is that the PND calculated did not reflect change in level, trend, and/or immediacy of the data to interpretation. The PND of four studies indicated that the use of PSDs was questionably effective or ineffective; however, the visual analysis of the studies demonstrated apparent changes in level and/or trend. The second limitation is that the total number of studies reviewed was 18, including 52 participants. These numbers may not be sufficient to quantify data for sound analysis and interpretation.

Suggestions for Future Research
Future research should investigate incorporating emerging technologies (e.g., VR and AR) with PSDs. So far, only two studies ( McMahon et al., 2015; Smith et al., 2017) have examined the effectiveness of using AR, and no study on VR was located in the search for this review. Also, although positive effects of using PSDs have been reported, there is still a gap between research and practice in using PSDs to teach functional skills to students with ID, since there is little guidance in using these devices. Therefore, researchers should provide practitioners guidance on how to easily create and/or use instructional materials on PSDs. In addition, to date, no study has evaluated whether using PSDs is effective in teaching academic skills. With the current demands of teaching academic skills to students with ID, researchers should investigate the effects of using PSDs to teach such skills, especially early literacy or math skills.

In conclusion, PSDs seem to be effective tools for use in teaching various functional skills to students with ID. Various types of PSDs can be used in multiple ways with other evidence-based practices. Particularly, using PSDs possesses great potential for increasing the self-prompting and independence of stu-
dents with ID (Cannella-Malone et al., 2013; Laarhoven et al., 2009). Also, the review suggests that learning functional skills through the use of PSDs could increase the independence of students with ID across multiple contexts, including home, school, community, and job settings. Finally, the accessibility and portability of PSDs can expand the possibility of using these devices in a potentially large number of settings and functional, life-skills activities.

References


Received: 4 January 2018
Initial Acceptance: 26 February 2018
Final Acceptance: 3 April 2018

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Comparing Multiple Stimulus Preference Assessments without Replacement to In-the-Moment Reinforcer Analysis on Rate of Responding

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Abstract: The provision of reinforcement to increase the rate of desired behaviors is a crucial element of behavior analytic intervention for individuals diagnosed with autism spectrum disorder (ASD). Formal preference assessments, like the multiple stimulus without replacement procedure (MSWO), are often used to determine potential reinforcers used during intervention. While these types of assessments have been widely investigated, there is no empirical evidence to support that these rigorous methods of reinforcement identification produce higher rates of responding compared to the in-the-moment reinforcer analysis. The present study compared the rate of responding on a sorting task when participants were provided with items selected based on a MSWO preference assessment versus items provided using in-the-moment reinforcer analysis.

The identification of items that have a reinforcing function is essential for the development of new skills and for the amelioration of aberrant behavior for individuals diagnosed with autism spectrum disorder (ASD; Graff & Karsten, 2012). For some individuals, simply asking “What do you like?” or “What do you want?” can result in the identification of potential reinforcers. However, for many individuals diagnosed with developmental disabilities, such as ASD, asking “What do you like?” is not sufficient or effective due to limited language and communication repertoires, interfering behaviors, and/or lack of comprehension or play skills (Pace, Ivancic, Edwards, Iwata, & Page, 1985). Given these challenges, researchers have developed a variety of formal preference assessments which can be used to help identify potentially reinforcing items for individuals diagnosed with ASD (e.g., Fisher et al., 1992; Piazza, Fisher, Hagopian, Bowman, & Toole, 1996). These formal preference assessments have included single stimulus (SS; Pace et al., 1985), paired-stimulus preference (PS; Fisher et al., 1992), multiple stimulus with or without replacement (MS, MSWO; Leon & Iwata, 1996), and free operant (FO; Roane, Vollmer, Ringleh, & Marcus, 1998).

There have been numerous studies comparing various formal preference assessments to identify the most effective and efficient formal preference assessment. These have included PS to SS (e.g., Fisher et al., 1992; Paclawskyj & Vollmer, 1995), free operant to MS (e.g., Kodak, Fisher, Kelley, & Kisamore, 2009), and PS to MSWO (e.g., Call, Trosclair-lasserre, Findley, Reavis, & Shillingsburg, 2012; Davies, Chand, Yu, Martin, & Martin, 2013; Horrocks & Morgan, 2009; Lang, van der Werff, Verbeek, & Didden, 2014; Lanner, Nichols, Field, Hanson, & Zane, 2010). The results of these comparative studies indicate that formal preference assessments are effective; however, there are idiosyncratic effects in terms of effi-
ciency and accuracy of reinforcement identification across the various studies.

An alternative to the use of formal preference assessments to identify potentially reinforcing items for individuals diagnosed with ASD is in-the-moment reinforcer analysis (IMRA; Leaf et al., 2015; Leaf et al., 2016). Within IMRA the interventionist makes decisions based upon in-the-moment assessment and clinical judgment to determine potential reinforcing items. Interventionists’ assess a variety of variables within IMRA such as, but not limited to, learner affect, the learner’s interaction, frequency of use, an item’s similarities to other known reinforcing items, targeted behavior change, and overall treatment goals. Each of these variables comes to control the interventionist’s behavior with respect to the selection of potentially reinforcing items. For instance, if a child is displaying favorable affect while interacting with an item for an extended period of time, the interventionist may select that item to use contingently for a targeted behavior. Conversely, if the child is displaying neutral affect and not interacting with an item, the interventionist may not choose to use that item contingent upon a targeted behavior.

To date, there have been two studies that have compared the use of IMRA, to formal preference assessments. Leaf and colleagues (2015) first investigated the use of IMRA comparing it to a formal PS preference assessment to evaluate the rate of responding during a sorting task with three children diagnosed with ASD. Ten items were determined as highly preferred according to interviews with the members of each participant’s clinical team. These 10 items were included in two PS preference assessments that were conducted to determine the top three preferred items. These top three items determined from the preference assessment were used in a predetermined, randomized order within one condition. The 10 items in the PS assessment were available to the interventionist in the IMRA condition. Therefore, in both conditions there was the same initial process of identifying potential reinforcers, but in the IMRA condition the interventionist had to rely on in-the-moment assessment to determine which of the 10 items to use contingent upon child performance as opposed to an a priori determination based on a formal preference assessment. The contingent delivery of an item in the IMRA and PS conditions was determined based upon the child’s baseline performance and increased based upon child responding within each condition. A third, control condition was included in which no items were delivered regardless of the child’s rate of responding. The results showed little difference in the rate of responding between the PS and IMRA conditions. Leaf and colleagues also found that the interventionists in the IMRA condition selected more items outside the top three items ranked in the PS preference assessment. Furthermore, the results indicated that IMRA was more efficient, with respect to time, than the PS preference assessment.

Leaf and colleagues (2016) extended their previous findings by comparing the use of a PS preference assessment or IMRA to identify potential reinforcers to teach a new skill (i.e., expressive labels). Both participants in the study were pre-school aged children diagnosed with ASD. The methods used were similar to those in Leaf and colleagues (2015); however, contingent delivery of a potential reinforcer was based upon accurate responses to the targeted stimuli. Leaf and colleagues (2016) obtained similar results to Leaf and colleagues (2015) in that the participants demonstrated similar rates of skill acquisition in both conditions. The authors found that the IMRA was more efficient in terms of time for both participants, and no significant difference between conditions was found with respect to child skill acquisition, responding, or maintenance.

While Leaf and colleagues (2015) and Leaf and colleagues (2016) provided a comparison of IMRA to PS preference assessments, it remains unknown how IMRA compares to other formal preference assessments (e.g., free operant, MSWO). Given the importance of finding effective reinforcers for individuals diagnosed with ASD (Hanley et al., 2006; Pace et al., 1985), identifying the most effective procedures (National Autism Center, 2015), and maximizing teaching time (Leaf et al., 2015; Leaf et al., 2016) it is important for researchers to continue to compare the use of various types of preference assessments. Thus, the purpose of this study is to compare a MSWO
preference assessment to IMRA, both of which have been shown to be effective in previous studies, but have yet to be compared to each other empirically. Specifically, the purpose of this study is to compare the relative effectiveness and efficiency of a MSWO preference assessment to IMRA on the rate of sorting for four children diagnosed with ASD.

Method

Participants

Jeff was a 3-year-old boy diagnosed with ASD. Jeff had a Wechsler Preschool and Primary Scale of Intelligence-IV (WPPSI-IV; Wechsler, 2012) full scale IQ of 105, a Vineland Adaptive Behavior Scales (VABS; Sparrow, Cicchetti, & Saulnier, 2016) composite score of 79, a Peabody Picture Vocabulary Test (PPVT-IV; Dunn & Dunn, 2007) standard score of 107, and an Expressive One Word Picture Vocabulary Test (EOWPVT; Martin, & Brownell, 2011) standard score of 100. Prior to the study, Jeff had received 15 months of early intensive behavioral intervention. Louis was a 7-year-old boy diagnosed with ASD. Louis had a WPPSI-IV full scale IQ of 72, a VABS composite score of 69, a PPVT-IV standard score of 77, and an EOWPVT standard score of 94. Prior to the study, Louis had received 11 months early intensive behavioral intervention.

Robert was a 9-year-old boy diagnosed with ASD. Robert had a VABS composite score of 74, a PPVT-IV standard score of 109, and an EOWPVT standard score of 97. Prior to the study, Robert had not received any early intensive behavioral intervention. Brandon was an 8-year-old boy diagnosed with ASD. Brandon had a PPVT-IV standard score of 106 and an EOWPVT standard score of 118. Prior to the study, Brandon had not received any early intensive behavioral intervention.

Interventionists

The interventionists ranged in age from 23–28 years old. All four interventionists were members of a one year-long internship that was administered and managed by a non-profit agency that provides advanced training opportunities for professionals providing intensive behavioral treatment for individuals with ASD. Although all four interventionists had varying levels of experience with applied behavior analysis (ABA) and/or ASD, none were familiar with the procedures used within this study. Sally was a 28-year-old woman who had a master’s degree in Behavior Analysis and was a Board Certified Behavior Analyst (BCBA) and had five years of previous experience providing intervention for individuals diagnosed with ASD. Miranda was a 27-year-old woman who had a master’s degree in Special Education with an emphasis in ABA and had six years of prior experience providing intervention for individuals diagnosed with ASD. Isabelle was a 27-year-old woman who had a master’s degree in Special Education with an emphasis in ABA and had five years of prior experience providing intervention for individuals diagnosed with ASD.

The researchers ensured that each interventionist was paired with two participants with whom they had no prior history providing ABA interventions. The conditions were alternated for each of the participants (i.e., for one participant they would implement the IMRA and for the second participant they would implement the MSWO). Table 1 provides detailed information of the interventionist, participant, and condition. The interventionists were kept blind from each other’s findings and toys used within each condition. As such, the interventionists assigned to the IMRA condition did not know the results of the MSWO preference assessment. If the interventionist was assigned to the MSWO condition, s/he was expected to run the two MSWO preference assessments, as well as the MSWO assess-

<table>
<thead>
<tr>
<th>Participant</th>
<th>MSWO Condition</th>
<th>IMRA Condition</th>
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<tbody>
<tr>
<td>Jeff</td>
<td>Ethan</td>
<td>Miranda</td>
</tr>
<tr>
<td>Louis</td>
<td>Sally</td>
<td>Isabelle</td>
</tr>
<tr>
<td>Robert</td>
<td>Miranda</td>
<td>Ethan</td>
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<td>Brandon</td>
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ment condition sessions. If the interventionist was assigned to the IMRA condition, s/he was only responsible for running the IMRA assessment condition sessions. The control condition was run by interventionists assigned to either condition.

**Interventionist Training**

All interventionists were trained in the procedures prior to intervention. The training consisted of three phases. The first phase focused on the principles of ABA as it relates to ASD intervention (e.g., how to identify reinforcers). The second phase focused on how to conduct a MSWO preference assessment, baseline sessions, control sessions, and MSWO sessions. The third phase of the training concentrated on the IMRA condition. Training consisted of didactic presentation, modeling, and role-playing.

**Setting and Materials**

All sessions within this study took place in a room at a clinic located in Southern California. The room measured 25 ft. by 10 ft. and was separated into two areas. The front of the room had a long table and two chairs used during each session; the back of the room contained four adult sized desks and chairs and a sitting area with two small couches and a coffee table.

Materials in this study fell into three broad categories: (a) instructional materials; (b) reinforcer materials; and (c) research related materials. Instructional materials consisted of three rubber bins and 450 poker chips (i.e., 150 red poker chips, 150 green poker chips, and 150 white poker chips). Reinforcer materials included various toys that could be used as reinforcers for completing the task (see below). Research materials consisted of different colored mats designated to each condition (i.e., blue mat for IMRA condition, red mat for MSWO condition, and yellow mat for the control condition), timers, data sheets, and a video camera to record research sessions.

Reinforcer materials consisted of 10 different toys for each child participant. The toys were selected by the interventionists prior to the start of the study. The interventionists were told the age and gender of the child participant (e.g., 8-year-old male). Using this information, they selected 10 toys and activities from a toy store that would be used during the MSWO and IMRA conditions for each child. The 10 toys and activities selected for Jeff included a Thomas the Train, a toy car, a Woody doll, a Ninja turtle, a toy shark, a kaleidoscope, an angry bird toy, sticky hand, and rocket balloons. The toys selected for Louis included a Batman toy game, a remote control car, a flyer disc spinner, floam, table top air hockey, a toy gun, a yo-yo, Buzzlightyear skateboard toy, and a ninja turtle. The items selected for Brandon included an electronic centipede, Lego Batman sticker book, street shots racing car, rocket balloons, helicopter spinner, a football, sock'em boppers, floam, a bow and arrow, and a car and car ramp.

**Dependent Measures**

Four dependent variables were evaluated in this study. The primary dependent variable was the average number of chips sorted per trial across all three conditions (i.e., MSWO, IMRA, and control condition). The average number of chips sorted per trial was calculated by dividing the total number of chips sorted during each condition by the total number of trials for each condition (i.e., six).

The second dependent variable was efficiency (i.e., total amount of time each child spent in each of the three conditions). It should be noted that the total time for the MSWO condition included the time the participants spent in the MSWO condition as well as time spent to conduct the MSWO preference assessment. A third additional measure was the stimuli selected by the interventionists in the IMRA condition. Specifically, the percentage of times the interventionist selected each of the ten stimuli across all IMRA sessions. The final measure was the rationale the interventionists provided for choosing the toy in the IMRA condition (rationales are displayed in Table 2), which was listed by the interventionist on the data sheet. Reinforcer rationale was calculated by evaluating the percentage of the time each reason was indicated.
Prior to the first MSWO assessment, the participants were given access to each item for 30 s. Next, the interventionist assigned to the MSWO condition began the preference assessment. The MSWO preference assessment consisted of the interventionist placing all 10 items in a randomized array on a table in front of the participant and stating, “Pick something to play with.” After selecting an item, the participant was provided 30 s access. During this time, the interventionist engaged with the participant and the item. The item selected was then removed from the array, and the remaining items in the array were rotated. This process was repeated until all items from the array were selected. If the participant selected more than one item simultaneously or if no items were selected within 10 s, the instruction was presented again. The second MSWO assessment was identical to the first preference assessment with the exception that the participant did not engage with the items prior to the assessment. The three items whose average rank order across the two MSWO assessments was the highest were used as reinforcers during the MSWO condition, whereas all 10 items were available for the interventionist to select from during the IMRA condition.
(during the MSWO and IMRA conditions) or there will be no toys this time (during baseline or control condition). Ready, set, go!" The interventionist then started a timer for 1 min. The interventionist did not provide any prompts, reinforcement, praise, redirect any off-task behavior, and did not interact with the participant during the minute.

When the timer expired, the interventionist told the participant to “stop” and/or prevented the participant from sorting any additional chips. The interventionist counted the number of chips that were correctly sorted in each of the bins aloud with the exception of baseline in which the chips were not counted out loud. The interventionist then provided the consequence based upon the condition if the participant sorted the targeted number of chips (described below). This was repeated for a total of six trials per condition.

The number of chips the participant had to sort in the MSWO and the IMRA condition varied and was told to the interventionist prior to each session, but was not communicated to the participant. During the first session of intervention, to access a potentially reinforcing item, participants were required to sort 20% more chips than the average calculated across three baseline sessions. After every two consecutive sessions in which the participant sorted the targeted average number of chips, the targeted number of chips increased by 20%. If, after three consecutive sessions, the participant did not sort enough chips to meet or surpass the targeted number, the interventionist provided the child with 1 min access to the prescribed item from the MSWO assessment. If the participant did not sort enough chips to meet or surpass the targeted number, the interventionist said, “You did not sort enough chips and there will be no toy this time.”

**Baseline**

Baseline sessions consisted of six trials. The interventionists indicated to the participants that they would not be working for items during this condition. At the end of each trial the interventionist provided neutral or no feedback regardless of the number of chips sorted and began the next trial. No programmed reinforcement was provided during baseline. Baseline was conducted until stable rates of responding were observed.

**Intervention**

**Control.** Control sessions were identical to baseline sessions. Control sessions were comprised of six trials. The interventionists indicated to the participants that they would not be working for items during this condition. At the end of each trial the interventionist provided neutral or no feedback regardless of the number of chips sorted and began the next trial. No programmed reinforcement was provided during the control condition.

**MSWO.** The MSWO condition consisted of six trials in which the top three items identified from the MSWO preference assessment were used and were evenly distributed across the six trials. The interventionists who were randomly assigned to this condition conducted every session in the MSWO condition. Each trial was implemented using the general procedure mentioned above. If the participant sorted enough chips that meet or surpassed the targeted number, the interventionist provided the child with 1 min access to the prescribed item from the MSWO assessment. If the participant did not sort enough chips to meet or surpass the targeted number, the interventionist said, “You got enough, we can play with...” and provided the child with 1 min access to one of the items from the MSWO preference assessment. The interventionist had the flexibility to choose any of the items at his or her own discretion (e.g. providing the same item throughout the entire session, providing different items after each trial). The selections made by the interventionist in this condition were based upon a number of previously described variables (e.g., facial expression, body language, comments or statements that indicated like or dislike, the frequency with which the item had been provided during previous trials or sessions, the participant’s skill responding on the task).

**IMRA.** The IMRA condition consisted of six trials during which the interventionists could use any of the ten toys used in the MSWO preference assessment. If the participant sorted enough chips to meet or surpass the targeted number, the interventionist said, “You got enough, we can play with...” and provided the child with 1 min access to one of the items from the MSWO preference assessment. The interventionist had the flexibility to choose any of the items at his or her own discretion (e.g. providing the same item throughout the entire session, providing different items after each trial). The selections made by the interventionist in this condition were based upon a number of previously described variables (e.g., facial expression, body language, comments or statements that indicated like or dislike, the frequency with which the item had been provided during previous trials or sessions, the participant’s skill responding on the task).
Experimental Design

An alternating treatments design was used to assess the effects of the three conditions. The order of conditions was randomly determined prior to beginning the session.

Interobserver Reliability

The interventionist scored the participant’s responses during every session. A second observer simultaneously and independently recorded participant responses during 100% of MSWO preference assessment sessions, baseline sessions, MSWO condition sessions, IMRA condition sessions, and 96.5% of control condition sessions. Interobserver agreement (IOA) was calculated by totaling the number of agreements (i.e., number of trials in which both observers scored the same amount of chips sorted) divided by the number of agreements plus disagreements and multiplying by 100. IOA was 100% for the MSWO preference assessment, 99.4% for baseline sessions, 99.7% for the MSWO condition, 99.8% for IMRA condition, and 99.7% for control condition.

Treatment Integrity

A second observer independently scored interventionist behavior to assess treatment integrity across all conditions. Treatment integrity was scored for 33% of sessions for each phase of the study. Correct interventionist behaviors per trial of intervention consisted of: (a) placing the colored mat that corresponded to the condition on the table; (b) placing all four bins on the table; (c) providing the prescribed instruction for each trial; (d) setting a timer for 1 min and providing the participants with the opportunity to sort the chips for the allotted time; (d) not providing any prompts or feedback throughout the interval; (e) signaling to stop sorting when the timer stopped; (f) counting the number of chips sorted; (g) recording the number sorted on the data sheet; (h) providing the correct consequence based upon the participant’s rate of responding; and (i) providing 1 min of access to the item, as applicable. Treatment integrity was calculated by dividing the total number of correct interventionist responses by the total number of opportunities to engage in a correct response and multiplying by 100. Treatment integrity for the MSWO preference assessment, baseline, control condition MSWO condition, and IMRA condition was 98.1%, 100%, 99.7%, 99.7%, 99%, respectively.

Results

Rate of Responding

The primary dependent variable was each participant’s rate of responding during the three conditions which is depicted in Figure 1. Jeff’s results are depicted in the top left panel. During baseline, Jeff sorted an average of 6.38 chips. Following baseline, his average rate of sorting was 37.46, 37.5, and 25.4 in the MSWO, IMRA, and control conditions, respectively. Jeff sorted more chips in three out of 10 sessions in the MSWO condition, six out of 10 sessions in the IMRA condition, and one out of 10 sessions in the control condition. A one-tailed t-test showed there was no significant difference in the rate of sorting in the MSWO and IMRA condition ($p = .494$), a significant difference between the MSWO condition and control condition ($p = .0326$), and a significant difference between the IMRA condition and control condition ($p = .0455$). Although, there were significant differences between the two conditions in which reinforcement was available when compared to the control condition, an increase in the rate of responding was observed during the final sessions of the control condition.

Louis’ data is depicted in the top right panel of Figure 1. Louis sorted an average of 32.6 chips per trial across the three baseline sessions. Across seven intervention sessions his average rate of sorting was 67.57, 70.61, and 69.23 in the MSWO, IMRA, and control conditions, respectively. Louis sorted more chips in two out of seven sessions in the MSWO condition, four out of seven sessions in the IMRA condition, and one out of seven sessions in the control condition. A one-tailed t-test showed there was no significant differences in responding in the MSWO and IMRA condition ($p = .227$), no significant differences in responding between the MSWO and control condition ($p = .287$),
and no significant difference in responding between the IMRA and control condition ($p = .368$).

Robert's data is depicted in the bottom left panel. Robert sorted an average of 33.22 chips per trial across three baseline sessions. Across five intervention sessions his average rate of sorting was 93.46, 91.6, and 79.4 in the MSWO, the IMRA, and control conditions, respectively. Robert sorted more chips in three out of five sessions in the MSWO condition, two out of five sessions in the IMRA condition, and never sorted more chips during the control condition. A one-tailed $t$-test showed there was no significant differences in responding in the MSWO and IMRA condition ($p = .383$), a significant difference in responding between the MSWO and control condition ($p = .0228$), and a significant difference in responding between the IMRA and control condition ($p = .0472$).

Brandon's data is depicted in the bottom right panel. Throughout baseline, Brandon sorted an average of 33.27 chips per trial.
Across seven intervention sessions his average rate of sorting was 85.71, 89.85, and 80.09 in the MSWO, IMRA, and control conditions, respectively. Brandon sorted more chips in three out of seven sessions in the MSWO condition, three out of seven sessions in the IMRA condition, and one session in the control condition. A one-tailed $t$-test showed there was no significant differences in responding in the MSWO and IMRA condition ($p = .258$), no a significant difference in responding between the MSWO and control condition ($p = .104$), and no significant difference in responding between the IMRA and control condition ($p = .052$).

**Efficiency**

Table 3 displays the efficiency measures across for each participant. Efficiency was measured by the total amount of time for each condition as well as the preference assessment used. For the MSWO condition this time included conducting the MSWO preference assessments and the experimental sessions. For the IMRA condition this only included the time spent in experimental sessions since there were no formal preference assessments conducted within this condition. Across the four participants, the average amount of time spent on the MSWO assessment was 28 min (range, 26 min 48 s to 29 min 43 s). The average amount of time spent on the MSWO sessions was 2 hr 2 min (range, 1 hr 31 min to 2 hr 46 min). The average total amount of time required for assessment plus teaching across the four participants was 2 hr 30 min (range, 1 hr 1 min to 3 hr 13 min) and 2 hr 9 min (range, 1 hr 15 min to 2 hr 50 min) in the MSWO and IMRA conditions, respectively.

**Distribution of Stimulus Selection in IMRA**

Figure 2 depicts the percentage of trials the interventionist selected each item available in the IMRA condition. The items are listed in order of preference as determined by the MSWO preference assessment (i.e., the most preferred item is closer to the y-axis and the least preferred item is furthest from the y-axis); therefore, the first three items on the x-axis were used during the MSWO condition. The two items delivered most frequently for Jeff were the toy shark (18.4%, fifth in the MSWO assessment) and the rocket balloon (15.7%, last in the MSWO assessment). The three items delivered most frequently than others in the IMRA condition for Louis: the air hockey game (28.5%, fifth in the MSWO assessment); the Batman toy (23.8%, first in the MSWO assessment); and the flyer spinner (23.8%, third in the MSWO assessment). For Robert, three items were delivered more frequently than others: Pokémon ball & figure (25%, first in the MSWO assessment); the sock’em boppers (25%, second in the MSWO assessment); and the nerf guns (25%, sixth in the MSWO assessment). The items that were delivered more frequently than others for Brandon were the Lego Batman book (25%, second in the MSWO assessment), an electronic centipede (15%, first in the MSWO assessment).
ment), and a street shots race car (15%, second in the MSWO assessment).

**Interventionist Rationale**

Figure 3 depicts the rationales provided by the interventionist during all IMRA sessions. Affect, interaction, frequency, skill improvement, similar quality, and conditioning were provided as possible rationales while novelty and child request were written in by the interventionists throughout the study. Two and three factors refer to situations in which two or three rationales were provided. For Jeff, novelty and multiple factors were the rationales provided most frequently. Two rationales were provided most frequently followed by novelty for Louis. For Robert, two

![Figure 2. IMRA reinforcement selection.](image-url)
rationales were provided most frequently. Two rationales were provided most frequently followed by novelty for Brandon. When two rationales were provided the most common reason was affect interaction followed by age appropriate and novel and interaction and similar quality. When three rationales were provided the most common reason was affect, interaction, and skill improvement followed by affect, interaction, and stated preference.

Discussion
The purpose of this study was to compare the relative effectiveness and efficiency of using stimuli identified from a MSWO preference assessment to IMRA on the rate of sorting for
four children diagnosed with ASD. Overall, there were minimal differences in the rate of responding for all four participants across the MSWO and IMRA conditions. For two participants (i.e., Louis and Brandon) there were also minimal differences in the rate of responding across all conditions including the control condition. The lack of differentiation for these two participants suggests that the items selected from the MSWO assessment did not, in fact, function as reinforcers.

The results also indicated that conducting MSWO preference assessments added a considerable amount of time to intervention as compared to using IMRA. The results of the IMRA condition also showed that the interventionists were often responding to multiple variables when selecting an item to use contingently upon sorting. Finally, the results from the distribution of stimulus selection indicated a substantial degree of overlap of reinforcer selection between interventionists assigned to the IMRA condition as compared to interventionists assigned to the MSWO condition. This overlap occurred with interventionists blind to the results of the MSWO assessment. Taken together, this indicates that conducting a MSWO preference assessment provided no advantage in terms of performance, identification of potentially reinforcing stimuli, or efficiency with respect to time required to complete the MSWO preference assessment.

The results of this study have several clinical implications, especially for those providing intervention for individuals diagnosed with ASD. Graff and Karsten’s (2012) survey found that 45% of BCBA and/or BCaBAs conduct formal preference assessments on a regular basis, ranging from several times a day to once a month. More specifically, 33% reported having previously conducted a MSW or MSWO preference assessment. These data demonstrate the widespread use of formal assessments to identify potential reinforcers. Despite the prevalence of these formal preference assessments, the present study demonstrates an alternative strategy to a MSWO preference assessment for identifying potential reinforcers. Second, measures of efficiency demonstrated that implementing a MSWO preference assessment adds a substantial amount of time the child spent in the preference assessment condition in order to accomplish similar rates of responding to those in the IMRA condition. Graff and Karsten found that 3.8% of BCBAs reported implementing formal preference assessments (e.g., MSWO) on a daily basis. The results of the present study in combination with previous research comparing a PS preference assessment suggest a more efficient way to identify potentially reinforcing items for use during intervention. Therefore, when selecting an approach to identify potential reinforcing items or events, and efficiency is preferred, clinicians may elect to utilize in-the-moment assessment such as IMRA opposed to an MSWO preference assessment.

Finally, considering the ease with which one may develop a protocol for an interventionist to conduct a formal preference assessment, an essential question is the amount of training required for one to be effective at IMRA. The interventionists in this study had varying degrees of experience ranging from no prior work with individuals diagnosed with ASD or ABA to multiple years (five to six years) of experience with individuals diagnosed with ASD and the field of ABA, as well as a master’s degree or BCBA certification. Regardless of prior experience, all of the interventionists were novice with respect to IMRA. Therefore, this study demonstrated that with minimal training IMRA could be equally as effective at identifying potential reinforcers as a MSWO preference assessment.

This study expanded upon previous research on IMRA and formal preference assessments in several ways. First, this study expands upon the types of formal preference assessments that have been compared to IMRA. In other investigations of IMRA, Leaf and colleagues (2015) and Leaf and colleagues (2016) compared IMRA to a PS preference assessment. The present study demonstrated that similar results can be obtained when comparing IMRA to a MSWO preference assessment. Second, in previous evaluations of IMRA interventionists with moderate to extensive levels of training and interventionists that had previous histories with the child participants were used. The results of the current study demonstrated that the effects of IMRA demonstrated in previous studies can be replicated by novice interventionists who had no
previous experience with the child participants. Finally, the current study expanded upon previous studies on IMRA by including the interventionists’ in-the-moment rationales for selecting items to use contingent upon child performance. This inclusion could help inform training others to use IMRA by identifying potential variables associated with the identification of potential reinforcing items.

This study is not without its limitations that future research should address. First, this study only included child participants often described as high functioning; therefore, it is unknown if the results could be replicated for individuals often described as low functioning. Second, this study only examined the use of two methods of identifying potential reinforcing items as it applies to rate of responding on a previously demonstrated skill (i.e., sorting). While previous research has evaluated the use of IMRA to teach new skills (i.e., expressive labelling; Leaf et al., 2016) that research evaluated the use of a PS preference assessment. Future researchers may wish to evaluate whether similar results in the acquisition of new skills would be generated comparing IMRA to MSWO preference assessments for identifying potentially reinforcing items. Along these lines, research on the IMRA has included only two types of formal preference assessments (i.e., PS and MSWO). Therefore, it is still unknown how effective and efficient IMRA is when compared to other formal assessments (e.g., MS, free operant) and future research is required to investigate these procedures.

Third, for two participants (i.e., Louis and Brandon) there were no real differences between the conditions in which presumed reinforcing items were available as compared to the control condition. Having no clear separation from treatment to control conditions could weaken functional control and indicate that a functional reinforcer was not identified. For Louis, there are several potential explanations. First, it could be that none of the items were reinforcing. Second, it could be the activity itself had some reinforcing value which was unknown to the interventionists. Third, it could be that the response effort required was minimal and intrinsic reinforcement was as effective as the extrinsic reinforcers being used. Fourth, it could be that instructional control (i.e., doing what an interventionist asks you to do) was the reason why sorting was consistent across the three conditions. Last, it could be that the interventionists did not signify the change in conditions clearly enough. For Brandon, it is hypothesized that during the initial sessions of the intervention condition there was a sequencing effect which increased the rate of sorting that occurred during the control condition. As Brandon progressed through the study the sequencing effect appeared to dissipate.

Despite these limitations, this study demonstrated that for all four participants, there was no significant difference in the rate of responding between the conditions in which items were used based off of a MSWO preference assessment as compared to the use of items based off of IMRA. Additionally, the study showed that IMRA was more efficient, requiring less time to achieve similar results as the MSWO preference assessment. Finally, this study extended previous research that demonstrated similar results with other types of formal assessments (Leaf et al., 2015, Leaf et al., 2016). Given these results, the use of the MSWO preference assessment was not warranted for the four participants within this study. Taken collectively with other studies that have compared IMRA to formal preference assessments (Leaf et al., 2015, Leaf et al., 2016), these findings suggest our time would be better spent training technicians on assessing child behavior and responding accordingly instead of training technicians on how to follow a protocol for a formal preference assessment.

References


Received: 21 December 2017
Initial Acceptance: 22 February 2018
Final Acceptance: 18 March 2018
Abstract: Evidence-based practices have been identified for children with autism spectrum disorder (ASD). Given the co-occurrence of ASD and visual impairments (VI), it is critical that the effectiveness of these practices be assessed with children who have ASD and VI. Structured work systems have not been evaluated for children with ASD and VI. Structured work systems have been identified as evidence-based practices for children and youth with ASD under the category of visual supports. Additionally, while parent-implemented interventions have proven effective for children with multiple disabilities, parent-implemented interventions are most often researched with young children with insufficient focus on maintenance and generalization. Using a multiple baseline across routines, this study assesses the effectiveness of structured work systems implemented by a parent on independence in skills for a child with ASD and VI. Parent-implemented structured work system were effective across three routines, maintained at 1, 2, and 3 weeks post treatment, and generalized to another parent and new materials.

Research on the effectiveness of interventions for children and youth with autism spectrum disorder (ASD) has received increased attention as the prevalence of ASD (Christensen, et al., 2012) continues to be of concern. Reviews of efficacy literature have been conducted by the National Professional Development Center on ASD (Wong et al., 2014, 2015) and National Autism Center (2015). These reviews have resulted in reports and lists of evidence-based practices (EBP) intended to inform the work of educators and researchers, and knowledge of parents. This single-case-design study utilizing multiple baselines extends knowledge of the implementation of EBPs for children with significant disabilities by assessing the effectiveness of an intervention merging two EBPs (i.e. visual supports, parent-implemented intervention) for a child with ASD and visual impairment (VI).

ASD and Visual Impairment

The co-occurrence of ASD for individuals with VI has received increased attention (Do et al., 2017; Mukaddes, 2007). Do et al. (2017) conducted a meta-analysis of peer-reviewed literature over 22 years and estimated the relative risk of ASD for people with VI as 31 times that of the general population. Along with increased comorbidity, a secondary concern is heightened severity of disability symptoms experienced by those with co-occurring ASD and VI. Mukaddes et al. (2007) assessed 257 children in Turkey, ages 7–18, with VI for ASD and found that individuals with blindness and ASD had significantly greater severity of blindness than those with VI only. Given the likely increased comorbidity of ASD in children with VI and the increased severity of VI with comorbidity, early intervention for development of skills associated with ASD characteristics (i.e. pragmatic communication, adaptive behavior) is recommended in addition to treatments to address ophthalmological and neurological issues (Mukaddes et al., 2007).

Visual Supports and Visual Impairment

With the co-occurrence of ASD and VI, it is imperative that known EBPs for children with ASD be researched for effectiveness with children with ASD and VI (Do et al., 2017). A number of EBPs identified by recent reviews
of interventions for children and youth with ASD are characterized by the intention to visually structure space, information, activities, and tasks in order to support independence and comprehension. These EBPs are categorized as visual supports by the NPDC review of effective practices for children and youth with ASD (Wong et al., 2014). Visual supports may seem antithetical for use with children with VI since the purpose of a visual support is to engage understanding through the visual senses. Of the 18 studies that met criteria for inclusiveness and provided evidence for the effectiveness of visual supports in the NPDC review (Wong et al., 2015), none of these included children or youth with VI. While the implementation of visual supports for children with VI and ASD have received little attention, one visual support, structured work systems, which can be manipulated physically, may lend itself well to interventions for children and youth with ASD and VI.

**Visual support through structured work systems.** Structured work systems incorporate visual prompts to cue the student to four pieces of information regarding the tasks at hand: what is to be done, how much is to be done, when work is complete, and what to do when task is complete (Carnahan, Hume, Clarke, & Borders, 2009; Hume & Odom, 2007; Hume, Plavnick, & Odom, 2012). Structured work systems emphasize independence through visual prompts and systematic implementation across tasks by increasing generalization across settings, activities, and instructors. They have been studied across academics, functional daily living, work and play domains, and chronological and developmental age ranges (Carnahan et al., 2009; Carnahan, Harte, Schumaker, Hume, & Borders, 2011; Hume & Odom, 2007; Hume et al., 2012). Structured work systems have been found to decrease off-task behavior, increase productivity, increase functional play, promote accuracy, foster independence and improve generalization (Carnahan et al., 2011; Hume & Odom, 2007; Hume et al., 2012). A 2011 study by Bennett, Reichow, and Wolery suggests further research is needed into the components of structured work systems implemented across settings, ages, and individuals, promoting sustained engagement and task completion across disabilities.

Carnahan, Harte, Schumaker, Hume, and Borders (2011) denote key variables to consider when implementing structured work systems. Prior to implementation, the practitioner must consider the presentation and format of materials to be incorporated based on the individual’s level of independent functioning. Examples include incorporating written lists, pictures, or objects as visual cues, as well as adjusting the sequence, structure, and support, all determined by the needs of the individual child (Carnahan et al., 2011; Mavropoulou et al., 2011). Focusing on the visual instructions, visual organization, and visual clarity enhances the strength of the intervention (Mavropoulou et al., 2011). Designing interventions with the strengths of the individual user at the forefront is more likely to increase participation levels, reduce latency, minimize off-task behaviors, and fade prompt dependency (Hume et al., 2012). Such design decisions include other variables when considering structured work systems for children with comorbid conditions, such as visual impairment.

**Parent-implemented interventions.** Parent-implemented interventions and training programs are included as EBPs in both recent reviews of ASD literature referenced earlier (NAC, 2016; Wong et al., 2015). Parents are increasingly encouraged to become active participants in interventions to ensure the child is able to effectively and efficiently gain skills to function with increased independence across settings (Bearss, Burrell, Stewart, & Scahill, 2013; Crockett, Fleming, Doepke, & Stevens, 2007; Heitzmann-Powell, Buzhardt, Rusinko, & Miller, 2014). Parent-implemented interventions are those in which the parent is the primary change agent providing direct instruction to the child with the coaching and support of professionals in natural environments. This EBP creates opportunity for instruction and generalization to occur in the natural environment, further improving outcomes for the child (Bearss et al., 2015; Matson, Mahan, & Matson, 2009). A meta-analysis of parent-implemented social and communication interventions showed a need for research on parent implementation of interventions for older children with disabilities, beyond preschool age (Hong et al., 2016).
Research rigor in studies of implementation of EBPs for students with ASD and VI is a barrier to understanding the impact of findings of their generalizability (Banda, Griffin-Shirley, Okungu, Ogot, & Meeks, 2014). A review of intervention studies for individuals with ASD and sensory impairment (i.e., hearing impairment, visual impairment) found that few addressed generalization or social validity, and most did not have sufficient experimental control. Barton and Fettig’s (2013) review of parent-implemented interventions for young children with disabilities found that implementation fidelity (measurement of practices used to train parents) was weak across studies and aligned with Roberts and Kaiser (2011) findings that intervention studies did not include information on parent training.

This study tests the effectiveness of parent-implemented structured work systems, an evidence-based practice categorized under visual supports (Wong et al., 2014), on independence in routines for a school child with ASD and VI. The study examined the effectiveness of parent-implemented structured work systems on child acquisition, maintenance, and generalization of independence skills in family preferred routines. The intervention was designed to meet the guidelines outlined by Li (2009) for implementation of interventions for children with ASD and VI, which include: establishing rapport with the child; prioritizing the child’s independence in skill, orientation, and mobility; using applied-behavior analysis practices; providing intervention on whole tasks to avoid fragmented learning; and recognizing the need for independence in skill, orientation and mobility in a highly structured, predictable environment. Effective parent implementation of evidence-based practices has the potential to greatly affect child outcomes and opportunities for engagement in the home. This study extends the evidence base on parent implementation of evidence-based practices to a school age child with ASD and VI.

Method

Participants and Setting

Child and parent. The participant was a 7-year-old Caucasian girl, Lilly (pseudonym). Lilly was diagnosed with autism spectrum disorder and a balanced chromosomal translocation resulting in functional blindness. The prevalence of this translocation is unknown, as Lilly is the only child with this chromosomal abnormality in the databases available. Lilly was identified as functionally blind at 2 months of age. She began vocalizing, primarily echoic, and became ambulatory at 4 years. At 7, Lilly was diagnosed with ASD, through a diagnostic center, based in part on her limited interest in social and functional communication, restricted interests, and repetitive behaviors not attributed to her functional blindness. She receives special education services in a self-contained elementary classroom for children with multiple disabilities. Lilly is vocal, mainly through echoic phrases, words, and songs. At the time of the study, she demonstrated minimal functional communication except through object exchange during snack with her mother. As an example, Lilly and her mother were consistently exchanging objects for preferred snack items (e.g., cookies, chips, fruit, juice) from a choice of up to five objects. No other systems of communication or skill development interventions were in place in the home.

Lilly lives at home with her mother, father, and two siblings ages 4 and 2, where the primary language spoken is English. Lilly’s mother, Renee (pseudonym), implemented the structured-work intervention. Renee is a Caucasian woman in her mid-30s who stayed home with the two younger children during the day. Prior to beginning the study, IRB approved informed consent materials were reviewed with Lilly’s mother. Lilly’s mother consented to her own and Lilly’s participation with the understanding that at any point they could withdraw from the study, in particular if Lilly protested participation beyond the point that her mother felt the intervention was beneficial.

Social validity. Lilly’s mother completed a social validity measure, pre- and post-intervention, adapted from one used by Hume, Loftin, & Lantz (2009). Prior to the intervention, Lilly’s mother said independence was an important area needing improvement for her child, that Lilly’s sequencing and completion of tasks independently was important, that Lilly never sequenced tasks on her own, and that she never initiated tasks or completed
tasks without prompts. After the intervention, Lilly’s mother agreed that independence increased, engagement in the task increased, the work system could be used for other tasks at home and school, prompts decreased when Lilly became more independent, Lilly initiated tasks with fewer prompts and more quickly, and Lilly sequenced the steps to complete the task with fewer prompts.

Setting. Research was conducted in Lilly’s home each weekday afternoon after school. The teaching phase was conducted at the kitchen sink. Baseline and intervention phases took place in Lilly’s bedroom, the family’s bathroom, and the kitchen/dining area. Maintenance and generalization probes were conducted in the same locations. Figure 1 shows pictures and materials used across the routines.

Experimental Design

A multiple-baseline, single-case design study was used to test the effectiveness of parent-implemented structured work systems on Lilly’s independence across routines. This study was conducted across phases, as described below, to identify priority routines and skills, teach Lilly’s mother to implement procedures
to fidelity, collect data across a multiple-base-
line design across routines, and conduct main-
tenance and generalization probes.

Phase 1 – identifying family routines. Once
informed consent was obtained, an initial
meeting was conducted with Lilly’s mother. In
addition to gathering demographic and social
validity data, an informal interview was done
to identify the family’s priorities and routines,
adapted from routines-based interviews con-
ducted in early intervention settings (Mc-
William, 2010). Questions were developed to
gain knowledge about a typical weekday/
weekend; typical family activities and routines,
and Lilly’s engagement in these; how often
routines and activities occur; typical challeng-
es; routines and activities that Lilly seems to
enjoy; routines and activities that are impor-
tant to the family that seem challenging to
Lilly; skills Lilly has that are currently incor-
porated in family activities; and learning op-
opportunities in typical family routines. The in-
terview revealed that Lilly was participating in
very few family routines. In those that she was
a part of (e.g., meals, outings), she was a pas-
sive participant (e.g., being led by parent).
Additionally, no systematic interventions to in-
crease Lilly’s independence or communica-
tion were being implemented at home.

Through an iterative process based on the
interview and two additional phone calls, the
family and research team identified the fol-
lowing routines: play, hand washing, and
snack. The cues and tasks across routines are
illustrated in Figure 1. Play was a three-step
routine: complete puzzle, complete shape
sorter, ask mother for reinforcer. Hand-wash-
ing steps were wash hands, dry hands, ask
mother for reinforcer. The steps for the snack
routine were put plate and cup on table, put
object box on table, ask mother for reinforcer.
The order of routines was determined based
on the natural sequence in which they would
occur in the home: 1) play after school, 2)
hand washing before snack, and 3) setting up
for snack. Lilly’s mother set up intervention
materials at each of the phases described.

Data collected were prompts used (i.e. verbal,
physical) and number of steps completed in-
dependently out of eight steps per routine. A
fourth routine, dish washing, was used to
teach Lilly’s mother to implement the struc-
tured work system through the process de-
scribed next.

Phase 2 – parent training. The purpose of
this phase was to ensure that the parent-
implemented procedures to fidelity to the
extent possible within the context of a busy
home. Procedures included setting up the
work system boxes in order with the correct
materials inside, using the correct time de-
lay (i.e. 0 seconds, 3 seconds), using verbal
and physical prompts correctly, and rein-
forcing immediately. Over three sessions,
two researchers verbally described the proce-
dures, modeled implementation of prompts us-
ing a 0-second time delay, modeled imple-
mentation of prompts using a 3-second time
delay, observed and provided performance
feedback on Lilly’s mother’s implementation
of verbal and physical prompts using a
0-second time delay, and observed and
provided performance feedback on Lilly’s
mother’s implementation of verbal and
physical prompts using 3-second time delay.
When Lilly’s mother reached 100% fidelity
for three consecutive trials of each condi-
tion (0 seconds, 3 seconds) of time delay,
Phase 3 was begun. To ensure fidelity to
intervention procedures, the researchers
collected data on fidelity throughout remaining
phases.

Phase 3 – baseline. During baseline, no
changes were made to the family’s or child’s
routines or expectations of performance. Lil-
ly’s mother brought her daughter into the
settings in which the routines would be taught
(e.g., bedroom, bathroom, kitchen) and pro-
vided the cue to begin the routine (e.g., “time
to play,” “time to wash hands,” “time for
snack”). Lilly was observed for at least one
minute. Data were collected on Lilly’s engage-
ment with materials during this minute. Base-
line probes were collected until stability was
reached in one routine before intervention
began.

Intervention. As described in Phase 1, iden-
tified family routines, and Figure 1, three rou-
tines (i.e. play, wash hands, prepare for snack)
were identified for intervention using struc-
tured work systems. The structured work sys-
tem for each routine used three clear plastic
boxes (17-inches long, 11.125-inches wide, 6.5
inches tall). The first two boxes contained
materials for Lilly to use before she accessed
the reinforcer to exchange for an edible from her mother. Lilly’s mother was taught the following intervention process: Each routine began with Lilly’s mother giving Lilly a verbal cue (e.g., “Lilly, time to play”) while placing her hand on the first box in the sequence in order to orient Lilly. First, a 0-second time delay was used with full physical prompts and simultaneous verbal prompts by her mother to guide Lilly through the routine. The 0-second time delay was used for three consecutive sessions. Next, a 3-second time delay was used with most-to-least prompting hierarchy across two levels (i.e. verbal, full physical controlling prompt). More specifically, after the verbal cue to begin the activity and placing her hand on the first box in the sequence, Lilly’s mother waited for the 3-second time delay. If Lilly did not start the next step in the sequence within three seconds, she gave Lilly the full physical controlling prompt for that step and again waited the 3-second delay, then continued the process for all subsequent steps. At this point intervention began on the next routine while continuing baseline probes on the last routine.

**Phase 4 – maintenance and generalization.**

Three maintenance probes were conducted, one each week, beginning the week after intervention ended. The conditions were identical to baseline sessions. The maintenance sessions were used to determine if the child retained the skill of using a structured work system for an afternoon routine, and determine if the family would continue to use the system within their daily routine.

Stimulus generalization across play objects and people was measured three months after treatment ended. Three months after Phase 3 was complete, generalization was measured across tasks, people, and materials. Generalization was measured for two new play sequences using different materials (stacker, different puzzle, different puzzle and shape sorter pieces). Generalization was also measured across people by having her father cue Lilly to begin each of the three routines. Generalization was measured across routines by including new materials in each routine (i.e. different play materials, different soap pump, different snack plate and cup).

**Inter-observer Agreement and Treatment Integrity**

Inter-observer Agreement (IOA) and treatment integrity were collected during all phases of the study. Inter-observer agreement data was collected on 33% of all sessions and independently scored by two observers. Inter-rater reliability was calculated by the formula agreements/(agreements + disagreements) × 100. Inter-rater reliability was 97% across all tasks and all phases.

Treatment integrity was accomplished in several ways. First, parent instructions were embedded into the task analysis that was utilized for data collection. This allowed the parent to use it as a script while implementing the work systems. During the initial sessions, the parent placed the task analysis in the environment to use as a job aid. Second, the very same task analysis was used to collect data on the independence level of the student as well as treatment integrity data of each session. If treatment integrity fell below 100%, the parent received feedback on the teaching protocol immediately after each session. In order to calculate treatment integrity, every third session was video recorded and the first author viewed 33% of all videos and scored treatment integrity. Treatment was carried out with 100% fidelity on task set up (e.g., correct task objects, correct order), 88% on maintaining time delay, 95% on use of prompting sequence, and 100% on immediacy of reinforcer. Treatment integrity was analyzed across these core components of the interventions to easily identify implementation challenges (e.g., maintaining time delay) across trials.

**Results**

As depicted in Figure 2, visual analysis of all three routines indicate a degree of experimental effect. It is clear from the relatively stable baseline and subsequent changes in percent completed independently after introducing the parent implemented work systems that the intervention was responsible for the change in percent completed independently.

For each routine there was an immediacy of effect, albeit a slight immediacy within the first routine followed by acquisition of the
skill. Comparison of baseline and intervention phases also show a degree of experimental effect. While baseline phases in washing hands and getting ready for snack have some variability, they do not reach levels of intervention. The variability in baselines may be due to carryover effects from learning in the play routine. Trend in the baseline was stable in two out of the three routines. An acceleration trend was seen in all intervention phases. The washing hands routine was the most difficult for Lilly to master as is indicated by a lower acceleration trend for that routine. Comparing experimental effect across behaviors also indicated experimental effect. The percentage independent in the intervention phase of the play routine was higher than both the washing hands and snack routine. The intervention phase of play and washing hands was higher than the baseline phase of the snack routine; however, baseline in snack was variable with one high data point.

Overall, the mean percentage completed independently increased across all routines. The percentage of non-overlapping data indicate an effective intervention. Table 1 provides a summary of the results.

**Discussion**

This study suggests that parents can be effective implementers of structured work systems to increase independence in the home. The results indicate that parent-implemented work systems in the home setting are an effective intervention to increase independence for a child with severe disabilities. Further, this study suggests that structured work systems, generally thought of as a visual support, can be effective as spatial organizers for children with visual impairment and ASD. While the child increased independence in all routines, perhaps the most interesting finding was the adaptations needed for working with a child who has ASD and VI, as well as the family considerations that went into intervention development.

**Family Priorities and Research Rigor in Parent-Implemented Interventions**

Routines-based interventions are established practices in early intervention. Practitioners are expected to understand important family routines and activities, consider ways to alter routines to support the child and family’s
learning, and embed interventions in daily routines (Division for Early Childhood, 2014). This study addresses the need to extend research of parent-implemented interventions for school age children (Hong et al., 2016). In order to assess the effectiveness of a home-based, parent-implemented intervention, the family routine was the context for implementation. Choosing routines for intervention proved challenging given the child’s minimal independence across current family routines. Further, given the child’s limited range of known preferred reinforcers, it was determined that currently reinforcing routines would not be disrupted to ensure that the intervention did not interfere with her success. For example, leaving for school in the morning was one of few routines that was reinforcing and within which Lilly showed independence. The research team and Lilly’s mother decided not to expand on her independence within the routine so as not to create unintentional regression of skills within this routine. As discussed, the primary goal of the intervention was to assess the effectiveness of teaching Lilly’s mother to use the structured work system to teach Lilly new routines with the expectation that these would expand over time.

Generalization and maintenance data show that within the scope of this research, Lilly did learn to generalize the routine to new materials and people and was able to maintain previously learned routines.

Barton and Fettig (2013) found in their review of studies of parent-implemented interventions for young children with disabilities that most lacked maintenance information, specific features of implementation, and implementation fidelity on the practices used to train parents. Similarly, Alsayedhassan et al.’s (2016) review of picture exchange communication interventions found that not only were most studies focused on practitioners rather than parents, most also showed minimal generalization. In this study, in addition to collecting data on maintenance, generalization was assessed across objects, routines, and people. Further, implementation features of the research design (e.g., routines-based interview, parent training) are described, as is treatment integrity of the implementer (i.e. Lilly’s mother).

Structured Work System as Spatial Organizer

Structured work systems are included in the category of visual supports for children with ASD (Wong et al., 2015). This study demonstrates the effectiveness of structured work systems for a child with ASD and VI. Conceptualized as a spatial organizer, a structured work system for a child with visual impairment provides an effective, familiar process for teaching new skills within the home. The core components of structured work systems remain the same, whether it is considered a visual support or spatial work. The child is provided four pieces of information: “What do I need to

### TABLE 1

**Summary of Results**

<table>
<thead>
<tr>
<th></th>
<th><strong>Play</strong></th>
<th><strong>Wash Hands</strong></th>
<th><strong>Snack</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>Mean = 0%</td>
<td>Mean = 5.5%</td>
<td>Mean = 12.35%</td>
</tr>
<tr>
<td></td>
<td>(Range = 0%)</td>
<td>(Range = 0–20%)</td>
<td>(Range = 0–80%)</td>
</tr>
<tr>
<td></td>
<td>Stable with</td>
<td>Stable with</td>
<td>Stable with</td>
</tr>
<tr>
<td></td>
<td>No Acceleration</td>
<td>Slight Acceleration</td>
<td>Acceleration</td>
</tr>
<tr>
<td><strong>Intervention Phase</strong></td>
<td>Mean = 82.5%</td>
<td>Mean = 73.9%</td>
<td>Mean = 88.0%</td>
</tr>
<tr>
<td></td>
<td>(Range = 12–100%)</td>
<td>(Range = 63–100%)</td>
<td>(Range = 63–100%)</td>
</tr>
<tr>
<td></td>
<td>Variability-Stable</td>
<td>Slight Variability</td>
<td>Stable</td>
</tr>
<tr>
<td></td>
<td>Acceleration Trend</td>
<td>Acceleration Trend</td>
<td>Acceleration Trend</td>
</tr>
<tr>
<td><strong>PND Baseline-Intervention Phase</strong></td>
<td>Mean = 100%</td>
<td>Mean = 100%</td>
<td>Mean = 75%</td>
</tr>
<tr>
<td></td>
<td>Highly Effective</td>
<td>Highly Effective</td>
<td>Moderately Effective</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td>Mean = 100%</td>
<td>Mean = 70%</td>
<td>Mean = 93%</td>
</tr>
<tr>
<td></td>
<td>Stable Trend</td>
<td>Acceleration Trend</td>
<td>Stable Trend</td>
</tr>
</tbody>
</table>

**PND**: Parent-Noted Data
do?,” “how much do I need to do?,” “how will I know when I’m finished?,” and “what will I do next?” (Hume & Odom, 2007).

A number of considerations were made to ensure the work system was specific to the participating child with ASD and VI. First, objects in each box directly reflected a skill or behavior for the child to complete, rather than have a more abstract association with a skill or behavior. Also, objects needed to be ones familiar to Lilly regardless of her level of independence with the string of tasks that comprise the full routine. Second, objects in the box were ones that could be accomplished in close proximity to the structured work system to ensure that challenges with orientation and mobility did not distract the child from the task. Finally, in addition to the first verbal cue given by Lilly’s mother at the beginning of each task (e.g., “time for play,” “time to wash hands”), Lilly’s mother placed Lilly’s hand on the first box of the structured work system in order to orient her to the activity.

As suggested by Hume and Odom (2007), incorporating the structured work system in the natural environment enhances the generalization of skills. Implementing the same teaching strategy across skills and settings further enhances generalization, as well as efficacy (Hume & Odom, 2007; Hume et al., 2012). Three work systems, designed for use by a school-aged child with multiple disabilities including blindness, were effectively implemented by her parent and led to acquisition, maintenance, and generalization of independence in these routines.

Limitations and Future Direction

A number of limitations deserve comment. First, routines were scheduled during a time when the research team was available and the family would be least disrupted. This may not have been the most efficient time for teaching new routines. The family and research team agreed that morning preparation or bedtime were most optimal. That Lilly was successful at a less optimal time of day speaks to the potential of the routine for generalizing to other skills across her day. Second, real-life interruptions (e.g., a toddler brother waking up from nap early) are inherent in the study of parent implementation in the home. Lilly’s mother was able to complete a routine with Lilly before having to attend to her siblings or held a child while prompting Lilly. A future study might track the impact that interruptions have on parent implementation, as well as parent strategies used to attend to interruptions, in order to identify opportunities to build in supports in procedures. Third, the parent implementing the intervention has a degree in education and taught in a kindergarten classroom. While this level of experience may impact generalization to a broader population of parents, it is important to point out that no prior systematic interventions were being implemented at home by Lilly’s mother.

Study findings speak positively to the potential impact of parent-implemented structured work systems for children with multiple disabilities. This study expands the known effective application of visual supports, such as structured work systems, for children with ASD, and visual impairment. Research in the effective implementation of known EBPs for children with ASD to children with co-occurring disabilities is critical, particularly for those disability categories with heightened prevalence with ASD, such as VI. Further, the study explores the use of routine-based interviews and parent implementation of interventions for a school-age child in the home. Implications for teachers and other interventionists include adaptation of structured work systems to accommodate for visual impairments (e.g., choice of objects, considerations for mobility and orientation) and to accommodate for home priorities (e.g., critical routines). Future research should evaluate the extent to which other identified EBPs for children with ASD have not been applied to children with VI, test implementation of these with children with co-occurring VI, and identify accommodations necessary for this specific population.

References


O’Hara, M., & Hall, L. J. (2014). Increasing engagement of students with autism at recess


Received: 19 October 2017
Initial Acceptance: 19 December 2017
Final Acceptance: 22 February 2018
Comparison of Antecedent Activities for Increasing Engagement in a Preschool Child with ASD during a Small Group Activity

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Abstract: Antecedent-based interventions, including sensory integration-based interventions and physical exercise, are regularly used in clinical and educational settings despite the lack of high-quality research documenting their efficacy. This study analyzed the effect of two comparisons—wearing headphones and not wearing headphones, and the provision of three structured antecedent activities (gross motor activities, sensory based interventions, and seated work)—on the level of engagement, vocal stereotypy, and motor stereotypy in a young child with ASD during a small group setting. Results indicate that sensory-based interventions do not result in higher levels of engagement or decreased vocal or motor stereotypy when compared to structured physical activities or typical classroom conditions.

Antecedent-based interventions have been shown to consistently produce therapeutic changes for individuals with autism spectrum disorder (ASD) across a range of ages, abilities, and behavior classes, including challenging, self-injurious, on-task, and stereotypic (Wong et al., 2015). Antecedent-based procedures typically include manipulations of the immediate context or stimuli (e.g., non-contingent reinforcement, headphones during loud activities) and might include the use of specific activities (e.g., sensory integration-based interventions [SBI], physical exercise) to elicit improved behavior following the activity (Cooper, Heron, & Heward, 2007).

SBI are commonly used to improve the functioning of individuals presenting differences in response to environmental stimuli (Baranek, 2002; Watling & Hauer, 2005), a phenomenon referred to as sensory dysfunction. Sensory dysfunction is a condition purported to arise from insufficient development of the nervous system, resulting in impaired neurological processing of sensory input (i.e., visual, auditory, tactile, vestibular, or proprioceptive; Ayres, 1972). SBI are used to ameliorate the effects of a sensory dysfunction on the development and learning of individuals, ostensibly through improved integration of sensory input and the nervous system (Ayres, 1972; Baranek, 2002). Such interventions involve the use of targeted strategies to address the individual processing issues. For example, “therapeutic” swinging might be used to improve vestibular functioning, a “brushing” program might be used to improve tactile functioning, or a weighted vest might be worn to improve proprioceptive functioning (Case-Smith, Weaver, & Fristad, 2015). In addition, equipment—such as specialized glasses or headphones with or without auditory input—might be used to alter or block sensory input for individuals who exhibit hypersensitivity to environmental stimuli (Baranek, 2002).

SBI are a common practice for improving sensory dysfunction for children with ASD (Case-Smith et al., 2015; Watling & Hauer, 2015), and are often implemented by occupational therapists (Parham et al., 2007) despite the lack of empirical support (Barton, Reichow, Schnitz, Smith, & Sherlock, 2015). Although sensory dysfunction is not supported by the American Academy of Pediatrics...
(AAP, 2012) as a medical diagnosis, it is often a focus of occupational therapists when working with individuals with ASD (Case-Smith & Arbesman, 2008). The AAP (2012) and researchers have recommended against the use of SBI based on the substantial number of rigorous studies with weak or negative findings (Barton et al., 2015; Lang et al., 2012; Losinski, Sanders, & Wiseman, 2016; Watling & Hauer, 2015); however, SBI continue to be used in clinical and educational settings (American Occupational Therapy Association, 2015; Faller, Hunt, Hooydonk, & Schaaf, 2016). Thus, research comparing the efficacy of SBI to other interventions or typical conditions might have a meaningful impact on clinical and educational practice for students with ASD.

Conversely, there is burgeoning empirical support for the use of antecedent physical exercise for reducing challenging and stereotypic behaviors (Celiberti, Bobo, Kelley, Harris, & Handleman, 1997; Fite & Vitulano, 2011; Neely, Rispoli, Gerow, & Ninci, 2015; Wong et al., 2015). Interventions utilizing antecedent physical exercise involve the use of gross motor activities to evoke desired behaviors or reduce challenging behaviors or stereotypy following their performance (Fox, Carta, Strain, Dunlap, & Hemmeter, 2010). These exercises can range from mild to vigorous, and might include running, bicycling, or exercises such as sit-ups (Lang et al., 2010). While such antecedent interventions might be empirically supported, the aggregate body of research is limited in quality, rigor, and feasibility for young children (Lang et al., 2010; Kasner, Reid, & MacDonald, 2012). When sensory-based interventions include exercise activities, equivocal effects might be anticipated.

The majority of individuals with ASD present with processing difficulties in one or more sensory systems or deficits in gross motor development (Case-Smith & Miller, 1999; Lang et al., 2010). And, regardless of their lack of empirical support, SBI remain one of the most common treatments for this aspect of ASD (Green et al., 2006). Additionally, interventions targeting gross motor skills are used with regularity with this population (Case-Smith & Miller, 1999). While antecedent interventions might be widely applied, there is a dearth of high-quality research demonstrating their effectiveness, resulting in increased scrutiny in recent years. Given their purported benefits—and that the targeted behaviors are congruent—rigorous comparisons between SBI and other antecedent interventions are necessary to make recommendations for practice. We addressed this with two comparisons: a contrast of the effect of (a) wearing headphones and not wearing headphones, and (b) three structured antecedent activities conducted immediately prior to a small group activity—gross motor activities, SBI, and seated work—on the level of engagement, vocal stereotypy, and motor stereotypy in a young child with ASD. The purpose of these comparisons was to compare levels of engagement and stereotypy during typical classroom group activities under different conditions.

Method

Participant and Implementers

The primary participant was Max—a 54-month-old white male diagnosed with ASD. Max communicated verbally using one or two word utterances and consistently made choices related to his preferences. His teacher completed the Childhood Autism Rating Scale-2 (CARS-2; Schopler, Van Bourgondien, Wellman, & Love, 2010), which resulted in a raw score of 37.5, placing him in the severe range of the autism spectrum. In addition, Max had a medical diagnosis of sensory processing disorder. His teacher and parents completed the Sensory Profile 2 (Dunn, 2014), a standardized questionnaire that evaluates sensory processing patterns across multiple environments; teacher and parent scores placed him in the 90th percentile for both auditory-avoidant behaviors and vestibular-seeking behaviors (e.g., jumping, climbing). They reported he exhibited high levels of vocal and motor stereotypy and low levels of engagement across the school day, particularly during small group activities. They also reported his stereotypy interfered with participation in academic and community settings and responding to social initiations, at levels greater than same-aged peers. His teacher completed the Functional Assessment Screening Tool (FAST; Iwata & DeLeon, 2005), which indi-
icated Max’s stereotypy was maintained by automatic sensory reinforcement.

Max received occupational therapy once a week, during which the Occupational Therapist (OT) provided individualized SBI designed to target his sensory dysfunction (e.g., vigorous vestibular input). In addition, noise-reducing headphones were recommended by the OT, and supported by his parents, in response to Max’s adverse reaction to loud noises. Max’s classroom teacher—a white female with a master’s in Special Education and three years teaching experience—implemented all sessions except SBI, which were implemented by Max’s OT, a white female with 11 yrs of clinical experience.

Materials and Settings

Instructional materials consisted of condition-specific visuals (i.e., schedules, token board, and visual representations of choices), edible reinforcers, and a MotivAider®, a wearable electronic device that provides vibrational prompts at pre-determined intervals. Max’s parents provided the noise-reducing headphones, which he commonly wore at home and occasionally wore at school prior to the study. All other materials (i.e., gross motor & sensory equipment, seated work materials, small group materials) were typically used during Max’s school day. Data collection materials consisted of a Canon VIXIA mini video camera and computers equipped with ProCoderDV software (Tapp, 2003).

Antecedent interventions occurred on the playground, in the gym, or in Max’s classroom at an inclusive, university-based preschool. Gross motor activities were conducted on the playground, a large outdoor play area comprised of typical play structures and toys (e.g., swings, slides, bikes). SBI were conducted in the gym, an indoor play space containing a variety of play and occupational therapy materials (e.g., scooter boards, balance beam, trampoline). Seated work sessions occurred in Max’s classroom at a small, child-size table. All interventions were provided during Max’s regularly-scheduled playground time. Consequently, other children were present during gross motor sessions but not during the SBI or seated work sessions.

Measures and Response Definitions

The dependent variables were engagement, vocal stereotypy, and motor stereotypy, which were operationally defined based on Max’s individual behavioral repertoire. Engagement was coded when Max’s face and eyes were oriented towards the teacher, activity materials, a peer who was appropriately engaged in the activity, or his token board. Vocal stereotypy was coded when Max emitted vocal sound(s), words or otherwise, without a functional purpose (i.e., not related to the activity or directed at another person). Motor stereotypy was coded if Max made forceful contact between the heel of one or both hands and another part of his body. A graduate student in Special Education who was blind to condition and study purpose coded all variables from video recordings using a momentary time sampling (MTS) procedure with 5 s intervals.

Experimental Design and Analysis

Two alternating treatments designs (ATD) were used to compare engagement, vocal stereotypy, and motor stereotypy across conditions. The first ATD compared headphones versus no headphones. The second compared three structured antecedent activities (i.e., gross motor activities, SBI, and seated work). Visual analysis was used to evaluate comparisons. Specifically, the amount of overlapping data across conditions was compared to determine if one condition was consistently superior to other condition(s) and to compare the efficacy of conditions. Five additional data characteristics (i.e., level, trend, variability, immediacy, & consistency) were examined within and across conditions to analyze data patterns and identify functional relations.

Procedure

The two comparisons (headphones, antecedent intervention) were conducted independently at different times of the day, and concurrently across a six-week period, for a total of one to two sessions per day, three to four days per week. The headphones comparison session occurred immediately after Max arrived at school in the morning and during the
first small group of the day. The antecedent intervention comparison session occurred about two hours later during the second scheduled small group activity.

**Small group.** All dependent variables were measured during small group activities. The routines within the small group activities were identical for both comparisons, although the specific activities varied during the course of the study. Each small group began with the implementer directing Max to the carpet, showing him his token board, and telling him it was time to “sit, look, and respond.” Small groups were 8–12 min long and consisted of the lead teacher instructing 4–6 students, including Max, while the a second teacher provided Max with contingent reinforcement and redirection as needed throughout the session. Reinforcement consisted of social attention at least once per minute for sitting on the carpet and visually attending to the teacher, materials, or peers. Redirection consisted of reorienting Max to the teacher or materials and reminding him of the contingency to “sit, look, and respond” to earn tokens (while showing him his token board), and blocking motor stereotypy by physically guiding Max to return his hands to a more appropriate location. During each session the lead teacher asked Max seven questions, at random intervals, related to the lesson; when Max responded, either independently or following a prompt, he received a token, praise, and an edible reinforcer. When Max earned all seven tokens the session was complete and he was excused from the small group. During the headphone comparison small group sessions, the implementer would put the headphones on Max and provide the directive, “In two minutes we are going to small group.” For no-headphones sessions, the implementer provided the same directive without placing the headphones on Max. After 2 min the teacher showed Max the small group visuals and prompted him to go to the carpet where small group occurred.

**Comparison 2 Procedure: Antecedent Interventions**

Three types of structured antecedent activities—gross motor activities, SBI, and seated work (as a business-as-usual control condition)—were compared. The purpose of this comparison was to analyze the differential effects of the three conditions on Max’s levels of engagement and stereotypy during the subsequent small group activity. Antecedent intervention sessions were 10–15 min long and occurred during Max’s regularly scheduled outdoor playground time. The condition order was randomly determined a priori using an online random number generator, with the rule that two sessions of the same type could not occur consecutively and that each condition had to occur at least every third session. Across antecedent conditions the implementer delivered social attention every 1 min in the absence of stereotypy and blocked all motor stereotypy within 5 s. When the session was complete the implementer showed Max the small group visuals and prompted him to go to the carpet for small group, during which all dependent variables were recorded.

**Gross motor.** Max’s classroom teacher started the session by showing Max a visual schedule of the randomized set of gross motor activities (i.e., slide, swing, bike, tire swing, climbing, & running). Each activity, with the exception of the slide, occurred for approximately 3 min; sliding occurred for a single turn. If Max exhibited non-compliance or physical resistance he was physically prompted through the activity. If he indicated he was finished (stating he was “all done”) with an activity before 3 min,
he was prompted to begin the next activity on the schedule.

SBI. Max’s OT intentionally designed the SBI to address Max’s specific sensory dysfunctions as identified in the sensory assessment. This intervention consisted of two parts: a vigorous activity (i.e., trampoline) followed by a calming activity series (i.e., 4-step obstacle course). The OT started the session by showing Max a visual schedule of the sensory activities. Max then jumped on the trampoline for at least 1 min, followed by the sensory obstacle course. The obstacle course included crawling through a tunnel, walking across two balance beams, walking across half-sphere balance discs, and propelling the scooter board in prone position to procure a piece for a peg puzzle (located at the beginning of the obstacle course). When a puzzle piece was secured, Max returned to the beginning of the obstacle course, put the piece into the puzzle, and began the obstacle course again.

Seated work. Max’s classroom teacher started the session by showing him the visual timer (set for 10 min) and stating, “Max, it’s time to work.” She presented him with a series of skill-appropriate work tasks (e.g., file folder activities, worksheets). If Max became unengaged with a task for more than 10 s she used graduated guidance to prompt task completion. A reinforcer was provided for completion of each work task.

Interobserver Agreement

Interobserver agreement (IOA) was calculated for 33% of randomly-selected sessions across behaviors and conditions using the point-by-point method (i.e., number of agreements divided by the number of agreements plus disagreements, multiplied by 100; Ayres & Ledford, 2014). A graduate student in Special Education served as the IOA coder. The mean IOA for engagement was 90% (range = 67%–100%), vocal stereotypy was 97% (range = 95%–100%), and motor stereotypy was 98% (range = 95%–100%).

Procedural Fidelity

Procedural fidelity was measured for implementer behaviors across 33% or more of all comparisons and conditions. Fidelity measures included the length of sessions, use of appropriate visuals (i.e., visual schedule, token board, and visual representations of choices), reinforcement for appropriate behaviors, blocking of motor stereotypy, and appropriate response-prompting. The mean fidelity across conditions was as follows: headphones: 89% (range = 67%–100%); no headphones: 100%; antecedent interventions: 94.8% (range = 82%–100%); and classroom sessions: 90% (range = 83%–94%). Within the antecedent intervention condition, the mean fidelity for gross motor activities was 90% (range = 82%–97%), the mean fidelity for SBI was 98% (range = 98%–98%), and the mean fidelity for seated work was 97% (range = 94%–100%).

Results

Headphones Comparison

Engagement was higher during the no headphones condition for 50% of comparisons, equal in 33% of comparisons, and higher with headphones for 17% of comparisons (see Figure 1). However, there was considerable overlap in Max’s engagement during small group with headphones and no headphones conditions, and minimal differences in level across conditions. Vocal stereotypy was variable during the headphones condition (range = 2%–26%) and lower and more stable in the no headphones condition (range = 0%–10%). There was some overlap in vocal stereotypy between the headphones and no headphones conditions, but vocal stereotypy was higher with headphones for 67% of comparisons and nearly or exactly equal in 33% of comparisons. Motor stereotypy was low and variable for both the headphones (0%–8%) and no headphones (1%–7%) conditions, with considerable overlap. When provided a choice to wear them, Max chose headphones for three sessions and no headphones for two sessions, with no discernable pattern (see Figure 2).

Antecedent Intervention Comparison

Engagement during small group following gross motor activities was variable (range = 45%–77%), but generally higher than the other two conditions for all comparisons, with minimal overlap (Figure 3). There was consid-
erable overlap between the seated work and SBI conditions. Vocal stereotypy remained low during all three conditions, with slightly higher levels during sessions following seated

Figure 1. Percentage of intervals engaged (top panel), with stereotypy (middle panel), and with motor stereotypy (bottom panel) for headphones (triangles) versus no headphones (squares) conditions during Comparison #1.
work (range = 2%–13%) for all comparisons. Sessions following gross motor activities and sessions following a SBI remained below 3% and 2%, respectively, with considerable overlap across the three conditions. Overall, motor stereotypy was highest during small group activities following seated work and lower after gross motor and SBI sessions, but variable for all conditions (range = 0%–14%) with considerable overlap. Small group following gross motor sessions had the highest levels of engagement, whereas small group following seated work had the highest levels of vocal stereotypy; however, the amount of overlap across the three conditions prevented the identification of a superior treatment for any of the dependent variables.

Discussion

We conducted two comparisons to identify conditions under which a child with ASD was most likely to be engaged and least likely to emit motor or vocal stereotypy. During the first comparison, Max’s engagement was higher during small group activities without headphones for half of the comparisons, but overall differences between conditions were minimal. Conversely, Max’s vocal stereotypy was higher during small group activities with headphones for 67% of the comparisons, and differences were notable across conditions. Max’s motor stereotypy was low and stable across both conditions with considerable overlap, suggesting that using headphones might result in decreased engagement and increased vocal stereotypy for Max. These results are supported by previous research on the use of headphones—specifically those that played non-contingent white noise to block auditory input—with this population (Saylor, Sidener, Reeve, Fetherston, & Progar, 2012). In addition, Max did not demonstrate a clear preference for wearing headphones during classroom sessions. Noise levels (as measured by the Decibels application) remained consistent across conditions, indicating that Max’s level of engagement, vocal stereotypy, motor stereotypy, and choice of headphones vs. no headphones were not influenced by changes in environmental noise. Max’s teachers anecdotally noted that he might be choosing headphones to escape non-preferred tasks, rather than to block noise. Functional assessments should be used to determine whether use of materials such as headphones are maintained by escape from potentially beneficial instructional activities (Losinski & Ennis, 2016). Although additional research is needed, the presence of headphones might ostracize and limit peer initiations for children with ASD who already experience fewer social interactions, and subsequent friendships, and reduced opportunities to respond to instruction. Thus, the potential benefits of headphones should be considered in light of their likelihood to reduce both ambient and distracting noise as well as relevant social and instructional auditory input.

During the second comparison, engagement was slightly higher or equal during the small group activity following gross motor play for all comparisons. Vocal stereotypy was slightly higher or equal after seated work for all comparisons. Motor stereotypy was variable in all conditions with considerable overlap across conditions. These results suggested that engaging in any type of antecedent physical activity (gross motor activities on the playground or a sensory-based obstacle course in the gym) might increase engagement and decrease vocal stereotypy. These results are supported by previous research suggesting antecedent exercise might lower rates of challenging behaviors including stereotypy during subsequent activities (Celiberti et al., 1997; Fite & Vitulano, 2011; Neely et al., 2015; Wong et al., 2015). However, given children with ASD also often benefit from structured social
activities with peers, engaging in physical activities with or near peers—for example, on the playground or in the gym during regularly-scheduled class activities—might be more beneficial and ecologically valid than one-on-one activities in a separate room without peers (as was true of the SBI in the current comparison). Further, the structured physical activities on the outdoor playground might be more feasible and less resource intensive than hav-

Figure 3. Percentage of intervals with engaged (top panel), with vocal stereotypy (middle panel), and with motor stereotypy (bottom panel) during gross motor (squares), SBI (triangles), and seated work (circles) conditions for the antecedent interventions Comparison #2.
ing an adult design and implement SBI in a one-on-one context in a separate room or area.

There are several limitations of the current study. First, the SBI and gross motor interventions were topographically similar: Both included gross motor activities Max completed independently while being supported by an adult. Because both treatments demonstrated similar outcomes across dependent variables, the similarity of the two interventions might have limited the study’s effectiveness in discerning differences between treatments. Second, the OT recommended that the SBI be tailored each session to meet Max’s needs for that day. However, due to the reduced internal validity this would have produced, we chose to use a consistent SBI for the duration of the study. This rigidity might have impacted the results. Third, we did not conduct a functional analysis to identify the function(s) maintaining Max’s stereotypic behavior. Although the FAST provided evidence that automatic sensory reinforcement was the primary function of the behavior, the lack of an experimental analysis precluded a definitive identification of function. Finally, because the study included only a single participant, the external validity of the study is considerably reduced. Replication is recommended to provide additional data on potential differential outcomes within each comparison.

In conclusion, the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) requires the use of “scientifically based research” as the foundation for education programs and for students with disabilities. The results of the current, scientifically rigorous comparisons do not support the use of the more resource intensive SBI (obstacle course or headphones) over structured physical activities or typical conditions (e.g., seated work, not wearing headphones). Further, these results demonstrate that when provided a choice, individuals might not choose to engage in SBI over typical conditions. These results, along with those of previous studies and syntheses, should be considered when designing educational programs, during discussions of policy, and when identifying evidence based practices for students with ASD.

References
Faller, P., Hunt, J., van Hooydonk, E., Mailloux, Z., & Schaaf, R. (2016). Application of data driven...


Received: 7 February 2018
Initial Acceptance: 9 April 2018
Final Acceptance: 24 May 2018
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