Education and Training in Autism and Developmental Disabilities

Focusing on individuals with autism, intellectual disability and other developmental disabilities

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The purposes of this organization shall be to advance the education and welfare of persons with autism and developmental disabilities, research in the education of persons with autism and developmental disabilities, competency of educators in this field, public understanding of autism and developmental disabilities, and legislation needed to help accomplish these goals. The Division shall encourage and promote professional growth, research, and the dissemination and utilization of research findings.
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Exploring Predictors of Postsecondary Outcomes for Students with Autism Spectrum Disorder

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Abstract: Participating in postsecondary activities such as education and employment can increase an individual’s independence, contribution to society, and quality of life. However, researchers suggest that students with autism spectrum disorder (ASD) engage in these postsecondary activities less than their peers do. The extent to which academic and social skills predict postsecondary outcomes for students with ASD is not yet understood. Logistic regression analyses using the National Longitudinal Transition Study – 2 (NLTS2; SRI, 2000) dataset were conducted to examine the extent to which academic skills and social skills predict postsecondary outcomes for students with ASD. Results suggested that academic achievement was significantly related to postsecondary education and overall success and that social skills significantly predicted all three postsecondary outcomes for students with ASD.

The transition from adolescence to adulthood can be challenging for many students. Students with disabilities in particular experience lower rates of success when transitioning from high school to postsecondary roles in comparison to their typically developing peers (Blackorby & Wagner, 1996). Specifically, students with autism spectrum disorder (ASD) encounter a variety of challenges. ASD is a developmental disorder characterized by impaired social interaction and communication skills and a repetitive or restricted pattern of behavior (American Psychiatric Association, 2013). These challenges can make the transition to postsecondary experiences especially difficult for students with ASD. In a comprehensive review of existing literature on the transition from high school to postsecondary environments among students with ASD, Wehman et al. (2014) point to the tremendous potential for individuals with ASD to make important contributions to society if various barriers to their postsecondary success can be overcome. Currently, students with ASD participate in postsecondary educational programs, employment opportunities, and independent living at very low rates (Billstedt, Gillberg, & Gillberg, 2005; Hendricks & Wehman, 2009). Anderson, Shattuck, Cooper, Roux, and Wagner (2014) found that individuals with ASD were much less likely than students of other disability groups to live independently following high school, even when controlling for functional ability. Given these findings, it is important to more carefully explore factors that can potentially affect these students’ transition and integration into the community.

There is evidence to suggest that academic achievement in high school is an important factor that corresponds to later outcomes for the student population in general (Hein, Smerdon, & Sambolt, 2013). However, the relationship of academic achievement and postsecondary outcomes for students with ASD is not yet well understood. Additionally, this emphasis on academic achievement may lead to a reduced focus on social skill instruction, which may be especially important for students with ASD given that “persistent deficits in social communication and social interaction across multiple contexts” are a defining feature of ASD according to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013). Although variability exists in the severity and manner in which social impairments manifest across the autism spectrum, students...
with ASD by definition universally experience social difficulties, and social skills instruction has been shown to improve social functioning for students with ASD (White, Koenig, & Scahill, 2010). Given the social impairments experienced by students with ASD, social skills may be a particularly important and predictive factor that affects the postsecondary outcomes of students with ASD. Thus, the purpose of the current study is to explore both academic achievement and social skills as predictors of postsecondary success for students with ASD.

**Postsecondary Outcome Rates**

Transitioning to and completing a postsecondary education program or obtaining gainful employment can increase an individual’s independence, contribution to society, and quality of life (Hendricks, 2010; Stodden & Mzurek, 2010). However, little research has been conducted regarding these postsecondary outcomes for students with ASD. Some researchers have examined the postsecondary participation rates of individuals with ASD. In a study of 140 young adult and adult males with ASD, only about 14% were a) employed or enrolled in higher education or vocational training and b) living independently, and 27% reported participating in one or the other (Cederlund, Hagberg, Billstedt, Gillberg, & Gillberg, 2008). In another study of 48 young adult males and females with ASD, less than one-third of the participants participated in a postsecondary educational or training program, with only one attending a four-year university, and none having yet graduated with a certificate or degree (Eaves & Ho, 2008). Additionally, only about half of the participants had ever participated in employment opportunities, most of which were in volunteer or part-time settings, such as delivering papers or sorting recyclables (Eaves & Ho, 2008). Finally, more than half of the participants lived at home with their parents, with only four participants living independently.

Taylor and Seltzer (2010) examined the postsecondary experiences of 66 students with ASD and examined more closely differences for those with and without comorbid intellectual disabilities (47 with comorbid intellectual disabilities [ID] and 17 without ID). Of the students with ASD and ID, 82% were involved in some sort of regular day activity (i.e., college, employment, adult day services), whereas only 76% of those with ASD and no ID were involved in these regular day activities. Although more students with ASD and no ID were attending a college or university compared to those with ID (i.e., 47% vs. 2%), the lack of structured postsecondary activity among many of the students with ASD and without ID suggests a potential need to look more carefully at those who are higher functioning. Researchers have also compared postsecondary experiences of individuals with ASD to those of the general population and students with other disabilities (Hendricks & Wehman, 2009). These researchers found that less than one-third of 23- to 26-year-olds with ASD were currently employed and worked for pay compared to an average of 59% for all respondents (Hendricks & Wehman, 2009). Compared to other disability groups, those with ASD had the second lowest rate of postsecondary employment participation (Hendricks & Wehman, 2009).

Rates of postsecondary participation have also been examined in a nationally representative sample of students with ASD. In one study, postsecondary participation rates of students with ASD were compared to those of students of three other disability categories: speech/language impairment, learning disability, and intellectual disability (Shattuck et al., 2012). Postsecondary participation rates in this larger nationally representative sample were consistent with findings in the existing literature, with only about 35% of students with ASD attending a postsecondary educational institution and about 55% participating in paid employment within six years of graduating from high school. However, more than 50% of the ASD group had no participation in postsecondary educational or employment activities within two years of high school graduation. In comparison to the other disability groups, those with ASD had the lowest rate of participation in employment and the highest rate of no participation in postsecondary educational or employment activities (Shattuck et al., 2012). In other studies examining a nationally representative sample of students with ASD, findings indicated that 43% of students with ASD attended a postsecondary educational institution (Chiang, Cheung,
Hickson, Xiang, & Tsai, 2012) and 56% participated in paid employment (Chiang, Cheung, Li, & Tsai, 2013). Together, results from the existing literature consistently indicate that individuals with ASD have poorer postsecondary outcomes and are participating in important postsecondary activities, such as education, employment, and independent living, at lower rates compared to their peers. Based on data from the National Longitudinal Transition Study - 2 (NLTS2), enrollment in postsecondary training among students with autism was estimated to be approximately 44% and was less than enrollment rates of six other disability groups, including those with learning disabilities, speech/language impairments, hearing impairments, visual impairments, orthopedic impairments, and those with other health impairments (Newman et al., 2011). The postsecondary completion rate for students with ASD was estimated to be 39% (Newman et al., 2011). In a survey of postsecondary institutions, only 56% reported enrolling students with an ASD; a higher proportion of institutions reported enrolling students of several other disability types, including those with hearing impairments, visual impairments, mobility concerns, learning disabilities, ADD/ADHD, health impairments, and mental illness (Raue & Lewis, 2011).

**Academic Achievement and Postsecondary Outcomes**

Pursuing postsecondary activities such as higher education and employment can be a selective process in which only those who meet certain qualifications are given the opportunity to participate (Hart, Grigal, & Weir, 2010). Academic achievement is one qualification that has been found to be a strong predictor of postsecondary success for the student population in general (Garland et al., 2011). For instance, an American Institutes for Research review of the literature found several academic factors associated with postsecondary educational success, such as higher GPAs and standardized test scores on national and state academic assessments (Hein et al., 2013). Academic factors have been linked to enrollment and persistence in postsecondary education across a variety of programs, including both two- and four-year institutions (Garland et al., 2011). Students with higher academic performance may have the necessary skills to pursue, persist, and succeed in demands of higher education.

**Social Skills and Postsecondary Outcomes**

Social skills have also been shown to be an important predictor of postsecondary success. Some researchers suggest that students who have better social skills demonstrate greater persistence and ability to navigate the demands of postsecondary education compared to students with lesser social skills (Dymnicki, Sambolt, & Kidron, 2013). Students with greater social skills may also be more desirable to employers (Hein et al., 2013). Many employers seek potential employees who demonstrate specific social skills in addition to work-related qualifications. Some researchers have found that individuals who demonstrate better social skills are more sought after by employers and may be more likely to secure entry-level positions (Casner-Lotto & Barrington, 2006).

Social skills have also been identified as important for postsecondary success among students with disabilities. Test, Mazzotti, Mustian, Fowler, Kortering, & Kohler (2009) conducted a systematic literature review to examine the existing research on predictors of postsecondary outcomes for students with disabilities. Of the 22 empirical articles included in the review, the authors identified three studies as including social skills as a predictor of postsecondary success for students with disabilities, with the three studies identifying a medium to large effect size for social skills on postsecondary success (i.e., Benz, Yovanoff, & Doren, 1997; Halpern, Yovanoff, Doren, & Benz, 1995; Roessler, Brolin, & Johnson, 1990). Whereas the Benz et al. (1997) and Roessler et al. (1990) studies focused on actual measurement of social skills as predictors, the Halpern et al. (1995) included instruction in social skills as the predictor, and found that receipt of such instruction was a predictor of postsecondary education participation. Based on a more recent analysis and report put out by the National Secondary Transition Technical Assistance Center (NSTTAC), social skills have been found to be predictive of several postsecondary outcomes including education, employment, and independent living for students with
disabilities (NSTTAC, 2013). Although some students with ASD may have been included in
the related studies examined, separate analyses were not conducted to specifically examine predictors for students with ASD. In fact, NSTTAC (2013) points to a need for related information disaggregated by disability type.

Predictors of Postsecondary Outcomes for Students with ASD

Three recent studies have examined predictive factors of postsecondary outcomes for students with ASD using data from the NLTS2. Chiang et al. (2012) found that academic achievement, among a variety of other factors, significantly predicted participation in postsecondary education for students with ASD. Second, Chiang et al. (2013) found that social skills were significantly related to participation in postsecondary employment. Third, Wei, Wagner, Hudson, Yu, and Shattuck (2015) identified three primary pathways of postsecondary outcomes for students with ASD, including (1) primarily postsecondary education focused, (2) primarily employment focused, and (3) disengaged from both postsecondary education and employment; they further found that a brief measure of functional skills and conversational skills predicted which students were categorized as primarily postsecondary education focused, but these same skills did not differentiate between those in the other two groups. The current study aims to extend on these studies and the previous literature in several ways. First, while Chiang et al. (2012) and Chiang et al. (2013) identified academic achievement and social skills separately as predictive of postsecondary education and employment outcomes respectively, this study examines both academic achievement and social skills as potential predictors of postsecondary success. Given that academic achievement and social skills may both be important factors linked to postsecondary outcomes, it is important to consider both factors together. Additionally, the predictor variables used in this study (i.e., academic achievement and social skills) are based on data from instruments that have been developed to measure a broad range of academic and social skill proficiency levels and that have established technical adequacy. As opposed to use of categorical academic and social skills variables in Chiang et al. (2012), Chiang et al. (2013), and Wei et al. (2015), this allows for more specific examination of the levels of academic achievement and social skills that are more likely to result in successful postsecondary outcomes for the population of students in our study. Second, multiple postsecondary outcomes (i.e., education, employment, independent living, and overall success) will be examined in this study together, as it is important to explore the variety of postsecondary opportunities available to students with ASD. Fourth, the most recent data on student outcomes will be used for analysis in this study, as opposed to outcomes examined from an earlier time point in Chiang et al. (2012) and Chiang et al. (2013). Finally, this study examines postsecondary outcomes for a specific subset of students with ASD. As a spectrum of disorders, ASD comprises a large variety of symptom manifestation and severity. Higher-functioning students with ASD have different challenges and needs than those with more severe ASD. Increased attention should be given to examine factors that may be related to postsecondary outcomes for higher-functioning students with ASD, as more of these students are entering the school system and aspiring to pursue postsecondary roles (Camarena & Sarigiani, 2009). Some research has indicated that a higher proportion of these higher-functioning students may not be accessing appropriate daytime activities when compared to lower functioning students with ASD (Taylor & Seltzer, 2010). Thus, the purpose of the current study is to answer the following research questions (1) To what extent do academic achievement and social skills in high school predict postsecondary education enrollment and/or graduation among higher-functioning students with ASD? (2) To what extent do academic achievement and social skills predict postsecondary employment among higher-functioning students with ASD? (3) To what extent do academic achievement and social skills predict overall success (i.e., enrollment or graduation from postsecondary educational institution or employment) among higher-functioning students with ASD? and (4) To what extent do academic achievement and social skills predict independent living
status among higher-functioning students with ASD?

**Method**

*National Longitudinal Transition Study – 2*

Data collected as part of a larger project, the National Longitudinal Transition Study – 2 (NLTS2; SRI, 2000), were analyzed in this study. The NLTS2 was a longitudinal study funded by the United States Department of Education that collected information about students with disabilities and their experiences transitioning from secondary school to postsecondary roles. Data were collected at five time points from 2001 to 2009. Data were gathered through multiple means: parent and/or youth telephone interviews, direct assessments of students, teacher surveys, school program surveys, school information surveys, and student transcripts (SRI International, 2000). The NLTS2 sample was developed with the intent to include a nationally representative sample of students across each of the 12 federal special education disability categories. Participants from the NLTS2 were identified using a two-stage process (SRI International, 2000; Wagner, Newman, Cameto, & Levine, 2005). First, a stratified sample of Local Educational Agencies (LEA) and state-supported schools were randomly selected to account for geographic region, student enrollment, and wealth of the LEA/community. Second, students within the selected LEAs and special schools who were receiving special education services, between the ages of 13 and 16, and in at least seventh grade on December 1, 2000 were randomly selected to participate. Participants were 13 to 16 years of age at the start of the study and 21 to 26 years old at the time of final data collection.

**Participants**

In this study, participants were a subset of the sample from the NLTS2. Students who were identified as having a primary disability of “autism” in Wave 1 of the Parent Interview were selected. Then, only those with data in the Wave 2 Direct Assessment and Wave 5 Parent/Youth Survey were included (N = 170). As part of NLTS2, about 67% of participants completed either the direct or alternate assessment based on their level of functioning (Wagner, Newman, Cameto, & Levine, 2006). Students with sensory, physical, behavioral, or cognitive disabilities who were unable to follow instructions or answer questions reliably participated in the alternate assessment (Wagner et al., 2006). Given that the sample in this study consisted only of students who participated in the direct assessment, the sample likely represented students with ASD who were higher-functioning in general (e.g., had appropriate skills to complete language arts, math, social science, and science assessments). Through a brief analysis of the proportion of students with ASD taking the direct vs. alternate assessment, we identified a substantially greater proportion of those taking the alternate assessment to have comorbid moderate to severe intellectual disabilities (41%) compared to the proportion of those taking the direct assessment (10%). This supports the notion that our sample tended to be higher-functioning students with ASD. Use of the direct assessment data allowed for analysis of information about our predictor variables with higher technical adequacy, given that only students who participated in the direct assessment completed these measures. Ultimately, the total unweighted sample was 170 (NOTE: This is rounded to the nearest 10 per the requirements set by the Institute of Education Sciences (IES) for reporting purposes). Demographic information is similarly rounded to the nearest 5%. Participants represented approximately 20% of the students who were originally identified as having a primary disability of autism.

The final sample consisted of approximately 80% male and 20% female participants. Approximately 90% were White, approximately 5% were African American and approximately 5% were Asian/Pacific Islander. At the start of data collection, approximately 50% were 13 to 14 years old, approximately 10% were 15 years old, approximately 30% were 16 years old, and approximately 10% were 17 years old. At the time the direct assessment was administered, approximately 50% were 16 years old, approximately 40% were 17 years old, and approximately 10% were 18 years old. Household income was over $50,000 for approximately 60% of students,
between $25,001 and $50,000 for approximately 20% of students, and under $25,000 for approximately 10% of students; income data was missing for approximately 5%.

Data Collection

Data were pulled from the NLTS2 Wave 1 Parent Interview, Wave 2 Direct Assessment, and Wave 5 Parent/Youth Survey. The Wave 1 Parent Interview was a 60-minute phone interview completed with a parent or guardian. Mail questionnaires were administered to parents who were unavailable by phone. Parents answered questions about student and family characteristics, satisfaction with school programs, student activities outside of school, and student activities after high school. The Wave 5 Parent/Youth Survey was conducted in the same manner, except students who were able to answer the questions themselves were asked to provide information about their experiences and outcomes. If both youth and parent data were available, information provided by the youth was used. The Wave 5 Parent/Youth Survey contained the most recent data available for each participant as of 2009, which may have been collected at a previous time point. The Direct Assessment was conducted by trained on-site school professionals during the wave in which the student was between 16 and 18 years old.

Measures

Academic achievement. Academic achievement was measured using students’ standard scores from four subtests (Passage Comprehension, Applied Problems, Social Science, and Science) on the research edition of the Woodcock-Johnson Tests of Achievement III (WJ-III ACH; Woodcock, McGrew, & Mather, 2001). Students’ standard scores on the Passage Comprehension, Applied Problems, Social Sciences, and Science subtests from the Wave 2 Direct Assessment were averaged to create an overall academic achievement score.

Social skills. Social skills were measured using parent-ratings of the students’ social skills in the Wave 1 Parent Interview. There were 11 total items, most of which were drawn from the Social Skills Rating System – Parent Form (Gresham & Elliot, 1990), reflecting three social skill areas: assertion, self-control, and cooperation. Parents were asked to rate whether the student engaged in specific social interaction skills on a scale of “never,” “sometimes,” or “always.” A composite social skills score based on parents’ responses to the 11 items was calculated by the dataset developers, ranging from 0 to 22. This composite score was used as a measure of students’ overall social skills in this study. A reliability analysis of this scale was conducted for the purpose of this study and indicated a reliability coefficient of 0.65, which is considered to be an acceptable level of internal consistency (DeVellis, 1991; Kline, 2000).

Postsecondary educational success. Postsecondary educational success was defined as being enrolled in or having graduated from a postsecondary institution (i.e., vocational, two-year, or four-year college). Participants who were reported by the student or parent in Wave 5 to be currently attending, have graduated/completed and currently attending, or have graduated/completed their education at a postsecondary institution were coded as 1. Participants who were reported to have left, did not complete their education, or have not yet attended a postsecondary institution were coded as 0. Those who reported returning to secondary school were also coded as 0. Participants with a not applicable answer, those who skipped the question, and those who indicated attending but whose statuses in a postsecondary institution were unknown were coded as “missing.”

Employment success. Employment success was defined as holding a current paid job since leaving high school and within the past two years of the interview. Participants were coded as 1 if they were reported by the student or parent in Wave 5 to have a paid job currently and works/ worked full- or part-time at all jobs combined. Those who reported not having a paid job currently were coded as 0. Additionally, those who reported returning to secondary school were coded as 0. Those who provided an answer of not applicable or skipped the question were coded as “missing.” For the related analysis, participants who were currently enrolled in a postsecondary educational institution were not included and considered “missing.”

Overall success. “Overall success” was defined as experiencing postsecondary educational and/or employment success. Particip-
pants who were reported by the student or parent in the Wave 5 interview to (a) be enrolled in a postsecondary institution, (b) have graduated from a postsecondary institution, or (c) hold a current paid job were coded as 1. Those who did not experience postsecondary success and did not experience employment success were coded as 0.

Independent living. Independent living was defined as living autonomously from parental/guardian and assisted care. Those who were reported by the student or parent in Wave 5 to be in the following living conditions were coded as 1: on his/her own, with a spouse or roommate, in a residential or boarding school, in college housing or dormitory, in military housing, in job corps, job training program, or on location at the job. Those who were reported to be living with his/her parents, in foster care, with another relative, in a group home or assisted living center, in a hospital or medical facility, in a mental health facility, in a correctional facility/youth detention center, to be transient, homeless, or living in a car, with a non-family legal guardian, or in some other situation/location were coded as 0. Participants who reported living in several locations across categories \( (n = 2) \) were coded as missing.

Results

Descriptive statistics for the predictor variables are presented in Table 1. Participants performed generally in the low average range compared to same-age peers. Average scores on the WJ-III fall between standard scores of 90 to 110. Standard scores between 80 and 89 are considered to be in the low average range of academic functioning. Passage Comprehension and Applied Problems scores \( (M = 87.5 \text{ and } M = 87.3) \) were in the low average range compared to same-age peers, while Social Science and Science scores \( (M = 91.8 \text{ and } M = 93.6) \) were within the average range. The mean score of the social skills composite \( (M = 11.6) \) indicates that parents on average rated their youth to sometimes engage in appropriate social skills. Possible scores on this composite measure ranged from 0 (youth never engages in appropriate social skills) to 22 (youth always engages in appropriate social skills). A score of 11.6 indicates that parents, on average, perceived their youth to sometimes engage in appropriate social skills.

Approximately 60\% of the sample experienced postsecondary educational success. Of those individuals the areas of study represented included arts/drama/dance/music/graphic design/graphic arts/fashion, computer science/programming/information technologies/computer support, health care, communications/journalism/TV/radio/entertainment, science, liberal arts, 5\% social sciences, business/marketing/advertising/management/finance, engineering, clerical work, English/literature/library science, and animal care. Approximately 40\% of the individuals who were represented in this study were considered to have experienced employment success. Of those employed, areas of work included material recording/scheduling/distributing, food preparation/service, material moving work, and building cleaning/pest control. Approximately 15\% of the represented individuals in this study were considered to be living independently. Given that only a small percentage of the sample met the criteria for independent living, the logistic regression analyses were not carried out for this outcome variable.

Predicting Postsecondary Success

Logistic regression analyses were conducted using academic achievement and social skills to predict success for individuals with ASD for three postsecondary outcomes.

Post-Secondary Educational Success

First, the two predictor variables (i.e., academic achievement and social skills) were re-

<table>
<thead>
<tr>
<th>Predictors of Outcomes for ASD / 349</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td>8</td>
<td>129</td>
<td>90.05</td>
</tr>
<tr>
<td>Passage Comprehension</td>
<td>17</td>
<td>147</td>
<td>87.54</td>
</tr>
<tr>
<td>Applied Problems</td>
<td>4</td>
<td>116</td>
<td>87.31</td>
</tr>
<tr>
<td>Social Science</td>
<td>1</td>
<td>140</td>
<td>91.77</td>
</tr>
<tr>
<td>Science</td>
<td>9</td>
<td>136</td>
<td>93.60</td>
</tr>
<tr>
<td>Social Skills Composite</td>
<td>4</td>
<td>22</td>
<td>11.57</td>
</tr>
</tbody>
</table>
gressed on postsecondary educational success (see Table 2). According to the likelihood ratio statistic, this model was statistically significant ($\chi^2 = 39.8, p < .001, df = 2$), indicating that the overall model was statistically reliable in distinguishing between individuals with ASD who were successful and those who were not yet successful. The regression model explained 30.3% of the variance in postsecondary educational success (Nagelkerke’s $R^2$), suggesting a moderately weak relationship between prediction and grouping, and the model correctly classified 74% of cases (59% for unsuccessful and 84% for successful). The Wald criterion suggested that both academic achievement ($p < .001$) and social skills ($p = .034$) were statistically significant predictors of postsecondary educational success. The exponent of the coefficient (odds ratio) for academic achievement (1.05) suggested that for every one unit increase in academic achievement, individuals with ASD were 1.05 times as likely (5% more likely) to be successful, holding social skills constant. The odds ratio for social skills (1.13) suggested that for every one unit increase in social skills, individuals with ASD were 1.13 times as likely (13% more likely) to be successful, holding academic achievement constant. Analysis of predicted probabilities indicated participants predicted to experience postsecondary educational success had an average academic achievement standard score of 99.61 and an average social skills score of 10.73. When the interaction was added to the model, no significant improvement in prediction was evident.

**Employment Success**

Next, academic achievement and social skills were regressed on employment success (see Table 3). Again, the likelihood ratio statistic suggested this model was statistically significant, indicating the model reliably distinguished between successful individuals and those who were not yet successful ($\chi^2 = 7.16, p = .03, df = 2$). The regression model explained 7.4% of variance in employment success (Nagelkerke’s $R^2$), suggesting a weak relationship between prediction and grouping, and the model correctly predicted 59.5% of cases (74.6% for unsuccessful and 40.0% for successful). The Wald criterion suggested that social skills were a significant predictor of employment success ($p = .02$), while academic achievement was not a significant predictor ($p = .34$). The odds ratio for social skills (1.15) suggested that for every one unit increase in social skills, individuals with ASD were 1.15 times as likely (15% more likely) to experience employment success, holding academic achievement constant. Analysis of predicted probabilities indicated that participants predicted to experience postsecondary employment success had an average social skills score of 15.07. Participants predicted to be not yet successful had an average social skills score of 9.82. When the interaction was added

### Table 2

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald (df)</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td>.05</td>
<td>.01</td>
<td>27.22 (1)</td>
<td>&lt;.001*</td>
<td>1.05</td>
</tr>
<tr>
<td>Social Skills</td>
<td>.12</td>
<td>.06</td>
<td>4.32 (1)</td>
<td>.04*</td>
<td>1.13</td>
</tr>
<tr>
<td>Constant</td>
<td>-5.51</td>
<td>1.19</td>
<td>21.32</td>
<td>&lt;.001</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note: the dependent variable in this analysis is postsecondary educational success coded so that 1 = successful and 0 = not yet successful.

* Indicates significance at the .05 level.
to the model, no significant improvement in prediction was evident.

**Overall Success**

Finally, academic achievement and social skills were regressed on overall success (i.e., experiencing postsecondary educational and/or employment success; see Table 4). A test of this regression model was statistically significant ($\chi^2 = 29.37, p < .001, df = 2$). The regression model accounted for 24.9% of the variance in overall success (Nagelkerke’s $R^2$) suggesting a weak relationship between prediction and grouping, and the model correctly predicted 77% of cases (25.6% for unsuccessful and 93.4% for successful). The Wald criterion suggested that both academic achievement ($p < .001$) and social skills ($p = .001$) were significant predictors of overall success for individuals with ASD. The odds ratio for academic achievement (1.04) suggested that for every one unit increase in academic achievement, individuals were 1.04 times as likely (4% more likely) to experience overall success, holding social skills constant. The odds ratio for social skills (1.25) suggested for every one unit increase in social skills, individuals were 1.25 times as likely (25% more likely) to experience overall success, holding academic achievement constant. Analysis of predicted probabilities indicated participants predicted to experience overall success had an average academic achievement standard score of 90.03 and an average social skills score of 12.24. Participants predicted to be not yet suc-

| TABLE 3 | Logistic Regression Model for Employment Success |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **Independent Variable** | **B** | **S.E.** | **Wald (df)** | **Sig.** | **Exp(B)** |
| Academic Achievement | .01 | .01 | .91 | .34 | 1.01 |
| Social Skills | .14 | .06 | 5.81 | .02* | 1.15 |
| Constant | -2.56 | 1.00 | 6.54 | .01 | .08 |
| Model $\chi^2$ | = | 7.16 (2), $p = .03^*$ |
| Nagelkerke $R^2$ | = | .07 |
| Correct Predictions | = | 59.5% |
| n | = | 130 |

*Note: the dependent variable in this analysis is employment success coded so that 1 = successful and 0 = not yet successful.

* Indicates significance at the .05 level.

| TABLE 4 | Logistic Regression Model for Overall Success |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **Independent Variable** | **B** | **S.E.** | **Wald (df)** | **Sig.** | **Exp(B)** |
| Academic Achievement | .04 | .01 | 14.76 (1) | $p < .001$ | 1.04 |
| Social Skills | .22 | .07 | 10.78 (1) | $p = .001$ | 1.25 |
| Interaction of Predictors | -4.43 | 1.16 | 14.47 (1) | = |
| Constant | = | .01 |
| Model $\chi^2$ | = | 29.374 (2), $p < .001$ |
| Nagelkerke $R^2$ | = | .25 |
| Correct Predictions | = | 77% |
| n | = | 160 |

*Note: the dependent variable in this analysis is overall success coded so that 1 = successful and 0 = not yet successful.

* Indicates significance at the .05 level.
cessful had an average academic achievement standard score of 56.85 and an average social skills score of 7.95. When the interaction was added, no significant improvement in prediction was evident.

Discussion
In this study, a secondary analysis of the NLTS2 data focusing on predictors of postsecondary outcomes for individuals with ASD was conducted. The results of this study suggest that (a) academic achievement was a significant predictor of postsecondary educational success and overall success and (b) social skills were a significant predictor of all three postsecondary outcomes. Similar to findings in the existing literature, which indicate that academic achievement corresponds to participation in postsecondary education for typically developing students and students with disabilities (Garland et al., 2011; Stodden & Mzurek, 2010), the results of this study suggest that academic achievement was predictive of enrollment in and/or completion of a postsecondary educational program for individuals with ASD. This finding is also consistent with the results from Chiang et al. (2012); individuals with ASD who achieved higher academic achievement scores were more likely to enroll in or graduate from a postsecondary institution. Specifically, those with a greater likelihood of enrolling in or graduating from a postsecondary educational institution on average achieved academic scores in the average range compared to typical peers. These findings highlight the importance of continuing to support the academic needs among individuals with ASD in high school in order to facilitate successful transitioning to a postsecondary educational program.

It is important to note that the results of this study indicated a higher rate of participation in postsecondary education for individuals with ASD than previously reported in the existing literature. While the results from many studies together have suggested low rates of postsecondary educational participation for individuals with ASD, finding that less than half of participate in postsecondary education (Chiang et al., 2012; Shattuck et al., 2012), 62% of the sample in this study were either enrolled in or had graduated from a postsecondary institution. The higher percentage of postsecondary educational participation found in this study was likely due to the nature of our sample. Specifically, the sample of individuals with ASD in this study included only those who had appropriate skills to participate in academic achievement assessments and thus, likely represents students with ASD who were higher-functioning in general. In fact, descriptive statistics showed that our sample, on average, performed within the low average to average range academically in comparison to typically developing peers. Thus, these higher-functioning students with ASD were perhaps less likely to have cognitive deficits that are typically found in more severe cases of ASD and more likely to possess the appropriate intellectual abilities to pursue postsecondary education. This is consistent with what has been reported in the existing literature, which suggests that higher-functioning individuals with ASD are beginning to attend college or seek other postsecondary educational opportunities (Camarena & Sarigiani, 2009). Additionally, our definition of postsecondary educational success included participation in vocational education and/or training programs in addition to traditional two- and four-year institutions. When examining postsecondary outcomes for individuals with ASD, it is important to consider this broader definition of postsecondary educational success, as participating in vocational training programs becomes a viable option for students with and without disabilities alike. Ultimately, the higher rate of postsecondary educational success for higher-functioning individuals with ASD is reassuring, as it shows that these capable students are aspiring and beginning to participate in postsecondary education (Camarena & Sarigiani, 2009).

In addition to the encouraging rates of postsecondary educational participation, the individuals of ASD in this sample were engaged in studies across a variety of disciplines, including the arts, technology, healthcare, communications/entertainment, science, liberal arts, business, social sciences, engineering, clerical work, literature, and animal care. This finding is important because it suggests that individuals with ASD can pursue higher education in numerous different areas. This is contrary to the misconception that individuals with ASD are limited to certain subjects due to their...
social deficits. For example, some researchers recently noted that students with ASD chose to study science, technology, engineering, and math at higher rates than the general population of students (Wei, Yu, Shattuck, McCracken, & Blackorby, 2013); however, the results from this study suggest that individuals with ASD may actually be exploring a greater variety of educational opportunities.

Social skills were found to be a significant predictor of all three postsecondary outcomes for individuals with ASD in this study. These findings further contribute evidence to the existing literature suggesting that social skills predict postsecondary education and employment success for students with and without disabilities (Casner-Lotto & Barrington, 2006; Chiang et al., 2013; Dymnicki et al., 2013). In this study, students with better social skills were more likely to have been enrolled in or graduated from a postsecondary educational institution. On average, those with a greater probability of experiencing postsecondary educational success were rated as engaging in appropriate social skills more than just “sometimes.” These individuals perhaps possessed the appropriate social skills necessary for navigating the social environment of a postsecondary institution. For individuals with ASD who were not currently enrolled in a postsecondary institution, social skills also significantly predicted whether or not they obtained paid employment. Those with a greater likelihood of experiencing employment success were rated as engaging in appropriate social skills significantly more than “sometimes,” but not quite “always.” While academics is undoubtedly an important goal for schools and educators, these findings highlight the importance of continued social skills instruction for individuals with ASD, who may particularly need support in this area. It may be especially important to provide appropriate social skills support to students with ASD to ensure that they are learning to engage in social skills and interactions appropriately at a higher rate than just some of the time, as this may help increase their likelihood of participation in various postsecondary activities.

The low rate of postsecondary employment participation in this study is consistent with findings of low participation rates in previous studies (Shattuck et al., 2012). Additionally, individuals with ASD who were not currently enrolled in a postsecondary institution worked in a lesser variety of areas, such as material recording/scheduling/dispatching/distributing, food preparation/service industry, material moving, and building cleaning/pest control. There were extremely few to no individuals with ASD who worked in any other lines of work. These findings are inconsistent with those of Chiang et al. (2013), who found that more than half of individuals with ASD in general participated in a variety of jobs after high school graduation. The differences in our findings is again likely due to the nature of our sample and related analyses, which only included higher-functioning individuals who were not currently enrolled in a postsecondary institution. Thus, the findings of this study suggest that, for individuals who obtained paid employment without first enrolling in or completing a postsecondary education, the opportunities for paid work may be limited. These findings highlight the potential importance of pursuing postsecondary education prior to employment, especially for higher-functioning individuals with ASD who may be capable of doing so. Postsecondary educational experiences can increase individuals’ future employment opportunities in general (Stodden & Mruzek, 2010), and this may also be true for individuals with ASD. Participating in postsecondary education first may open more opportunities for higher-functioning individuals with ASD to pursue individual areas of interests and strengths and obtain future employment in a larger variety of areas.

Implications

The results of this study hold several implications for practice. The results highlight the imperativeness of improving the academic skills of students with ASD, especially higher-functioning students who are capable of participating in academics. It is important for educators to use effective instructional practices, in addition to continuing to educate students with ASD in the general education curriculum, in order to promote the academic growth of students with ASD. Explicit and direct instruction in academic skills has been shown to be effective for students with ASD (Bethune & Wood, 2013; Ganz & Flores, 2009;
Knight, Smith, Spooner, & Browder, 2011), and may be particularly important for putting students with ASD on track for successful postsecondary educational experiences. Academic achievement appears to predict later participation in postsecondary education, and students who performed in the average range academically experienced a greater likelihood of postsecondary success. The importance of providing appropriate social skills instruction to students with ASD, who may particularly benefit from support in this area, is also emphasized in the findings. Effective social skills instruction should be provided in order to ensure students with ASD learn the appropriate social skills necessary for navigating the social environment of a postsecondary educational institution or the workplace. Students who had a greater likelihood of experiencing postsecondary success were rated as engaging in appropriate social skills more than sometimes, and thus, it is crucial that students with ASD are provided with effective instruction to learn how to improve their social interaction skills. As both academic achievement and social skills appear to be important for postsecondary success, students with ASD may benefit from interventions and instructional strategies that target both of these skills. For instance, cooperative peer groups and peer-mediated learning are two instructional methods have been shown to increase both social interactions and academic performance in students with ASD (Dugan et al., 1995; Kamps, Barbetta, Leonard, & Delquadri, 1994). Finally, the results suggest the potential importance of postsecondary education for high-functioning students with ASD. It may be important for parents and educators to plan for students’ transitioning from high school to a postsecondary institution early and set related goals to encourage participation in postsecondary educational experiences, which can open greater opportunities for students to pursue their areas of strengths and interests.

Limitations and Future Directions

Although this study contributes valuable information regarding predictors of postsecondary outcomes for students with ASD, several limitations should be noted. First, although we developed our sample from a nationally-representative dataset, and our sample represents students with a variety of demographic characteristics, the specific sample of students with high-functioning autism included in our analysis were not necessarily representative of the nation as a whole. Additionally, the percentage of students meeting the criteria for independent living was too small to carry out the related analyses. Finally, using the data available, we were only able to examine the success of young adults with ASD within a few years of high school graduation. We considered those who were still enrolled in a postsecondary institution as successful, and so it remains unknown whether those students ultimately went on to secure successful employment opportunities in their chosen areas of study.

Future research should consider examining more specific predictors of postsecondary outcomes for students with ASD. For example, what specific social and academic skills may be particularly important for promoting postsecondary success for students with ASD? Additionally, future research should examine postsecondary outcomes for students with ASD across the spectrum. Students across the spectrum have a variety of skills and needs, so different skills may be important for postsecondary outcomes depending on the severity of ASD. The limited extent to which students with ASD appear to be living independently, which has been similarly identified in prior work (Anderson et al., 2014), is also an important area for additional investigation. Finally, although exploratory studies such as the one described here can provide an initial foundation of areas ripe for further exploration, controlled investigations are warranted to identify practices that support the transition experiences of students with ASD. Specific recommendations for controlled investigations have been highlighted in prior work (e.g., Wehman et al., 2014); the current study echoes the need for such investigations, particularly those focused on promoting social interaction and academic success.

References


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Parents’ Educational Expectations for Young Children with Autism Spectrum Disorder

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Abstract: Among typically developing children, many characteristics have been associated with parents’ expectations for their children’s adjustment to school and academic progress. Despite the history of increased parental involvement in the education of children with autism spectrum disorder (ASD) relative to parents of children without ASD, there is little research on the educational expectations that parents hold for their young children with ASD and how they are formed. In the current study, we addressed this gap by using a mixed methods design to examine the association between parents’ expectations for the level of success their children would achieve during the current school year, and multiple child-, parent/family-, and teacher/school-level factors, among parents of 4 to 7 year olds with ASD (N = 121). When these different factors were considered simultaneously, children’s externalizing behaviors, parents’ educational level, and parents’ employment status were found to be significantly associated with parents’ expectations of schooling.

Parents’ expectations for their children shape their parenting behaviors, and consequently, children’s self-concept, school adjustment, and academic outcomes (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). In fact, parents who hold high academic expectations have children who exhibit better school outcomes than might be anticipated based solely on their cognitive functioning or previous academic achievement (de Boer & van der Werf, 2015). Past research suggests that parents’ expectations may play a protective role in children’s academic achievement for children facing risk factors, such as economic disadvantage (Alexander, Entwistler, & Bedinger, 1994; Davis-Kean, 2005). However, despite the potentially influential role of parents’ expectations of schooling, very little attention has been placed on parents’ expectations for their young children with autism spectrum disorder (ASD) as they transition into early schooling. In the current study, we examined parents’ school-related expectations for their young children with ASD, as well as their child-, parent/family-, and teacher/school-level correlates. The intent was to identify areas where professionals might better understand and support parents of children with ASD adapting to school entry.

Ecological Systems Theory and School Adjustment

In examining the individual, family, and school contexts that relate to parents’ expectations of schooling and academic achievement for their children with ASD, Bronfenbrenner’s (1979) ecological model provides a useful guide (Eisenhower, Bush, & Blacher, 2015; Odom et al., 2004). Ecological systems theory suggests examining not only direct contextual influences, such as parents, school, and peers (microsystem), but also the effects...
of interactions between these contexts, such as parent-teacher communications and relationships (the mesosystem). More external factors also affect children’s experiences, including the special education service system (the exosystem), and broader, societal factors (e.g., laws such as the Individuals with Disabilities Education Act, 2004) that govern service provision (the macrosystem). Finally, developmental changes over time, for both the child and these systems, warrant consideration (the chronosystem). Overall, child, parent, teacher, classroom, school factors, and interactions among these systems are likely to influence school adjustment for young children with ASD (Pi-anta, 2010). The importance of considering the influence of multiple environmental and contextual factors in the lives of individuals with disabilities is reflected in the International Classification of Functioning, Disability and Health (WHO, 2001). Given our aim – to explore the educational expectations of parents who raise children with ASD – we do not seek to replicate Bronfenbrenner’s (1979) ecological model, but instead to examine how parents’ educational expectations may shape children’s school experiences, including the interactions that children have with teachers. This study will support a more in-depth understanding of the microsystem and the mesosystem for the children with ASD in our sample.

Parent Expectations for Typically Developing Children

Prior research with typically developing children has shown that child characteristics, such as greater intellectual ability, greater academic achievement, and more positive attitudes toward learning, are positively associated with parents’ educational expectations (Briley, Harden, & Tucker-Drob, 2014; Johnson, McGue, & Iacono, 2007; Sonuga-Barke, Stevenson, Thompson, Lamparelli, & Goldfoot, 1995). For example, Sonuga-Barke and colleagues (1995) found that parents held greater educational attainment expectations for children who showed more advanced cognitive abilities, and physical and behavioral self-regulation; these findings were evident for children as young as 3 years old.

Parent and family characteristics also have been associated with parents’ educational expectations among parents of typically developing children. For example, ethnic minority parents, and parents with less annual income and fewer years of education have reported lower and/or more misaligned expectations of schooling for their children than parents from more socio-economically advantaged backgrounds (Alexander et al., 1994; de Boer & van der Werf, 2015; Yamamoto & Holloway, 2010). Relatively less research has examined the impact of teacher and school characteristics (microsystem), parent-teacher relationships (mesosystem), and their associations on parents’ educational expectations. However, in a recent study by Lawrence (2015), parents’ income was found to moderate the relation between racial diversity within the school and parents’ educational expectations. Specifically, for lower income parents, expectations were higher when schools were more racially diverse; however, expectations were not correlated with racial diversity of the school for higher income parents. While this finding requires additional investigation, it does suggest that, to varying degrees, parents of typically developing children consider teacher- and school-level factors (e.g., student body characteristics) when forming expectations for their children’s schooling. Teacher- and school-level factors may be particularly relevant when a child has ASD, as parents may have particular concerns about classroom placement, teacher qualifications, or the amount of time the child interacts with typical peers during the school day (Tobin et al., 2012). For example, it may be the case that when parents believe that the school setting is a good match for their children’s needs and have confidence in teachers’ abilities, then they may be more optimistic and form more positive expectations for the school year ahead. Further, longitudinal studies among typically developing children have shown a positive, transactional relation between parents’ expectations and children’s academic performance, with parents’ expectations and academic achievement predicting increases in one another over time (Briley et al., 2014). Further research is needed to understand whether these patterns also exist for parents of children with ASD.
Parents’ Expectations for Children with ASD

While most research in this area has examined parents’ educational expectations for their typically developing children, a few studies have examined parents’ school-related expectations for their young children with ASD. Ivey and colleagues (2004) explored expectations of educational attainment, employment, and family life among 25 caregivers of children (4-20 years old) with ASD. In this study, parents identified both the importance of certain goals, and the likelihood that their children would achieve them. Parents rated attending school highly important and they viewed it likely that their children with ASD would do so. However, they rated “achieving the highest education possible” and “being successful in school” as important, yet less likely to occur.

In another study, Chiang and colleagues (2012) examined how parents’ expectations predicted postsecondary education for 830 adolescents with ASD. Parents’ expectations for their children to pursue postsecondary accounted for unique variance in students’ subsequent educational attainment, after accounting for variables such as children’s verbal skills, and the presence or absence of intellectual disability. Indeed, 78% of students who pursued postsecondary education had parents who expected that they would; 75% of those who did not pursue postsecondary education had parents who expected that they would not. These findings are consistent with those of many non-ASD studies: parents’ expectations were strong predictors of academic achievement.

There are important ways in which expectations may differ between parents of typically developing children and parents of those with ASD. Parents of children with ASD may face unique barriers that impede formation of positive expectations of schooling. Such barriers might include parents, teachers, and therapists having different goals and beliefs about what would be best for the child, which may impede the child from maximizing his or her academic potential (Parsons, Lewis, & Ellins, 2009; Russell, 2005). Parents’ and teachers’ expectations may differ in the extent to which they are achievable or realistic, given children’s current level of functioning; this contrast could lead to strained communications and goal-setting between parents and teachers. Similarly, parents may hold expectations that prioritize or emphasize different aspects of the child’s development, such as social or emotional development versus academically-focused expectations. Further, tensions may arise when parent expectations do not align with the services that are available or feasible within the school district (Russell, 2005), or when parents encounter difficulties communicating or sharing their perspectives with the educational team (Tucker & Schwartz, 2013).

On the other hand, parents of children with ASD, who have an Individualized Education Plan (IEP), are more likely to be actively involved in their children’s day-to-day educational experiences (e.g., engaging in consistent communication with the child’s teacher or therapists, attending conferences and meetings more frequently), as compared to parents of typically developing children, without an IEP (Wagner, Newman, Cameto, Javitz, & Valdes, 2012; Zablotsky, Boswell, & Smith, 2012). This regular involvement may provide parents with specific knowledge about their child’s capabilities, resulting in more alignment or specificity in parents’ expectations.

Research Questions

The current study is part of a multisite, longitudinal study on the educational experiences of early elementary age children with ASD, with the overarching goal of better understanding the factors that promote adaptation to formal schooling and positive school adjustment for this population. The focus here is on the following two research questions:

1. What types of school-related expectations do parents hold for their young children with ASD?
2. Which child-, parent/family-, and teacher/school-level factors are associated with parents’ educational expectations for their young children with ASD?

Method

Participants

Participants in the current study included triads of youth with ASD (n = 121, 83% male),
one parent per child ($n = 121$, 86% biological mothers), and one teacher per child ($n = 104$, participation rate = 86%). On average, children were 5 years, 8 months (range = 4–7 years) and parents were 38 years old (range = 24–52). Most of the children attended a public school (88%), and were in preschool (37%), kindergarten (31%) or first grade (25%). About half of the children were in small, special education classes (overall mean class size = 16) for 50% or more of the school day. Parents racially identified as White (69%), Latino (9%), Asian American (8%), multiracial (8%), Black (6%), and other races (1%), based on an open-ended item later aggregated into categories. Most parents were married (84%) and held at least a 4-year college degree (74%). Half of the families had annual incomes above $80,000, and 54% of parent respondents worked outside the home. Families were recruited through schools, autism clinics, and word of mouth in the northeastern United States (42%) and southern California (58%). Most teacher participants ($n = 104$) were White (77%) and female (87%), with a master’s degree or higher (66%). Teachers had an average of 13.8 years of teaching experience (range = 1–44).

Measures

Parents’ educational expectations. Each parent completed a 20–35 minute structured, qualitative interview with a trained research assistant, which focused on different aspects of children’s school adjustment (e.g., getting along with teachers, steps the parents and/or teacher had taken to prepare the child for the upcoming school year). Given the limited existing research on school adjustment among young children with ASD, a structured interview script was developed specifically for the current study and a qualitative, phenomenological approach to understanding parents’ perceptions of their child’s educational experiences was employed. During the interview, the following question was presented to all participants: “How do you think your child will do this year in school?” The aim of this question was to explore parents’ schooling expectations for their child in an intentionally broad manner, in order to capture the full range of expectations that they might hold. The interview did not ask specifically about academic versus other types of expectations (e.g., social, behavioral), with the understanding that some parents might emphasize some domains more so than others. If parents did not discuss the presence of characteristics or experiences that might make school easier or more challenging in their initial response, then they were asked specific follow-up questions about these. A detailed manual was developed for the current study, and a coding team listened to recordings of parents’ responses and coded each one on a 4-point scale, reflecting the level of success anticipated for the child. The codes included: 4 = “successful”, 3 = “mostly successful”, 2 = “somewhat successful”, and 1 = “not at all successful” (see Table 2 for further explanation of each code and example quotes from parents). The coding team consensus-coded 20% of the interviews ($n = 25$) and achieved inter-rater reliability of 88%.

Child behavior problems. The parent-reported Child Behavior Checklist ages 1.5–5 and the Child Behavior Checklist ages 6–18 (CBCL; Achenbach & Rescorla, 2000, 2001), depending on the age of the child, were used to assess children’s behavior problems. Items present child problems alphabetically (from “aches and pains without medical cause” to “worries”), parents are asked to rate whether each problem was not true, somewhat or sometimes true, or very true or often true for their child over the past two months. The measures yield broadband Internalizing and Externalizing T scores ($M = 50$, $SD = 10$), with higher scores indicating higher levels of symptomatology. The CBCL has demonstrated excellent validity and both total and broadband scores are correlated with other measures of behavior problems (Achenbach & Rescorla, 2000). In the current study, Cronbach’s alphas ranged from .82 to .91.

Child social skills. The parent-reported Social Skills Improvement System-Rating Scales (SSIS-RS; Gresham & Elliott, 2008) was administered to assess children’s social skills. On the SSIS-RS, respondents rate the frequency of behaviorally specified social skills on a 4-point scale of never, seldom, often, and almost always. The scale yields scores that can be converted to standard scores ($M = 100$; $SD = 15$); children’s total standard scores were analyzed in the cur-
rent study. On this measure, higher scores indicated higher levels of social skills. The total standardized score was chosen as it has demonstrated high internal consistency, strong construct validity, good test-retest reliability, and good convergent validity (Gresham & Elliott, 2008). Versions of the SSIS-RS have been used to assess social functioning in children with autism (Frankel, Myatt, & Feinberg, 2007) and intellectual disabilities (Neece & Baker, 2008). In the current sample, Cronbach’s alpha was .85.

**Children’s ASD symptoms.** To assess ASD symptomatology, parents completed the Social Responsiveness Scale (SRS; Constantino & Gruber, 2005). The 65-item SRS assesses receptive, cognitive, expressive, and motivational aspects of social behavior, as well as autistic preoccupations. The SRS total T score (\(M = 50; SD = 10\)) distinguishes children with ASD from children with and without different psychological disorders (Constantino, Przybeck, Friesen, & Todd, 2000). A high score on this measure indicates greater autism symptomatology, or less social responsiveness. In the current sample, Cronbach’s alpha was .88.

**Child language skills.** To assess language skills, children were administered the Comprehensive Assessment of Spoken Language (CASL-2; Carrow-Woolfolk, 1999), a performance-based, standardized assessment of language for individuals 3–21 years old. All child participants completed the Syntax Construction and Pragmatic Judgment subtests; higher scores indicate greater language skills. The CASL-2 has demonstrated good construct validity and strong reliabilities of .90 and higher (Carrow-Woolfolk, 1999). The measure has been widely used among children with autism, as well as children with language delays, aphasia, and intellectual disabilities (e.g., Reichow, Salmack, Paul, Volkmar, & Klin, 2008); its inclusion of verbal and nonverbal responses, independent of reading and writing, is also advantageous.

**Child literacy skills.** Children were administered the following subtests of the Woodcock-Johnson III Normative Update Tests of Achievement (Woodcock, McGrew, & Mather, 2007), each of which was selected to assess a central aspect of literacy: Letter-Word Identification (letter and word knowledge), Word Attack (phonics), and Picture Vocabulary (vocabulary). On these subtests, higher scores indicate greater skills. In the standardization sample, reliability of individual subtests ranged from .74 to .94. The WJ-III has strong test-retest reliability and adequate validity with young children (Woodcock et al., 2007), and has been used with children with ASD (e.g., Newman et al., 2007).

**Demographics.** Background information was obtained through parent- and teacher-report surveys. Variables included parent age in years (continuous), parent education level (ordinal), parent employment (ordinal; full-time/part-time/not employed), household income (ordinal), teacher education level (ordinal), years of teaching experience (continuous), classroom size (continuous; number of students), and the percentage of time the target child spent in the general education classroom (ordinal).

**Parent-teacher interactions.** Parents’ perceptions of their interactions and relationships with their children’s teachers were measured using modified versions of the parental school involvement subscale (16 items) and the parent-teacher relationship subscale (9 items) of the Parent-Teacher Involvement Questionnaire: Parent (PTIQ-P; Corrigan, 2002; NICHD, 2005). Items on the parental school involvement subscale assessed how frequently the parent initiated or received different types of contact from the child’s school or teacher (e.g., “I receive a written report on my child’s progress or activities”), while items on the parent-teacher relationship subscale assessed the parent’s feelings about their interactions, communications, and relationship specifically with the teacher (e.g., “I feel comfortable talking with my child’s teacher”). On these subscales, higher scores indicate higher levels of parental school involvement and perceptions of the parent-teacher relationship, respectively. The PTIQ-P has shown good predictive validity with measures of child academic engagement and student-teacher relationship quality in young children, and has distinguished between high- and low-risk families (Corrigan, 2002). In the current sample, Cronbach’s alpha was .60 for the involvement subscale and .94 for the relationship subscale. The relatively low alpha for the involvement subscale is consistent with a technical report published by the NICHD (Corrigan, 2002).
and it likely reflects the fact that it included items reflecting both parents’ behaviors (e.g., asking the teacher questions about one’s child), and teacher and school practices that are not under parental control or that parents may not know as much about (despite receiving a written report about the child’s daily activities, or a log entry).

Procedure

Participants were drawn from a multi-site, longitudinal study of school adaptation among children with ASD. At an initial visit at study offices, children were assessed for eligibility with the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) and a brief battery of Wechsler Preschool and Primary Scale of Intelligence, 3rd Edition (WPPSI-III; Wechsler, 2002). This battery included the Matrix Reasoning, Vocabulary, and Picture Completion subtests, which has demonstrated high reliability and convergent validity with the complete WPPSI-III (Sattler, 2008). Eligible participants were those who (a) scored in the autism or autism spectrum range on the ADOS, (b) had received a previous diagnosis of ASD from an out-of-school clinician or also scored in the autism or autism spectrum range on the Autism Diagnostic Interview – Revised (ADI-R; Lord, Rutter, & LeCoulter, 1994), (c) earned an estimated IQ score of 50 or higher on the abbreviated WPPSI-III battery, and (d) were ages 4 to 7 years and entering elementary school or their final year of pre-K. Participating child and parent dyads returned to study offices for additional data collection after the eligibility visit; parents were also given a questionnaire packet for the child’s teacher to complete and mail back to the study offices. Although this was a multi-wave study, data presented here were from the first time point following the eligibility visit. Informed consents were obtained from all parents and teachers included in the study, and they received an honorarium for their participation. IRB approval was obtained for all aspects of the study.

Data Analyses

Analyses were performed with SPSS 22.0. Parent interview data were complete for all 121 participants, and less than 5% were missing for parent-report questionnaires and child assessment measures. Teacher-report data were missing for 23% of the sample. Results of Little’s Missing Completely at Random (MCAR) Test suggested that data were missing completely at random $[\chi^2 (10, N = 85–93) = 6.39, p = .78]$. Thus, to avoid the loss of statistical power associated with listwise deletion of missing teacher data, multiple imputation was applied in five iterations to estimate continuous missing values on the scale level.

Results

Descriptive Analyses of Parents’ Educational Expectations

Qualitative analysis of parents’ interview responses showed that 17% of parents expressed wholly positive expectations, with no concerns for the school year ahead (code = 4, “successful”). These parents believed that their children would succeed in school and discussed only positive factors, such as children’s reading ability or comprehensive supports provided through the IEP. The largest percentage of parents (48%) expressed mostly positive expectations, but also one or two concerns about the upcoming school year (code = 3, “mostly successful”). Frequently, these parents discussed relatively strong academic skills and relatively weak social skills, as well as one or two issues (e.g., a problem behavior) that could cause challenges at school. Some parents (29%) had mostly negative expectations, citing three or more concerns, but still expressed some guarded optimism and hope (code = 2, “somewhat successful”). These parents often expressed concerns about the greater school environment, including children’s educational team members whom they felt were not meeting their responsibilities, or accommodations in the IEP that were not being provided. Six percent of parents had wholly negative expectations and did not identify any positive, hopeful, or protective factors that could help their children adjust to school (code = 1, “not at all successful”). Thus, about a third of parents had negative expectations about their child’s performance and experience in school (see Table 1).
Factors Associated with Parents’ Educational Expectations

Child-level factors. Higher parent educational expectations were associated with lower levels of parent-reported internalizing problems \( r_s(119) = -.24, p = .01 \), externalizing problems \( r_s(119) = -.34, p < .001 \), ASD symptoms \( r_s(119) = -.29, p < .01 \), and marginally with children’s age \( r_s(119) = -.20, p = .06 \). Higher parents’ expectations also were associated with emerging reading skills \( r_s(119) = .24, p < .01 \) and phonics skills \( r_s(119) = .19, p = .04 \), and marginally with greater social skills \( r_s(119) = .18, p = .06 \). Parents’ expectations were not associated with child gender, IQ, or language skills (pragmatic language, syntactical language skills, or vocabulary; see Table 2).

Parent- and family-level factors. Higher parent educational expectations were associated with higher levels of parental education \( r_s(119) = .19, p = .04 \). Male parents were observed to hold higher expectations than female parents \( t(119) = 2.19, p = .03 \), but since the vast majority of parent participants were female, this finding should be interpreted with caution. Parent expectations were not associated with employment status or household income.

Table 1: Parents’ Qualitative Responses Regarding Educational Expectations (N = 121)

<table>
<thead>
<tr>
<th>Code</th>
<th>Interpretation</th>
<th>% of sample</th>
<th>Illustrative quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>“successful” = parents exhibited only positive expectations about their child’s schooling</td>
<td>17</td>
<td>“I think he’s going to nail kindergarten. He already is. The teacher told my nanny that she’s never given so many awards to a kid before, and that was in mid-October... the academics of kindergarten, he’s already well above where he should be.”</td>
</tr>
<tr>
<td>3</td>
<td>“mostly successful” = parents exhibited mainly positive expectations about their child’s schooling, but also discussed 1–2 concerns</td>
<td>48</td>
<td>“I feel he’s always done well and will this year also. I think. He thrives in that constant-type school schedule ... understanding how to behave in school, he’s doing very well. He’s thriving in that kind of structured environment... in all things except straight academics, first-grader level-type stuff, I think he’s going to do well this year. Of course, that’s part of an IEP, whatever level he’s academically. We don’t really have expectations about [academics].”</td>
</tr>
<tr>
<td>2</td>
<td>“somewhat successful” = parents exhibited mainly negative expectations for their child’s schooling, citing 3 or more concerns, but also expressed guarded optimism and hope</td>
<td>29</td>
<td>“Academically, I think he’s going to be able to stay on track... however, I have worries that he’s just not going to be able to work independently enough to function well in a class. Again, I think he’s very immature. It really worries me that he might not fit in with the other kids who are at first-grade mentality. I think socially he’s going to really, really struggle.”</td>
</tr>
<tr>
<td>1</td>
<td>“not at all successful” = parents exhibited wholly negative expectations and had difficulty identifying any positive, hopeful, or protective factors</td>
<td>6</td>
<td>“I don’t know. He’s going to have a hard time. We already had a meeting because he’s not doing well transitioning and has been refusing to go to school. So, I’m worried he’s not going to do well this year.”</td>
</tr>
</tbody>
</table>

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expectations, parents held higher expectations when they experienced a positive relationship with their child’s teacher; their expectations were slightly lower when their children were attending larger classes. Parents’ expectations were not associated with teacher education level, years of teaching experience, amount of time the child spends in general education, or level of parental school involvement.

Regression Analyses

In the final set of analyses, the child-, parent/family-, and teacher/school-level factors found to be significantly correlated with parents’ expectations were entered as predictors into a binary logistic regression. Given the ordinal nature of the parent expectation variable, it was dichotomized (codes of 3 and 4 = “higher expectations”, codes of 1 and 2 = “lower expectations”) before being entered as the dependent variable. The logistic regression contained three steps. Child-level factors including internalizing behavior, externalizing behavior, ASD symptoms, emerging reading skills, and vocabulary skills were entered in the first step. While phonics skills also were significantly correlated with parents’ expectations, phonics skills and emerging reading skills were very highly correlated with each other \( r (119) = .79, p < .001 \) and to avoid multicollinearity, the phonics skills variable was excluded from the model. A parent/family-level factor, parents’ education, was entered in the second step. Finally, a teacher/school-level factor, parent-teacher relationship quality, was entered in the third step. When these factors were considered simultaneously, only externalizing behavior \( B = -.09, SE = .03, OR = .91, p < .01 \) significantly predicted parents’ expectations (see Table 3). Specifically, parents with children who exhibited fewer challenging behaviors reported more positive expectations for the school year ahead, as compared to parents with children who exhibited more behavior problems.

Discussion

Many parents of children with ASD were optimistic about the school year ahead, with the majority expressing mostly positive expectations and only mild concerns (48%), and some expressing wholly positive expectations and no concerns at all (17%). These generally positive expectations were consistent with Ivey’s (2004) findings and may set an early, positive tone for interactions among students,
parents, and teachers. Although about a third of parents did express negative views, our findings suggest that negative expectations are relatively less common among parents of young children with ASD. Thus, when school professionals do encounter parents with low expectations, they should try to understand and address the reasons why parents might be feeling less optimistic. Based on the assumption that parents’ expectations may play an important role for typically developing children and children with ASD alike, it is important to understand and address the barriers to parents holding positive educational expectations for their children with ASD. Specifically, the current study revealed that parents held low expectations for their children’s school outcomes when their children exhibited externalizing behavior problems. Although this study was correlational and could not address causality, this finding suggests that early intervention providers would particularly benefit from training in addressing challenging behaviors and in coaching parents to respond to these behaviors themselves. Conversely, it is possible that children’s externalizing behaviors are interfering with success in school and indirectly affecting parents’ expectations, thus underscoring the importance of supporting teachers to address challenging behaviors in the classroom.

Unique to the current study was the extent to which children’s behavioral characteristics and ASD symptoms were associated with parents’ expectations. Indeed, when other factors were accounted for, children’s externalizing problems were the sole predictor of parents’ educational expectations. Surprisingly, parents’ educational expectations were uncorrelated with children’s intelligence or estimated IQ – a departure from the findings of some previous non-ASD studies (e.g., Johnson et al., 2007; Sonuga-Barke et al., 1995). Behavioral development and adjustment are areas of need for many children with ASD; as such, these areas are more salient on a day-to-day basis and likely more closely reflected in parents’ expectations than IQ or academic factors. Another paper with the same sample as the current study indicated that behavioral challenges, more so than intellectual challenges, accounted for difficulties with school adjustment (citation removed for anonymous peer review). The current findings reflect the factors that may help to align IEP goals and expectations between parents and teachers. Additionally, this understanding may help teachers and parents shape behavioral and socio-emotional curriculum development in the classroom.

In addition to child-level characteristics, some relations were observed between par-

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### TABLE 3

#### Summary of Binary Logistic Regression Analysis for Child-, Parent/Family-, and Teacher/School-Level Variables Predicting Parents’ Expectations

<table>
<thead>
<tr>
<th>Step 1: Child-level factors</th>
<th>B</th>
<th>SE</th>
<th>Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalizing behavior</td>
<td>.02</td>
<td>.03</td>
<td>1.02</td>
</tr>
<tr>
<td>Externalizing behavior</td>
<td>-.09**</td>
<td>.03</td>
<td>.91</td>
</tr>
<tr>
<td>ASD symptoms</td>
<td>-.03</td>
<td>.03</td>
<td>.98</td>
</tr>
<tr>
<td>Emerging reading skills</td>
<td>.02</td>
<td>.02</td>
<td>1.02</td>
</tr>
<tr>
<td>Vocabulary skills</td>
<td>.00</td>
<td>.02</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Parent/family-level factor</th>
<th>Parent education</th>
</tr>
</thead>
<tbody>
<tr>
<td>High school or less</td>
<td>1.23, 1.11, 3.44</td>
</tr>
<tr>
<td>Some college</td>
<td>.39, .93, 1.47</td>
</tr>
<tr>
<td>College degree</td>
<td>-.19, .87, .83</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>.02, .91, 1.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3: Teacher/school-level factor</th>
<th>Parent-teacher relationship quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.03, .03, 1.03</td>
</tr>
</tbody>
</table>

Note. *** p < .001. ** p < .01. * p < .05. † p < .10. This table reflects imputed data.
ents’ expectations and parent/family-level factors and teacher/school-level factors. Within Bronfenbrenner’s (1979) microsystem, parents who reported higher educational levels held more positive expectations for their children’s schooling than parents who reported lower educational levels. Within Bronfenbrenner’s (1979) mesosystem, parents who reported a positive or higher relationship quality with their child’s teacher also reported higher academic expectations, compared to parents who reported a negative or lower relationship quality with their child’s teacher. Parents’ positive reports of the parent-teacher relationship may indicate a strong working relationship with the teacher, a belief in the teacher’s capabilities to meet the needs of their child, and parents’ active involvement in school—all factors, logically, that could increase parents’ academic expectations. Interestingly, parents’ perceptions of parent-teacher relationship quality were significantly correlated with their expectations for the school year, while parents’ self-reported involvement with the school was not. Similar to our findings, Zablotsky and colleagues (2012) found that parents’ level of school involvement was uncorrelated with their overall satisfaction with the school among parents of children with ASD. These findings suggest that it is important to consider the nature and quality of parents’ interactions with their child’s teacher and school—not just the quantity—when examining the relation between parental school involvement and their feelings about their child’s school experiences.

**Strengths and Limitations**

The current study contains multiple methodological strengths, including a large sample recruited from the community, the use of the ADOS to verify ASD diagnosis among child participants, and the efforts of a coding team, which achieved high inter-rater reliability, to code qualitative interview data. The current study also benefited from a high rate of teacher participation. While children’s level of cognitive functioning was not found to be significantly correlated with parents’ expectations, the inclusion of children with a range of cognitive abilities increases the external validity and applicability of our work. Further, the majority of our child participants attended public schools, thus reflecting the educational experiences of the majority of young children with ASD in the United States.

It is likewise important to note that current findings may not generalize to the school experiences of children with ASD and moderate-to-severe intellectual disability. Also, many participating families were economically resourced. While household income was not found to be significantly correlated with parents’ expectations, our findings may not capture the experiences of economically disadvantaged parents of children with ASD. As is the case with all interview data, there is the possibility of social desirability effects, or that parents may have overemphasized the extent to which they felt positive about school. Also as noted, the correlational nature of the current study cannot speak to causality or to transactional relations. Specifically, it is uncertain whether parents held high expectations for their children because they noticed children’s strengths, whether children developed greater strengths in response to their parents’ positive expectations, or whether there were unmeasured variables that influenced both expectations and child outcomes.

An important area for future investigation is whether parents’ expectations play a unique role in predicting later school adjustment and academic outcomes for children with ASD, as they may for typically developing children (e.g., de Boer & van der Werf, 2015). Increased understanding of parents’ expectations, and the different factors they consider when forming these expectations, may ultimately inform supports for parents as they navigate schooling for their child with ASD.

**References**


other disabilities from an online survey. *European Journal of Special Needs Education*, 24, 37–58. doi: http://dx.doi.org/10.1080/08856250802596790


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Educational Outcomes for Secondary Students with Mild Intellectual Disability

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Abstract: Attention to the educational programming of secondary students with mild intellectual disability has declined in recent decades, although the need for the attention has not, particularly when considering the postschool outcomes of this population. This paper discusses the current state postschool outcomes and secondary education services for students with mild intellectual disability. It then provides a proposed vision for the educational programming of secondary students with mild intellectual disability to improve those postschool outcomes.

Students with mild intellectual disability represent a unique population of students with disabilities. It is a population typically defined by an IQ between 55 and 70 and with impairments in adaptive skills, such as daily living, social skills, and communication (Schalock et al., 2010). However, too often, students with mild intellectual disability are inappropriately aggregated with students with moderate intellectual disability and/or students with other high incidence or “mild” disability categories (e.g., learning disability) in research and practice (Polloway, 2004, 2005, 2006; Sabornie, Evans, & Cullinan, 2006). In support for the disaggregation of data and practices for students with mild intellectual disability, Bouck and Satsangi (2015) found secondary students with mild intellectual disability were qualitatively and quantitatively different that students with other disabilities, such as students with moderate/severe intellectual disability, students with learning disabilities, and students with other high-incidence disabilities more generally.

Attention to research regarding students with mild intellectual disability has declined; subsequently, researchers are also concerned about the declining identification of students with mild intellectual disability, although they still comprise the majority of students with intellectual disability (Bouck, 2004, 2007; Edgar, 1987; Gargiulo, 2015). The decline of attention in research and practice prompted some scholars to call for the eulogy for the category of mild intellectual disability within the school system (Polloway, 2004, 2005, 2006), or to refer to this population as the “forgotten generation” (Fujiura, 2003). Despite the decline, the specific educational needs, experiences, and outcomes of students with mild intellectual disability are important and should be considered distinct from other categories of students with disabilities.

This paper will discuss the current state of postschool outcomes for students with mild intellectual disability. It will also discuss the current state of educational experiences for this population, which are hypothesized to be impacting the outcomes. Finally, the paper will end with a vision for moving toward crafting educational experiences to, in theory and supported by research-based practices, improve the postschool outcomes of students with mild intellectual disability.

Postschool Outcomes

When considering postschool outcomes of students with disabilities, researchers typically discuss the big three: employment, postsecondary education, and independent living (c.f., Simonsen & Neubert, 2012). These three are also considered typical in the transition to
adulthood for all individuals in general (Hendricks & Wehman, 2009). However, post-school outcomes are more nuanced than the broad-sweeping categories. When examining employment as a post-school outcome, researchers generally examine whether a student is working in a paid job as well as aspects such as working full time (vs. part time) and hourly wages (or salary). There is also attention to employment in terms of competitive employment, in contrast to supported or sheltered employment (Krainski, 2013a, 2013b; Wehman & Targett, 2013). For postsecondary education, participation in two-year (i.e., community college), four-year, or vocational/technical programs is generally examined. However, an important post-school outcome relative to postsecondary education is also successful obtainment. In other words, did the student who participated – or attended – a postsecondary education program earn a diploma, certificate, or other metric for successful completion (Plotner & Marshall, 2015)? Finally, in terms of independent living, researchers generally examine whether a student is living on his or her own, with a roommate, or spouse/partner, in contrast to living with one’s parents, other family member, or in a more supported residential environment (e.g., group home) (Anderson, Shattuck, Cooper, Roux, & Wagner, 2015).

The current – or most recent – data on post-school outcomes for students with mild intellectual disability suggest that there is room for improvement. Bouck (2014), from a secondary analysis of the National Longitudinal Transition Study-2 (NLTS2), reported that students with mild intellectual disability were employed at the time of data collection (i.e., survey) at rates less than 50% for all time points examined – within two, four, and six years of exiting high school. Less than 75% of individuals with mild intellectual disability were ever employed across these time periods as well. In other words, the secondary analysis by Bouck (2014) suggested that – at a minimum – 25% of individuals with mild intellectual disability never held a paid job after school exit. While Bouck (2014) found the majority of students with mild intellectual disability were working full time, about one-third were only working part-time. On a positive note, however, the majority were earning above minimum wage when employed.

The postsecondary education outcomes of students with mild intellectual disability are less positive than employment outcomes. Bouck (2014) reported that less than 25% of students with mild intellectual disability reported attending community college across the three time periods examined – within two, four, and six years of exiting high school. A lower frequency of students reported attending a vocational or technical program (less than 15%) and a still lower frequency a four-year college (less than 6%). Of those that reported attending a community college or vocational/technical program, less than 50% indicated they earned a diploma. Finally, with respect to independent living, less than 33% of students reported living independent within any of the time ranges (Bouck, 2014). The data suggest room for improvement in the postschool outcomes of students with mild intellectual disability.

Educational Experiences

The current state of educational experiences for students with mild intellectual disability, when considering curriculum and instruction, is generally focused or split along two camps: a functional curriculum and an academic curriculum (Bouck, 2012b). However, as will be discussed later in this article, these two do not need to be at odds but can – and should – work in combination; there is a framework for embedding functional curricula and an academic curricula together, which will be discussed later in the article (Bouck, Taber-Doughty, & Savage, 2015; Collins, 2012; Collins, Hager, & Galloway, 2011; Karl, Collins, Hager, & Ault, 2013). A functional curriculum refers to a curriculum designed to deliver the skills needed to be as independent as possible in work, life, and community participation (Brown et al., 1979; Falvey, 1989; Snell & Browder, 1987). A functional curriculum is focused on developing independence in real-world setting and with real-world skills (Bouck et al., 2015). Typically, a functional curriculum is presumed to include the following components: functional academics, financial skills, daily living, transportation, vocational education, community access, independent living,
social skills and relationships, and self-determination (Patton, Cronin, & Jairrels, 1997). An academic curriculum involves teaching core content area instruction and is typically focused on standards-based instruction (Bouck, 2012b; Wehmeyer, Lattin, & Agran, 2001). Often an academic curriculum is equated with the general education curriculum (Bouck, 2012b).

Historically, a functional curriculum was commonly used to educate students with intellectual disability (Bouck, 2009). However, over the past few decades a decline in attention in research and practice with a functional curriculum occurred (Alwell & Cobb, 2009; Billingsley, 1997; Browder, Spooner, Wakeman, Trela, & Baker, 2006; Nietupski, Hamre-Nietupski, Curtin, & Shrikanth, 1997). While not systemically explored, the decline in attention to a functional curriculum corresponds to an increase in the accountability system for all students, students with mild intellectual disability participating in standardized large-scale assessments, and a greater focus on inclusive education (Ayres, Lowrey, Douglas, & Sievers, 2011; Billingsley & Albertson, 1999; Bouck, 2012b).

Since the reauthorization of the Elementary and Secondary Education Act in 2001 – referred to as No Child Left Behind – there has been increased emphasis on all students participating in standardized assessments (Perner, 2007; Yell & Drasgow, 2005). For students with mild intellectual disability participation in the accountability system has typically meant the general large-scale assessment with accommodations or an alternate assessment based on modified achievement standards (AA-MAS), in those states that offered an AA-MAS (Perner, 2007; The Center on Standards & Assessment Implementation and National Center on Educational Outcomes, 2014). Going forward, however, the federal government suspended the offering of AA-MAS, under the presumption that the new assessments – such as the Partnership for Assessment of Readiness for College and Careers (PARCC) and the Smarter Balanced Assessment Consortium – were more encompassing of all students and hence that form of alternate assessment was no longer needed (National Center on Educational Outcomes, 2014; The Center on Standards & Assessment Implementation and National Center on Educational Outcomes, 2014).

With students with mild intellectual disability presumably taking the general large-scale assessment with accommodations – and other options ceasing to be available (i.e., AA-MAS), the importance of access to academic curriculum is inflated and will continued to be so. Yet, it inappropriate and unfair to ask students to take a test (e.g., the general large-scale assessment) for which they have not received instruction (e.g., academic instruction) (Kurz, Talapatra, & Roach, 2012). In other words, if students with mild intellectual disability are to take the general large-scale assessment, it is important that they have access to the curriculum or content on such tests (Bouck, 2007, 2009). In education, students without disabilities are not routinely tested on content they have not learned, and students with mild intellectual disability deserve no less. Yet, what test a student must take should not drive their educational experiences. For students with mild intellectual disability, this form of teaching to the test is incredibly high stakes – a decrease in attention to functional life skills (including potentially vocational education), which can be authentic content to their future adult life experiences (Ferretti & Eisenman, 2010). It is apparent that students with mild intellectual disability and their educators are essentially caught in a catch-22 situation. The students need to be provided an opportunity to learn what they are going to be tested on (presuming that the majority of students with mild intellectual disability will take the general large-scale assessment with accommodations), but a total focus on academics can decrease or negate opportunities to learn life skills while in school.

Aside from the philosophical debate of a functional curriculum versus an academic curriculum, it is important to explore the research base regarding each curriculum. One means of determining the research base for each curricular approach is through systematic reviews. Bouck and Flanagan (2010) conducted a systematic review of the literature on use of components of a functional curriculum for educating secondary students with mild intellectual disability. The systematic review, which spanned 1994 to 2009, located seven articles. The seven articles focused on differ-
ent aspects of a functional curriculum, including cooking, safety, and leisure. In all articles, the students improved in the skill targeted. In other words, receipt of a component of a functional curriculum improved outcomes, when considering skill attainment or learning. To date, a comprehensive systematic review of an academic curriculum for secondary students with mild intellectual disability approach does not exist. However, a systematic review regarding mathematics instruction for students with mild intellectual disability was conducted, although it involves elementary and secondary students (Hord & Bouck, 2012). Hord and Bouck (2012) found seven articles focused on students with mild intellectual disability and mathematics instruction published between 1999 and 2010; six of the seven were focused on secondary students. Of those seven articles, six were focused on procedural aspects of mathematics, rather than higher-order mathematics or conceptual understanding of mathematics education. Hence, while focused on academic instruction, the research on mathematics and students with mild intellectual disability suggests a heavy emphasis on lower level skills.

Limited research also exists that compares the receipt of the two curricular approaches for educating secondary students with mild intellectual disability. Bouck and Joshi (2012) conducted a secondary data analysis of the NLTS2 to explore the impact of curriculum on the postschool outcomes of students with mild intellectual disability. Using a logistic regression model as well as comparing the postschool outcomes of students with mild intellectual disability on the basis of secondary curriculum received – functional or academic – Bouck and Joshi (2012) found curriculum did not impact any of the postschool outcomes examined. In other words, the curriculum (functional vs. academic) received by secondary students with mild intellectual disability was not a predictor variable in the logistic regression model for whether students were currently employed (at the time of data collection), ever employed since exiting high school, working full time, earning more than minimum wage, attending any form of postsecondary education, or living independently. The authors also found no statistically significant differences in the postschool outcomes of students who received a functional curriculum and students who received an academic curriculum. The lack of statistically significant differences in curriculum in terms of outcomes can lead to questions if high school curriculum matters for adult life success.

A Vision for Educational Experiences

Given room to improve the postschool outcomes of students with mild intellectual disability and the lack of clear, explicit direction for the best educational experiences for secondary students with mild intellectual disability, a vision for the future direction of educating secondary students with mild intellectual disability remains open for suggestion. The following section of the paper will present such a vision.

The first important element in the proposed vision for the educational experiences for secondary students with mild intellectual disability is attention. The education of secondary students with mild intellectual disability needs more attention. As previously noted, a decline in attention in research and practice occurred for this population. Yet, it is still a population that comprises the majority of students with intellectual disability (Bouck, 2012a; Gargiulo, 2015). The educational experiences of students with mild intellectual disability deserve no less attention than the education of students with any other disability or the education of students without disabilities (Bouck, 2007).

Attention can be heightened via multiple ways and means. For one, more researchers need to conduct research on the educational experiences and outcomes of students with mild intellectual disability, or – at the very least – disaggregate research results for students with mild intellectual disability from those of students with moderate/severe disabilities or learning disabilities. Second, the stigma of identifying students with mild intellectual disability needs to be removed so educational researchers and practitioners can easily and accurately describe the educational experiences and outcomes of this population. Finally, the field of teacher preparation can evaluate and change how it prepares future teachers for educating students with mild intellectual disability, including explicit atten-
tion to this population and their educational needs in methods classes. As an example, multiple methods textbooks exist for teaching students with severe or moderate and severe disabilities (e.g., Brown, McDonnell, & Snell, 2016; Collins, 2012) as well as students with mild or high-incidence disabilities (e.g., Polloway, Patton, Serna, & Bailey, 2013; Vaughn & Bos, 2015), but little attention is paid to the education of students with mild intellectual disability in either of these types of textbooks and hence, potentially, in class.

The second important element in the proposed vision for the educational experiences for secondary students with mild intellectual disability involves changing the perspective and conversation regarding the curriculum for these students (e.g., functional curriculum and academic curriculum). Curricular decisions for secondary students with mild intellectual disability should not be viewed as a one-or-the-other situation (Ayres et al., 2011). Rather, the field should view a functional curriculum and an academic curriculum as two ends of a spectrum (Bouck et al., 2015). Secondary students with mild intellectual disability can benefit from receiving both curricular approaches and both can be used to support the postschool success – or educational outcomes – of this population.

Pulling from the work by Collins and colleagues and others (Bouck, 2012; Collins et al., 2011; Collins, Karl, Riggs, Galloway, & Hager, 2010; Kleinert, Collins, Wickham, Riggs, & Hager, 2010), educators should seek to embed a functional curriculum within an academic curriculum and vice versa. In other words, for secondary students with mild intellectual disability who are primarily taught with an academic curriculum, educators should work to embed – or infuse – functional curriculum elements or components within the academic instruction. And vice versa – educators of secondary students with mild intellectual disability who are primarily taught using a functional curriculum should embed academic instructional elements within the functional curriculum (Bouck et al., 2015; Collins, 2012; Collins et al., 2010; Karl et al., 2013).

As a concrete example for embedding functional skills within academics consider the context of mathematics. A high school Common Core math standard is to “understand solving equations as a process of reasoning and explain the reasoning” (Common Core State Standards Initiative, 2016, p. 65). From a life skills functional perspective, budgeting and price comparison situations can be envisioned as simple equations in which students must explain how to solve and construct a viable argument to justify their solution, such as selecting a lower priced item. For example, when considering if it is more economic to purchase a 12-pack of pop for $4.99 or a 24-pack of paper for $8.99, a teacher could help explain how they would solve and what the solution would be. The teacher, in helping the students – who would be allowed to use a calculator – would also discuss how price comparison is one, abet important, aspects of making purchasing decisions and how price comparison fits into budget planning. The students are receiving access to the general education curriculum and standards, but connecting the content to important functional curriculum elements.

In converse, academic content – and standards – can be implemented in functional activities. Karl et al. (2013) discussed how to embed mathematics, science, and reading standards within a functional cooking activity to secondary students with intellectual disability. In another example, Miller (2012) discussed how teachers could integrate academics into functional skills, such as connecting oral hygiene and its products to aspects of physical science. In a final example, in teaching a unit on social skills – an important functional curriculum component that impacts in-school and post-school success (i.e., employment), educators can embed the Next Generation of Science Standard HS-LS2-8 “Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce” (Achieve, 2013). In teaching social skills and helping students understand the impact of their behavior and choices on others, educators can discuss the impact of individual and a group of students behaviors on others and hence “survival” in both high school and then in the work force. Educators can expand these concepts to relate how other animals (e.g., wolves) work in groups for survival.

The third important element in the proposed vision for the educational experiences
for secondary students with mild intellectual disability is embracing the subsequent environment attitude (Cronin & Patton, 1993; Polloway, Patton, Smith, & Roderique, 1991). The subsequent environment attitude involves a focus on a student’s postschool goals as a place of decision-making for secondary curriculum and instruction (Bouck, 2012b; Hunt, McConnell, & Crockett, 2012). In other words, a student’s desired adult life outcomes shape the individualized educational experiences for the student in school to help him or her to achieve those goals. A student’s educational experiences are shaped by a desire to help him or her obtain as much independence as possible in their adult life, as opposed to being shaped by an accountability system. In other words, the educational experiences and programming of students with mild intellectual disability can be reimagined.

For example, for students with mild intellectual disability who have a goal of competitive employment after exiting high school, their secondary educational experiences might include prevocational education, vocational education, and paid work experience or internship. These experiences would be built into the school day rather than after school; these experiences would also compose significant components of their school day rather than an hour here or a day there. In addition, students whose goal is to obtain competitive employment post high school would also benefit from aspects of a functional curriculum, such as functional academics (e.g., reading and math) as well as financial skills to support students in understanding their pay check and paying taxes, among other aspects of adult life and employment. Similarly, for students who want to attend postsecondary education, their high school educational experiences would involve attention to not just academics, but also vocational or technical programs – if their desired postsecondary education institution is a vocational or technical program. These students would also benefit from attention to study skill and learning strategies. Finally, for any student who desires to live independently after high school, a secondary education program would focus on life skills, independent living, and attention to preparation for adult roles (Edgar & Polloway, 1994; Smith & Puccini, 1995).

As previously stated, taking a subsequent environment attitude to the educational experiences and programming for secondary students with mild intellectual disability would be, on the one hand, reimagining education. Yet, on the other hand, it would be valuing the educational needs of students with mild intellectual disability to the same extent as students without mild intellectual disability, specifically, or students with disabilities more generally. A subsequent environment attitude as an educational programming model would make a space for the educational needs and programming of students with mild intellectual disability in secondary education.

In addition to the aforementioned three main aspects of the envisioned educational experiences for secondary students with mild intellectual disability, the programming should also draw from and be based upon research and best practices. In other words, in addition to being provided attention, infusing functional instruction in academics and academics in functional instruction, and being guided by a subsequent environment attitude, the secondary educational experiences of students with mild intellectual disability should also involve self-determination, independent living skills, meaningful academics, vocational education, work experience, and inclusive educational and community engagement.

Self-determination is an important skill for all students, but especially secondary students with mild intellectual disability. Self-determination involves students becoming autonomous in their decision-making and taking control of their lives (Wehmeyer & Palmer, 2003; Wehmeyer & Schwartz, 1998). Led by Wehmeyer and his colleagues (e.g., Palmer, Wehmeyer, Shogren, Williams-Diehm, & Soukup, 2012; Shogren, Palmer, Wehmeyer, Williams-Diehm, & Little, 2012; Wehmeyer, Palmer, Shogren, Williams-Diehm, & Soukup, 2012), the use self-determination has strong research support for assisting students with disabilities during transition. Yet, more attention in practice and implementation of self-determination into the educational experiences of students with disabilities is needed (Wehmeyer, 2015). Students with mild intellectual disability can benefit from explicit instruction and specific attention to teaching.
and developing self-determination during their secondary education.

Students with mild intellectual disability also need explicit instruction regarding independent living skills (Bouck, 2004; Bouck et al., 2015). As previously noted, the education of students with mild intellectual disability needs to be valued to the same extent as students without disabilities. That being said, schools do not believe students are going to learn algebra, chemistry, or foreign language – for the most part – at home; neither can schools believe that students with mild intellectual disability are going to learn independent living or life skills at home. Nor can schools assume that students with mild intellectual disability will learn these implicitly (Bouck, 2004). Independent living – or life – skills need to explicitly be taught to secondary students with mild intellectual disability as part of their educational experiences and programming. These skills can be infused into academic instruction and/or addressed individually in a specific independent living or life skills class.

Similar to making a space for independent living skills, a space must also be made in the educational programming for secondary students with mild intellectual disability for vocational education and paid work experiences. Benefits exist for students with disabilities who receive vocational education (Haber et al., 2015) and paid work experiences (Joshi, Bouck & Maeda, 2012). Haber and colleagues (2015), from their meta-analysis, reported that vocational education was positively related to postschool employment for students with disabilities. Joshi et al. (2012) found work experience was a statistically significant predictor variable for employment-related outcomes for students with mild intellectual disability. The results of these prior studies suggest the benefit for overt educational experiences in these areas.

As stated, functional and academic curricula both serve a role and purpose in the education of students with mild intellectual disability. However, the academics must be meaningful. For example, doing basic skills worksheets in mathematics classes (i.e., addition, subtraction, multiplication, and division) is not meaningful academics for secondary students. Secondary students with mild intellectual disability can be taught to use a calculator to solve the basic fact of a problem and move onto meaningful academics – academics that are beneficial to their subsequent environments (Ayres, Lowrey, Douglas, & Sievers, 2012). For example, learning price comparison is a meaningful academic task that also fulfills a functional purpose to support individuals’ independence (Bouck, Satsangi, & Bartlett, 2016).

Finally, the educational experiences of secondary students with mild intellectual disability must involve opportunities for inclusive educational and community engagement. In terms of school, students with mild intellectual disability have the right to be educated in inclusive settings along side their peers without disabilities. This, however, does not mean that all students should be educated in inclusive settings for the entire school day or that inclusion is the best option for all students. In fact, the research on inclusive educational experiences for students with mild intellectual disability is equivocal (Bouck, 2009; Logan & Keefe, 1995; Polloway, 1984). A continuum of instructional environment options exists, and inclusion is one of them (Yell, 2012). Inclusion has a role in the education of secondary students with mild intellectual disability but it is not the only option. However, inclusive educational experiences can pave the way for more inclusive community and adult life experiences and opportunities.

While hard and fast guidelines for selecting instructional environments and curriculum for secondary students with mild intellectual disability are not possible – given the individualized nature of these decisions and the proposed focus on each student’s subsequence environment to help guide decision making, students who wish to attend postsecondary education should spend a significant portion of their day in general education settings receiving more academically-oriented content. Those with goals towards independent living should spend more time in special education settings receiving functional curriculum. Regardless of the desired subsequent attitude, a student’s instructional environment and curriculum should not be a total one or the other – all secondary students with mild intellectual disability can benefit from receiving a functional curriculum just as all secondary students with mild intellectual disability can ben-
benefit from being in an inclusive environment. However, if educators are proficient in embedding elements of a functional curriculum within an academic curriculum and/or embedding elements of an academic curriculum within a functional curriculum, one’s instructional environment essentially becomes a relatively mute point. Yet, many educators are not trained to embed one of these curricula into the other but rather with a perspective towards either a functional curriculum or an academic curriculum. Students with mild intellectual disability can benefit from both general education and special education secondary teacher preparation programs preparing pre-service teachers to embed a functional curriculum and an academic curriculum.

Community access is important for individuals with disabilities (Bouck et al., 2015; Nirje, 1969); positive experiences of inclusive community participation in schools promote positive experiences of inclusive community involvement as adults (McDonnell, 2010b). A means to provide inclusive community experiences during school is community-based instruction; community-based instruction involves the instruction of real-world – or independent, life – skills in the natural setting (McDonnell, 2010a). For example, students with mild intellectual disability would engage in work experiences or internships in actual employment settings in their community, or students would engage in budgeting and price comparison in a grocery store or other type of store in which they would actually be making purchases, as opposed to simulated settings or doing the activities via a worksheet (Bouck et al., 2015).

Postsecondary education. An educational vision for secondary students with mild intellectual disability is not complete without attention to postsecondary education. The educational experiences of students with mild intellectual disability do not need to end at high school; students with mild intellectual disability can be supported in comprehensive, integrated, specifically-designed programs to address students with disabilities in postsecondary educational settings (Grigal, Hart, & Weir, 2013). These programs go beyond the protection from discrimination and the provision of reasonable accommodations covered by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990. Postsecondary education programs specifically designed to support students with disabilities, such as students with intellectual disability or autism, occur at two-year, four-year, and vocational/technical schools (Think College, 2016). These postsecondary education programs include ones that are substantially separate programs (i.e., not integrated or inclusive), mixed or hybrid programs (i.e., aspects involve inclusion although some portions of the program – such as certain classes – just involve the admitted students with disabilities), and inclusive individual support programs (i.e., fully inclusive or integrated throughout all aspects of that postsecondary education setting) (Cook, Hayden, Wilczenski, & Poynton, 2015; Hart & Grigal, 2010; Neubert & Moon, 2006).

Postsecondary education programs for students with mild intellectual disability provide for many, if not all, of the various research-supported and best practices for educating this population. Postsecondary education programs allow students to continue to learn independent living, vocational, and academic skills in, generally, an inclusive community environment with their similar-aged peers. Grigal et al. (2013) suggested students with intellectual disability gain the following benefits from participation in postsecondary education programs: (a) access to advanced academic opportunities through college courses with peers without disabilities (Grigal, Hart, & Weir, 2012); (b) career development; (c) self-determination; and (d) community membership. Students can continue to develop and practice the skills they need to obtain a job, live independently, or further attend a postsecondary education program, but in a supportive environment.

Although still limited, research on postsecondary education programs for students with intellectual disability – generally not disaggregated for students with mild intellectual disability – suggests benefits. Researchers reported such benefits as a new identity for students with intellectual disability (Paiewonsky, 2011), friendships via peer mentors and other peers (Thoma, 2013), and employment (Zafft, Hart, & Zimbrich, 2004). Other researchers found indirect benefits for individuals with intellectual disability as a result of
participation in postsecondary education programs – peers without disabilities were more welcoming and form more positive opinions of individuals with intellectual disability after participating in a college course together and/or becoming aware of such postsecondary education programs (May, 2012; Westling, Kelley, Cain, & Prohn, 2013).

**Family Involvement**

No clear vision for the educational experiences of secondary students with mild intellectual disability is complete without recommending and advocating for family involvement. Families are often very important in the education and lives of all individuals with disabilities, including individuals with mild intellectual disability. For example, Jones (2012) found family involvement can enhance the self-concept of adolescents with intellectual disability as well as help mediate negative life experiences. Other researchers reported the relationship between family involvement and adult life outcomes, such as finding employment, attending postsecondary education, and participating in one’s community, for individuals with intellectual disability (Foley et al., 2012; Papay, 2011; Timmons et al., 2011; Verdonchot, deWitte, Reichraft, Buntinx, & Curfs, 2009). The involvement of one’s family is important when an individual is in secondary education, transitioning, and early adulthood; educators and other practitioners should seek to actively involve families of secondary students with mild intellectual disability in the educational planning, transition planning, and adult services provisions and planning.

**Implication for Practice**

Educators need to reimagine and value the educational experiences of secondary students with mild intellectual disability. Educators need to plan and advocate for the secondary educational experiences for these students to be based on each student’s subsequent environment (Cronin & Patton, 1993; Pollock et al., 1991). To do so, educators must communicate with students and their families about the student’s desired subsequent environment, and then must work with other members of the school community, community resources, vocational rehabilitation, potential or current employers, and disability services representatives at postsecondary education institutions to provide the student with the personalized and individualized secondary education program to maximum his or her opportunities for successful adult life outcomes. In other words, the educational programming for a student with mild intellectual disability should truly be as the Individualized Education Program (IEP) was intended and individualized, with some students receiving more academics, and other more functional life skills, while others are attending a local work site for a portion of the day or attending a vocational education program with their peers without disabilities. Those who teach, support, parent, research, or advocate for secondary students with mild intellectual disability must be prepared to advocate that the traditional model of six periods of day in a high school setting with classes labeled algebra, life skills, or even welding is not the most appropriate model for these students. Although an implication for practice of this articulated educational experiences vision for secondary students with mild intellectual disability cannot be a specific program of implementation (e.g., each student’s secondary experiences should be 25% functional, 25% academics, 25% vocational, and 25% community and independent living) – as that would be contrast to the subsequent environment attitude, the following components are important in each student’s educational experiences in secondary schools, just at varying levels or degrees: functional life skills, academics, self-determination, vocational education, work experiences, independent living skills, and engagement with peers without disabilities.

**Future Directions for Research**

As previously stated, more researchers need to conduct research on the educational experiences and outcomes of secondary students with mild intellectual disability. We as a field need to know more about evidence-based practices for this population. Future research should also be undertaken to validate the vision for the educational experiences for secondary students with mild intellectual disability articulated and advocated for here in this
article. The articulation represents the author’s vision; a vision supported by research, but still a vision. Research definitely needs to be conducted to support the proposed ideas for a reimagined education for secondary students with mild intellectual disability.

Conclusion

For too long the educational needs and programming for secondary students with mild intellectual disability have been ignored or been addressed through the aggregation of this population with other students. This paper provides a renewed assertion for making space in the secondary programming for the unique needs and curriculum considerations for secondary students with mild intellectual disability. While additional research is needed on this population and their educational experiences, we can use current research to inform decision-making. For example, previous research supports making spaces within the school day for students with mild intellectual disability to engage in work experiences and/or vocational education (Haber et al., 2015; Joshi et al., 2012). Similarly, previous research supports providing attention to the infusion of self-determination in educational programming for these students (Wehmeyer, 2015). As noted, while more research is needed, what is clear is that the educational experiences for secondary students with mild intellectual disability should be driven with these particular students in mind, including an individualized focus for each student’s subsequent environment, rather than the participation of a student on a particular assessment. By paying attention to the unique educational needs and experiences of secondary students with mild intellectual disability, we can, in theory, improve their adult life outcomes and success.

References


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Inclusion of Students with Significant Disabilities in SWPBS Evaluation Tools

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Abstract: Students with significant disabilities (intellectual and developmental disabilities) are predominantly educated in separate settings, and tend to have little access to schoolwide positive behavior supports (SWPBS). In this study, we first identified the most commonly cited SWPBS evaluation tools in the literature between 2010 and 2016. The SET, TIC, and BoQ were identified as the most commonly cited. Next, these evaluation tools were analyzed for their purposeful inclusion of students with significant disabilities. Findings revealed the tools emphasize all staff and all students when describing systems and data aspects of SWPBS which have limited direct impact on students, but make allowances, such as “most students” when describing the implementation SWPBS that directly impact students, thus creating loopholes that may inadvertently permit the exclusion of learners with the most significant disabilities from fully participating in, and benefitting from, SWPBS efforts. Implications and recommendations for practitioners and researchers are provided.

The prevalence of schools implementing schoolwide positive behavioral supports (SWPBS) is increasing across the United States (Landers, Courtade, & Ryndak, 2012). The effectiveness of SWPBS has even prompted organizations, such as juvenile justice facilities, to modify the tools and tenets of schoolwide services to embrace its use organization-wide (Houchins, Jolivette, Wessendorf, McGlynn, & Nelson, 2005). The increasing prevalence of SWPBS is likely due to its success in reducing or preventing problem behaviors for students across the country, as well as other positive outcomes, including improved academic achievement, school attendance, and social competence (Sugai, Simonsen, Bradshaw, Horner, & Lewis, 2014). SWPBS is a broad-based, preventative approach to supporting student behavior (Andreou, McIntosh, Ross, & Kahn, 2014). Unlike individual behavior interventions, which focus on the problem behaviors of individual students on a case-by-case basis (Bambara & Lohrmann, 2006), SWPBS focuses on teaching positive, prosocial behavior skills to all students (Hawken & O’Neill, 2006).

SWPBS is applied through a multi-tiered continuum, including: tier 1 interventions and supports, focusing on all staff and all students across all settings; tier 2, targeted support for students whose behaviors are unresponsive to tier 1 practices; and tier 3, intensive support for those students unresponsive to tiers 1 and 2 (Sugai et al., 2014). Importantly, Sugai and colleagues (2014) emphasize these tiers are inclusive and cumulative, meaning they add to, but do not replace, existing supports in earlier tiers. Further, positive behavior supports as a whole (inclusive of SWPBS) includes systems, practices, data, and outcomes (Kincaid et al., 2016).

The needs of students with significant disabilities, defined here as students with intellectual and developmental disabilities who take the alternate achievement assessment (1–2% of all students), and have support needs across life domains (Kennedy, 2004), were the original beneficiaries of individualized behavior interventions (Bambara & Lohrmann,
As such, there is a long track record of success using positive behavioral interventions and supports (PBIS) to teach skills and improve behavioral outcomes for students with significant disabilities (Carr et al., 2002). For example, individualized strategies have been used to improve choice-making and quality of life outcomes (Clean & Grey, 2012), communication skills (Hetzroni & Roth, 2003), and self-management skills (Lee, Poston, & Poston, 2007) for students with significant disabilities. Similarly, individualized interventions have been used to improve behavior during home activities (Buschbacher, Fox, & Clarke, 2004).

In part due to the overwhelming effectiveness of individualized behavior interventions, the term “positive behavioral interventions and supports” (PBIS) was introduced in the 1997 amendments to the Individuals with Disabilities Education Act (IDEA). Then, Congress required its use for all students when reauthorizing the Individuals with Disabilities Education Improvement Act (IDEA) in 2004. However, providing individualized supports for all students, including those with infrequent problem behaviors, was unfeasible, thus resulting in the development of system-wide approaches to behavior problems, namely, SWPBS (Crimmins & Farrell, 2006). Similar to individualized behavior interventions, SWPBS has an established research base with demonstrated positive outcomes for students. For example, Ross and Horner (2014) found the use of SWPBS improved elementary student behaviors related to bullying prevention. Others, including McIntosh, Bennett, and Price (2011), have found the use of SWPBS reduces the number of student office discipline referrals. Similarly, many others, including Sanchez and colleagues (2015) have demonstrated the effectiveness of Check-in, Check-out procedures in SWPBS implementation. Notably, however, this research focuses on the needs of students without significant disability.

Consequently, while individualized behavior interventions and SWPBS are each effective practices, they have tended to focus on different populations of students, with limited research exploring the extent to which SWPBS is effective for students with significant disabilities. In fact, a recent review of the literature found only two empirical studies focusing on access to SWPBS for students with significant disabilities (Kurth & Enyart, 2016). The first study, completed by Landers et al. (2012) surveyed state SWPBS coordinators in nearly 4,000 U.S. schools, finding students with significant disabilities were largely absent from SWPBS instruction. Further, SWPBS state coordinators reported personnel attending SWPBS trainings would not be prepared to meet the needs of students with significant disabilities. No empirical studies have been identified examining the effectiveness of SWPBS for students with significant disabilities.

The second study included a survey of alternative school administrators in the state of Michigan (Schnelling & Harris, 2016). These alternative schools, serving students with significant disabilities, were found to implement some key features of SWPBS, but implementation across SWPBS components, particularly tier 1 interventions, was low and in some cases incongruous. For example, Schnelling and Harris (2016) found highest fidelity related to having procedures in place to address emergency/dangerous situations (86%) and the presence of a school administrator as an active participant of the behavior support team (73%). However, many key areas, including clearly defining problem behaviors and defining consequences for problem behaviors, were implemented with much lower fidelity (24 and 18%, respectively).

The reasons for the overall exclusion of students with significant disabilities from SWPBS literature and instruction (in both public and alternative settings) remain unknown. One hypothesis articulated by Kurth and Enyart (2016) is that, while the SWPBS literature describes an intended focus on the needs of all students (Horner et al., 2014; Sugai, O’Keeffe, & Fallon, 2011), “all” is repeatedly interpreted as “some” or “most” in schools. For example, school-wide reading models have excluded students with significant disabilities (e.g., Simmons et al., 2002), as has the movement to educate students with disabilities in general education settings (Kurth, Morningstar, & Kozleski, 2014), despite the inclusion movement originating in the significant disabilities community (Wolfenberger, 1972).
Lending further credence to this hypothesis, Hawken and O’Neill (2006) found the content of “frequently used tools for evaluating school-wide behavior support initiatives . . . [indicate] that students with disabilities, particularly severe disabilities, have not been clearly included in the SWPBS process” (p. 48). In other words, it is possible the SWPBS movement, in embracing “all” students, has inadvertently failed to outline ways to include students with significant disabilities in SWPBS assessments. However, the movement towards SWPBS has only gained pace since Hawken and O’Neill’s claim, and it is possible newer or updated tools more directly and adequately include students with significant disabilities in their evaluations.

Thus, the purpose of this study is to complete a contemporary analysis of commonly used SWPBS evaluation tools and their direct and implicit inclusion of students with significant disabilities. We then offer recommendations for use of the tools (i.e., modifications or further explanations) and implications for tool use by practitioners and researchers.

Method

To analyze SWPBS evaluation tools, two strategies were used. First, we completed a comprehensive literature review to identify the most commonly cited SWPBS evaluation tools between 2010 and 2016. Next, we completed a content analysis of the three most frequently cited SWPBS evaluation tools for evidence of their inclusion of students with significant disabilities (Hsieh & Shannon, 2015).

Literature Review

To identify the most frequently used SWPBS tools in the literature, defined as those tools cited in 10% or more of research studies, we conducted a systematic, electronic database search of peer reviewed studies using EBSCO host, Academic Search Complete, ERIC, Education Full text, Psycharticles, and Psych INFO. We used combinations of the following Boolean search terms, which were derived from search terms in other peer-reviewed publications related to implementation of SWPBS: SWPBS, SWPBIS, school wide positive behavior support, school wide positive behavior intervention* and support*, PBIS, positive behavior intervention* and support*, evaluation, implementation, fidelity, measure, measurement, and school, resulting in 167 articles.

After duplicates were removed, the first two authors read the remaining 165 abstracts and selected articles for full-text review if they met the following inclusion criteria: articles were peer-reviewed, published between 2010 and 2016, referenced the SWPBS process (implementation or evaluation), detailed an evaluation tool or validation of a SWPBS tool, referenced data collection, and was a literature review or meta-analysis. Articles were excluded from full-text review if they documented the results of a training, took place outside of the United States, detailed results of an intervention within only one specific tier, or surveyed a specific aspect of the SWPBS process. Inter-rater agreement for selecting articles for full text review was 100%.

Upon application of the inclusion and exclusion criteria, the authors selected the resulting 97 articles for full text review with the purpose of identifying the total number of articles that mentioned each SWPBS tool. The first two authors searched the articles and reference lists and recorded SWPBS tools that were mentioned at least once. As seen in Table 1, there were 126 mentions of tools within these 97 articles. Inter-rater agreement for articles mentioning the tools was also 100%.

Evaluation of SWPBS Tools

Given that our target population was students with significant disabilities, who are often served in separate settings, we evaluated the most frequently cited SWPBS tools for mentions of students with significant disabilities in different settings. To do this, we identified the following search terms related to possible placements and types of disabilities: all classrooms, all teachers, all staff, all students, disability*, general, segregate*, access, inclu*, resource, self-contained, separate*, low incidence, severe, significant, multiple, and disorder*.

Next, we downloaded the three most commonly cited evaluation tools (see Results) from the PBIS website (www.pbis.org/evaluation/evaluation-tools): School-wide Evaluation Tool (SET) version 2.1 (Sugai, Lewis-Palmer, Todd, & Horner, 2005), SET Man-
ual version 2.0 (Todd et al., 2012), the Team Implementation Checklist (TIC) version 3.1 (Sugai, Horner, Lewis-Palmer, & Rossetto, 2012), Benchmarks of Quality (BoQ) Scoring Form, BoQ Scoring Guide, and BoQ Team Member Rating (Kincaid, Childs, & George, 2010). To remain focused on the most current version of SWPBS evaluation tools, only the most recently updated or revised versions were analyzed.

The second author searched each evaluation tool for each search term individually and recorded the findings on a spreadsheet. Only relevant uses of the terms were recorded; for example, the term resource may have been referring to resources such as people or materials. For purposes of this analysis, we were interested in uses of the term resource related to the placement of students with disabilities in resource classrooms; therefore, other uses of the term were excluded. The third author applied the search terms to each evaluation tool, and initial agreement between the two authors was 88.88%. Next, the second and third authors completed this secondary search after they met to discuss discrepancies in the search using the first set of terms. At that time, the authors discussed the necessity to only include relevant uses of the terms; therefore, the reliability for this secondary search was 100%.

**Findings**

**Most Frequently Cited SWPBS Evaluation Tools in Literature Review**

A total of 13 SWPBS evaluation tools were identified in this review of the literature, as seen in Table 1. The three most commonly cited tools were the School-wide Evaluation Tool (SET), Team Implementation Checklist (TIC), and the Benchmarks of Quality (BoQ). These tools were mentioned or referenced in more than 10% of the 97 full-text articles reviewed. The SET was mentioned in 45% of the articles, the TIC was mentioned in 12%, and the BoQ was mentioned in 11% of the articles. The remaining 10 evaluation tools were mentioned in 9% or less of the collected articles, and thus excluded from further review.

**Analysis of Most Common SWPBS Tools**

Across the SET Scoring Guide, SET Manual, TIC, and BoQ forms, we found the following terms mentioned: all staff, all students, disabilities, general, special, almost, nearly, most, some, several, many, and a few. We also found instances of items or indicators referring to a percentage of staff or students. As seen in Table 2, we found the presence of the terms all staff and all students in the tools referred to the team, expectations, and the discipline system; in other words, elements of SWPBS evaluation and implementation that occur at the
systems or data level, and not those levels directly impacting students (i.e., practices and outcomes). Interestingly, the terms that represented only a portion of the students or staff (e.g., almost, nearly, most, some) predominantly referred to components of SWPBS that directly impact students, including the system of rewards, lessons on behavior, and the procedures for responding to inappropriate behavior.

References made to all staff and all students. Across the most common SWPBS evaluation tools, the term all staff was mentioned in reference to team membership, teaching expectations to students, expectations of staff, and teaching the discipline system to all staff. In the SET manual, all staff was mentioned six individual times in the original forms (excluding samples of completed forms). For example, one mention of all staff was in evaluation question F3: “Does the administrator report that team membership includes representation of all staff?” This mention was repeated 10 times in the samples of the evaluation criteria. The other five times in which all staff was mentioned were in the Self-Assessment Survey within the SET. This includes the definition of school-wide: “School-wide is defined as involving all students, all staff, and all settings” (Todd et al., 2012, p. 163).

Across the tools, the phrase, all students, was mentioned in reference to expectations taught to students, expectations of students, participation of students in the SET process, and the definition of school-wide. The phrase all students was mentioned in the SET manual a total of 12 times. However, only two of these occurred outside of the sample documents. The first of these mentions was in the PBIS Background Information: “The goal of PBIS is to prevent the development and the intensifying of problem behavior and maximize academic success for all students” (Todd et al., 2012, p. 116). The other mention of all students was in the frequently asked questions section of the manual regarding allowing all students in a group to answer questions.

References to general and special educators. General and special educators were only mentioned in the SET Manual and the TIC. In the SET manual, the respondent to the Self-Assessment Survey was instructed to indicate their role, and there is a note that the PBIS

| TABLE 2 |
|---|---|---|---|---|---|---|---|---|---|
| **Relationship Between Terms and SWPBS Elements** |
| **Term** | **All classrooms** | **All teachers** | **All staff** | **All grades** | **All students** | **Disabilit* General** | **Special** | **Almost** | **X** |
| **Term** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Rules/ Expectations** | **Team Membership** | **Staff Training** | **Praise/ Rewards** | **Responding to Behaviors** | **Handling Emergencies** | **Discipline Data used** | **Teaching Students** |
| **All classrooms** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **All teachers** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **All staff** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **All grades** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **All students** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Disabilit* General** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Special** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Almost** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Nearly** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Percentage** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Most** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Some** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Several** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Many** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Few** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |

*Note. X = The term appeared.*
team should include a special educator and general educator. The TIC also mentioned that the SWPBS team should include a special educator. The particular licensure of special educator (e.g., teacher of students with “mild” or “significant” disabilities) was not included in any tool.

Disabilities. The term disabilities only appeared one time across all of the tools; the term disability was not used. In the SET manual, disabilities appeared as part of a definition of harassment listed in the “Definitions for Behavior Tracking Form.” A student may be harassing or bullying others if they deliver “disrespectful messages to another person” based upon, among others, disabilities (Todd et al., 2012, p. 137).

References to a portion of students or staff. Across the tools, we found use of various terms that made reference to portions of students, teachers, staff, or classrooms including: almost, nearly, most, some, several, and many. Within the SET scoring guide, TIC, and the BoQ scoring guide, there were also uses of percentages either with exact percentages or “large percentage.” We found these terms used in reference to giving and receiving rewards; teaching of behavioral expectations; responding to inappropriate behavior; and classroom rules, routines, and procedures.

Rewards. In the BoQ Scoring Guide and the SET, several benchmarks refer to the system of rewards in place at the school. For example, the BoQ Scoring Guide Benchmark 52 is “Staff use reward system appropriately” (Kincaid et al., 2010, p. 12). The scores range from almost all staff (3 points) to few staff (0 points) “understand and use identified guidelines for reward system” (Kincaid et al., 2010, p. 12). Therefore, a school could receive a high score of 3 for Benchmark 52, even if 10% of the staff are not using the reward system appropriately. The SET Scoring Guide also included evaluation questions about the portion of students who have received a reward and a portion of staff who have delivered a reward (Todd et al., 2012).

Teaching expectations. The SET and the BoQ Scoring Guide also include indicators of a portion of faculty teaching the behavioral expectations. For example, item B2 in the SET Scoring Guide asks if “90% of staff asked state that teaching of behavioral expectations to students has occurred this year?” (Todd et al., 2012, p. 5). Similarly, the BoQ Scoring Guide Benchmark 32 is “Lessons are embedded into subject area curriculum” (Kincaid et al., 2010, p. 7). Then, the scoring for that benchmark ranges from “nearly all teachers,” to “about 50% of teachers, to “less than 50% of teachers.”

Responding to inappropriate behavior. The BoQ also includes a benchmark for the staff use of the “referral process (including which behaviors are office managed vs. which are teacher managed)” (Kincaid et al., 2010, p. 12). The range of scores is similar to other benchmarks in the BoQ in that a school can receive a score of 3 (the highest rating) if “almost all staff know the procedures for responding to inappropriate behavior” (Kincaid et al., 2010, p. 12). Although slightly different, the SET also includes scoring items related to staff response to inappropriate behavior. For example, the SET asks if 90% of staff agree with the principal about which behaviors are managed by the office, the procedures for handling emergencies, and that behavior data is used to make decisions (Todd et al., 2012).

Classroom rules, routines, and procedures. In the BoQ Scoring Guide, several benchmarks refer to classroom rules, routines, and procedures. The ratings for these items range from “evident in most classrooms” or “>75% of classrooms” (2 points) to “evident in only a few classrooms” or “less than 50% of classrooms” (0 points; Kincaid et al., 2010, p. 10). For example, one of the benchmarks refers to the posting of classroom rules and procedures. Another benchmark is “expected behavior routines in classroom are taught” (Kincaid et al., 2010, p. 10).

Discussion

A review of the SWPBS literature revealed researchers referenced over a dozen evaluation tools, with the most frequently cited between 2010 and 2016 being the SET, the TIC, and the BoQ. Analysis of these tools revealed no explicit reference to students with, or teachers of students with, significant disabilities. In fact, reference to specific groups of students and teachers in general was absent, with little reference made to general or special education teachers, or students with disabilities.
This finding of generality is not surprising, given the stated aim of SWPBS to focus on all students and staff. However, references to all students and all staff appeared in the tools when discussing “behind the scenes” aspects of SWPBS not directly impacting students, occurring at the systems or data levels of PBS. For example: ensuring membership on SWPBS teams is available to all staff; that all staff should teach expectations to students; and that all students can participate in the SET process. Conversely, exceptions to all staff and students, by using limiters such as “some,” “most,” or a proportion, appear in SWPBS evaluation tools when SWPBS directly impacts students. For example, almost all or most staff might provide rewards, teach behavioral expectations, or know how to respond to inappropriate behaviors. Thus, loopholes arise which may enable schools to persist in omitting students with significant disabilities in SWPBS efforts.

**SWPBS Evaluation Tool Loopholes**

Given the findings of this analysis, and the loopholes that exist, it is possible for some students, staff, or classrooms to be left out of the SWPBS evaluation process. At great risk of being left out are those students with significant disabilities who are routinely taught outside of the mainstream in self-contained classrooms and even separate schools (Kurth et al., 2014), and therefore remain absent from universal SWPBS instruction and activities. Thus, while SWPBS has potential to advance inclusive practices using tiered approaches that meet the needs of all students (Freeman et al., 2006), the reality is many will interpret SWPBS as another continuum with intensive interventions delivered in separate settings (Hawken & O’Neill, 2006). Consequently, discipline issues are insular with little, to no, oversight from school administrators. This lack of oversight, coupled with a lack of preventative supports and instruction, increases the risk of restraint and seclusion as reactionary measures to student challenging behaviors (Amos, 2004).

For example, one of the items in the evaluation tools is a system for determining which behaviors are managed in the classroom and which behaviors the office staff handles (Kincad et al., 2010). If this system is not well-developed for students with significant disabilities, a lack of documentation of these behaviors may exist if the behaviors are only managed in the classroom. This could lead to lack of administrative and district support for the teachers in addressing the student’s serious behaviors simply because the administration is not aware of the behaviors are occurring. This is particularly concerning because of the behavior support needs of students with significant disabilities and the fact that evidence suggests students with significant disabilities are at greater risk of experiencing seclusion and restraint at school compared to students in any other disability category (Westling, Trader, Smith, & Marshall, 2010). Therefore, the presence of evaluation loopholes that could directly impact students with significant disabilities allows researchers and school teams to avoid examining practices that truly impact all students across all three tiers of the SWPBS framework, which has the potential to inadvertently maintain separate, exclusionary practices for this sub-group of students.

A second reason we believe the omission of explicit reference to students with significant disabilities in SWPBS evaluation tools is problematic is this exclusion allows evaluators to refrain from examining practices across the entire school. That is, there are no cues in the examined SWPBS tools to prompt evaluators to examine SWPBS supports provided to students with significant disabilities or students in self-contained classrooms. As a consequence, it is not possible to evaluate the types of supports and instruction these students are re-
receiving. Many presume students with significant disabilities receive exclusively intensive, tier 3 supports (Brown & Michaels, 2006). Thus, it is unlikely school personnel will acquire skills to develop coordinated, cumulative multi-tiered systems of support that could positively impact learners with significant disabilities.

Limitations

Before discussing the implications of our findings, we must recognize the limitations of the present study. First, the extent to which schools use the SWPBS evaluation tools cited in the research literature is unknown. It is possible schools use evaluation tools other than those examined here (SET, TIC, and BoQ), and that those tools used by schools are more explicit in evaluating the presence and participation of students with significant disabilities and their teachers. Second, it is possible schools take measures to include these students and their teachers without explicit cues to do so. In our experience in schools, however, this is not the case. Nevertheless, further research should examine the extent to which students with significant disabilities and their teachers participate in SWPBS instruction and evaluation, across all tiers. Third, we acknowledge students with emotional behavioral disorders (EBD) are also among the students most likely to be taught in self-contained, separate classrooms and schools (McLeskey, Landers, Williamson, & Hoppey, 2012). Like students with significant disabilities, students with EBD may greatly benefit from SWPBS. Future research should examine the inclusion of students with EBD, who are taught primarily or entirely in separate classrooms, in SWPBS evaluations and instruction.

Recommendations and Implications

Presently, there is an assumed inclusion of all students and staff in SWPBS evaluation, instruction, and activities. The extent to which students with significant disabilities are part of the schoolwide system, despite their physical removal from general education classrooms and activities (e.g., Kurth et al., 2014) remains unclear. Further, the extent to which students with significant disabilities can and will benefit from SWPBS remains uncertain (Hawken & O’Neill, 2006). However, assuming students with significant disabilities constitute the student body (all students), and further assuming they may derive some benefit from SWPBS, efforts must be made to improve participation of this group in SWPBS evaluations and activities. Four recommendations are derived from these assumptions and the findings of this study.

First, SWPBS evaluation tools should include explicit directives to consider the inclusion of students with significant disabilities in SWPBS evaluations. Providing explanations and guidance for obtaining input and participation of students with significant disabilities and their teachers should be added. For example, the SET and TIC presently provide instructions to include special education teachers in the evaluation. These directions could be expanded to specify the inclusion of special education teachers working in self-contained classrooms. Relatedly, a shift from use of the word “all,” which takes a macro-, group-level view, to the word “each,” which focuses attention on individuals, may be beneficial. It’s possible that reference to each student, and each staff member, will more specifically ensure that truly each and every student and staff is part of SWPBS efforts.

Second, to facilitate representation from students with significant disabilities and their teachers in SWPBS evaluations, guidance may be offered within the tools to use approaches that target a truly random selection of students and staff, such as a lottery. This approach could minimize the loopholes we have articulated, particularly related to the scores in the SET and BoQ which refer to some, most, and proportions of students and staff. Using the lottery approach, it is possible that, even if only a proportion of staff or students demonstrate the behavior or knowledge, there is an improved chance those representing students who have significant disabilities will be included in this calculus.

Third, the findings of this study serve as a reminder that, even without explicit or implicit directives or guidelines, practitioners should be mindful of participation of students served in self-contained classrooms, those students with extensive support needs (such as communication support needs), and those
with intellectual disability should be included in SWPBS evaluations and activities. That is, regardless of directives or guidance from the tools themselves, we urge practitioners to embrace the intent of all students and all staff as articulated throughout SWPBS tools, descriptions, and research. Practitioners can engage in context-relevant activities to actively recruit participation from students and teachers at their own school campuses who have not traditionally been part of SWPBS teams, evaluations, activities, or instruction. Additionally, practitioners can work to include students with significant disabilities in SWPBS efforts by ensuring their access to elements of tier one SWPBS through teaching behavior expectations across the school and including them in the schoolwide system for rewards and incentives.

Fourth and finally, researchers are urged to complete investigations of the appropriateness of SWPBS for students with significant disabilities and the degree to which these students are included in all tiers of SWPBS instruction and activities. With this data in hand, researchers can then describe how instruction and evaluation includes students with significant disabilities in all tiers of instruction. Lastly, research describing the tools used by schools, and how schools use tools to include the needs of students with significant disabilities in SWPBS evaluations, is needed.

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Self-Reinforcement Compared to Teacher-Delivered Reinforcement during Activity Schedules on the iPod Touch

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Abstract: The current study assessed whether four 15- to 17-year-old individuals diagnosed with autism would remain on-task for more intervals and complete tasks independently as a function of using self-reinforcement or teacher-delivered reinforcement. An adapted alternating-treatments design with teacher-delivered reinforcement, self-reinforcement, and a control condition was used. The participants followed a schedule on an iPod touch to complete a vocational task, a daily living task, and a leisure task. To promote independence, the proximity of the instructor was faded until the instructor was completely removed during self-reinforcement. Results of this study demonstrated high percentages of on-task behavior and schedule completion. Overall, during the self-reinforcement condition, proximity of the instructor was faded in fewer sessions than during the teacher-delivered reinforcement condition. Generalization of responding was observed in the community. The results of this study established a novel method for implementing self-reinforcement.

Vocational skills can considerably enhance one’s quality of life; attaining these skills, however, poses a difficult challenge for those with autism spectrum disorder (Robinson & Smith, 2010). Deficits in independence among this population often hinder learning certain skills, including vocational or functional living (Spriggs, Gast, & Ayres, 2007; Wacker, Berg, Berrie, & Swatta, 1985).

One procedure developed to promote independence is the picture or text-based activity schedule, which consists of a set of pictures or text, each describing a particular task within a sequence of activities (Clannahan & Krantz, 1999). For this teaching procedure, individuals are typically taught skills in the presence of an instructor and the schedule is presented in a book or binder (Clannahan & Krantz, 1999; MacDuff, Krantz, & McClannahan, 1993). Spriggs et al. (2007) compared schedules with and without teacher instruction and found that picture-based activity schedules can be a valuable tool for increasing independence and duration of on-task behavior.

One problem with schedules in this form is that they can be cumbersome. Recent technologies, such as iPods, iPads, and smart phones, have allowed researchers to explore novel instructional strategies for designing interventions including picture cues, picture-based activity schedules, and video models. Several studies examined the use of portable electronic devices to teach various skills and found that the devices may provide a discreet form of support (Mechling, Gast, & Seid, 2009). For example, Cihak, Kessler, and Alberto (2006) evaluated the successful use of a handheld computer that provided auditory and picture cues during vocational skills in the community with adolescents and demonstrated increased skill acquisition without additional training from an instructor. Several subsequent studies demonstrated how new technologies can broaden the possibilities for effective teaching strategies (Laarhoven et al., 2009; Mechling et al., 2009; Taber-Doughty et al., 2013). Mechling et al. (2009) successfully used a personal digital assistant device to teach meal preparation using video models. Taber-Doughty et al. (2013) used video models presented on an iPad to teach a vocational task and increase the inde-
pendent transitions between the steps of the target work task. Laarhoven et al. (2009) effectively presented a video model on an iPod to evaluate the skill acquisition of a work task at the employment site, suggesting that individuals can independently complete work tasks. Visual and audio prompts were delivered via smartphone in a supported employment program in a study by Chang, Wang, and Chen (2011). These studies demonstrated that portable hand-held electronic devices may provide a discreet form of support in the community.

Thus far the iPod touch has been incorporated into teaching interventions, but only one study has used it to display activity schedules. Carlile, Reeve, Reeve, and DeBar (2013) used an iPod touch to present a picture-based activity schedule to teach children with autism to independently structure their leisure time. Although the presence of the instructor was systematically faded, it was not possible to fade the instructor completely as the instructor was necessary to deliver reinforcement. Results suggested that schedules on the iPod touch may be helpful to promote independence.

In addition to portable devices, self-management, an intervention involving self-instructing, self-monitoring, and self-reinforcement, has also been used to promote independence in the absence of instructors (Ackerman & Shapiro, 1984; Christian & Polling, 1997; Moore & Fodor-Davis, 1989; Newman, 1996). Self-instructing is a technique in which individuals vocalize the steps to perform while they are completing them (Salend, Ellis, & Reynolds, 1989). Self-monitoring is a procedure that requires individuals to systematically monitor their own behavior and record whether the target behavior occurred (Holifield, Goodman, Hazelkorn, & Heflin, 2010). Self-reinforcement is a procedure in which the individual self-delivers a reinforcing consequence contingent on a target response (Newman, Tuntigian, Ryan, & Reinecke, 1997). Self-management is effective as it allows the individual to manage his or her own behavior in the absence of an instructor for potentially long periods of time (Koegel, Koegel, Hurley, & Fre, 1992).

To date, self-management research has focused on training packages when teaching individuals with developmental disabilities (Ackerman & Shapiro, 1984; Callahan & Rademacher, 1999; Christian & Polling, 1997; Moore & Fodor-Davis, 1989). Christian and Polling (1997) first extended the use of self-management to a competitive employment to increase productivity. Ackerman and Shapiro (1984) used prompting, reinforcement, and self-monitoring to increase the productivity of tasks in a community-based workshop. Callahan and Rademacher (1999) used a self-management package to increase on-task behavior of an individual with autism in an inclusion classroom. Moore and Fodor-Davis (1989) evaluated a training package consisting of self-instruction, goal setting, and self-reinforcement with young adults with developmental disabilities to successfully increase productivity. Based on findings of self-management studies, self-management procedures can effectively increase independent productivity in vocational tasks for individuals with disabilities.

Thus far, self-reinforcement, which is one component of self-management training, has received little attention in the literature as a procedure separate from a self-management treatment package. Newman, Buffington, and Hemmes (1996) investigated the use of teacher-delivered reinforcement and self-reinforcement to increase appropriate conversations in adolescents with autism. Results indicated that self-reinforcement was as effective as teacher-delivered reinforcement; however, during self-reinforcement, an additional trainer was not required to deliver tokens, suggesting self-reinforcement may be more appropriate than teacher-delivered reinforcement.

The current study expanded on research with activity schedules and the use of portable technology by presenting schedules on an iPod touch, which was used to teach vocational, leisure, and functional living skills. The purpose of this study was to assess whether individuals remained on-task for longer durations and completed tasks independently when using self-reinforcement compared to teacher-delivered reinforcement. This study extended Carlile et al. (2013) by including the comparison of self-reinforcement (Newman et al., 1996). It was hypothesized that the addition of the self-reinforcement condition to an already established procedure (i.e., activity schedules) on an iPod touch would further promote independence by allowing the in-
structor to be more easily removed from the teaching session in fewer teaching sessions in self-reinforcement than in teacher delivered reinforcement.

Method

Participants

The participants were three adolescents, Jared, Matthew, and Lizzy, diagnosed with autism spectrum disorder, ranging from 15 to 17 years old. Prior to the study, the only exposure participants had to self-reinforcement was delivering a token upon a vocal instruction from a teacher. All three participants follow text-based activity schedules on an iPad mini throughout the day for instructional purposes. They also followed a cooperative schedule outlining cleaning tasks that was presented on a dry erase board in the afternoon. The participants had no prior experience using an iPod touch for instructional purposes. Inclusionary criteria for participation, which were identified from an in-person interview with the classroom teacher, included: the participant (a) was of an age in which independent completion of tasks was important, (b) currently completed tasks in the community, and (c) exhibited low levels of problem behavior. All participants had an extensive history of receiving clicks on the golf counter as their method of delivering reinforcement.

To assess the participants’ skills and behaviors, the Essential for Living Skill Assessment was conducted (McGreevy, Fry, & Cornwell, 2012). Sixteen questions were scored on a 4-point Likert-type scale. The questions were based in the areas of requesting, expressive language, receptive language, tolerating unfamiliar situations, and problem behavior. The assessment was conducted with direct observations and an in-person interview with the classroom teacher. Across the points on the assessment, Jared’s mean score was 3.0 with a range of 2–4. Matthew’s mean score was 2.7, with a range of 2–4. Lizzy’s mean score was 2.7 with a range of 1–4. The results of the assessment showed that all three participants emitted few spoken words that were understandable and made requests for 10 preferred items or activities without prompts. Jared and Matthew named and described items or activities related to routine activities and recognized and retrieved items that were part of 4–6 routine activities. Lizzy named and described items related to 1–3 routine activities and followed directions to complete routine activities. The classroom teacher reported that Matthew exhibited low intensity challenging behavior, specifically aggression in the form of hitting and hair pulling, particularly with novel female staff. During the study, Matthew emitted one instance of aggression with the experimenter. Jared and Lizzy displayed zero instances of challenging behavior.

Setting and Materials

The private school where the study took place provides individualized instruction based on the principles of applied behavior analysis in one-to-one staffed classrooms. Treatment sessions were conducted in the school’s kitchens and the school store. During sessions, other students and teachers were present completing a variety of instructional programs. Pre- and post-intervention sessions were conducted in a novel kitchen within the school and the community. The materials present were an iPod touch, the necessary items associated with each task, and a golf counter. The First-Then application was used to display the schedule on the iPod touch, which consisted of the word or phrase of the step to complete. The participant then swiped the screen to the left to display the next step.

The counting worksheet and the items to be counted in the school store were used to complete the inventory task. A bin in the refrigerator of the kitchen held the ingredients and baking utensils to complete the meal preparation task. Another bin on the kitchen counter held the melt and pour soap ingredients and baking utensils. The participants earned clicks on a golf counter throughout all tasks.

Description and Assignment of Stimuli

Before creating the schedules, the difficulty of the task for each schedule was assessed using guidelines outlined by Bellamy, Horner, and Inman (1979). Based on their guidelines, the following revisions were made: (a) schedules used contained an equal number of steps and were topographically comparable in difficulty,
(b) each step of each schedule required one response to complete, and (c) the response chains produced an equal number of conditioned reinforcers. To further ensure the schedules were comparable in difficulty, five graduate students in a Master of Arts in applied behavior analysis program ranked the schedules for difficulty using a 4-point Likert-type scale. All students rated the schedules as a 4 for most equal in difficulty.

Each reinforcement condition was assigned a different corresponding task for each participant. The tasks were then counterbalanced across participants to ensure that each participant received a different sequence of tasks.

Activity Schedules

Three text-based activity schedules were created across the domains of vocational, functional living, and leisure skills. A text-based schedule was selected based on the participants’ learning history and current schedules at the time of the study. The classroom teacher also evaluated the reading difficulty of each schedule.

The vocational task schedule consisted of items required to complete taking inventory at the school store. The steps appeared on the iPod as Get worksheets, Name of the first item (e.g., fruit snacks), Count item, Count item, Count item, Clean up items, Name of the second item (e.g., pencils), Count item, Count item, Clean up items, and Clean up worksheets. The daily living schedule consisted of steps required to prepare a meal. Specifically, the steps listed were Set oven to 350, Get Meal Prep bin, Scoop chicken, Scoop mushroom, Pour milk, Stir, Add mix to dish, Handful of cheese, Cover dish, Oven for 10 min, and Clean up. The leisure task schedule consisted of the necessary steps to make soap. The steps listed were Get soap bin, Bowl, Soap block, Microwave, Spoon, Stir, Oil, Stir, Molds, Refrigerator, and Clean up. The tasks within the schedules were determined based on recommendations from the participants’ teachers. The schedules consisted of tasks that had not been previously taught or had been identified for future programming, were of appropriate difficulty, and were novel to the participants.

Experimenter and Assistants

The experimenter was enrolled in a Masters of Arts in applied behavior analysis program. Assistants were teachers who worked in the same classrooms as the participants. Inter-observer agreement (IOA) and procedural integrity data were collected by teachers in the school. Each classroom teacher held a Master’s degree in Applied Behavior Analysis or Special Education or was currently pursuing one of these degrees.

Dependent Measures

Independent schedule completion. A task analysis was used to identify the necessary components of the schedules. Data were collected on independent completion of each task of the schedule. A step was scored as correct if the participant checked the schedule within the specified delay (2 s or 4 s) after completing the prior step and began the next step each within the specified delay after checking the schedule. A step was scored as incorrect if the participant did not respond within the current delay. If the participant did not respond within the delay, manual guidance was used immediately to perform that step. Once the prompt delay was fully faded (i.e., one day at 100% at 4 s), if the participant did not check the schedule or begin the next step within 5 s, manual guidance was used to perform the correct step and that step was scored as incorrect. After manual guidance was used, that step was reset and the participant had the opportunity to perform the step independently. Data were summarized as the percentage of steps of the task analysis completed correctly and independently (Carlile et al., 2013). Mastery criterion for schedule completion was one session at 100%.

On-task behavior. On-task behavior was defined as the participant emitting any of the following components: (a) visually attending to the schedule, (b) visually attending to any appropriate materials, (c) appropriately manipulating the correct materials necessary to complete the task (i.e., as they were designed to be used), or (d) transitioning between schedule tasks appropriately. Off-task behavior was recorded if the participant engaged in any of the following for more than 5 s: (a)
used materials in a manner other than that for which they were designed, (b) engaged in interfering behavior, or (c) did not engage or use the correct materials for that task (Carlile et al., 2013). Data were collected using a 30-s momentary time sampling procedure and summarized as the percentage of intervals scored as on task. Mastery criterion for on-task behavior was 80% of intervals for one session.

Decreasing proximity and thinning reinforcement. Decreasing proximity was defined as systematically removing the instructor’s presence from a distance of 0 m from the participant to completely out of the participants’ view. The proximity of the instructor was decreased as a participant’s percentage of on-task behavior and schedule completion increased across nine systematic fading levels. Data were collected using a frequency count for the number of sessions at each fading level and summarized as the total number of sessions until the final fading level was reached.

Preference Assessment

To identify preferred activities, a multiple-stimulus-without-replacement (MSWO) preference assessment was conducted prior to baseline sessions (Leon & Iwata, 1996). First, a direct interview with the classroom teacher was used to identify 10 iPod applications and games for each participant. The pictures for music videos or iPod games were then arranged arbitrarily on one screen of the iPad. The experimenter instructed the participant to select an activity and then moved the selected activity to another screen. The participant did not have access to the chosen application during the session. The experimenter then returned the iPad to the participant with the original screen and instructed the participant to select another activity. Trials continued in this manner until all activities were selected. After the MSWO was conducted three times (Carr, Nicholson, & Higbee, 2000), items were rank ordered by selection. The top five items were available for the participants to choose from once they earned the required number of counter clicks.

Experimental Design

An adapted alternating-treatments design was used to evaluate any differences in responding across three conditions. An adapted alternating treatments design is one in which multiple instructional items that are equivalent are taught using different methodologies. The two experimental conditions were self-reinforcement and teacher-delivered reinforcement. The control condition was included to demonstrate that no prompting or reinforcement was less effective than reinforcement. Sessions alternated between self-reinforcement and teacher-delivered reinforcement conditions with the control condition presented after every fourth session.

Procedure

Golf counter training. Prior to experimental sessions, participants were taught to use the golf counter by identifying the icon of the golf counter in the schedule, retrieving the golf counter, and delivering one token at a time. These steps were taught using manual guidance with a 0-s delay. After two consecutive sessions at 100% at 0 s, the delay increased to 4 s. After 100% of steps were completed for one session at 4 s, the participant’s delivery of reinforcers was considered mastered.

General format. The iPod touch was presented to the participant along with the vocal instruction, “Follow your schedule.” The participant then followed the steps and no additional vocal instruction was delivered. Session duration was approximately 5–10 min.

Baseline. No prompting was delivered during baseline. Data were collected on schedule completion and on-task behavior. Sessions were terminated when the participant did not respond correctly within 2 min of the vocal instruction or stopped responding for 2 min. All requests for assistance related to task completion were redirected by providing verbal directions (e.g., “you can do it”; “just keep trying”). Although unnecessary, assistance would have been provided for a technology issue (e.g., the iPod not turning on). Reinforcement was provided in the form of clicks on the golf counter on a 30-s fixed time schedule.

Teacher-delivered reinforcement. A schedule consisting of written words of the necessary steps to complete the functional living skill or vocational skill was presented on the First-
Then application on the iPod touch. The teacher delivered reinforcement using clicks on a golf counter for correct responses beginning on a fixed ratio 2 schedule, eventually thinning reinforcement to an FR 28. After earning all the necessary clicks, the participant selected one of the five iPod applications identified from the preference assessment.

Manual guidance was used to prompt the correct response. Manual guidance was defined as the use of hand-over-hand prompts to complete the picture-based activity schedule components. Prompts were systematically faded using a prompt-delay procedure. After three sessions at 0 s at 100% of intervals on-task and steps completed independently, the delay increased to 2 s. After one session at 100% of intervals on-task and steps completed independently, the delay increased to 4 s. After 100% of intervals on-task and steps completed independently for one day at 4 s, the prompt was fully faded. If an error occurred, manual guidance was used immediately to perform the step correctly. The experimenter then reset that step and the participant had the opportunity to perform the step independently.

Self-reinforcement. The schedule was presented in the same manner as in the teacher-delivered reinforcement phase, except that pictures of the golf counter were embedded in the schedule to signal participants to deliver a click on the counter. Prompting to occasion the correct response was implemented in the same manner as in the teacher-delivered reinforcement condition.

Decreasing proximity and thinning reinforcement. Different levels were implemented to thin reinforcement and decrease proximity for both conditions. Once mastery criterion was met for schedule completion and on-task behavior, the schedule of reinforcement was thinned for the subsequent session. Reinforcement was thinned from FR 2 (level 0), to FR 3 (level 1) to FR 4 (level 2). Next, experimenter’s distance from the participant was increased to 2.1 m (levels 3–5). Once the participant reached level 2 (FR-4), the experimenter’s distance increased from 0.3 m (level 3) to 1.2 m (level 4), to 2.1 m (level 5). After level 5, the experimenter hid in the hallway to be completely out of sight of the participant. Criterions to advance to the next level was set at one day at 80% of intervals on-task and 100% completion of schedule. At this point, the instructor only entered the room to check on the participant and deliver reinforcement (for the teacher-delivered reinforcement condition). The frequency of checking on the participant was reduced from 10 times (level 6), to five times (level 7), to two times (level 8), and finally once per session (level 9). Once level five was reached, reinforcement was further thinned to FR 5 (level 6), FR 9 (level 7), FR 22 (level 8), and finally FR 28 (level 9).

Each time a participant met criterion on one level, the instructor probed three levels ahead before continuing with the systematic fading levels. If the participant met criterion for that level, the instructor continued to assist three levels ahead until the final fading level. Although not needed, if a participant’s schedule completion had been at or below 80% for two consecutive sessions, the instructor would have returned to the earlier systematic levels.

Control condition. Reinforcement was delivered in the same manner as in baseline (i.e., the fixed-time schedule). The experimenter presented the iPod and the vocal instruction, “follow your schedule.” No prompts were delivered and any response or attempts at responding were ignored.

Pre- and post-intervention generalization and maintenance. Generalization of the tasks across settings was assessed through two pre- and two post-intervention sessions conducted in the community and a novel kitchen. Generalization was programmed by varying the order in which the inventory items were presented and providing multiple exemplars of the inventory items. During each session the inventory schedule was used, different items were listed for the participant to count. The location of meal preparation and soap making was varied within the kitchen area. Generalization of responding was not programmed or assessed across novel instructors because a primary goal was for participants to independently perform the tasks in the absence of instructors. Reinforcement was delivered on the same 30-s fixed-time schedule as in baseline.

Maintenance sessions were conducted three weeks after the mastery criterion was met for each participant. Sessions for both teacher-delivered reinforcement and self-reinforce-
ment were conducted in the instructional kitchen in the school and the school store. During the pre- and post-intervention sessions and maintenance sessions, data were collected and summarized in the same format as treatment.

Social validity. To assess the goals of the study, parents of the participants completed a questionnaire at the conclusion of maintenance sessions. Parents used a 7-point Likert-type scale to rate the independent completion of the tasks, the appropriateness of the schedule and self-reinforcement, the feasibility of the schedule and self-reinforcement, and the predicted future use of the schedule and self-reinforcement.

To assess the social validity of the procedures, two measures were administered. First, the four teachers of the participants completed a questionnaire to evaluate the degree to which they agreed with the procedures of the study, including the feasibility of the schedule, the appropriateness of the reinforcement, using a 7-point Likert-type scale. Second, the participants were asked whether they enjoyed following the schedule and delivering their own tokens.

To assess the social validity of the outcomes of the study, nine undergraduate psychology students were shown pairs of video clips with one video each from each participant’s pre- and post-intervention sessions from the teacher-delivered and self-reinforcement conditions. The undergraduate students then completed a questionnaire to rate appropriateness of the tasks, participant engagement, and completion of the activities using a 7-point Likert-type scale.

Inter-observer Agreement and Procedural Integrity

Inter-observer agreement (IOA) data were collected for 50% of experimental sessions. An agreement was defined as both observers scoring the same interval with the same response. IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Across participants, mean IOA for on-task behavior was 94% (range = 90%–100%). Mean IOA for schedule completion was 97% (range = 95%–100%). IOA was 100% for the number of sessions to decrease proximity and thin reinforcement, accurate delivery of self-reinforcement, and number of conditioned reinforcers.

Procedural integrity data were collected for 50% of experimental sessions. The mean accurate implementation of the procedures by the experimenter was 94% (range = 90%–100%). IOA data were also collected on procedural integrity for 50% of the sessions in which procedural integrity data were collected. Mean IOA for procedural integrity was 96% (range = 94%–100%).

Results

Schedule Completion

Figure 1 depicts the percentage of schedule completion across sessions for the three participants. None of the participants correctly completed the schedule during baseline. During the self-reinforcement condition, Jared’s mean schedule completion was 81% (range = 0%–100%). Jared’s percentage of correctly completed schedule components for the teacher-delivered reinforcement condition increased to a mean of 75% (range = 0%–100%). Jared’s mean percentage of correctly completed schedule components during the control condition was 14%.

During the self-reinforcement condition, Matthew’s mean percentage of schedule completion increased to 76% (range = 0%–100%). Matthew’s percentage of correctly completed schedule components for the teacher-delivered reinforcement condition increased to a mean of 85% (range = 0%–100%). Matthew’s mean percentage for the control condition was 15%.

During the self-reinforcement condition, Lizzy’s mean schedule completion was 77% (range = 0%–100%). Lizzy’s percentage of correctly completed schedule components for the teacher-delivered reinforcement condition increased to a mean of 73% (range = 0%–100%). Lizzy’s mean percentage for the control condition was 9%.

On-Task Behavior

Figure 2 shows the percentage of intervals with on-task behavior across the participants. For Jared, the percentage of intervals on task was 0% during baseline but increased to a mean of 100% during both the self-reinforce-
ment condition and the teacher-delivered reinforcement condition. Jared’s mean percentage of on-task behavior was 14% during the control condition.

For Matthew, the percentage of intervals with on-task behavior was 0% during baseline but increased to a mean of 100% during both the self-reinforcement and teacher-delivered reinforcement conditions. Matthew’s percentage of on-task behavior was 13% during the control condition.

For Lizzy, the percentage of intervals with on-task behavior was 0% during baseline but increased to a mean of 100% during both the self-reinforcement and teacher-delivered reinforcement conditions. Lizzy’s percentage of on-task behavior was 11% during the control condition.

Number of Sessions to Decrease Proximity and Thin Reinforcement
During self-reinforcement, all three participants completed the fading procedure in three sessions. During teacher-delivered reinforcement, Jared and Matthew required four sessions and Lizzy required three sessions.

Pre- and Post-intervention Generalization and Maintenance
Pre- and post-intervention generalization probes were conducted for one session each in the novel kitchen and community for Jared and Lizzy. For Matthew, two pre- and post-intervention generalization sessions were conducted in the novel kitchen only. During the pre-intervention probes in the novel kitchen and community, correct schedule completion and on-task behavior was 0% for all participants across both sessions. During post-intervention generalization probes in the novel kitchen, Jared completed 96% of the schedule and Lizzy completed 100% of the schedule. Matthew completed 96% and 100% of the schedule for the probes in the novel kitchen. All participants were on-task.
for 100% of intervals. For post-intervention probes in the community, Jared and Lizzy completed 100% of the schedule correctly and were on-task for 100% of intervals.

During the two maintenance sessions, Jared and Lizzy maintained 100% schedule completion. Matthew maintained at 96% and 100% for the two sessions. All participants were on task for 100% of the intervals during both maintenance sessions.

**Social Validity**

To address the social validity of the goals, the parents rated self-reinforcement on an iPod as appropriate for the participants. Parents also rated self-reinforcement as more appropriate method for their child than teacher delivered reinforcement in the community. There were seven points on the questionnaire with a mean of 7 with no range.

For the assessment of social validity of the procedures, the teachers rated the treatment as acceptable and manageable in the classroom. The teachers were likely to use the iPod touch and self-reinforcement in the future and found self-reinforcement more acceptable than teacher-delivered as a method in the community. The mean of the seven points on this questionnaire was 6.3 (range = 5–7). When the participants were asked to rate their enjoyment using on the iPod touch and self-reinforcement, they reported that they enjoyed following the schedule and delivering tokens to themselves.

To address the social validity of the outcomes of the study, nine undergraduate students from a psychology class viewed videos from the final fading levels. The students rated the participants in the self-reinforcement condition as more independent and on-task than the participants in teacher-delivered reinforcement. The mean for the six points on the questionnaire was 6.1 (range = 5–7). Participants were also rated as more independent and on-task from pre-intervention to post-intervention.
Discussion

The current study assessed whether self-reinforcement and teacher-delivered reinforcement produced any differences in task completion and on-task behavior by three adolescents with autism. Results of this study demonstrated high percentages of on-task behavior and schedule completion in both self-reinforcement and teacher-delivered reinforcement. Post-intervention sessions in the novel settings and maintenance sessions remained at high percentages of on-task and schedule following behavior for both reinforcement conditions. There were no notable differences in responding as a function of the condition. In addition, the proximity of the instructor was decreased in approximately the same number of sessions in both conditions for all participants.

Responding during the control condition also increased slightly during the treatment phase but remained variable for all participants. Meal prep and soap making took place in the same location (i.e., kitchen), where several functional living programs are taught on a daily basis. While one participant was completing the soap or meal task, other participants were completing tasks as part of their typical programming. During the control condition, it is possible that the participants learned from their peers as they were observed attending to the tasks and the location of the materials. This is potentially a limitation of this study in that the skill assessment conducted prior to beginning the study did not reflect the participants’ ability to engage in observational learning. An additional limitation is that generalization of responding in the community was not assessed for one participant (i.e., Matthew). Because task assignment was counterbalanced across participants, Matthew’s control condition was the vocational task and he did not learn the task in the school. As a result, it did not make sense to assess the skill in the community.

Thus far, the majority of self-management research has used treatment packages to increase independence (Ackerman & Shapiro, 1984; Moore & Fodor-Davis, 1989). The current study extends the literature on self-management by demonstrating the effectiveness of self-reinforcement alone. In particular, Newman et al. (1996) found that self-reinforcement is as effective as teacher-delivered reinforcement; however, the presence of the instructor can be removed completely with self-reinforcement. The results of the current study agree with these results in that even though the two procedures are equally effective, self-reinforcement may be more appropriate for individuals with autism because self-reinforcement can remove public supervision, which could be stigmatizing in the community.

Few studies have evaluated the use of portable devices in the community (Laarhoven et al., 2009; Mechling et al., 2009; Taberdoughty et al., 2013; Chang et al., 2011); the results of the current study demonstrate generalization of skills from the classroom to the community, requiring less instructor support to complete tasks. One way generalization was programmed for in the present study was through mediated generalization. By transferring the iPod touch from the teaching setting to the generalization setting, responding came under control of the iPod. Further research is needed to determine successful strategies across skills and settings for promoting independence in the community.

The current study further demonstrates the effectiveness of self-reinforcement while establishing a new system of reinforcer delivery. Carlile et al. (2013) used a picture-based activity schedule via the iPod touch to increase on-task behavior and schedule completion. Self-reinforcement builds upon this method by demonstrating more rapid proximity fading of the instructor and generalization of responding to novel settings, including the community. Receiving tokens on the iPod touch is more socially acceptable in the community as it can be discreetly implemented. By allowing participants to administer their own tokens, this reinforcement system removes the need for instructor support in the community. Based on the social validity results, parents, teachers, and undergraduate students agree that self-reinforcement supports increased independence.

Future studies could expand upon the use of an iPod touch to promote independence and generalization of skills across settings. For certain skills, such as vocational and functional living skills, it may be more beneficial...
for the individual to learn directly in the community or home. The current study also used a golf counter as the method to deliver reinforcement because the device was familiar to the participants; however, a future study could use the iPod touch to deliver reinforcement; such use would decrease the number of materials needed to complete work tasks in the community. It is also possible that a different set of tasks would result in a difference in responding between self-reinforcement and teacher delivered reinforcement. Future studies could assess different activity schedules to evaluate whether different tasks would produce a difference in responding between conditions.

Future studies could also assess response generalization when using the iPod touch in the community. Prompting strategies are often used in the classroom, but may not be an effective teaching tool in the community. Future studies could also compare different reinforcement schedules to determine the optimal schedule for thinning reinforcement and increasing the proximity of the instructor. With appropriate teaching methods and reinforcement schedules, learners can be independent and successful in a range of activities in the community, leading to a higher quality of life (Chang et al., 2011).

In summary, the present study extended the prior research in this field, and also identified an effective and innovative approach to self-reinforcement. The positive outcome for participants is important in that it should increase their success and improve their quality of daily living.

References


Moore, S. C., & Fodor-Davis, M. A. (1989). Using self-management strategies to increase the pro-


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Abstract: Recently researchers have begun exploring the efficacy of interventions designed to improve text comprehension skills for students with developmental disabilities (DD). Text comprehension is essential for understanding academic content as students with disabilities make progress in the general education curriculum. This article focuses on single case design (SCD) studies of interventions and supports for improving text comprehension skills for students with DD. Specifically, the article examines elements essential for rigorous single case design research in this area. After reviewing the research, we provide recommendations for improving rigor of research in this area.

Within the past decade, an increased focus on academic achievement for all students has changed the approach to instruction for students with developmental disabilities (DD, including students with intellectual disability and autism spectrum disorders). Historically, curriculum for students with DD has emphasized life skills instruction (e.g. preparing meals) or prerequisite skill instruction (i.e., calling letters). While there is still debate over how to balance academic instruction with instruction on life skills (Ayres, 2012; Browder, 2012; Hunt, McDonnell, & Crockett, 2012), researchers have begun to explore effective methods for teaching academic content to this population. Results show that students can learn academic content in math (Browder et al., 2012), science (Hudson, Browder, & Jimenez, 2014; Knight, Spooner, Browder, Smith, & Wood, 2013), social studies (Schenning, Knight, & Spooner, 2013; Zakas, Browder, Ahlgrim-Delzell, & Heafner, 2013), and language arts (Mims, Lee, Browder, Zakas, & Flynn, 2012) when explicit and systematic procedures are implemented.

An increased emphasis on reading for all students can create greater opportunity to engage in the general curriculum and learn skills that are meaningful for all students. The National Reading Panel (NRP, 2000) identified the following core components for reading instruction: phonemic awareness, phonics instruction, fluency, vocabulary instruction, and text comprehension. While the NRP report evaluated reading practices for readers without disabilities, researchers have suggested that students with developmental disabilities also require intensive instruction in these five areas (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozine, 2006). However, traditionally reading instruction for students with DD has focused on sight word instruction. Despite research indicating that sight word instruction does not contribute to comprehension in advanced stages of reading, (e.g., when reading words in extended text; Erickson, Hatch, & Clendon, 2010), little emphasis was placed on other elements of reading instruction for students.
with DD, such as phonics instruction and comprehension (Knight, Browder, Agnello, & Lee, 2010).

Reading instruction for students with DD should systematically address all of the components recommended by the NRP. However, slow progress or lack of progress in one area, such as phonics instruction, should not impact whether or not students with DD receive instruction in text comprehension skills (Browder et al., 2009). Some researchers have emphasized that text comprehension is not just a by-product of successful decoding (Erickson et al., 2010; Nation, Clarke, Wright, & Williams, 2006) but is central to why we teach students to read.

Students who make slow progress towards fluently decoding text have other ways to engage text, allowing for instruction to focus on text comprehension. Assistive technologies such as E-text and text-to-speech can support struggling readers and can offer students an opportunity to interact with text without decoding it (Browder et al., 2009). Additionally, read alouds or shared story reading, where a proficient reader reads the text to the student while providing opportunities for the student to participate and respond within the story are low tech and inexpensive solutions for accessing text without the ability to decode (Hudson & Test, 2011). Providing access to written text, whether through E-text or read-alouds, will not be enough to guarantee comprehension. Students with DD still require intensive instruction to learn text comprehension skills (Erickson et al., 2010).

Text comprehension is crucial for students’ progress in the general education curriculum and their independence throughout a text rich society. In typical general education science, social studies, and language arts courses, a great deal of content is communicated through written text and subsequently full participation in those domains requires skilled text comprehension. Additional research is needed to determine the best instructional methods to increase comprehension of academic text. To accomplish this, researchers need to use methodologically sound and well-designed studies to yield precise information regarding effective and efficient methods for developing text comprehension skills.

This review evaluates how researchers have used single case research designs to analyze interventions, measure dependent variables, and control for threats to internal validity with respect to academic text comprehension skills of students in K-12 with DD. This review focuses on single case designs because they include some of the design methodologies used most frequently with lower incidence populations. Relative to reading, the review adopts the definition of text comprehension used by Knight and Sartini (2015), which included a student demonstrating his/her understanding of text-based content (e.g., answering questions, providing definitions, applying text content to novel situations), regardless of whether the student reads independently (i.e., reading comprehension) or accesses text via proficient readers or assistive technology (i.e., listening comprehension). While they may seem like different skills on a surface level, both are rooted in overall language ability. “It may be more correct to say that the potential for comprehending a written text is set by the ability to comprehend that same text when it is spoken,” (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001, p. 43). In this study, authors review the current state of the single case design literature on teaching comprehension across content areas to students with DD and make recommendations based on these findings.

**Method**

Identification of potential articles began with an electronic search using the following databases: ERIC, Proquest, PsycInfo, and Web of Science for the combinations of the terms: reading, reading comprehension, text comprehension, and literacy combined with other search terms to narrow the specific population, including: disability, intellectual disability, cognitive disability. The online search was conducted for years 1975–2015. To be included in this literature review, articles needed to meet several criteria. First, only articles using single case design methodology were included. The definition of single case design was adopted from the What Works Clearinghouse Single Case Design Technical Documentation (Kratochwill et al., 2010). Articles needed to be peer-reviewed and published in English. Second, the researchers had
to evaluate interventions where at least one dependent variable was text comprehension (i.e., either reading, listening, or supported), although the academic subject matter could vary (i.e., text comprehension of science content would be included). Third, comprehension had to be measured at the phrase level or higher. Studies measuring comprehension at the single word level were omitted. Fourth, participants had to be between 3–22 years of age in order to reflect the population of students who receive special education services under IDEA. Finally, students with developmental disabilities was defined as students who met at least one of the following disability related criteria: documentation of an intellectual disability (IQ below 70 and deficits in adaptive behavior or special education eligibility), or autism spectrum disorder with documented intellectual functioning below 70. Studies of students participating in the state’s alternate assessment were included when disability was not clear. As long as one participant in the study met the above criteria, the article was analyzed. Several journals were hand-searched from 2012–2015: Exceptional Children, Research and Practice for Persons with Severe Disabilities, The Journal of Special Education, Education and Training in Autism and Developmental Disabilities and Focus on Autism and Other Developmental Disabilities. These journals were searched to identify any articles not identified in the online searches and were selected because they contained many of the articles identified during the online search. Finally, an ancestral search was completed on all articles identified through the online and hand searches. A total of 26 single case design studies met the full inclusion criteria (see Table 1).

Study Analysis

Analysis and synthesis of the research is organized around key elements typically found in the method section of a research study. The review focuses on potential issues that may threaten internal validity by summarizing: participants, research design, independent and dependent variables, and data analysis. The review then provides recommendations for future research based on the synthesis. Some of these validity issues may be unavoidable while others, given sufficient resources, may be more amenable to change for future studies. Adopting the most rigorous research methodology will generate instructional strategies that we can be sure are effective when implemented in classrooms. In order to improve focus within this narrative, results are presented for each component area (e.g., participants) and then immediately followed by a discussion and recommendations. While this combination of results and discussion is unconventional, this presentation reduces the need to repeat elements of the results within the discussion.

Results and Recommendations for Future Research

Participants

Results. The term developmental disability encompasses individuals with a wide range of abilities. Typically, researchers described their inclusion criteria relative to students by IQ scores, medical diagnoses, school eligibility category, and/or whether students participated in alternate assessments based on alternate achievement. While these descriptors use terms that are familiar to many researchers, they do little to explain the heterogeneity within this population of students relative to the topic of interest. Some studies included in this review selected participants based on students’ behaviors or learning needs. For example, Browder, Trela, and Jimenez (2007) selected students based on current reading skills by including students who could read less than 20 sight words.

Some studies described their participants’ skills beyond those required for inclusion in the study. One particular study described the student’s English language ability, pre-academic skills, and ability to follow a picture schedule with prompts (Spooner, Rivera, Browder, Baker, & Salas, 2009). Information about students’ challenging behaviors that impacted academic instruction was reported (e.g., Browder, Lee, & Mims, 2011; Mims, Hudson, & Browder, 2012). One study included information about the students’ participation with their general education peers and reading levels (Shurr & Taber-Doughty, 2012).

Student communication skills were frequently reported (e.g. Browder et al., 2007; Mims, Browder, Baker, Lee, & Spooner, 2009; Shurr & Taber-Doughty, 2012). One study in-
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Research Design</th>
<th>Independent Variables</th>
<th>Dependent Variable Related to Comprehension</th>
<th>Text</th>
<th>Participant Response Mode</th>
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<tbody>
<tr>
<td>Bethune &amp; Wood (2013)</td>
<td><em>n</em>=3, aged 8–10 years Mild ID/ASD</td>
<td>Multiple baseline across participants</td>
<td>Graphic organizer to organize text topics by wh-questions</td>
<td>Independent correct answers literal comprehension questions</td>
<td>Excerpts from published reading curriculum, 2–4 pages long</td>
<td>Vocal</td>
</tr>
<tr>
<td>Browder, Hudson, &amp; Wood (2013)</td>
<td><em>n</em>=3, aged 11–13 years Moderate ID</td>
<td>Multiple probe across students</td>
<td>Graphic organizer to teach definitions of wh-questions, system of least prompts &amp; constant time delay</td>
<td>Correctly matching wh-questions to definitions, and independent correct answering comprehension questions</td>
<td>Books adapted from grade level text (reduced reading level to 1st–2nd grade, divided into small chapters, comprehension questions embedded into sections)</td>
<td>Vocal or touching correct answer in text</td>
</tr>
<tr>
<td>Browder, Lee, &amp; Mims (2011)</td>
<td><em>n</em>=3, aged 6–9 years Severe ID and physical or sensory impairment</td>
<td>Multiple probe across response modalities</td>
<td>Scripted task analytic lessons with systematic prompting</td>
<td>Independent, correct answers to literal comprehension questions from choice of 2 objects or answers</td>
<td>Books adapted from age appropriate text (laminated, real objects inserted, embedded repeated story line)</td>
<td>Eye gaze, select object, or touch correct object</td>
</tr>
<tr>
<td>Browder, Mims, Spooner, Ahlgrim-Delzell, &amp; Lee (2008)</td>
<td><em>n</em>=3, aged 7–10 years, profound ID with physical disabilities and intense medical needs</td>
<td>Multiple probe across participants</td>
<td>Task analyzed lessons built based on Universal Design for Learning, system of least prompts</td>
<td>Independent correct student responses to comprehension questions from choice of 2 objects or answers</td>
<td>Books adapted from age appropriate text (character’s name changed to child’s name, insertion of repeated story line, real objects used as comprehension aids)</td>
<td>Eye gaze, reach towards object, touch object</td>
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<tr>
<td>Browder, D., Trela, K., &amp; Jimenez, B. (2007)</td>
<td><em>n</em>=6 students, aged 12–14 years Moderate ID</td>
<td>Multiple probe across teachers</td>
<td>Read alouds, adapted books, task analysis for teachers to teach reading skills to emergent readers</td>
<td>Correct student responses on certain steps of task analysis, one step was correct student response to a comprehension question</td>
<td>Adapted text (e.g., text was simplified to 2nd-3rd grade reading level, picture symbols inserted for important vocabulary, embedded definitions of new words, repeated story lines, summaries at end of chapters)</td>
<td>Vocal or by touching symbol</td>
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<tr>
<td>Evmenova, Behrmann, Mastropieri, Baker, &amp; Graff (2011)</td>
<td><em>n</em>=5, aged 19–24 years One 19 year old participant with moderate ID</td>
<td>Multiple baseline across participants with alternating treatments</td>
<td>Adapted video instruction (captions, highlighted text)</td>
<td>Independent correct responses to 3 factual questions</td>
<td>Video clips from Discovery Channel United Streaming</td>
<td>Vocal</td>
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<td>Study</td>
<td>Participants</td>
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<td>Dependent Variable Related to Comprehension</td>
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<td>Participant Response Mode</td>
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<tr>
<td>Evmenova &amp; Behrmann (2014)</td>
<td>n=6, aged all MOID or MID enrolled in a secondary program. Only 4 were under 22. GE reading level for those 4 are grades K-8</td>
<td>Multiple baseline across students</td>
<td>Video clips with alternate narration at reduced reading level, alternate narration with verbatim captions, with symbols, or with text highlighted in yellow as it was read. Video searching option presented at end of video</td>
<td>Correct answers to inferential and factual comprehension questions</td>
<td>In adapted narration condition, the text difficulty was reduced and all passive voice sentences were removed</td>
<td>Vocal</td>
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<tr>
<td>Flores &amp; Ganz (2009)</td>
<td>n=4, aged 10–14 years, Three participants with mild and moderate ID/ASD</td>
<td>Multiple probe across behaviors</td>
<td>Use of scripted published reading program utilizing Direct Instruction (DI)</td>
<td>Correct responses on 3 DI comprehension tasks</td>
<td>Text from DI reading program</td>
<td>Vocal</td>
</tr>
<tr>
<td>Flores &amp; Ganz (2007)</td>
<td>n=4 aged 10–14 years, One participant with Moderate ID</td>
<td>Multiple probe across behaviors</td>
<td>Use of scripted published reading program utilizing Direct Instruction (DI)</td>
<td>Correct responses on 3 DI comprehension tasks</td>
<td>Text from DI reading program</td>
<td>Vocal</td>
</tr>
<tr>
<td>Fritschmann, Deshler, &amp; Schumaker (2007)</td>
<td>n=8, aged 15 years old, Three participants with mild or moderate ID</td>
<td>Multiple probe across students</td>
<td>Instruction in multi-step inference strategy</td>
<td>Independent correct answers of factual and inferential comprehension questions, participants correct usage of strategy</td>
<td>Text passages from published reading curriculum, grades 4-9</td>
<td>Unknown</td>
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<tr>
<td>Hua, Hendrickson, Therrien, Woods-Groves, Ries, &amp; Shaw (2012) Focus</td>
<td>n=3, aged 21 years, Mild ID/ASD</td>
<td>Multiple baseline across participants</td>
<td>Repeated readings with error correction, comprehension prompting before reading passage, systematic prompting to answer comprehension questions after reading passage</td>
<td>Correct answers on inferential and factual comprehension questions</td>
<td>Text passages adapted from 3rd and 6th grade materials (shortened to be completed within 90 seconds)</td>
<td>Vocal</td>
</tr>
<tr>
<td>Hua, Therrien, Hendrickson, Woods-Groves, Ries, &amp; Shaw (2012)</td>
<td>n=3, aged 19-21 years, 2 with Mild ID</td>
<td>Multiple baseline across participants</td>
<td>Repeated readings with error correction, question generation prompts (cue cards) before reading passage, systematic prompts</td>
<td>Independent correct answers on factual and inferential comprehension questions</td>
<td>Text passages adapted from 1st, 2nd, and 6th grade materials (e.g., shortened to be completed within 90 seconds)</td>
<td>Vocal</td>
</tr>
<tr>
<td>Hudson &amp; Browder (2014)</td>
<td>n=3, aged 9–11 years, Moderate ID</td>
<td>Multiple probe across students</td>
<td>Peer tutoring, peer read-alouds with scripted directions for providing system of least prompts, pre-teaching wh-concepts, response boards</td>
<td>Independent correct answers and prompted correct answers</td>
<td>Books adapted from grade level text (reduced reading level, definitions inserted, enlarged text, laminated page protectors. Response boards - each contained the wh-rule, a place to indicate need for help, and possible answers on the board (see p. 8)</td>
<td>Point to correct answer on response board with up to 9 possible choices</td>
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</table>
TABLE 1—(Continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Research Design</th>
<th>Independent Variables</th>
<th>Dependent Variable Related to Comprehension</th>
<th>Text</th>
<th>Participant Response Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hudson, Browder, &amp; Jimenez (2014)</td>
<td>n=3 upper elementary (ages not specified) Moderate and severe ID</td>
<td>Multiple baseline across participants</td>
<td>Peer tutoring, adapted science lessons (e.g., read aloud with scripted directions for how to administer system of least prompts)</td>
<td>Independent correct answers and prompted correct answers on 6 comp questions (2 inferential and 4 literal)</td>
<td>Adapted grade level science (e.g., lesson summaries developed at 400-600 Lexile to capture main ideas, vocabulary definitions inserted)</td>
<td>Point to correct answer on response board from 6 possible choices</td>
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<tr>
<td>Knight, Spooner, Browder, Smith, &amp; Wood (2013)</td>
<td>n=3, aged 13–14 years Moderate ID and ASD</td>
<td>Multiple probe across students</td>
<td>Constant time delay, multiple exemplars of a graphic organizer, teach examples and non-examples, teaching loosely</td>
<td>Independent correct completion of steps of a task analysis demonstrating student knowledge on a science topic (e.g., convection)</td>
<td>Science concepts and vocabulary related</td>
<td>Points to, touches, or vocalizes correct answer. Also placing answers in correct location on graphic organizer</td>
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<tr>
<td>Knight, Wood, Spooner, Browder, &amp; O’Brien (2015)</td>
<td>n=4, aged 11–14 years Mild and moderate ID/ASD</td>
<td>Multiple probe across participants</td>
<td>Supported e-text (BookBuilder) with explicit instruction (Model-Lead-Test)</td>
<td>Independent correct answers from a field of 4 possible answers on digital quiz with vocabulary, factual, and application questions</td>
<td>Grade level science lessons adapted for use with BookBuilder (vocabulary definitions, examples and illustrations, simplified text, etc.)</td>
<td>Select by clicking correct answer</td>
</tr>
<tr>
<td>Mims, Browder, Baker, Lee, &amp; Spooner (2009)</td>
<td>n=2, aged 6–9 years Severe ID and visual impairments</td>
<td>Multiple probe across books</td>
<td>System of least prompts, comprehension questions asked within the text, adapted text</td>
<td>Independent correct answers to factual comprehension questions</td>
<td>Adapted age-appropriate books (e.g., real objects inserted in book, repeated storylines added)</td>
<td>Select by touching real object from field of 2</td>
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<tr>
<td>Mims, Hudson, Browder (2012)</td>
<td>n=4, aged 12-14 year Severe ID and autism</td>
<td>Multiple probe across participant</td>
<td>Read aloud, systems of least prompts to use graphic organizer to answering questions and sequence story events</td>
<td>Independent, correct answers to multiple choice questions</td>
<td>Books adapted from grade level materials (text summation, controlled vocabulary, words paired with symbols, books printed &amp; laminated inside binders)</td>
<td>Select picture answer from field of four</td>
</tr>
<tr>
<td>Mucchetti (2013)</td>
<td>n=4, aged 6–8 years Moderate ID and ASD</td>
<td>Multiple baseline across participants with modified alternating treatment design probe</td>
<td>Shared reading, teacher task analysis to engage students in lesson (e.g., system of least prompts)</td>
<td>Correct responses to literal comprehension questions (e.g., who, what, where)</td>
<td>Adapted books (e.g., tactile objects inserted, picture symbols, simplified text)</td>
<td>Vocal, pointing or touching correct response from field of 4</td>
</tr>
<tr>
<td>Study</td>
<td>Participants</td>
<td>Research Design</td>
<td>Independent Variables</td>
<td>Dependent Variable Related to Comprehension</td>
<td>Text</td>
<td>Participant Response Mode</td>
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<tr>
<td>Roberts &amp; Leko (2013)</td>
<td>n=3, 6th grade students</td>
<td>Multiple baseline across</td>
<td>Individualized lesson plans targeted to address student’s IEP goals and academic content, teacher task analysis to teach content</td>
<td>For the one participant, correct responses to yes/no comprehension and vocabulary</td>
<td>Adapted books (e.g., split books into sections and inserted 2–3 comprehension questions in each section, inserted symbols, reduced text complexity)</td>
<td>Answer with communication device or sign language</td>
</tr>
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<td></td>
<td>(ages not specified). Only one participant (moderate ID and ASD) had comprehension as a dependent variable</td>
<td>participants</td>
<td></td>
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<tr>
<td>Schenning, Knight, &amp; Spooner (2013)</td>
<td>n=3, aged 11–13 years</td>
<td>Multiple probe across</td>
<td>Structured inquiry process, teacher task analysis and script for presenting lessons, adapted text, graphic organizer</td>
<td>Independent correct student responses to placement and placement of answers on graphic organizer</td>
<td>Adapted social studies text (e.g., picture cues, reduced text complexity to 2nd–3rd grade reading level)</td>
<td>Vocal or placing answer in correct location on graphic organizer</td>
</tr>
<tr>
<td></td>
<td>Moderate ID</td>
<td>participants</td>
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<tr>
<td>Shurr &amp; Taber-Doughty (2012)</td>
<td>n=4, aged 12–15 years</td>
<td>Multiple probe across</td>
<td>5 picture cues (representing a text feature such characters) presented with discussion about the pictures before, during, and after the read aloud</td>
<td>Correct answers to factual multiple choice questions.</td>
<td>Text from age-appropriate published reading series</td>
<td>Vocal or by pointing to the picture</td>
</tr>
<tr>
<td></td>
<td>Moderate ID</td>
<td>participants</td>
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<tr>
<td>Spooner, Ahlgrim-Delzell, Kemp-Inman, &amp; Wood (2014)</td>
<td>n=4, aged 8–12 years</td>
<td>Multiple probe across</td>
<td>Shared stories delivered via iPad, systematic instruction (constant time delay and modified system of least prompts)</td>
<td>Independent correct answers to factual and inferential comprehension questions from a field of 4</td>
<td>Adapted books (e.g., repeated story line, highlighted vocabulary words, pages separated for easy turning)</td>
<td>Select by touching correct answer on iPad</td>
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<tr>
<td></td>
<td>Mild and moderate ID</td>
<td>students</td>
<td></td>
<td></td>
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<tr>
<td>Spooner, Rivera, Browder, Baker, &amp; Salas (2009)</td>
<td>n=1, aged 6 years</td>
<td>Multiple probe across</td>
<td>Culturally relevant adapted books, forward chaining of literacy tasks</td>
<td>Independent correct responses across three literacy-related skill sets (one was comprehension)</td>
<td>Adapted children’s books (e.g., repeated story line, enlarged print in some places, laminated pages)</td>
<td>Vocal or by selecting picture of correct answer from field of 2</td>
</tr>
<tr>
<td></td>
<td>Moderate ID and ASD</td>
<td>skill set</td>
<td></td>
<td></td>
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<tr>
<td>Zakas, Browder, Ahlgrim-Delzell, &amp; Heafner (2015)</td>
<td>n=3, aged 11–13 years</td>
<td>Multiple probe across</td>
<td>Modified graphic organizer with scripted prompts, pre-teaching social studies vocabulary</td>
<td>Correct answers on graphic organizer</td>
<td>Adapted grade level passages (e.g., reduced text complexity, picture symbols, all passages rewritten to follow same story structure)</td>
<td>Written answers</td>
</tr>
<tr>
<td></td>
<td>Two participants with mild ID and ASD</td>
<td>students</td>
<td></td>
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cluded information about the student’s listening comprehension skills, such as the ability to follow verbal directions (Mims, Hudson, et al., 2012). If students did not communicate using words, information about other communication modalities (such as facial expressions, reaching, and eye movement) were reported in several studies (e.g., Browder et al., 2011; Browder, Mims, Spooner, Ahlgrim-Delzell, & Lee, 2008; Mims et al., 2009).

Some researchers assessed students’ skills after teacher nomination, but before the beginning of the study. For example, Shurr and Taber-Doughty (2012) assessed whether participants could answer basic multiple-choice questions, the same response topography measured in the study. Other researchers assessed students’ skills using standardized measures like the Peabody Picture Vocabulary Test (Mucchetti, 2013), curriculum-based measures like the Dynamic Indicators of Basic Early Literacy Skills (DIBELS, e.g., Allor, Gifford, Al Otaiba, Miller, & Cheatham, 2013; Hua, Hendrickson, et al., 2012).

**Recommendations.** Since students with DD have a wide range of abilities and needs, researchers should provide as detailed behavioral descriptions about participants as page limits allow. With respect to text comprehension specifically, researchers should describe the participant’s communication abilities (e.g., orally, using AAC, sign language), academic strengths (e.g., decoding and comprehension abilities), and academic deficits. This comprehensive description assists in assessing the potential generality of the findings to specific learners. In addition, detailed participant descriptions may aid in future replications.

Researchers should consider assessing students’ skills to establish baseline equivalence between participants as well as to determine if participants demonstrate sufficient prerequisite skills (e.g., attending to materials, responding to attentional cues) to meaningfully participate and benefit from the intervention. Screening students’ skills may help researchers determine if prerequisite skills need to be taught before the start of the intervention study. Establishing baseline equivalence will enable researchers to make comparisons between each participant’s response to intervention.

**Research Designs**

**Results.** Almost all SCD studies included in this review used multiple baseline or multiple probe designs (e.g., Bethune & Wood, 2013; Evmenova & Behrmann, 2014; Flores & Ganz, 2007; Fritschmann, Deshler, & Schumaker, 2007; Hua, Hendrickson, et al., 2012; Hudson et al., 2014; Mims et al., 2009; Spooner et al., 2009), likely because these designs are ideal for academic skills that cannot be reversed (Gast, Lloyd, & Ledford, 2014). Most multiple baseline studies in this review measured changes across participants (e.g., Bethune & Wood, 2013; Hua, Hendrickson et al., 2012; Hua, Therrien, et al., 2012; Hudson et al., 2014; Roberts & Leko, 2013). One study used a multiple baseline across participants design in combination with an alternating treatments design (Evmenova, Behrmann, Mastropieri, Baker, & Graff, 2011). In this study, the authors evaluated a functional relation between the intervention package and improved text comprehension with a multiple baseline, and used an alternating treatment design during the intervention phase to evaluate components of the intervention package.

Multiple probe designs have been used across students to improve skills (e.g., reading, comprehension, pre-literacy; Bethune & Wood, 2013; Browder, Mims, et al., 2008; Shurr & Taber-Doughty, 2012), conditions (e.g., books, student response modes; Browder et al., 2011; Flores & Ganz, 2009; Mims et al., 2009), and across student response modalities (e.g., signing, pointing; Browder et al., 2011).

**Recommendations.** Multiple probe and multiple baseline across participant designs are the most widely utilized SCD in this line of research. These variations are fundamentally different from SCDs that measure the dependent variable across conditions or across behaviors, and have some limitations researchers should consider and address in their studies. First, because the independent variable is introduced across various individuals but not systematically replicated with any one individual, multiple baseline designs across participants rest “solely on inter-subject replication” (Wolery, Gast, & Ledford, 2014, p. 313). Future research should consider combining across participants designs with other single...
subject research designs to improve rigor (e.g., Evmenova et al., 2011).

Researchers may wish to consider utilizing multiple probe over multiple baseline designs. Multiple probe designs offer a distinct advantage because baseline behaviors are measured intermittently rather than continuously, requiring fewer exposures to pre-intervention conditions. This is ethically prudent because researchers have already made an a priori assumption that the intervention is better than what is occurring in baseline conditions. Not only is less exposure to the less effective condition preferable, but students are unlikely to increase text comprehension skills from repeated testing alone (Gast, Lloyd, & Ledford, 2014). As research continues to identify successful text comprehension interventions, researchers may wish to consider employing comparative designs (e.g., adapted alternating treatment) to study intervention components and/or refine intervention packages (Wolery et al., 2014).

Independent Variables

Results. In some studies, the independent variable consisted of one intervention rather than a package of multiple interventions (e.g., a published reading program). The majority of studies, however, utilized treatment packages with multiple intervention components.

Published reading programs. Two studies used a Direct Instruction reading intervention series (Corrective Reading Thinking Basics) to improve text comprehension (Flores & Ganz, 2007, 2009). In both studies, researchers implemented the Direct Instruction program exactly as recommended by the publisher.

Comprehension-enhancing supports. In many studies, comprehension-enhancing supports, such as paper-based materials and technology applications were created or adapted for use in the treatment package. A few studies created graphic organizers to enhance text comprehension (e.g., Bethune & Wood, 2013; Browder, Hudson, & Wood, 2013; Knight et al., 2013; Schenning et al., 2013; Zakas et al., 2013). Some studies utilized technology applications to aid text comprehension, including supported eText (Knight, Wood, Spooner, Browder, & O’Brien, 2015) and adapted video instruction (Evmenova et al., 2011).

Adapted text. While some studies used original text as intervention materials, many researchers created adapted books or reading passages to increase student understanding. Typical adaptations included inserting repeated story lines (e.g., Browder et al., 2011; Browder, Mims, et al., 2008; Browder et al., 2007) and symbols to augment text (e.g., Mims, Hudson, et al., 2012; Roberts & Leko, 2013). Word count was often reduced in order to effectively communicate the most essential components of the passage (e.g., Evmenova et al., 2011; Mims et al., 2009). Grammatical changes were made, such as removing passive voice statements in favor of declarative statements (Evmenova et al., 2011). In one study, all of the social studies passages were adapted so that content was presented in the same order (i.e., first the event, then place, then people; Zakas et al., 2013).

Some studies inserted real objects referenced in the story (e.g., shoelaces, pens, candy) within the book for students with sensory or visual impairments or to provide context for students who benefit from using real objects over pictures (e.g., Browder et al., 2011; Mims et al., 2009; Mucchetti, 2013). Portions of the book were often enlarged for emphasis or to increase access for students with visual impairments (e.g., Spooner et al., 2009). In a study conducted with students who had profound multiple disabilities, researchers addressed individual student needs through added accommodations, such as low light adaptations, illuminated reading materials on a light box, and a flashlight to call attention to the features of the book (Browder, Mims, et al., 2008).

Instructional procedures. Instructional procedures were often included as components of larger treatment packages. Both studies by Hua and colleagues (2012) utilized repeated reading, where the text is presented multiple times to increase comprehension. Additionally, many studies evaluated the use of teacher task analyses to improve fidelity of instruction in respect to text comprehension (e.g., Browder, Flowers, & Wakeman, 2008; Browder et al., 2011; Browder et al., 2007). Read-alouds or shared story reading was frequently included in treatment packages.
aimed at increasing comprehension (e.g., Browder, Flowers, et al., 2008; Browder et al., 2007; Mims, Hudson, et al., 2012; Mucchetti, 2013; Shurr & Taber-Doughty, 2012; Spooner et al., 2009).

**Recommendations.** One challenge in analyzing the current research on text comprehension revolves around the inability to parse effects of different components in a treatment package. For example, many studies reported in this review included adapted text as part of a larger treatment package. More research needs to be done to determine if adapted text is effective on its own, because adapting text with pictures, symbols, and real objects can be costly and time consuming for classroom teachers. Conversely, graphic organizers are generally inexpensive and easy to create. There is some evidence that graphic organizers may be effective comprehension support tools, but research generally evaluates their effectiveness within larger intervention packages. Adapted text and graphic organizers may not be effective without systematic instruction in text comprehension or how to use those aids to comprehend text. Some researchers have begun to examine the effectiveness of adapted text/graphic organizers when paired with systematic instruction (e.g., Knight et al., 2013; Mims, Hudson, et al., 2012). More research needs to be done to explore this relationship across content areas and grade levels.

Researchers should continue to evaluate the effectiveness of commercially-available reading programs. First, many of these programs provide a more comprehensive approach to reading instruction, including skills beyond text comprehension. It may be more logical to target comprehension alongside of other reading skills rather than in isolation. Targeting multiple reading skills through comprehensive instruction may help students draw connections between the individual reading skills and how to apply those skills when encountering text (Allor, Mathes, Champlin, & Cheatham, 2009). There is some early evidence that reading programs validated for use with students with high incidence disabilities may also work for developing readers with DD (Allor et al., 2009). If a school’s existing reading curriculum can be used effectively with students with DD (with adaptations and differentiated instructional strategies), then this may reduce school expenditures and time spent by teachers to create new or adapted reading materials for students with DD. Exposing students with DD to the same instructional materials used by general education peers may be in alignment with the law but doing so without evidentiary support is not.

More research needs to examine generalization of reading strategies across academic content areas. Different kinds of text (e.g., expository and narrative) may require different text comprehension strategies. Different text comprehension strategies may need to be taught differently to students with DD.

**Selection and Presentation of Text Materials Across Phases**

**Results.** The amount of instructional materials varied significantly across studies. Most studies included fewer than five different reading samples that were presented multiple times within the baseline and intervention phases (e.g., Browder et al., 2011; Browder, Mims, et al., 2008; Mims et al., 2009; Mucchetti, 2013). Two studies by the same research group used 27 reading passages to minimize student exposure to the same texts. Authors stated that the purpose of the large number of reading passages was so that participants did not encounter the same passage twice within the study (Hua, Hendrickson et al., 2012; Hua, Therrien, et al., 2012). One study used different reading passages for each data point in a tier, as well as one passage used in baseline and intervention (Knight et al., 2015).

The manner in which researchers selected reading passages varied. Mucchetti (2013) selected books with concrete (rather than abstract) storylines about concepts familiar to young urban students. Mims, Hudson et al. (2012) selected five biographies because participants’ general education peers would likely read those same biographies. In several studies, content experts advised the research team regarding the appropriateness of the materials (e.g., Browder et al., 2011, Mims et al., 2012; Zakas et al., 2013), and whether the adapted materials reflected the essence of the original materials (Mims, Hudson, et al.,
2012). In another study, a social studies content expert reviewed the adapted text for content validity (Zakas et al., 2013). Many researchers selected reading materials based on level of difficulty. Some researchers modified text to achieve a particular level of difficulty. Bethune and Wood (2013) selected all reading passages from the same reading level in a particular reading curriculum. Mucchetti (2013) only used passages with a Scholastic grade level of 1.6–1.9. Hua, Hendrickson and colleagues (2012) computed Flesch-Kinkaid reading levels for research materials to ensure that materials matched known student reading levels. Additionally, they shortened reading passages to match participants’ assessed reading fluency rates. All passages were designed so that participants could read the passage within 90 seconds. Additionally, each passage used in the study introduced the same number of science concepts, regardless of topic. Another study assessed adapted reading passages to obtain a Lexile number (Hudson et al., 2014).

The manner in which materials are presented to the student(s) is important for controlling for practice effects. Bethune and Wood (2013) presented each reading passage only once during the study. In other studies, researchers randomly assigned passages to intervention sessions. (Hua, Hendrickson et al., 2012; Hua, Therrien et al., 2012; Mims et al., 2012). Mucchetti (2013) utilized only three books, two adapted with picture symbols and one unadapted. Comprehension responses for the un-adapted book were continuously assessed in relation to responses for the two adapted books.

Mims and colleagues (2012) used five adapted biographies. In baseline, each biography was presented in an alternating fashion. Prior to intervention, each biography was probed once, then assessed 3–4 times in the intervention phase. Authors suggest that repeated exposure may have benefitted the student’s comprehension but highlighted this concern as a potential confound. Hudson et al. (2014) presented seven adapted science lessons in random order across participants to control for order effects.

Recommendations. When intervention materials are limited in number, repeated exposure to the same content can lead to practice effects and threaten internal validity. If repeated exposure is an intervention of interest, or if repeated exposure can’t be avoided, researchers may wish to measure repeated readings or materials in baseline to ensure that repeated exposure alone is not responsible for the change in the target behavior. If used, stability or contratherapeutic trends replicated across multiple students would indicate repeated readings alone had no effect on the target behavior.

On the other hand, if repeated readings are not a variable of interest or could be a potential confound, researchers may wish to create different passages for each data point so that students are never exposed to the same text/narrative twice. The researcher should ensure that reading passages were functionally equivalent in complexity, content, word count, and number of sentences, and/or paragraphs. Research has found minimal agreement among the various methods for determining passage difficulty (Ardoin, Suldo, Witt, Aldrich, & McDonald, 2005), so researchers should take care to employ the method with the strongest empirical support. If passages are not similarly difficult, comprehension will be confounded. Presenting the reading materials in different order across participants will also help to control for order effects (Mims, Hudson et al., 2012). Addressing these concerns during the planning stages of the project will help to establish the future case for a strong causal inference between the independent variable and the text comprehension skill upon visual inspection.

Dependent Variables

Results. Almost all studies included in this review measured students’ correct, independent responses to comprehension questions (e.g., Browder et al., 2013; Browder, Mims, et al., 2008; Browder et al., 2007; Evmenova et al., 2011; Evmenova & Behrmann, 2014; Fritschmann et al., 2007; Hua, Hendrickson et al., 2012; Hua, Therrien et al., 2012; Hudson & Browder, 2014; Hudson et al., 2014; Knight et al., 2013; Mims et al., 2009; Mims, Hudson, et al., 2012; Mucchetti, 2013; Shurr & Taberdoughy, 2012; Spooner, Ahlgrim-Delzell, Kemp-Inman, & Wood, 2014; Spooner et al., 2009). Evmenova and Berhmann (2014) also
measured students’ correct responses following review of the material after an initially incorrect response. Students were presented comprehension questions after viewing a video with captioning. If the student answered incorrectly, the student was permitted to use a video search feature to find the answer to questions within the video text (Evmenova & Behrmann, 2014).

Several studies used only literal recall comprehension questions, where the answer to the question is explicitly stated in the text (e.g., Bethune & Wood, 2013; Evmenova et al., 2011; Mims, Hudson, et al., 2012; Shurr & Taber-Doughty, 2012). Shurr and Taber-Doughty (2012) asked five literal recall questions, all using a wh-question format. Many more studies assessed students’ answers to both literal and inferential questions, where the reader has to draw meaning from different parts of text in order to answer the question (e.g., Fritschmann et al., 2007; Hua, Hendrickson et al., 2012; Hudson & Browder, 2014; Hudson et al., 2014; Spooner et al., 2014).

Development of questions varied across studies. Some studies utilized specific recommendations for developing comprehension questions. Shurr and Taber-Doughty (2012) followed Piontek’s (2008) criteria for developing valid and reliable multiple choice questions. In the same study, Flesch-Kincaid reading levels were determined for the questions to be sure they were not more or less difficult than the actual text. In two studies, researchers wrote factual and inferential questions according to a definition authored by Davey and McBride (1986). According to this definition, the answers to factual questions can be found in the text without requiring the student to incorporate information from multiple sentences. The answer to inferential questions cannot be found directly in the text or require the student to incorporate information from multiple sentences (Hua, Hendrickson et al., 2012; Hua, Therrien et al., 2012).

In one study, researchers embedded comprehension questions on the page in the adapted text where students could locate the answers. Four possible answers were presented with words and symbols. All of the possible answers were plausible distractors, meaning that if the question was a “who” question, all of the possible answers would be people. Additionally, all four symbols depicted in the possible answers appeared on the corresponding page in the adapted text. This prevented students from choosing an answer because it was the only symbol from the possible answers that appeared on that page in the text (Mims, Hudson, et al., 2012).

Many studies required an oral response to comprehension questions (e.g., Evmenova et al., 2011; Flores & Ganz, 2007; Hua, Hendrickson et al., 2012; Hua, Therrien et al., 2012). Some researchers permitted students to respond using other response modalities, such as selecting the correct response from a field of pictures or items (e.g., Browder et al., 2007; Mims et al., 2009; Spooner et al., 2014). Answers were commonly provided in the form of yes/no or multiple choice questions ranging from a field of two (Browder et al., 2011; Browder, Mims, et al., 2008) to four answers (Mucchetti, 2013). Some studies allowed students to respond in a variety of ways depending on the student’s needs (e.g., eye gaze, point; e.g., Browder et al., 2011; Browder,
Mims, et al., 2008; Spooner et al., 2009). Browder and colleagues presented two real objects from the story. Students were asked to select the item that represented what the story was about. Students could respond using eye gaze, by touching the correct object, or by reaching towards the correct object (Browder, Mims, et al., 2008). Mucchetti (2013) provided response boards including four possible answers to support answering questions. Each possible answer included a word, symbol, and real object. Students could say the correct answer, point to the correct answer, or select the correct answer by pulling it off the board.

**Recommendations.** The manner in which text materials are selected and presented may impact researchers’ abilities to establish functional relations between the independent and dependent variables. Most of these studies measured comprehension as correct answers to questions (e.g., yes/no, multiple choice). Future research needs to ensure that questions are similarly difficult (i.e., written at similar reading levels). Yes/No questions are likely easier to answer correctly than multiple choice questions with more than two choices. Regardless, in baseline, researchers need to monitor student response patterns. Straight zero level correct responding with Yes/No or multiple choice questions in baseline would be a statistical anomaly and point to potential over-selectivity or possibly student naïveté regarding how to respond to the questions.

Future research needs to focus on the distractors in multiple-choice questions. Multiple choice questions with plausible distractors (items also in the passage, or items in a similar class as the target answer) may be more rigorous than distractors that are topically irrelevant. Some studies with other populations also measure if students can find the correct answer when given an opportunity to review the passage again after initially answering incorrectly. This is interesting from an experimental factor, and also is an important and practical skill for students to master.

Future research should continue to explore the impact of reading interventions on responding to factual and inferential questions as well as higher order thinking questions (i.e., Bloom’s Taxonomy). Answering factual questions correctly may be the foundation skill in reading comprehension, but it is not the end point. Additionally, because some interventions have differential effects on student responding to different question types, expanding the range of dependent measures is important. Story retell and question generation (where readers create questions about the story) are considered to be preferential methods for measuring comprehension (Salvia, Ysseldyke, & Bolt, 2013; Whalon, Al Otaiba, & Delano, 2009). Future research should explore if retell or other types of comprehension indicators are possible and/or preferable to the current measures for students who are able.

Students with DD might not always be able to respond orally to academic tasks. Students may demonstrate their understanding using other modalities, including signing, gesturing, vocalizations, other motor responses such as eye gaze, and/or assistive and augmentative communication devices (AAC; Browder et al., 2006). Defining other response modes is critical when the response behaviors might require a trained eye or some familiarity with the individual student in order to identify correct responding.

While infrequent in this literature, pre- and post-test assessments may be another way to quantify students’ response to intervention while simultaneously collecting ongoing data using single case design methodology (Whalon et al., 2009). Norm-referenced assessments may not be ideal due to inappropriate norm samples and strict standardization requirements. Some students with DD may not have much experience with the format and type of tasks common to these assessments, which may also limit student performance and may require accommodations that negate the norming standards. However, there are a variety of criterion-referenced assessments and curriculum-based measurements (CBMs, such oral reading fluency measures) that can be easily adapted so that students with DD can access the content of the assessment. Some of these assessments can be given as frequently as needed (Salvia et al., 2013). Furthermore, these types of assessments may be more sensitive to small but meaningful changes in performance that may be more typical for students with DD. 

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Visual Analysis and Reporting of Results

Results. Researchers used line graphs to display the single case data in these text comprehension studies. With visual analysis of multiple baseline and multiple probe designs (the most commonly used in text comprehension research), the visual analyst looks for an increase in level and/or therapeutic trend direction immediately after the independent variable is manipulated or introduced. Additionally, they look to make sure no changes occurred in the other tiers that had not been exposed to the intervention yet. Visual analysis is argued to be a more conservative method for evaluating intervention effects and making decisions about data (Parsonson & Baer, 1978).

For studies where the data changed following introduction of the independent variable, those changes were more commonly characterized by a change in therapeutic trend rather than an absolute level increase. For example, Mims and colleagues (Mims, Hudson, et al., 2012) documented an immediate increase for the first data point in the intervention phase for most participants. The following data points continued to indicate an increasing trend. In a different study by Knight and colleagues (2013), a similar trajectory was observed in the intervention phase data. In both of these studies, some participant data collected during the intervention phase continued to trend upwards until the participant reached mastery on the item (100%).

Some studies show much more variability in the intervention phase data, despite the upward trend observed after the intervention was introduced to the tier. Variability in data is not unusual for students with DD (Allor, et al., 2010; Whalon et al., 2009), but this does not simplify visual analysis of the data. Sometimes the data in the intervention phase overlaps some of the data points in the baseline phase (Browder et al., 2011; Browder et al., 2007; Mims et al., 2009; Shurr & Taber-Doughty, 2012). This data overlap may weaken conclusions regarding a functional relation between the independent and dependent variables. In some cases this may be the student’s first exposure to the type of intervention used, which may result in an overlap due to acquisition to the instructional procedure versus acquisition of the skill. There may be more overlapping data points in the first tier than in the remaining tiers as the student acclimates to the instructional procedure.

Recommendations. Visual analysis remains the most appropriate way to analyze results in single case designs (Gast & Ledford, 2014). When completing visual analysis, researchers should attend to stability prior to introduction of intervention and in the case of multiple probe or multiple baseline designs, continued stability in those tiers not yet exposed to treatment. Given the likelihood that the most prominent data feature change between baseline and intervention will be trend, researchers should avoid common overlap metrics (like percentage of non-overlapping data; PND) given the inappropriateness of this these statistics for single case design research (Haardörfer & Gagné, 2010; Wolery, Busick, Reichow, & Barton, 2010). Newer, true effect sizes are being developed and reported in the literature and researchers may consider using statistics like Tau-U which can account for trending data paths (e.g., Parker, Vannest, Davis, & Sauber, 2011).

Conclusion

Academic instruction for students with developmental disabilities is a recent phenomenon due to changes in legislative policy and subsequent changes in curricular focus. In addition, reading has been historically underemphasized for students with developmental disabilities (Browder et al., 2009; Katims, 2000). Considering these factors, the growing number of studies investigating text comprehension of academic materials for students with DD is promising. Excellent work has been conducted in this area, and the recommendations are not meant to diminish the importance of the previous research. Rather, the recommendations are offered via this synthesis as a means of helping to improve future research and build upon the foundation that past researchers have set.

Evaluating text comprehension for students with DD is a relatively new line of research and concerns related to methodological rigor are to be expected. Groundbreaking research will often have confounds, gaps, and flaws. Re-
searchers look to these bold trailblazers to guide their own work, leading to future improvements over time. Research teams build future projects based upon lessons learned directly from their own projects, reporting these limitations in discussion sections. Since this field is changing so quickly, researchers should support one another while advancing the field towards higher expectations of research rigor, including applying previous methodological strengths and recommendations to their own future research designs.

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Efficacy of an Electronic Editing Strategy with College Students with Intellectual and Developmental Disabilities

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Abstract: In this study we investigated an editing strategy to develop effective proofreading skills (i.e., mechanics and substantive revisions) within electronic texts through an experimental pre- and posttest group design with random assignment. Fifteen college students with intellectual and developmental disabilities participated in this investigation. The results of this study reveal a significant positive difference for the EDIT Strategy instruction group when compared with the non-intervention group for the total number and type of editing errors corrected in the posttest and follow-up 5 and 11-week maintenance phases. The findings support the use of the EDIT Strategy with study participants in improving the editing skills of postsecondary learners with intellectual and developmental disabilities.

Over the past decade there has been an ever-increasing emergence of postsecondary educational programs for students with intellectual and developmental disabilities (IDD) within the United States. In 2011 nationwide enrollment in postsecondary programs for students with IDD included approximately 44% of young adults with autism and 29% with an intellectual disability (Newman et al., 2011). Currently, there are more than 260 diverse programs located at community colleges and four-year universities (Think College Program Database, 2016). The reauthorization of the Higher Education Opportunities Act (2008) provides financial support (e.g., Pell grants) for college students with IDD who qualify. In 2010, the federal government provided further support through the funding of the Transition Postsecondary Program for Students with Intellectual Disability (TPSID) model demonstration program grants. This funding supported 27 pilot postsecondary education programs and the development of a national coordinating center (Grigal et al., 2015).

The overall mission and objectives of various postsecondary programs that serve students with IDD differ across programs and institutions. However, one common trend is emerging with regard to student access to academic instruction. All postsecondary students with IDD received academic instruction according to the TPSID Annual Report 2013–2014. Specifically, 52% of the students attended specialized academic courses and 48% attended inclusive academic courses in their respective postsecondary programs (Grigal et al., 2015, p. 2).

As postsecondary programs expand, new opportunities emerge to explore students’ personal academic strengths and areas of need as they exit their high school programs and enter postsecondary environments. As a result, this has bolstered an important paradigm shift from the implementation of functional skills program planning to a focus on academic skills instruction for postsecondary students with IDD (Woods-Groves et al., 2014;...
This has created an impetus for the development of effective academic programming for young adults with IDD in core literacy areas such as written expression.

Despite the need for effective instructional practices currently, there is a paucity of empirical support for the use of specific evidence-based instruction in the area of written expression for postsecondary students with IDD (Woods-Groves et al., 2014). Core academic literacy skills such as expertise in written expression continue to be an area of concern for students with and without disabilities in elementary and secondary settings and as they enter college (MacArthur, Graham, & Fitzgerald, 2016; National Commission on Writing, 2004). The National Assessment of Educational Progress 2011, computer-based writing assessment results, revealed that for those students who participated in the assessment, 74% of eighth-grade students and 73% of 12th grade students within the US performed below the proficient level (National Center for Education Statistics, 2012).

The process of writing permeates across one’s lifespan and influences personal success in the areas of living, learning, and working. Writing is produced from a contextual viewpoint (e.g., knowledge of a topic, writing for a purpose) and is a communicative act (Bazerman, 2016; Hayes, 2012; Hayes & Flower, 1987). Within the area of written expression, the process of motivation, planning, producing text, revising, and editing is a complicated and fluid endeavor (Graham, Bollinger, et al., 2012; Hayes, 2012; Hayes & Flower, 1987). An iterative relationship exists between each component of the writing process (Englert, 2009; Hayes, 2012; Scott & Vitale, 2003).

Learners with disabilities in elementary and secondary school settings who struggle in the area of written expression can experience the following difficulties during the writing process: (a) ineffective planning and goal setting, (b) not constructing text beyond knowledge telling, and (c) difficulty in identifying and correcting errors in mechanics in written products (Graham & Harris, 2003; Guzel-Ozmen, 2006; Scott & Vitale, 2003). In addition, learners with disabilities can experience difficulty with revising and editing written products beyond mechanics in order to focus on substance and content. Novice or struggling writers have been reported to spend an inordinate amount of time during the editing and revision process in the identification and correction of mechanics (e.g., spelling, capitalization, punctuation) and less time on revising content and in writing for an audience (Graham & Harris, 2003; MacArthur, 2016; Schumaker & Deshler, 2009).

Effective instruction in the area of written expression targets process and product outcomes and involves foundational skills (e.g., handwriting or typing text, mechanics of writing) and more advanced endeavors such as writing for a purpose in narrative, expository, and persuasive essays (Berninger, Garcia, & Abbott, 2009). For elementary and secondary learners who struggle with writing and for students with disabilities such as learning disabilities, intellectual disability, autism, and Asperger’s syndrome previous studies and empirical reviews have supported the use of explicit instruction and strategy instruction (Delano, 2007; Graham, Bollinger, et al., 2012; Graham, Harris, & Chambers, 2016; Graham, McKeown, Kuhara, & Harris, 2012; Graham & Perrin, 2007; Guzel-Ozmen, 2006; Joseph & Konrad, 2008; Konrad, Trela, & Test, 2006; Pennington & Delano, 2012; Schumaker & Deschler, 2009). Components of explicit instruction include direct and systematic modeling, guided practice, and independent practice of target skills (Archer & Hughes, 2010; Schumaker & Deshler, 2009). Philippakos, MacArthur, and Coker (2015) define a strategy as “…a conscious, cognitive process for completing complex tasks” (p. 2). Strategy instruction encompasses a mnemonic-driven format to frame the target skill and to aid in acquisition and retention of the strategy steps (Conderman, Hedin, Bresnahan, 2013). Elements of strategy instruction include the following (a) pre- and post-instructional assessment, (b) explicit instruction to teach skills in a systematic and sequential fashion, (c) mastery-based learning (i.e., students do not move to the next skill until they master the current skill meeting a predetermined criterion-80%), and (d) self-regulation skills such as goal setting and self-evaluation (Conderman et al., 2013; Englert, Raphael, & Anderson, 1992; Harris, Graham, Brindel, & Sandmel,
While empirical support exists for the efficacy of explicit instruction and strategy instruction for elementary and secondary learners with disabilities who experience writing difficulties, there is a paucity of empirical support for evidence-based writing instruction for postsecondary learners with IDD. Several studies have explored the use of strategy instruction in the area of expository essay construction (Woods-Groves et al., 2012; Woods-Groves, Therrien, Hua, & Hendrickson, 2013; Woods-Groves et al., 2014) and in computer-based editing and revising (Woods-Groves et al., 2015). Due to the expansion of postsecondary programs for learners with IDD, it is necessary to identify and implement effective writing instruction for individuals who continue to have difficulty in this area as young adults. The purpose of this study is to examine the efficacy of employing an electronic editing strategy, the EDIT Strategy (Hughes, Schumaker, McNaughton, Deshler, & Nolan, 2010) for college students with IDD.

The authors of the EDIT strategy (Hughes et al., 2010) incorporated aspects of two previous strategy instructional programs the Error Monitoring Strategy (Schumaker, Nolan, & Deshler, 1985) and the InSPECT Strategy (Naughton & Hughes, 1999). The EDIT Strategy incorporates evidence-based aspects of systematic instruction such as explicit instruction (Archer & Hughes, 2010). Additional EDIT Strategy components encompass (a) mastery-based learning (Schumaker & Deshler, 2009), (b) self-regulation through goal setting and self-evaluation (Schunk & Zimmerman, 2007), and (c) mnemonic prompting (Condeman et al., 2013; Mastropieri & Scruggs, 1991). The EDIT Strategy steps guide the learner through the electronic editing process using word processing and spell check.

There have been two previous investigations of the EDIT Strategy. Carranza and Hughes (2009) examined the utility of the EDIT Strategy instruction to improve the editing skills of “upper elementary and middle school students” (n = 22) who were diagnosed with learning disabilities (Hughes et al., 2010, p. 2). A random assignment placed students in instruction or control groups. The authors used a pre- and posttest experimental design. The students in the EDIT strategy instruction group significantly outperformed the control group following 2 to 3 weeks of 4 total hours of EDIT Strategy explicit instruction. The students who mastered the EDIT Strategy improved their pretest average “percentage of editing errors corrected from 28% to 80%” (Hughes et al., 2010, p. 2). Students in the EDIT strategy group maintained their posttest level editing skills several weeks following the end of the intervention (Hughes et al., 2010).

Woods-Groves et al. (2015) investigated the EDIT Strategy with college students with IDD (n = 19) who were enrolled in a campus-based, postsecondary 2-year certificate program for students with developmental disabilities. The college students were randomly assigned to intervention (n = 11) or control groups (n = 8) with a pre- and posttest design. The pre- and posttests consisted of two electronic passages of approximately, 220 words, written at the third-grade reading level. Each prompt consisted of 25 editing errors with five respective error types (i.e., spelling, capitalization, overall appearance, punctuation, substance). Following administration of a pretest to all college students, the intervention group received EDIT Strategy instruction in a large group format in a computer lab. Each college student had a PC computer and used Microsoft Word to edit electronic documents. Upon the completion of 16 EDIT Strategy lessons, administered twice weekly for 50-minute sessions, a posttest was administered to all college students. Results revealed that the intervention group significantly outperformed the control group in the Total Number of Editing Errors corrected and yielded a large effect size $p = .011, d = 1.01$. With regard to specific editing errors college students in the intervention group corrected a significantly higher number of Overall Appearance errors, $p = .048, d = 1.06$ and Punctuation errors, $p = .004, d = 1.54$ when compared to the control group. Comparisons of the intervention and control groups revealed no significant differences for Spelling, Capitalization, and Substance errors (Woods-Groves et al., 2015). The authors administered a maintenance prompt 12 weeks after the posttest. College students in the intervention group corrected a significantly higher Total Number of Editing Errors,
$p = .029$, $d = 1.19$ and a significantly higher number of Overall Appearance errors, $p = .004$, $d = 1.67$ when compared to the control group.

There were several limitations noted in the Woods-Groves et al. (2015) study. The first limitation was that the administration time of the total intervention was 16 lessons resulting in a total of 13.3 hours of teacher-led instruction. Future studies should investigate the efficacy of a shorter intervention period. The second limitation pertained to the fact that significant differences for college students who were taught the EDIT Strategy when compared with peers who did not receive the strategy instruction were revealed for two (i.e., overall appearance and punctuation) of the five editing correction error types. The dependent measures (i.e. pre- and posttests) noted in the Woods-Groves et al. (2015) study could be adapted to avoid a “ceiling effect” by extending the measure to include a higher instance of editing errors for each respective editing type in order to provide an opportunity to expand the possible range of student performance that could be measured (p. 105).

This current investigation of the EDIT Strategy incorporated aspects to address the limitations found in the Woods-Groves et al. (2015) study. This study used a shortened duration of the overall intervention with 11 instructional lessons instead of 16. Pre- and posttest editing errors were expanded to include 30 editing errors verses 25 editing errors with one additional error for each respective error type (i.e., spelling, capitalization, overall appearance, punctuation, substance). The following research questions were examined:

1. Will college students with IDD who received the EDIT Strategy instruction correct a significantly higher number of editing errors when compared to college students who did not receive the instruction?
2. Will college students who received the EDIT Strategy instruction correct a significantly higher number of respective types of editing errors (i.e. spelling, capitalization, overall appearance, punctuation, and missing words) when compared to students who did not receive the instruction?
3. Will college students who receive the EDIT Strategy instruction obtain significantly higher overall and respective error type EDIT scores compared to college students who did not receive the instruction during the maintenance stage?

Method

Participants

Fifteen young adults with developmental disabilities from a two-year postsecondary program for students with IDD participated in this study. The college students were in their second year of the 2-year postsecondary program located at a Midwestern University and ranged in age from 18 to 23 years ($M = 19.40$, $SD = 1.40$). College students entered the program with the following diagnoses: three (20%) individuals with Pervasive Developmental Disorders, one (7%) with autism, six (40%) with an intellectual disability, four (26%) individuals with multiple disabilities, and one (7%) individual with Down Syndrome and an intellectual disability.

There were six (40%) females and nine (60%) males. With regard to race, all of the college students were White and were from the following demographic areas: four (26.7%) rural, five (33.3%) suburban, and six (40%) urban. Individuals were from eight states across the United States. The college students’ Woodcock Johnson Tests of Achievement III (WJIII; Woodcock, McGrew, & Mather, 2001) standard Total Scores (i.e., mean of 100 and standard deviation of 15), ranged from 20 to 90, ($Mdn = 74$). Their WJIII Broad Reading scores ranged from 30 to 87, ($Mdn = 78$) while their WJIII Broad Writing scores ranged from 30 to 95, ($Mdn = 79$). The 15 college students were stratified based upon their total WJIII Total Scores and were randomly assigned to intervention ($n = 7$) and control ($n = 8$) groups using a coin flip (i.e., heads = intervention group; tails = control group).

Material

We used the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski,
oral reading fluency (i.e., DORF) and Retell Fluency (RTF) tests to determine the reading level of the college students with IDD. The college students were administered the assessments prior to the administration of the EDIT pretest prompts. The results delineated that the lowest reading level within the group was third-grade. As a result, the reading prompts and materials were adapted to not exceed the third grade level.

The EDIT Strategy instructional manual (Hughes et al., 2010) was used to create all EDIT lessons. We developed and adapted pre- and posttest EDIT prompts, instructional materials, practice prompts, and maintenance prompts to not exceed the 3.0 reading level. Lessons included graphic organizers with steps of the EDIT mnemonic. Instructional materials for each student included a computer flash drive, a folder containing a graph for self-monitoring, graphic organizers, and relevant cue sheets at the start of each lesson. Instruction occurred in a computer lab on campus. A staff member of the postsecondary program implemented EDIT Strategy lessons. The staff member used a projector, document camera, and PC desktop computer at the front of the computer lab to teach each lesson. Participants had access to a PC desktop computer for each lesson.

The original EDIT pre- and posttest prompts provided in the EDIT Strategy manual (Hughes et al., 2010) adapted and employed in Woods-Groves et al. (2015) were used in this study. The prompts were adapted to not exceed the third-grade reading level. In addition, five more grammatical errors were added to each prompt (i.e., original prompts each had 25 errors). The two pretest prompts, Prompt A, “Giant Panda,” and Prompt B, “California Redwood,” each consisted of three paragraphs. Prompt A contained 221 words and addressed the behavior and natural location of Giant Pandas. Prompt B contained 222 words and provided information about the California Redwood. Each prompt contained 30 errors.

For each EDIT prompt types of errors were related to capitalization (e.g., beginning of the sentence or proper nouns), overall appearance (e.g., inappropriate spacing or indentation), punctuation (e.g., inappropriate use of periods, commas, question marks, etc.), and substance (i.e., missing words). Missing words were limited to articles (e.g., a, an, the, or the subject of the sentence). Spelling errors were also present within each EDIT prompt. For spelling errors, two were contextual (e.g., a homophone) and four were incorrectly spelled words.

We used teacher material from the EDIT Strategy instructional manual to develop two maintenance prompts that did not exceed the third-grade reading level and that included 30 errors (i.e., six errors for each of the five error types). The first maintenance prompt was administered after five weeks following the completion of the EDIT intervention and was adapted from the EDIT Strategy manual (Hughes et al., 2010). This prompt pertained to a description of a family named the “Kettles” and consisted of 204 words. The second maintenance prompt and was administered 12 weeks following completion of the EDIT intervention. This prompt consisted of 211 words and pertained to “purchasing a vehicle.”

**Design and Procedure**

**Design.** For this study an intervention/control two-level, single factor, pre- and posttest experimental design was employed. There were 15 college students who were each randomly assigned to groups using a coin flip (i.e., heads = intervention group; tails = control group). The intervention and control groups consisted of seven and eight college students respectively. All of the college students were administered the pretest one week before the beginning of the EDIT Strategy instruction. The EDIT pretests consisted of a randomly assigned Prompt A or Prompt B passage. Two different prompts were used to control for difficulty levels between the pre- and posttest prompts, for instance, individuals who received Prompt A for the pretest would receive Prompt B for the posttest.

The college students were administered the pre- and posttests in a large group format and were given either Prompt A or Prompt B formatted in a Microsoft Word document on their PCs. Directions for the pre-, post-, and maintenance tests included the instructor telling individuals, “We have placed a word document on your computer. When I tell you please click on the document to open it. You
will have 30 minutes to read the document and then run the spell checker and correct any errors you find” (adapted from Hughes et al., 2010). If an individual met or exceeded the criterion of 80% accuracy on the pretest, he or she was excluded from the study. None of the college students met or exceeded 80% accuracy on their pretest. As a result, all college students were included as participants in this study.

**Intervention.** The EDIT intervention was implemented in 11 sessions of 45 minutes each for 5.5 weeks. Instructional sessions were conducted twice a week on Tuesday and Thursday. The cumulative instruction time was approximately 8.25 hours. For this current investigation the scope and sequence of the EDIT intervention lessons were designed to spend less time on the sessions pertaining to “reviewing using the spell check steps” than reported in the Woods-Groves et al. (2015) study (i.e., three lessons in the current investigation verses seven lessons in previous study). In addition, two lessons reported in the Woods-Groves et al. (2015) study were eliminated that pertained to “guided practice with all the EDIT Strategy steps.” Individuals were administered the EDIT Strategy in a group setting during a regularly scheduled course designed to teach editing strategies. The instructor, a staff member of the postsecondary education program students attended, and the study’s first author met prior to each lesson to review the EDIT manual, lesson plans, and materials.

The instructor used the EDIT mnemonic and a sequence of explicit instruction lessons to teach the EDIT Strategy. Figure 1 depicts the EDIT mnemonic in graphic organizer form. The instructor taught the EDIT Strategy to the intervention group over the course of 11 sessions. The EDIT Strategy steps, and a summary of each lesson, are depicted in Table 1. The instructor delivered explicit instruction adapted and scripted lessons from the EDIT Strategy manual. For each lesson the instructor used an advance organizer that included the material taught during previous and present session, and instructor expectations for students (e.g., taking notes, paying attention).

The instructor used a “think aloud” technique to model skills taught during each lesson followed by guided practice with immediate corrective feedback. An example of a Scoring Key for a Corrective Feedback Passage is depicted in Figure 2. Individuals completed an independent mastery exercise following guided practice and immediate feedback and graphed their scored independent work. The criterion for mastery for independent exer-
TABLE 1
Components of EDIT Strategy Lessons (adapted from Hughes et al., 2010)

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Sessions</th>
<th>Lesson Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>The instructor asked the students to describe the strategies they used when editing Word documents. The instructor then explained the utility of the EDIT strategy and introduced EDIT mnemonic. At the end of the lesson, the students made a commitment to learn the EDIT strategy.</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>The instructor taught the first two steps of the EDIT strategy (i.e., “Examine your first draft,” and “Do a SPELL Check”). Students learned how to open and examine a Microsoft Word document and use spellcheck. During spellcheck, students learned to correct errors according to the following rules. First, review the spellcheck suggestion and choose the correct word if it is available. Second, if the correct word is not available sound out the incorrectly spelled word, correct it, and run the spellcheck again. Third, replace the incorrectly spelled word with a different word that has the same meaning if correct spelling is not available.</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>The instructor and students reviewed the previous two steps (i.e., examine your first draft, do SPELL Check). The instructor then modeled the COPS Questions (i.e., Were there any capitalization, overall appearance, punctuation, or substance errors) using think-aloud. Students practiced each step with instructor’s guidance. At the conclusion of the lesson, the instructor taught the last step of the EDIT strategy (i.e., Correcting typos and running the spell checker again).</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>The instructor first evaluated student understanding of the steps and the rationale. The instructor then provided additional verbal practice for students to memorize the EDIT steps. At the end of the lesson, the instructor assessed student recall of each step and their description of the rationale using one-on-one assessment.</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>The instructor and the students discussed how and why they would apply the steps of SPELL and COPS when editing passages in Word document followed by guided practice. During guided practice, the students received immediate feedback from the instructor. After successful guided practice, the students practiced the EDIT strategy independently and recorded their score on a graph.</td>
</tr>
</tbody>
</table>

cises was 80%. EDIT Strategy lessons included a graphic organizer with current and previous strategy steps. Each lesson also included a visual depiction of the EDIT mnemonic which was located on the front of students’ folders. The mnemonic also included boxes for students to check off as they completed each EDIT Strategy step. Figure 1 shows the EDIT mnemonic graphic organizer.

Individuals used a flash drive to upload a model passage, a guided practice passage, and an independent passage to their desktops at the beginning of each EDIT Strategy lesson. Next, the instructor guided individuals through each previously taught EDIT Strategy step prior to introducing (i.e., model) the steps to be taught during the current lesson. A compact disc, provided by the EDIT Strategy manual, contained teacher and student passages for each lesson. Passages were adapted to not exceed the third-grade reading level. Further, original passages were also developed. These passages included approximately 25 to 30 errors. Guided practice and independent passages included only previously taught types of errors (i.e., spelling, capitalization, punctuation, overall appearance, substance/missing words).

Spelling errors within passages consisted of either misspelled words or contextual spelling errors (e.g., homophones). Two types of misspelled words were present in EDIT passages. The first type of spelling errors included those where the spell checker would present the first or second selection. The second type included errors that required individuals to
Lesson 3 Corrective Feedback Passage Key

My name is Peggy. One of my favorite things to do is to go on vacation. I love to travel to fun and exciting places. I have been to many different places. I went to Destin, Florida to the beach last week.

The beaches were pretty with white soft sand. The ocean was deep blue and green. The sun was bright and warm. I swam in the ocean and went under the water. I saw starfish and sea shells. I also rode in a boat on the ocean.

While I was in the boat I saw dolphins playing in the ocean. There was a motor. I fed them fish! It was fun and exciting.

I stayed in a hotel with fresh sheets and pillows on the bed. At night I watched television and ordered room service. It was so much fun. The next day I went fishing with my mom and dad. I had a fishing pole and used a worm on my hook.

This was the first time I had ever fished. Soon there was a pull on my fishing line. I pulled the line out of the water. I thought I would see a fish on the other end. All I saw was an empty hook! That fish ate my worm and got away.

<table>
<thead>
<tr>
<th>Errors</th>
<th>Spelling</th>
<th>Capitalization</th>
<th>Overall Appearance</th>
<th>Punctuation</th>
<th>Substance Missing Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Total</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Errors corrected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not corrected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correct out of 30 = \% total errors

Circle errors in document that occurred before feedback

Figure 2. Corrective Feedback Scoring Key.

Identify the sounds missing from the misspelled word, add the corresponding letters, and then use the spell checker to find and select the correct option. Capitalization errors were words not capitalized at the beginning of sentences and proper nouns within passages. Punctuation errors were errors at the conclusion of sentences and the use of punctuation (e.g., commas) within passages. Overall appearance errors were paragraphs that were indented incorrectly or not at all, paragraphs with additional spaces between them, and instances of incorrect spacing (i.e., too many spaces or no spacing) between words within or between sentences. Substances errors were missing words within sentences that included nouns, pronouns, or articles (i.e., a, an, the).

Passages ranged from approximately 198 to 240 words and contained three or four paragraphs. Topics covered in EDIT passages included but were not limited to the following: (a) vacation destinations, (b) favorite pets, and (c) family vignettes.

Two raters collected data using an instruction integrity checklist for each lesson. The checklist defined the instructional components (e.g., advance organizer, instructor expectations, EDIT Strategy steps taught) for each EDIT Strategy lesson. Raters observed the instructor and checked off instructional steps as they were completed.

Control group. The control group received science instruction while the intervention group received EDIT Strategy instruction.
Both groups received regularly scheduled (e.g., career development, money management) instruction throughout the week. Students attended their daily scheduled classes.

**Dependent variable.** Raters used EDIT Strategy scoring keys to score the pre- and posttest EDIT prompt responses for Prompt A and Prompt B. The total number of errors corrected yielded a total score that could range from 0 to 30. The specific error categories (i.e., spelling, capitalization, overall appearance, punctuation, and substance/missing words) yielded separate scores that could range from 0 to 6 for each error category.

**Data collection.** The college students were administered the pretest EDIT Strategy prompt and posttest EDIT Strategy prompt in a large group setting 1 week prior and 1 week following EDIT Strategy instruction. Individuals were administered two follow-up maintenance tests for 5 week and 12 week respective time periods. Two graduate students enrolled in the College of Education, scored the pre and posttest prompts, as well as maintenance tests. The students had previous experience in administering and scoring assessment materials. The first author provided each rater with an EDIT scoring key for Prompt A and Prompt B. Raters were unaware of whether or not the prompts they scored were products of individuals in the intervention or control groups. The first author met with raters to review the six scoring components and to discuss the types of corrections that individuals might have provided.

**Data Analysis**

A power analysis was conducted via G power 3 (Faul, Erdfelder, Lang, & Buchner, 2007). Our previous experimental studies yielded large Cohen’s $d$ effect sizes ranging from .95 to 2.63 (Woods-Groves et al., 2014; Woods-Groves et al., 2012; Woods-Groves et al., 2013). We used a large effect size of .80 based upon our previous work with experimental studies. The power analysis based on an alpha of .05, a large effect size .80 (Cohen’s $d$), and .80 for power a minimum and revealed that a minimal sample size of 15 for two groups ($N = 14.6429 – N = 15$) would be adequate. Statistical software IBM SPSS 23 (2016) was used to analyze college students’ data. The pretests EDIT scoring key results were examined via an analysis of variance (ANOVA). The posttests and maintenance EDIT scoring key results were examined via a series of analysis of covariance (ANCOVAs) with the pretest as a covariate. To examine the strength of statistically significant findings, Cohen’s $d$ effect sizes were used. Thus, effects sizes of <.2 were considered small, <.5 were considered medium, and >.8 were considered large (Cohen, 1988).

**Results**

**Instruction Integrity and Inter-Rater Reliability**

Two raters completed instruction integrity checklists for each lesson that contained the steps for each respective lesson. There was a 100% overall instruction integrity for each of the EDIT Strategy integrity checklists. The inter-rater reliability for the raters’ scores for the pre- and posttests and for both maintenance tests were compared and resulted in correlations that ranged from 1.00 to .93 ($Mdn = .99$) across all areas (i.e., the Total EDIT score and each of the five editing error types). The analyses of the results used the average from the two raters’ scores for the EDIT pre- and posttest scores and two maintenance probes.

**EDIT scoring key.** We examined raters’ average scores from the pretest EDIT scoring key results for the EDIT Strategy intervention and control groups. No significant differences were revealed for the scoring key Total EDIT and respective error type comparisons (i.e., spelling, capitalization, overall appearance, punctuation, substance) results. Table 2 provides mean values, standard deviations, $p$ values, effect sizes, and ANOVA results for the pretest.

A series of ANCOVAs were used to examine potential differences between the intervention and control groups’ posttests EDIT scoring key results using the pretests results as the covariate. ANCOVA results for the raters’ average Total EDIT scoring key posttest scores for the instruction and control groups yielded significant results with a large effect size in favor of the intervention group $p = .006, d = .84$. Potential differences for each of the five types of editing errors (i.e., spelling, capitalization, overall appearance, punctuation, and
TABLE 2

Instruction and Control Groups' EDIT Pre-, Posttest, and Maintenance 5 and 12 Weeks Scores

<table>
<thead>
<tr>
<th>Comparisons</th>
<th>EDIT Total</th>
<th>Spelling</th>
<th>Capitalization</th>
<th>Overall App</th>
<th>Punctuation</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C group (8)</td>
<td>15.69* (6.75)</td>
<td>4.31* (2.22)</td>
<td>4.69* (1.10)</td>
<td>3.75* (2.36)</td>
<td>2.00* (2.09)</td>
<td>0.75* (1.31)</td>
</tr>
<tr>
<td>T group (7)</td>
<td>12.71* (6.26)</td>
<td>4.07* (1.43)</td>
<td>4.14* (2.61)</td>
<td>3.36* (1.89)</td>
<td>1.43* (1.88)</td>
<td>0.29* (0.49)</td>
</tr>
<tr>
<td>ES</td>
<td>0.46</td>
<td>0.19</td>
<td>0.27</td>
<td>0.18</td>
<td>0.29</td>
<td>0.47</td>
</tr>
<tr>
<td>ANOVA</td>
<td>$F(1, 14) = .775$</td>
<td>$F(1, 14) = .217$</td>
<td>$F(1, 14) = .292$</td>
<td>$F(1, 14) = .124$</td>
<td>$F(1, 14) = .306$</td>
<td>$F(1, 14) = .779$</td>
</tr>
<tr>
<td></td>
<td>$p = .395^{ns}$</td>
<td>$p = .810^{ns}$</td>
<td>$p = .598^{ns}$</td>
<td>$p = .730^{ns}$</td>
<td>$p = .589^{ns}$</td>
<td>$p = .393^{ns}$</td>
</tr>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C group (8)</td>
<td>13.75* (8.27)</td>
<td>4.00* (2.51)</td>
<td>3.81* (2.14)</td>
<td>3.63* (2.71)</td>
<td>2.13* (1.64)</td>
<td>0.51* (0.46)</td>
</tr>
<tr>
<td>T group (7)</td>
<td>20.21* (7.15)</td>
<td>5.36* (0.99)</td>
<td>4.57* (1.13)</td>
<td>4.14* (2.27)</td>
<td>4.07* (2.35)</td>
<td>2.14* (1.49)</td>
</tr>
<tr>
<td>ES</td>
<td>0.84</td>
<td>0.71</td>
<td>0.44</td>
<td>0.20</td>
<td>0.96</td>
<td>1.66</td>
</tr>
<tr>
<td>ANCOVA</td>
<td>$F(1, 15) = 11.049$</td>
<td>$F(1, 15) = 6.854$</td>
<td>$F(1, 15) = .674$</td>
<td>$F(1, 15) = .495$</td>
<td>$F(1, 15) = 6.099$</td>
<td>$F(1, 15) = 10.708$</td>
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<tr>
<td></td>
<td>$p = .006^{**}$</td>
<td>$p = .022^{**}$</td>
<td>$p = .428^{ns}$</td>
<td>$p = .495^{ns}$</td>
<td>$p = .050^{**}$</td>
<td>$p = .007^{**}$</td>
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<td>Time Period</td>
<td></td>
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<tr>
<td>MP 5 Weeks</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C group (8)</td>
<td>11.50* (5.55)</td>
<td>3.13* (1.73)</td>
<td>3.13* (1.36)</td>
<td>3.25* (1.58)</td>
<td>2.00* (1.60)</td>
<td>0.00* (1.00)</td>
</tr>
<tr>
<td>T group (7)</td>
<td>17.36* (6.02)</td>
<td>4.43* (0.79)</td>
<td>3.71* (1.25)</td>
<td>3.64* (2.10)</td>
<td>3.86* (1.57)</td>
<td>1.71* (1.89)</td>
</tr>
<tr>
<td>ES</td>
<td>1.01</td>
<td>0.97</td>
<td>0.44</td>
<td>0.21</td>
<td>1.17</td>
<td>1.13</td>
</tr>
<tr>
<td>ANCOVA</td>
<td>$F(1, 15) = 13.615$</td>
<td>$F(1, 15) = 9.659$</td>
<td>$F(1, 15) = 1.620$</td>
<td>$F(1, 15) = .558$</td>
<td>$F(1, 15) = 6.815$</td>
<td>$F(1, 15) = 6.971$</td>
</tr>
<tr>
<td></td>
<td>$p = .005^{**}$</td>
<td>$p = .009^{**}$</td>
<td>$p = .227^{ns}$</td>
<td>$p = .469^{ns}$</td>
<td>$p = .023^{**}$</td>
<td>$p = .022^{**}$</td>
</tr>
<tr>
<td>MP 12 Weeks</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C group (8)</td>
<td>15.88* (8.15)</td>
<td>4.00* (2.00)</td>
<td>4.88* (2.23)</td>
<td>4.00* (2.56)</td>
<td>1.75* (2.12)</td>
<td>1.25* (0.46)</td>
</tr>
<tr>
<td>T group (7)</td>
<td>19.14* (7.78)</td>
<td>4.86* (0.38)</td>
<td>4.86* (1.77)</td>
<td>3.14* (2.73)</td>
<td>3.57* (1.90)</td>
<td>2.71* (1.89)</td>
</tr>
<tr>
<td>ES</td>
<td>0.41</td>
<td>0.60</td>
<td>0.01</td>
<td>0.32</td>
<td>0.90</td>
<td>1.06</td>
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<tr>
<td>ANCOVA</td>
<td>$F(1, 15) = 8.173$</td>
<td>$F(1, 15) = 5.199$</td>
<td>$F(1, 15) = .659$</td>
<td>$F(1, 15) = .258$</td>
<td>$F(1, 15) = 6.599$</td>
<td>$F(1, 15) = 4.410$</td>
</tr>
<tr>
<td></td>
<td>$p = .014^{**}$</td>
<td>$p = .042^{**}$</td>
<td>$p = .812^{ns}$</td>
<td>$p = .621^{ns}$</td>
<td>$p = .025^{**}$</td>
<td>$p = .058^{ns}$</td>
</tr>
</tbody>
</table>

Note. * Denotes mean values, ** $p < .05$, C group (8) = number of control group participants, T group (7) = number of instruction group participants, Standard deviations are provided in parentheses. Overall App = Overall Appearance. $^{ns}$ = non-significant. ES = Effect size, Cohen's $d$, and MP = Maintenance Probe.
substance/missing word) were also examined. For spelling, a significant difference with a medium effect size was observed in favor of the intervention group $p = .022, d = .71$. No significant difference was observed between intervention and control groups regarding capitalization $p = .428, d = .44$ and overall appearance $p = .495, d = .20$. A significant difference with large effect sizes was observed for punctuation $p = .930, d = 0.96$ and substance $p = .007, d = 1.66$. Table 2 provides mean values, standard deviations, $p$ values, effect sizes, ANOVA, and ANCOVA results for the pre-, posttests, and maintenance analyses.

Maintenance. Individuals’ performances on EDIT Strategy passages were collected to determine if the effects of instruction were maintained at 5 and 12 weeks. The EDIT Strategy was not reviewed prior to the collection of maintenance data. Analysis of data for maintenance was completed through a series of ANCOVAs with the pretests as a covariate. At 5 weeks, the raters’ average total EDIT scoring key posttest scores for the intervention and control groups yielded significant results in favor of the intervention group with a large effect size $p = .003, d = 1.01$. Regarding spelling, a significant difference with a large effect size was observed in favor of the intervention group $p = .009, d = 0.97$. No significant difference was observed between intervention and control groups for capitalization $p = .227, d = .44$ and overall appearance $p = .469, d = .21$. A significant difference with a large effect size was observed for punctuation $p = .023, d = 1.17$ and substance $p = .022, d = 1.13$ respectively.

At 12 weeks, the raters’ average total EDIT scoring key posttest scores for the intervention and control groups yielded significant results with a medium effect size in favor of the intervention group $p = .014, d = .41$. Regarding spelling, a significant difference with a medium effect size was observed in favor of the intervention group $p = .042, d = 0.60$. No significant difference was observed between intervention and control groups regarding capitalization $p = .812, d = 0.01$ or overall appearance $p = .621, d = 0.32$. A significant difference with a large effect size was observed for punctuation $p = .025, d = 0.90$. For the error type substance, a non-significant difference was revealed with a large effect size $p = .058, d = 1.06$.

Discussion

There is an increase in enrollment of young adults with IDD in colleges within the U.S. Within postsecondary programs for students with IDD there is an increasing emphasis on academic coursework. These factors have bolstered the need for evidence-based instruction in the area of written expression for postsecondary students with IDD. College students with IDD can benefit from editing and revising strategies that support individuals in using existing electronic tools found in word processing programs (e.g., spell check and thesaurus). We conducted this study to examine the use of the EDIT Strategy (Hughes et al., 2010) intervention in improving the editing skills of college students with IDD. There were several research questions for this study. For our first and second research questions, “Would college students with IDD who received the EDIT Strategy correct a significantly higher number of total editing errors and respective error types compared to their peers” study results indicated that college students in the EDIT Strategy intervention group significantly outperformed the control group with the total number of editing errors and in the following respective error types: spelling, punctuation, and substance. Comparisons yielded large Cohen $d$, effect sizes that ranged from 1.66 to .71 for significant findings. Results for our third research question “Would college students who received the EDIT Strategy instruction significantly outperform peers in the control group in the maintenance stage” revealed that 5 weeks after the completion of instruction significant results were found for the EDIT Strategy intervention group for overall total and error types: spelling, punctuation, and substance. After 12 weeks results revealed significant results for overall total and error types: spelling and punctuation for the EDIT Strategy intervention group.

This study was the third experimental investigation of the EDIT Strategy. The first EDIT Strategy intervention conducted by Carranza and Hughes (2009) found significant improvement in middle school students with
learning disabilities’ editing skills following a total of 4 hours of instruction over approximately three weeks. The second EDIT Strategy study conducted by Woods-Groves et al. (2015) with postsecondary students with IDD revealed significant improvement in students’ editing skills after 13 hours of instruction over an 8 week time period. The previous investigations of the EDIT Strategy were used to inform the current study. College students with IDD in the Woods-Groves et al. (2015) investigation required an exponential increase in the number of sessions (i.e., from four sessions reported in Carranza and Hughes to 16 sessions) for each lesson in order to achieve mastery (80% criterion) of each lesson. In this current investigation we reduced the number of intervention sessions reported in Woods-Groves et al. (2015) from 16 sessions to 11 sessions. Specifically, we removed five sessions pertaining to “using the Spell check” and “guided practice with all steps.” Students in the intervention group continued to practice skills pertaining to a specific lesson until they reached 80% mastery. The total duration of the intervention was 11 sessions for 5.5 weeks. As in the Woods-Groves et al. study, college students with IDD required extended intervention sessions when compared to the Carranza and Hughes’ (2009) investigation with middle school students with learning disabilities. College students with IDD who received EDIT Strategy instruction in this study required additional instructional sessions, the use of graphic organizers, and multiple opportunities for guided practice with corrective feedback. The students were able to significantly improve their editing skills and maintain those skills over time (i.e., 5 and 12 weeks post-instruction).

For this study the adaptation of the pre-, posttest, and maintenance prompts were informed by a review of the previous two EDIT Strategy studies. We made an a priori decision to adapt the prompts from 25 to 30 total errors (i.e., one error type for spelling, capitalization, overall appearance, punctuation, substance). We extended the number of errors to provide further instances of errors and to increase the opportunities to measure students’ editing skills. Only five additional errors were included in order to keep the length of the passages manageable for the students and to parallel the type of passages (e.g., number of errors, length, etc.) used during instruction. Even though the cumulative EDIT Strategy intervention was shortened in this current study (8.25 hours vs. 13.3 hours) the extended dependent measure (i.e., 30 vs. 25 possible points) indicated that college students who were taught the strategy improved their overall editing performance and their performance in three editing types (i.e., spelling, punctuation, and substance) vs. the Woods-Groves et al. (2015) investigation where college students showed improvement in two editing types (i.e., overall appearance and punctuation). These findings support the use of a shorter intervention (i.e., 11 vs. 16 sessions) coupled with the revised dependent measure. This is significant due to the fact that it is necessary to determine the most efficient intervention design that can help bolster sustainable and effective use by educators and postsecondary learners with IDD.

Limitations and Future Research

There were three limitations concerning this study. The first limitation concerns the length of the intervention. Even though this investigation, in which a shorter intervention time was employed, yielded positive results for the college students who were taught the EDIT Strategy, it still required 8.25 hours of instruction and 11 sessions. Further investigations of the strategy should examine if equitable results could be found with the employment of a shorter intervention time. The second limitation pertains to the fact that the college students did not generate and edit their own responses due to the length of instruction and constraints concerning the amount of time allotted for strategy instruction. Future studies should be conducted that evaluate if college students would generalize editing skills to their own written work. The third limitation of this study is the fact that while postsecondary students with IDD acquired and successfully applied the EDIT Strategy steps in identifying and correcting spelling, punctuation, and substance errors they did not successfully apply the steps in the areas of capitalization and overall appearance. Future studies should examine aspects of intervention instruction to determine what supports are needed to bol-
Implications for Practice

When the pre- and posttest responses of the control group were examined the number of errors corrected actually decreased. We would hypothesize that even though the students in the control group had the same access to spell check and editing tools within their electronic word documents as their peers in the intervention group it is necessary to have explicit instruction or support in using these tools to identify and correct grammatical, overall appearance, and substance errors within the electronic prompts. An important implication of this study is the fact that many of the difficulties that college students with IDD can experience in the area of written expression with regard to editing, are difficulties they may have continually encountered in upper elementary, middle school, and high school. Due to the fact that postsecondary learners with IDD in this study continued to experience difficulty in this area after they indicates that it was necessary to quickly and effectively identify strategies in the area of written expression. The EDIT Strategy could be a useful intervention for students with IDD in secondary schools. Carranza and Hughes (2009) supported the use of the EDIT Strategy for improving the editing skills of middle school students. The EDIT Strategy promotes editing and revising within an electronic format which emulates requirements of many standardized outcomes-based writing assessments such as NAEP 2011, Partnership for Assessment of Readiness for College and Careers (PARCC, 2010), and SMARTER Balanced Assessment Consortium (SBAC, 2010). An important implication based upon the success of the postsecondary students with IDD within this study and the Woods-Groves et al. (2015) previous EDIT strategy investigation is the improvement in student skills in acquiring and applying the multi-faceted strategy. The results support the view that strategy instruction in the area of written expression with college students with IDD is worthy of further exploration.

References


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Effects of School Staff Communication on Initiations and Repair Strategies of Students with Severe Intellectual and Developmental Disabilities

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Abstract: The study examined the effects of the types of communication breakdowns of the communication partners on the repair strategies of students with severe intellectual disability during interaction within the natural school environment. Forty-eight staff members, divided into two groups based on daily vs. weekly contact with the student, and 12 students, ages 9–16, were videotaped during various activities. Results demonstrate that students used several types of repair strategies when faced with communication breakdowns adjusting some of them to breakdown types. Some of the students demonstrated attempts to shift partners as a systematic method when confronted with communication breakdowns, thus implying an alternative repair strategy. There were no significant differences among staff members based on their level of contact with the students except for more ‘request for clarification’ and more ‘substitution’ in the daily basis group.

The ability to initiate, communicate, and maintain interactions is critical for developing social skills, transferring messages to achieve communication goals, and becoming an active participant in society (Brady & Halle, 2002). Individuals with severe intellectual disability (SID) are characterized as having limitations in their language and communication abilities, low rates of initiations, and difficulties in conveying successful messages, thus resulting in limited interactions, reduced social skills, and lack of independence (Bunning, Smith, Kennedy, & Greenham, 2013). Research demonstrates that children with SID depend mainly on their communication partners for leading interactions and refer mainly to responses rather than to initiations (Bunning et al., 2013).

Limitations in the development of language and communication of children with SID place them at risk for communication delay or failure that occurs upon limited or no transfer of their intentions. The difficulties the communication partners have in identifying, decoding, and responding to the initiations of the children may enhance the dependency and develop learned helplessness. Learned helplessness develops when outcomes in the environment (i.e. communication partner’s response) are independent of the individual’s behavior (i.e. communication signal) resulting in limited correspondence between the initial communicative attempt and the consequence (Carter, 2002). These difficulties could be the result of the limited understanding of the idiosyncratic nature of the communicative attempts. As a result, communication partners succeed in interpreting more messages that are sent in response, within a context of a situation initiated originally by the partner, rather than by the child with SID.

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communication difficulties resulted in communication breakdowns (Steeples, 2002).

A communication breakdown occurs when the original message, created by the sender, is not recognized or not understood by the receiver, who thus, does not produce the expected response. Communication breakdown can occur if the partner misinterprets the original message or fails to acknowledge the message in a reasonable time (Meadan, Ostrosky, & Halle, 2006). A communication breakdown can be manifested in several ways: (1) 'request for clarification'; (2) 'ignore'; and (3) 'topic shift' (Dincer & Erbas, 2010; Meadan et al., 2006; Ohtake et al., 2005).

Difficulties in interpreting communication intents could be attributed to the tendency of individuals with SID to use idiosyncratic behaviors as part of their communication, which may be misidentified by the partner as non-communicative self-inflicted behaviors. These communicative attempts result in miscommunications that could prevent continuity of the interaction and minimize adult responses (Harwood, Warren, & Yoder, 2002; Stephenson & Dowrick, 2005). School staff working with students with significant disabilities often find it difficult to identify the communicative intent and the content specific behaviors of the students, and fail to continue interactions with them (Stephenson & Dowrick, 2005). ‘Request for clarification’, asking for explanations and elaborations, is most effective for maintaining interaction, as it presents a clear message that indicates that the intention was not understood, and channels the sender to repair the original message, usually with specifications regarding the type and nature of the breakdown. Young children during early stages of developing their communication respond positively to ‘request for clarification’ breakdowns and less to ‘ignore’ (Brady, Steeples, & Fleming, 2005). ‘Request for clarification’, associated with developing language skills among typically developing toddlers, enhances awareness to the situation, encourages repair, and provides clues, thus presenting a breakdown that has potential for educational and therapeutic purposes (Gozzard, Baker, & McCabe, 2008).

‘Ignore’, in which the partner disregards the communicative attempt, is a behavior that may occur due to off-topic or non-related reasons such as noise that masks the student’s initiation. These interferences could result from background noises in the classroom, from attention to other sounds or events in the environment or from the nature of the communicative intent that prevents the adult from noticing or understanding it as intended (Brady & Halle, 2002; Brady, McLean, McLean, & Johnston, 1995; Volden, 2004). This type of communication breakdown does not give the child any indication regarding their level of input or the message comprehension efforts, which results in a significant obstacle in communication development (Brady et al., 2005). More so, such a breakdown may add to the initial cognitive and communicative demands and requires additional resources to regain the partner’s attention and resume communication when trying to send the message again (Halle, Brady & Drasgow, 2004).

‘Topic shift’ is a communication breakdown that includes a response to the student, but not to the communicative intent. Although the communicative partner, in this case, is attentive to the participant and continues the flow of communication, there is no clarification as to the nature of the problem and the level of misunderstanding (Meadan et al., 2006). The participant remains with a limited understanding that the message transfer was unsuccessful, with no clue to the nature of the failure. This type of communication breakdown, also called ‘wrong response’ or ‘misunderstanding’ (Brady & Halle, 2002). ‘Topic shift’ can result from a purposeful intent of the adult to distract/redirect the attention of the child (Brady & Halle, 2002), or when the adult misunderstands the behaviors as a communicative intent, or when the nature of the message itself is misinterpreted (Tomasello, Conti-Ramsden, & Ewert, 1990). ‘Topic shift’ places the student in an ambiguous situation, confused, as the response does not match the original message and does not provide the appropriate response desired. More so, the student is required at that point to rethink the situation, reflect on the complicated outcome, to create a new message required from the changing of the topic as suggested by the communication partner, resulting in a cognitive load (Brady & Halle, 2002; Meadan et al., 2006). Thus, ‘topic shift’ is the hardest com-
munication breakdown to repair (Brady & Halle., 2002; Ohtake et al., 2005; Tomasello et al., 1990). In this study, the use of the concept ‘communication breakdown’ will be termed from the student point of view to include situations in which the student does not achieve the requested goal and refutes to using repair strategies. In line with this view, we included a fourth type of communication breakdown – ‘noncompliance’ whenever the partner states to the student his understanding of the message without giving the student what he wants.

Communication breakdowns appear frequently during interactions between children with SID and their communication partners (Dincer & Erbas, 2010). Any attempt to maintain the interaction or to achieve the communication goal requires use of repair strategies, even if bound by their limited language abilities. Thus, repair strategies refer to the ability to maintain the interaction and persist in the communication by modifying, repeating, or changing the topography of original message once a communication breakdown is identified (Dincer & Erbas, 2010; Meadan et al., 2006; Ohtake et al., 2005; Snell, Chen, Allaire, & Park, 2008; Weiner, 2005). Repair strategies used by children with SID include: (1) ‘repetition’, in which the whole topography of the original message is reiterated; (2) ‘modification’ (addition and reduction), in which information, behaviors, or intensity of the original message are increased or reduced; and, (3) ‘substitution’ of all or most on the original components of the original message (Dincer & Erbas, 2010). Yet, at times, when no repair strategy is used, the communication continuum terminates (Dincer & Erbas, 2010; Meadan et al., 2006; Ohtake et al., 2005).

‘Repetition’ is a basic strategy that appears early in language development (Brady & Halle, 2002), requiring minimal resources. The advantage of this strategy and the limited resources it requires, place it as an effective strategy to be used for all purposes by children with limited cognitive, language, and communicative abilities. ‘Substitution’ requires a higher level of resources and abilities needed for reconstruction of the message, changing the whole topography of the original message, to convey the idea again to the communication partner (Halle et al., 2004).

A successful interaction requires the use of repair strategies for maintaining the consistency of the conversation (Meadan et al., 2006). Communicative competence is required to establish a successful repair. The participant has to have sufficient abilities to both understand the mechanism of the communication breakdown and to devise a repair strategy with the required modifications. In addition, competence is required to express the modified message after the repair strategy has been selected. The partners has to have social and strategic competence to analyze the source of the breakdown as well as the required repair strategy (Volden, 2004). Repair strategies require cognitive abilities that develop over time, which in turn lead to the use of complex repair strategies, enabling the child to modify the message based on the ability to analyze another person’s perspective (Halle et al., 2004). Children with SID have been found to utilize repair strategies upon communication breakdowns, even when communicative competence is limited to non-verbal communication and use of idiosyncratic pre-symbolic communication (Weiner, 2005). Hence, their idiosyncratic symbolic and pre-symbolic communication are used to maintain the conversation and persist in transferring the message despite their limited communicative competence (Dincer & Erbas, 2010).

When observing the use of repair strategies among typically developing toddlers, the intensity of the interaction with the child had an impact on the use of communication breakdowns and the type and use of repair strategies (e.g., Tomasello, Farrar, & Dines, 1984; Tomasello et al., 1990). Thus, various social networks and differences in the intensity level of the interaction between communication partners and children with SID may be related to variation in the use of communication breakdowns and repair strategies.

Research demonstrates that different communication breakdowns may lead to an increase or a decrease in both use and type of repair strategies. Adapting and modifying responses and using repair strategies are pragmatic abilities that enable flexibility in maintaining communication goals (Brady et al., 2005; Reichle, Drager, & Davis, 2002).

Most of the research investigating communication breakdowns and repair strategies pertain
to young children early in their communication development, primarily while interacting with their main caregivers (e.g., Tomasello et. al., 1984, 1990). Yet, children with SID maintain many of the basic communication functions later in life, for example when interacting with various staff members at school. More so, the limited research predominantly addressed children with verbal language abilities (Dincer & Erbas, 2010), and controlled environments that present various types of communication breakdowns without viewing the frequency in the natural school setting (Brady et al., 2005; Brinton & Fujiki, 1991; Meadan et al., 2006; Volden, 2004). Thus, the purpose of the study was to examine communication behaviors of school age students with SID and their communication partners in the natural school environment. Communication breakdowns used by staff members and repair strategies used by students with SID were examined. In addition, correlations between repair strategies and communication partner’s type of communication breakdown and intensity levels of contact with the student in school (daily vs. weekly basis) were examined.

Method

Participants and Setting

Twelve students, eight girls and four boys, ages 9–16 (M = 12.7) participated in the study. The criteria for inclusion in the study were: (1) a diagnosis of SID based on records of the school local child developmental center and the school’s diagnostic team, as pertained by the DSM-IV-TR criteria (APA, 2000); (2) school-age children; (3) normal hearing, normal or corrected vision; (4) use of intentional communication, who are able to understand simple sentences, and initiate communicative acts for basic needs as determined by the speech language pathologist (SLP) working with the child. Students participating in the study were all identified with significant language deficits, mostly using pre-symbolic communication or one-to-two word sentences, with a limited vocabulary. All participants were found to be functioning within the low functional range in their general and communication abilities and were identified as less than 3 years in their mental age based on the Vinland II (Sparrow, Cicchetti, & Balla 2005). Table 1 presents functional profiles and demographics of the students.

For each student participating in the study, four staff members were identified as communication partners: two staff members that meet with the student on a daily basis (home room teacher and teacher assistant working in close contact with the child most of the time during school hours), and two that meet with the student weekly (professional staff working in the school who meet with the child once or twice a week for pre-scheduled 1 or 2 hour activities). Observations were conducted in the school during daily routine classroom activities (such as music lessons, home economics, occupational therapy, etc.,) either in the classroom or in the yard for the duration of 20 minutes for each observation.

Materials and Measures

Vinland-II: Teacher rating form, used for evaluating mental age and four functional levels - communication, activities of daily living (ADL), socialization, and motor skills. This has been found effective in assessing adaptive behaviors of children with SID (Sparrow et al., 2005).

Intentional communication: Level of intentional communication was defined using the report of the SLP and the COSMIC - The classroom observation schedule (Pasco, Gordon, Howlin, & Charman, 2008). Inter-observer agreement ranged from \( \alpha = 0.59 \) to \( \alpha = 0.97 \) (Pasco et al., 2008). Based on the COSMIC schedule, two coders review the transcribed videos and determined intentional communication for each student. Inter-observer agreement was computed to 10% of the observations using Kappa coefficient resulted in Kappa 0.73. (See Table 1 for examples).

Communication breakdown observation form: A coding form was created for the study. The coding tool included four categories identified as communication breakdowns in the literature: (1) ‘request for clarification’ – asking the communicator to explain or elaborate by repeating the message or changing it. The request can be verbal or non-verbal suggesting “What did you say?” or “What did you want?” “I didn’t understand?” “did you mean . . .?” etc. (Brady & Halle, 2002); (2) ‘ignore’ – complete disregard of the communicative attempt within a reasonable time frame, the
<table>
<thead>
<tr>
<th>Name</th>
<th>Year of Birth</th>
<th>Sex</th>
<th>Age in the Study</th>
<th>Adaptive Level</th>
<th>Socialization</th>
<th>Daily Living Skills</th>
<th>Communication</th>
<th>Age Equivalent</th>
<th>Students’ Expression Abilities</th>
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<tbody>
<tr>
<td>Nirit</td>
<td>2003</td>
<td>F</td>
<td>9 + 9 months</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non-verbal, uses eye contact, facial expressions, gestures and sounds to communicate, signs her wants by approaching and withdrawal</td>
</tr>
<tr>
<td>Anna</td>
<td>2003</td>
<td>F</td>
<td>10</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non-verbal, uses eye contact, facial expressions, gestures and sounds to communicate. Uses few conventional gestural signs (yes/no, waving for ‘hello’ etc.), points to few graphic symbols as a reply to simple questions</td>
</tr>
<tr>
<td>Ayelet</td>
<td>2002</td>
<td>F</td>
<td>10 + 5 months</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Uses few words, uses eye contact, facial expressions, gestures and sounds to communicate. Points to few graphic symbols as a reply to simple questions</td>
</tr>
<tr>
<td>Hagar</td>
<td>2001</td>
<td>F</td>
<td>11+ 6 month</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non verbal, uses eye contact, facial expressions, gestures and sounds to communicate, signs her wants by approaching and withdrawal</td>
</tr>
<tr>
<td>Mika</td>
<td>2001</td>
<td>F</td>
<td>12</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non-verbal, uses consistently some sounds as words. Uses eye contact, facial expressions, gestures and sounds to communicate. Uses few sign language signs (‘want’). Points to few graphic symbols as a reply to simple questions</td>
</tr>
<tr>
<td>Topaz</td>
<td>2000</td>
<td>F</td>
<td>12 + 1 months</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non-verbal, uses eye contact, facial expressions, gestures, posture changes and sounds (shouting) to communicate, signs her wants by approaching and withdrawal</td>
</tr>
<tr>
<td>Hagay</td>
<td>2000</td>
<td>M</td>
<td>12 + 3 months</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non-verbal, say only the word ‘no’. Uses eye contact, facial expressions, gestures and sounds (shouting) to communicate. Uses few consistent gestural signs</td>
</tr>
<tr>
<td>Name</td>
<td>Year of Birth</td>
<td>Sex</td>
<td>Age in the Study</td>
<td>Adaptive Level</td>
<td>Socialization</td>
<td>Daily Living Skills</td>
<td>Communication</td>
<td>Age Equivalent</td>
<td>Students’ Expression Abilities</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
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<td>---------------</td>
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<td>--------------</td>
<td>----------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Amir</td>
<td>1999</td>
<td>M</td>
<td>13 + 5 months</td>
<td>Low</td>
<td>Low</td>
<td>Low (moderate-low in the school community sub domain)</td>
<td>Low</td>
<td>&lt;3</td>
<td>Non-verbal, uses eye contact, facial expressions, gestures and sounds to communicate. Uses few sign language signs. Uses few graphic signs by pointing</td>
</tr>
<tr>
<td>Elia</td>
<td>1998</td>
<td>F</td>
<td>14 + 4 months</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Uses few words with some pronunciation difficulties. Some may be irrelevant talk. Uses eye contact, facial expressions, gestures and sounds to communicate. Points to few graphic symbols as a reply to simple questions</td>
</tr>
<tr>
<td>Ben</td>
<td>1998</td>
<td>M</td>
<td>15</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>&lt;3</td>
<td>Uses few words, with some pronunciation difficulties. Uses eye contact, facial expressions, gestures and sounds to communicate. Uses few consistent gestural signs. Points to few graphic symbols as a reply to simple questions</td>
</tr>
<tr>
<td>Dor</td>
<td>1997</td>
<td>M</td>
<td>15 + 5 months</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Between &lt;3 and 4:6 over the domains</td>
<td>Non-verbal, uses eye contact, facial expressions, gestures and sounds to communicate. Uses few consistent conventional gestural signs (‘no’) and leading the communication partner. Points to few graphic symbols as a reply to simple questions</td>
</tr>
<tr>
<td>Maya</td>
<td>1997</td>
<td>F</td>
<td>16</td>
<td>Low (moderate-low in the interpersonal relationship sub domain)</td>
<td>Low (moderate-low in the school and community sub domain)</td>
<td>Low</td>
<td>Between &lt;3 and 5:7 over the domains</td>
<td>Uses few words, two words sentence, with some pronunciation difficulties. Uses eye contact, facial expressions, gestures and sounds to communicate. Points to few graphic symbols as a reply to simple questions</td>
<td></td>
</tr>
</tbody>
</table>
partner does not respond and ignores the communicative behaviors (Brady & Halle, 2002); (3) ‘Topic shift’ – the communication partner reacts to the attempt, but shifts to a topic that differs from the original topic. In the case of a topic shift, the partner in fact, addresses the child’s communication act but ignores the child’s message (Brady & Halle, 2002), the interaction progresses but as the topic shifts, the interaction followed evolves in a non-relevant manner (Dincer & Erbas, 2010; Meadan et al., 2006; Ohtake et al., 2005); (4) ‘Non-compliance’ – occurs when the partner clearly understands the intent of the message but refuses to comply (Marcos & Bernicot, 1997). Occurs when the partner repeats the meaning of the message but declares he is not going to allow the request: “I know you want to play the computer, but now you have to finish your lunch”.

Repair strategy observation form: A coding form created for the study. The coding tool included five patterns describing the change in the topography of the communicative behaviors among the students following a communication breakdown (Brady & Halle, 2002). Four of the behaviors were identified as repair strategies (including the two modification repair strategies: addition and reduction), while the fifth behavior referred to a complete interaction arrest (Brady & Halle, 2002): (1) ‘Repetition’ of the whole topography of the original message; (2) ‘Addition’ - an increase of information, behaviors, or magnitude of the original message; (3) ‘Reduction’ of information, behaviors, or magnitude of the original message; (4) ‘Substitution’ of all or most of the original components of the original message to construct a new communicative behavior; and a non-repair strategy: (5) ‘communication arrest’. Behaviors were coded as repair strategies when appearing after a communication breakdown. Content analysis was used to evaluate behaviors, for deducting all behaviors that were not responses to communication breakdowns. Inter-observer agreement computed for 10% of the observations resulted in Kappa coefficient of 0.79.

Procedure
After obtaining permission from the Ministry of Education’s Ethics Committee, school principals were asked to select potential partici-pants for the study. Once signed consent forms were obtained from the parents, classroom teachers were asked to fill out the Vin-land–II questionnaire, and four staff members were asked to participate. Each student was observed twice in various activities conducted by each of the four staff members participating in the study, a total of eight observations per student, conducted during various days, times, and activities. All activities were part of the curriculum, conducted in the natural setting, including various activities such as morning meetings, music lessons, snack time, playground activities, and gym. All the activities included interaction between the student and the adult communication partner and several other students participating in the school activities. Activities were videotaped, transcribed, and coded to include all information pertaining to the study. For the purpose of this study, any gesture or word used along with eye gaze were coded as a communication act.

Data Analysis
Coded observations were separated into communicative events defined as a communication cycle, i.e., the interaction, created by either communication partner, continuing until terminated fully by both partners. A communicative attempt was defined as any initiation provoked by the student or by the staff member, directed specifically towards the partner. The end of the interaction was defined as the moment in which the both partners stop trying to communicate with each other. Overall, 529 communication events were coded, of which 176 were communicative attempts by the staff member not responded by the student, and 105 were communicative attempts by the student not responded by the adult. For the purpose of the study, we used the COSMIC (Pasco et al., 2008) definitions of initiation and intentional communication to define opening and closing of communication event. Each communicative event was analyzed to detect communication breakdowns by the staff and repair strategies by the students.

Communication breakdowns refer to lack or irrelevant response by the communication partner following a communication attempt by the student. The coding of the interactions revealed four types of behaviors relating to
communication breakdowns of the communication partners. The communication breakdowns are ‘ignore’, ‘request for clarification’, ‘topic shift’ (Brady & Halle, 2002). ‘Non-compliance’ (based on Marcos & Bernicot, 1997) was also referred to as a communication breakdown, regardless of the communication partner’s understanding of the message; although the communication attempt was understood, it was denied by the partner; the student maintained communication and used repair strategies after the noncompliance response by the staff. Thus, the assumption was that from the students’ point of view, the goal of the communication was not achieved, but rather a communication breakdown in the form of ‘noncompliance’ required them to attempt to repair.

Coding the behaviors of the students revealed four repair strategies: ‘repetition’, ‘substitution’, ‘addition’ and ‘reduction’ (Brady & Halle, 2002). When the student stopped communicating with the original partner this was coded as ‘communication arrest’. After reviewing all observations, another pattern of behavior was revealed for some of the students, who showed persistence and maintained the communicative attempt through transfer of the message to another partner. This behavior was identified as ‘partner shift’. ‘Partner shift’ occurs following a communication breakdown, in which the child terminates the communication with the original partner, and chooses a different partner to convey the same message.

Results

Communication Breakdowns

Analysis of the 96 video sessions of the 12 students with SID participating in the study revealed four communication breakdowns used by the staff members working with the students: ‘ignore’, ‘request for clarification’, ‘topic shift’, and ‘non-compliance’. ‘Non-compliance’ appeared most with 24% of the occurrences, ‘ignore’ with 16.5%, ‘topic shift’ with 10%, and ‘request for clarification’ appeared the least with 6.5% of the occurrences. Communication breakdown behaviors represent 57% of total communication and 43% represent the adjusted flow of the communication between the two partners (see Table 2).

Repeated measures analysis of variance (ANOVA) was conducted to investigate the differences between the four types of communication breakdown identified. Results demonstrate a significant difference between the four types of communication breakdown identified. Results demonstrate a significant difference between the four types of communication breakdown: \[ F(3,141) = 15.24, p < 0.001, \eta^2_p = 0.24 \]. To determine the nature of the differences, post-hoc analysis using Bonferroni correction was conducted. Results reveal that ‘non-compliance’ appeared most often, with significant differences between ‘non-compliance’ and

<table>
<thead>
<tr>
<th>Communication Breakdown</th>
<th>Non Compliance</th>
<th>Topic Shift</th>
<th>Request for Clarification</th>
<th>Ignore</th>
<th>F</th>
<th>df(3,141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetition</td>
<td>3.21 (3.106)</td>
<td>0.97 (0.87)</td>
<td>0.95 (0.85)</td>
<td>2.95 (2.838)</td>
<td>5.380*</td>
<td>A&gt;B,C,D</td>
</tr>
<tr>
<td>Addition</td>
<td>0.44 (0.414)</td>
<td>0.20 (0.162)</td>
<td>0.06 (0.01)</td>
<td>1.13 (1.079)</td>
<td>7.787***</td>
<td>D&gt;A,B,C</td>
</tr>
<tr>
<td>Reduction</td>
<td>0.39 (0.129)</td>
<td>0.35 (0.226)</td>
<td>0.29 (0.137)</td>
<td>0.6 (0.111)</td>
<td>1.718</td>
<td></td>
</tr>
<tr>
<td>Substitution</td>
<td>2.12 (2.051)</td>
<td>1.16 (1.083)</td>
<td>1.04 (1.038)</td>
<td>0.98 (0.514)</td>
<td>5.032***</td>
<td>A&gt;B,C,D</td>
</tr>
<tr>
<td>Communication arrest</td>
<td>1.96 (1.821)</td>
<td>1.43 (1.34)</td>
<td>0.34 (0.26)</td>
<td>2.89 (2.504)</td>
<td>8.519***</td>
<td>A&gt;C,D</td>
</tr>
</tbody>
</table>

* p < 0.05. *** p < 0.01.
‘topic shift’ and between ‘non-compliance’ and ‘request for clarification’. ‘Ignore’ was the second most used communication breakdown, with a significant difference between ‘ignore’ and ‘request for clarification’, but not between ‘ignore’ and the other communication breakdowns.

Repair Strategies

To identify repair strategies used by the students, all behaviors that appeared after breakdowns were coded. Five different behaviors were identified that represent a change in the topography of the communication behaviors of the students, of which four were recognized as repair strategies: ‘repetition’, ‘addition’, ‘reduction’, and ‘substitution’ (Brady & Halle, 2002) and one, ‘communication arrest’, representing complete halt of the interaction. Of the repair strategies, ‘repetition’ appeared most with 13% of the occurrences, ‘substitution’ with 11%, ‘addition’ and ‘reduction’ appeared 4% and 3% respectively, resulting in approximately 31% use of repair strategies. ‘Communication arrest’ appeared with 12.5% of the occurrences.

Repeated measures ANOVA conducted to investigate the differences between the six types of behaviors appearing after communication breakdown revealed a significant difference between the six types of behaviors: \[ F(4,188) = 36.29, p < 0.001, \eta^2 = 0.44 \]. To determine the nature of the differences post-hoc analysis using Bonferroni correction was conducted. Results reveal that ‘communication arrest’ appeared most often, with significant differences between ‘communication arrest’ and both ‘addition’ and ‘reduction’ modification repair strategies. ‘Repetition’ was the most frequently used repair strategy, with a significant difference between ‘repetition’, ‘addition’, and ‘reduction’. ‘Substitution’ was the second most used strategy, with a significant difference between ‘substitution’, ‘addition’ and ‘reduction’. No other significant differences were found.

After reviewing all observations, another behavior was detected, used by some of the students when encountering communication breakdowns. This behavior was identified as ‘partner shift’ representing a shift to a new communication partner, which in fact replaced the original communication partner without terminating the cycle. ‘Partner shift’ appeared with 5.5% of the occurrences, those were coded preliminarily as ‘communication arrest’, following the termination of the communication with the original partner, resulting in ‘communication arrest’ with 7% of the occurrences.

Student and Staff Communication Behaviors

Repeated measures ANOVA was used to assess differences in the repair strategies between the communication breakdowns. To determine the nature of the differences, post hoc Bonferroni correction was used. Table 3 presents analysis of variance for mean differences with post hoc comparisons for repair strategies after communication breakdowns. Results demonstrate ‘repetition’ is the repair strategy used significantly most frequently after ‘non-compliance’ in comparison with ‘repetition’ after all other breakdowns. ‘Repetition’ was also used frequently after ‘ignore’ communication breakdown, with significant difference between ‘repetition’ after ‘ignore’ and ‘repetition’ after ‘request for clarification’ and ‘topic shift’. ‘Addition’ was significantly most frequently used after ‘ignore’ communication breakdown in comparison with ‘addition’, after all other communication breakdowns. ‘Substitution’ was significantly most frequently used after ‘non-compliance’ communication breakdowns in comparison with ‘substitution’, after all other communication breakdowns. ‘Communication arrest’ was significantly most frequently used after ‘ignore’ communication breakdowns in comparison with ‘communication arrest’ after ‘request for clarification’ and ‘topic shift’. ‘Communication arrest’ was also frequently used after ‘non-compliance’, with significant difference between ‘communication arrest’ after non-compliance and ‘communication arrest’ after ‘request for clarification’. ‘Communication arrest’ appeared less frequently after ‘topic shift’, with significant difference between ‘communication arrest’ after ‘topic shift’ in comparison with ‘communication arrest’ after ‘request for clarification’. No significant differences were found for ‘reduction’ as a repair strategy after any of the communication breakdowns.
Nine of the 12 students used ‘partner shift’ following communication breakdowns. It was used in a varying degree across partners and across situations. To identify differences between the type of communication breakdown and ‘partner shift’, a repeated measures ANOVA was used. ‘Partner shift’ appeared after all types of communication breakdowns, with no significant differences between the types of breakdowns that resulted in ‘partner shift’.

Differences in the staff intensity level on daily and weekly contact with the students were identified through independent samples t-test to compare between communication breakdowns and repair strategies of the students. Significant differences were found between staff member who work daily with the students and those who see the students on a weekly basis in their use of ‘request for clarification’. Staff members who work with the students on a daily basis use ‘requests for clarification’ significantly more often. A significant difference was also found for the use of ‘substitution’ as a repair strategy, indicating that students use more ‘substitution’ repair strategies with staff members who work daily with them. No significant differences were found across all other variables when comparing the intensity level of the staff members.

Table 3 presents differences between daily/weekly basis groups regarding all staff and students behaviors.

**Discussion**

Communicative behaviors of students with SID were investigated to identify measures of communicative competence within the school environment i.e. repair strategies. Possible correlations between repair strategies and communication partner parameters were investigated from an environmental perspective. Partner’s parameters were defined by differences between daily and weekly contact of the school staff members in contact with the student and the types of communication breakdowns.

**Communication Breakdowns**

Students with SID who demonstrate significant language delays encounter communication breakdowns that may hinder their interaction with peers as well as with adult communicators. Results of the study demonstrate that the communication partners present several behaviors that could be recognized as communication breakdowns by the student with SID with more than 50% of interactions

### Table 3

<table>
<thead>
<tr>
<th></th>
<th>Weekly</th>
<th>Daily</th>
<th>T</th>
<th>df(46)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repair strategy: Repetition</td>
<td>14.54 (8.15)</td>
<td>11.38 (7.267)</td>
<td>-1.416</td>
<td></td>
</tr>
<tr>
<td>Repair strategy: Addition</td>
<td>5.35 (5.001)</td>
<td>4.02 (2.507)</td>
<td>-1.043</td>
<td></td>
</tr>
<tr>
<td>Repair strategy: Reduction</td>
<td>4.27 (3.321)</td>
<td>4.28 (2.2)</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Repair strategy: Substitution</td>
<td>8.96 (6.51)</td>
<td>12.66 (7.587)</td>
<td>1.815*</td>
<td></td>
</tr>
<tr>
<td>Communication arrest</td>
<td>11.95 (4.851)</td>
<td>13.15 (6.189)</td>
<td>0.748</td>
<td></td>
</tr>
<tr>
<td><strong>Partner’s Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication breakdown: Ignore</td>
<td>18.8 (18.167)</td>
<td>14.94 (14.001)</td>
<td>-0.780</td>
<td></td>
</tr>
<tr>
<td>Communication breakdown: Request for clarification</td>
<td>4.81 (4.806)</td>
<td>8.15 (7.456)</td>
<td>1.832*</td>
<td></td>
</tr>
<tr>
<td>Communication breakdown: Topic shift</td>
<td>10.25 (9.724)</td>
<td>10.16 (9.451)</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Communication breakdown: Non compliance</td>
<td>23.81 (14.755)</td>
<td>24.05 (12.521)</td>
<td>0.06</td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05.
ending in communication breakdowns. The communication breakdowns identified included ‘ignore’, ‘request for clarification’, ‘topic shift’ (Brady & Halle, 2002; Halle et al., 2004), and ‘non-compliance’ (Marcos & Bernicot, 1997). In this study we included ‘non-compliance’ as a communication breakdown from the student point of view. As the findings show the students indeed used repair strategies after ‘non-compliance’ of the adult. Non-compliance’ breakdown appeared most, ‘ignore’, second in frequency, while ‘topic shift’ and ‘request for clarification’ appeared least. Results support previous findings in which communication breakdowns dominated the interactions, with ‘topic shift’ and ‘request for clarification’ appearing less than ‘ignore’. For example, research findings demonstrate that teachers of children with SID ignore 30%–60% of the child’s communication (Calculator & Dollaghan, 1982). Those teachers requested clarifications after 28% of the communication attempts, and changed the topic after 8% of the attempts. In another study, research revealed that only 40% of the attempts made by children with SID who were AAC users resulted in a desired response (Wetherby, Alexander, & Prizant, 1998).

The high frequency of communication breakdowns might imply a reduced ability of the students to achieve their communication goals. This presents a potential obstacle to the development of communicative competence of the students. Students may learn that their communication attempts are not effective and leads to non-relevant consequences, this may cause learned helplessness and reduction in communication initiation.

Noncompliance—which was the most frequent breakdown—can achieve few goals for the adult, as it can preserve school boundaries (i.e. “now it is not time to eat”), prevent escape behaviors (i.e. “I know you don’t want to dance but now you have to.”), and increase participation (“I know you want to go outside, but now you have to finish your assignment”). However, the question remains whether the student understood the nature of ‘non-compliance’, as part of the interaction, remaining in participation mode, or reacted towards it as if the communication partner failed in communication.

The second most frequent communication breakdown identified in the study was ‘ignore’. This behavior was observed significantly more frequently than the other two communication breakdowns. This is also supported by previous studies researching interactions with students with SID (Calculator & Dollaghan, 1982; Weiner, 2005). Results of this study demonstrate that the staff used ‘request for clarification’ and ‘topic shift’ the least, leaving the student with limited possibilities to use it as opportunity to increase communication. Low expectations and limited experience in successful interactions could be the causes for such results, as the communication partners have limited expectations regarding the future of the potential interaction (Tomassello et al., 1990). ‘Request for clarification’ and ‘topic shift’ are breakdowns that are geared and motivated towards a continuation of the interaction, while ‘ignore’ is usually intended to arrest the interaction and does not seek repair strategies (Tomassello et al., 1990). Thus, the student’s environment is characterized by a frequent failure to achieve communication goals and by types of breakdown that do not support further communication.

Repair Strategies

Analysis of the students’ behaviors revealed five patterns depicting the changes in the topography of the message (Brady & Halle, 2002). Four of the behaviors were identified as repair strategies, appearing after communication breakdowns: ‘Repetition’, ‘substitution’, ‘addition’ and ‘reduction’. ‘Repetition’ and ‘substitution’ were used more frequently than ‘addition’ and ‘reduction’, although all were part of the students’ repertoire. These results support previous findings that document the use of ‘repetition’ as the most dominant repair strategy used among children with SID and other developmental disabilities (Brady et al., 1995; Calculator & Delaney, 1986; Erbas, 2005; Ohtake et al., 2005). These findings reflect on the ability of students with SID to amend communication breakdowns using a variety of repair strategies, and might indicate that those students relate to understanding another’s perspective (Halle et al., 2004). The dominance of ‘repetition’ and ‘substitution’ may be due to the difficulty in identifying the
source of the breakdown among the students. In light of the nature of most frequent breakdowns, 'ignore' and 'topic shift' that provide little or no information regarding the basis of the breakdown. It might be that the use of the above strategies are inevitable.

In addition to the four repair strategies, students participating in the study demonstrated a 'communication arrest' behavior that appeared frequently after breakdowns. Previous studies demonstrate similar findings (e.g., Brinton & Fujiki, 1991; Ohtake et al., 2005). The tendency to withdraw and terminate communication could result from the limited support provided when attempting to repair, leading to a conclusion about the unworthy nature of such efforts. In addition, the use of preempting by the communication partners that guide the student, and precede communicative intents, reduce the need to initiate, thus resulting in less attempts to initiate repairs, and in an increase in 'communication arrests' (Calculato, 1988). This finding supports the hypothesis regarding learned helplessness in reference to initiation and repair by students with SID (Rechle, 1997).

When observing the activities, a striking finding revealed that 10% of the communication breakdowns resulted in changing the communication partner, 5.5% of all interactions. Although 'partner shift' does not qualify as a repair strategy, as it does not focus on changing or repeating the message to the original partner, it does serve as an adaptive behavior that the student retracts to when sensing a communication breakdown. As interaction with the original communication partner did not yield the desired result, this strategy was used as an alternative, in an attempt to persist and continue the original intent, terminating the communication with the original partner and using another communication partner. By turning to another resource, the student activates the new partner as if using a repair strategy to pursue in achieving the communication goal. In this study, nine of the twelve students used this strategy. It could be assumed that previous history taught them that a different partner within the school could be as beneficial as the preliminary one, or that similar effort and resources are required regardless of the partner. By highlighting this behavior, we wish to expand the discussion about repair strategies among children with SID as this interesting behavior may suggest flexibility and pragmatic behavior used to overcome breakdowns. This finding is preliminary, as in this study, not all the observations included a second staff member, so opportunity to shift partner was not always available. Further investigation of this behavior is required.

**Communication Breakdowns and Repair Strategies**

Results of this study demonstrate that students were able to adjust some of the repair strategies to the communication breakdowns. The correlations found between breakdown and repair may present the students' ability to distinguish between types of breakdowns and to adjust the repair strategies to the types of breakdowns presented. The results demonstrate that complete 'communication arrest' appeared mostly after 'ignore' and least after 'request for clarification', which suggests that when the student was not receiving clear information regarding the message, communication stopped more often, and when information regarding the clarity of the message was present, a repair strategy was used. These findings are supported by a previous study demonstrating such findings among parents and typically developing toddlers (Tomasello et. al., 1990). Thus, use of communication breakdowns that provide information regarding the nature of the breakdown supports the continuation of the interaction, and invites efficient and effective communication, which in the long run enables less breakdowns and a better communication flow.

'Substitution' significantly appeared mainly after 'non-compliance' in comparison with all other communication breakdowns. The use of 'substitution' after 'non-compliance' could indicate a reaction to the response that sends a clear message to the student regarding the dissatisfaction of the adult towards the behavior of the student. The response of the adult does not promote any encouragement to the original topography of the student, leading to a decline or deletion. Therefore, his response could direct the resources of the student to creating completely different message topog-
raphy, thus using ‘substitution’ as the preferred strategy (Erbas, 2005).

A surprising finding in this study was the use of ‘addition’ as a repair strategy used significantly more often after ‘ignore’ than all other communication breakdowns. This type of repair strategy is usually associated with ‘request for clarification’, a strategy that requests clarifications regarding specific areas to be targeted by adding to the original message. However, as the use of ‘request for clarification’ as well as ‘addition’ was so sporadic and scarce in this study, further research should investigate this finding.

Social Networks

Two types of communication partners working with the students in the school were identified for the study based on their relative intensity level: weekly vs. daily. Differences in their patterns of communication with the students were identified with respect to their communication style across all variables investigated in the study. It was assumed that the intensity level would be related to familiarity with the child’s idiosyncratic communication, hence increasing the ability to identify and react to the communication signals of the students, especially concerning populations that tend to use non-verbal and pre-symbolic communication (Siegel & Cress, 2002). Results of this study demonstrate almost no significant difference between the staff based on their intensity level across most parameters investigated in the study.

Significant differences were found between staff members in the use of ‘request for clarification’ as a communication breakdown. Staff members that maintain daily contact with the students used more ‘request for clarification’ breakdown in comparison with staff members who interact on a weekly basis with the student. Other communication breakdowns were not represented differently between both groups. Similarly, no significant differences were found in the total frequency of communication breakdowns. Thus, results of this study suggest that staff members who have daily interaction with the student may also have a prior inclination to attempt to understand the student and further maintain interaction, thus, presenting more opportunities to repair and continue the interaction while communicating with the student. The motivation to understand the student may be the result of the intense contact with the student and the mutual need to understand one another in order to keep a productive routine in the classroom. Further research is needed to expand understanding of these findings.

Repair strategies used by the students after communication breakdowns differed between staff members only in the use of ‘substitution’, wherein, significantly more uses of this strategy were found when interacting with staff members who work on a daily basis with the students. ‘Substitution’ is a strategy that requires great effort, as it requires the student to gather many resources to change all components of the original message (Halle at al., 2004). It could be assumed that staff members who work more frequently with the student are focused more on understanding, thus placing a significant effort in the process. As a result, the student might learn in return to engage and incorporate more resources when attempting to convey an idea. Following a communication breakdown, the student engages in gathering all resources to change the topography and convey the message in a new format. With partners of lesser intensity, the student might not have the resources or even the ability to utilize this strategy. Further research is needed to investigate these findings.

Although intensity level varied among the staff members, all were professionals working closely with the students. As such, the limited differences in the results could be attributed to the similarity between the staff members rather than the intensity level. Results demonstrate no significant difference for all other variables across the two groups. Yet, further research should address various characteristics associated with different staff members such as attitudes, level of familiarity with the student, and the staff’s turnover in the school. Further research should address these issues within the different social networks of the students as well as across different school systems.

Limitations

Interpretation and generalization of this study’s results must consider these following limitations: limited study sample and the in-
Instruments used for the study. In this study, 12 students with SID ranging in age and abilities participated. Given the diversity of the students, results of the study have limited generalization. More so, due to the limited number of participants and the high number of behavior categories, some of the behaviors measured were scarce in their appearance, thus, influencing analysis. Further research is needed to understand the complexity of the findings resulting from the characteristics and the varying abilities of the students and the complexity of the instruments created for the study. Results of the study should also take into consideration the presence of the camera during school activities. Although staff members were blind to the study’s questions, their communication behaviors and their overall conduct could have been influenced by the presence of the camera in the room.

As part of the scope of the study, all activities were employed in the natural environment, at various activities, resulting in a variation with different kinds of demands from the students. Thus, some activities demand participating in a restricted environment such as cognitive activity beside a table and some were more open in nature such as therapeutic music group or playing outside. All the activities included interaction between the student and the adult, all including at least three more students.

Conclusions

Results of the study reveal that students with SID were able to demonstrate repairing communication breakdowns using a variety of strategies, especially ‘substitution’ and ‘repetition’. Results of the study demonstrate that the communicative environment of students in the school was characterized with a high frequency of communication breakdowns. Most of the communication breakdowns included ‘ignore’ and ‘non-compliance’ behaviors that resulted in termination of the interaction, especially in comparison with the lower appearance of ‘request for clarification’ that promoted more repair strategies and less ‘communication arrests’. Thus, ‘request for clarification’ was the most effective breakdown for use with the students, for increasing productive repair strategies that maintain interaction. To a certain extent, students with SID succeed in matching the repair strategy to the specific communication breakdown used by their partner.

In this study, results demonstrate that students with SID were able to use a variety of repair strategies to overcome communication breakdowns during interactions in school. Although, by far, these are encouraging findings, the limited use of communication promoting breakdowns by the communication partners revealed only limited use of repair strategies for maintaining interaction. The interesting finding concerning the use of ‘partner shift’ as an additional strategy for pursuing the original communicative attempt by the students in the study may also provide additional evidence as to the nature of strategies used for maintaining communication. Further research should investigate whether the nature of using ‘request for clarification’ would enhance the use of specific strategies such as ‘addition’ and ‘reduction’ rather than ‘substitution’ and ‘repetition’ that are more general in nature. Research could also further investigate the effects of expansion and elaboration of sophisticated repair strategies for effective message transmission. In this study, students with SID responded with specific repair strategies based on the nature of the breakdowns. However, as the students were not able to identify and effectively use the strategies for repairing the breakdowns, research should further investigate methods for overcoming such limitations, thus enhancing the communicative competence of students with SID.

The daily versus weekly contact of the staff members did not have a major impact on communicative behaviors of the students and the staff communicating with them. Two differences were found in favor of the daily basis group, which may imply a difference between the motivations of the two groups to continue interaction. The resemblance between the groups could be the results of the similarity in the basic nature of the characteristics of the staff members, the general environment within the school system, or even the turnover of the staff that could provoke the students to interact in a similar basis with all school staff. However, these results could also signify the restricted abilities of the students and their inadequate repertoire that limit their abilities.
to modify their strategies across different communication partners. More so, these behaviors of the students with SID could be the result of their limited ability to decode communication partners based on their intensity level resulting in the same limited resources. An indication of this above assumption could be reflected in the ability of the students to maintain and modify repair strategies when their communication partners’ breakdowns incorporated ‘requests for clarification’. Those breakdowns, used mainly by staff members with the greater intensity level enabled the use of ‘modification’ and ‘substitution’ rather than ‘repetition’ and ‘communication arrest’. The results are promising as all repair strategies were evident in the behavior of the participants as well as all types of communication breakdowns. Further research should expand on these findings.

References


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A Parametric Analysis of Specific Praise Rates on the On-Task Behavior of Elementary Students with Autism

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Abstract: Using contingent praise is a proactive strategy for increasing on-task behaviors in special education classrooms. Although there is large body of literature supporting the use of praise to decrease challenging behaviors and increase desirable behaviors, a consensus on how much praise is needed has yet to be reached. In an effort to identify optimum rates of praise, this study used an alternating treatments design to examine the comparative effects of three different rates of praise on the on-task behavior of five students with autism. The results varied across participants, but overall indicated that four or more praise statements per minute resulted in higher percentages of intervals of on-task behavior. An important implication of this study is that teachers of elementary students with autism should aim for praise rates between four and eight per minute, and that a MotivAider® can be an effective tool to help practitioners reach that rate.

Proactive classroom management skills, such as frequent use of contingent praise, are essential for maximizing instructional time and reducing the occurrence of challenging behavior. Conversely, reactive classroom management strategies consist of implementing consequences after the challenging behavior has already occurred. Clunies-Ross, Little, and Kienhuis (2008) found that predominant use of reactive behavior management was associated with increased off-task student behavior, self-reported teacher stress, and staff burn out. According to the National Center for Education Statistics (2000), 40% of surveyed teachers reported managing challenging behavior as the biggest factor affecting instruction. With the ever-increasing importance of student success and teacher retention, it is critical that teachers are equipped with proactive behavior management tools that special education teachers have at their disposal (Stichter et al., 2000).

Since the 1970’s, empirical research has demonstrated that teachers’ use of behavior-specific, contingent praise improves classroom management and student behavior (e.g., Gable, Hester, Rock, & Hughes, 2009; Hall et al., 1971; Noell et al., 2005; Strain & Joseph, 2004; Sutherland, Wehby, & Copeland, 2000; Thomas, Presland, Grant, & Glynn, 1978). Although previous research supports the use of teacher praise to increase on-task behavior, no research has identified exactly how much praise is needed to achieve the best results.

Pisacreta, Tincani, Connell, and Axelrod (2011) addressed the question of how much praise is needed by examining the effects of a 1:1 ratio of praise statements to corrective feedback statements. Pisacreta and colleagues used modeling and feedback to train three middle school teachers to provide a 1:1 ratio of praise statements to corrective feedback statements and examined the effects of this training on teachers’ adherence to the 1:1 ratio, intervals of student disruptive behavior, and teachers’ generalization to classrooms where no training occurred. The authors used a multiple baseline across participants design and showed that in baseline teachers typically provided about 1 praise statement per every 10 corrective feedback statements. After training, which consisted of modeling and feedback, the teachers increased their praise to corrective feedback ratios to closer to 1:1.
(ranging between 1:4 and 4:1) and two of the teachers demonstrated generalization of the trained praise ratio to other classrooms. Additionally, student disruptive behavior decreased substantially after intervention. During baseline, mean intervals of off-task behavior for each classroom ranged from 22% to 44%. After training, mean intervals of disruptive behavior decreased to means of 11% to 18%. Based on the limitations of their study, one of the recommendations of Pisacreta et al. (2011) was to conduct a parametric analysis examining the effects of different praise rates.

Similar to Pisacreta et al. (2011), Myers, Simmons, and Sugai (2011) sought to improve rates and ratios of specific praise for four teachers in a middle school implementing School-wide Positive Behavior Support (SWPBS). Myers et al. (2011) used multi-tiered levels of support to train teachers to attain six specific praise statements per 15 minutes and ratios of 4 positive to 1 negative interaction with students. Using a multiple baseline across teachers design, Myers et al. (2011) demonstrated that the multi-tiered system was effective for training teachers to criteria and for decreasing student disruptive behavior.

The research of Pisacreta et al. (2011) and Myers et al. (2011) demonstrated that teachers can be trained to deliver praise at increased rates and that those increased praise rates resulted in decreased off-task behavior. However, the optimum number of specific praise statements has not yet been established. Although a 4:1 ratio of praise to corrective feedback has been a suggested guideline to practitioners (e.g., Trussell, 2008), there has been no published research validating the 4:1 praise ratio or comparing different praise rates on student behavior. The purpose of this study was examine the differential effects of varying praise rates on the classroom behavior of students with autism. This study addressed the following research questions: What are the differentiated effects of various rates of praise on the on-task behavior of elementary-aged students with autism? What is the teacher’s opinion about the effectiveness and feasibility of the various praise rates?

### Method

#### Participants and Setting

Participants were five males, ages 7 to 10, enrolled in a special education program at a private school for children with autism spectrum disorder (ASD) in a large midwestern city. All participants were diagnosed with autism; Ned was also diagnosed with Sensory Processing Dysfunction. All participants functioned academically at the first to second grade level, and engaged in forms of aggression such as hitting and pinching the teacher, cursing, and engaging in noncompliance and elopement.

All five participants spent most of school day in the same classroom with the lead teacher and her aide. Their daily routine consisted of Direct Instruction (DI) curricula and fluency building programs for reading and math. Participants also attended other classes including physical education, science, and library. Table 1 shows demographic and school related information about the participants. The classroom teacher was a 29-year-old female with a bachelor’s degree in special education and one year of teaching experience.

Observations occurred 9:30 to 9:50 a.m., Monday through Friday, in the same classroom. The classroom was 30 × 15 feet and included six student desks arranged in a semi-circle, oriented towards a dry erase board and one teacher desk. Reading board work and fluency tasks were the focus of instruction during observations. Specifically, the teacher delivered DI reading instruction by presenting nonsense syllables on the board, signaling for students to decode each syllable by tapping under the syllable, and providing praise or

<table>
<thead>
<tr>
<th>Student</th>
<th>Age</th>
<th>Chronological Grade Level</th>
<th>Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ned</td>
<td>10</td>
<td>4</td>
<td>White</td>
</tr>
<tr>
<td>Baer</td>
<td>7</td>
<td>2</td>
<td>White</td>
</tr>
<tr>
<td>Eddie</td>
<td>9</td>
<td>3</td>
<td>African American</td>
</tr>
<tr>
<td>Reginald</td>
<td>7</td>
<td>2</td>
<td>White</td>
</tr>
<tr>
<td>Austin</td>
<td>10</td>
<td>4</td>
<td>Other</td>
</tr>
</tbody>
</table>

### Table 1

Participant Demographics
corrective feedback. Fluency instruction consisted of timed practice reading nonsense syllables on worksheets.

**Dependent Variable**

The dependent variable measured for students was on-task behavior. On-task behavior was defined as looking at the teacher during teacher-led instruction, looking at and/or writing responses on a worksheet, answering questions on signal, answering questions correctly, and following teacher directions. Student behavior data were recorded using a pencil and experimenter-designed data sheets. A momentary time sampling procedure was used to score on-task behavior. The daily observation time of 20 minutes was divided into 10-sec intervals. At the end of the each 10-sec interval, the observer recorded a “✓,” (check) if the student was on-task or a “0,” (zero) if the student was not on-task. Percentage of on-task intervals was calculated by dividing the number of intervals of on-task behavior by the total number of intervals and multiplying by 100.

**Treatment Integrity**

To assess treatment integrity, praise statements were recorded to determine the extent to which the teacher complied with the praise rate schedule in each condition. The teacher was instructed to deliver a specific praise statement every 60 s, 15 s, or 7 s depending on that day’s condition and used a MotivAider® as a prompt to deliver praise at each interval. A MotivAider® is an electronic signaling device that can be clipped on to a belt and can be programmed to vibrate at pre-set fixed or variable time intervals. The teacher was asked to praise only when the MotivAider® vibrated and to not praise beyond that. Similar to Myers et al. (2011), a specific praise statement was recorded when the teacher emitted a verbal statement of approval (e.g., “good job,” “well done,” “excellent”), indicated the behavior being praised (e.g., answering a question correctly, paying attention), and stating either the student’s name or saying “everyone” when addressing the whole group. General praise statements that did not specify the behavior or the individual(s) being addressed were not recorded.

**Observer Training**

Prior to data collection, the primary observer (i.e., the first author) trained observers by showing them recorded sessions from pre-baseline observations, having them score intervals of on-task behavior, and then calculating point-by-point IOA with the primary observer’s original data and discussing any discrepancies. Only one 2-hour training session was needed for observers to be trained to mastery criteria for IOA which was 90% agreement across two consecutive sessions. During that same session, the first author also provided training on procedural fidelity by showing the observers the procedural checklist, providing a description of each step, modeling each step, providing opportunities to practice, and delivering feedback. All observers were able to score procedural reliability to 100% accuracy during that training session.

**Interobserver Agreement (IOA)**

IOA data were collected on 33% of baseline sessions and 33% of praise rate manipulation (PRM) sessions independently by secondary observers who watched recorded sessions and scored the number of intervals of on-task behavior for each participant. The secondary observers’ data were compared to the primary observer’s data to assess agreement. IOA was calculated by dividing the number of agreements by the total number of agreements plus disagreements and multiplying by 100.

**Treatment Integrity**

To ensure the teacher was adhering to the treatment for each PRM condition, teacher praise statements for each session were recorded, and IOA of praise statements was assessed on 33% of the PRM sessions. Secondary observers’ data were compared to the primary observer’s data to assess agreement. IOA of teacher praise statements was calculated by dividing the number of agreements by the total number of agreements plus disagreements and multiplying by 100.
Procedural Fidelity

On 66% of experimental sessions, a trained, independent observer watched video recorded sessions and scored procedural fidelity by using a three-step (baseline) and four-step (PRM) experimenter-created checklist. The observer watched the recordings and scored “yes” or “no” for each step depending on whether or not the experimenter followed each of the procedural steps for delivering instructions to the teacher correctly.

Social Validity

At the end of the study, the teacher completed a social validity questionnaire by writing responses to the following questions: Which praise rate per minute did you feel was the easiest to implement and why? Which praise rate per minute did you feel was the hardest to implement and why? Which praise rate per minute did you feel resulted in your students being on-task the most and the least? Do you think you will now use an increased rate of specific praise following this study, why or why not? What were some of the biggest challenges and/or concerns you have about the manipulation of your praise rate?

Experimental Design

A single case alternating treatments design was used to examine the differentiated effects of specific praise rates on the participants’ on-task behavior during teacher directed reading instruction. After three data points were collected during an initial baseline phase, the PRM phase was introduced. In the PRM phase, three different experimental conditions were introduced and alternated in counterbalanced order. The conditions were as follows: (a) 1 teacher praise statement per minute, (b) 4 teacher praise statements per minute, and (c) 8 teacher praise statements per minute.

Procedure

Baseline. During baseline, the teacher was provided with no instructions regarding delivery of praise, she was only instructed to teach that day’s lesson as she usually would. During each 20-min baseline session, the observer recorded on-task behavior using the momentary time sampling procedure described under Dependent Variables above. The observer also recorded the total number of teacher praise statements to calculate praise statements per minute.

PRM. During the PRM phase, the teacher wore a MotivAider® that was pre-set to vibrate at fixed intervals to prompt her to deliver a praise statement to the students. As in baseline, the observer continued to record on-task behavior and teacher praise statements. The following three conditions were randomly alternated to compare their effects on student on-task behavior.

*One praise statement per minute condition.* The experimenter set the MotivAider® to vibrate every 60 s and informed the teacher that session’s praise rate was 1 per min. He instructed the teacher to deliver specific praise to either an individual or to the whole class every time the MotivAider® vibrated. The teacher clipped the MotivAider® to her belt loop and switched it to “on” at the beginning of the 20 min observation period. At the end of the observation period, the teacher turned off the MotivAider®, returned it to the observer, and continued teaching.

*Four praise statements per minute condition.* All procedures were the same as above except that the MotivAider® was set to vibrate every 15 s and the experimenter informed the teacher that session’s praise rate was 4 per min.

*Eight praise statements per minute condition.* All procedures were the same as above except that the MotivAider® was set to vibrate every 7 s and the experimenter informed the teacher that session’s praise rate was 8 per min.

Results

Figure 1 shows the mean percentage of intervals of on-task behavior aggregated across all five students during baseline and PRM conditions. During the PRM phase, the data path in the 1 per min condition is around 80% with little variability, and is clearly below the levels in the 4 per min and 8 per min data path. The 4 per min data path ranged between 88–92% with one overlapping data point over the 8 per min data path, little variability, and clearly above 1 per min and below 8 per min. The
level for 8 per min was around 90–95% with little variability and one overlapping data point with the 4 per min data path. The class was on-task for an average of 67% of intervals during baseline (range, 57–73%). During the 1 per min condition, the class was on-task for an average of 77% of intervals (range, 71–85%). During the 4 per min condition, the class was on-task for an average of 86% of intervals (range, 81–92%). During the 8 per min condition, the class was on-task for an average of 91% of intervals (range, 87–96%). Table 2 provides a summary of average percentage of intervals of on-task behavior and their ranges, respectively.

Figures 2, 3, and 4 presents Eddie’s, Reginald’s, and Ned’s data respectively. These three participants all demonstrated differentiated percentages of on-task behavior based on the teacher’s praise rate. Eddie, Reginald, and Ned’s data all demonstrated higher percentages of on-task behavior in 4 and 8 praise statements per min condition compared to 1 praise statement per min condition, with the 8 per min condition resulting in the highest rate of on-task behavior.

**TABLE 2**

Average Percentages of Intervals On-Task

<table>
<thead>
<tr>
<th>Student</th>
<th>Baseline</th>
<th>1 per Min</th>
<th>4 per Min</th>
<th>8 per Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddie</td>
<td>46 (range, 24–68)</td>
<td>48 (range, 35–66)</td>
<td>76 (range, 53–99)</td>
<td>94 (range, 89–100)</td>
</tr>
<tr>
<td>Reginald</td>
<td>39 (range, 29–54)</td>
<td>48 (range, 35–66)</td>
<td>65 (range, 53–99)</td>
<td>67 (range, 47–84)</td>
</tr>
<tr>
<td>Baer</td>
<td>91 (range, 87–96)</td>
<td>100 (range, 98–100)</td>
<td>100 (range, 99–100)</td>
<td>100</td>
</tr>
<tr>
<td>Austin</td>
<td>78 (range, 63–88)</td>
<td>97 (range, 93–100)</td>
<td>99 (range, 98–100)</td>
<td>100</td>
</tr>
<tr>
<td>Ned</td>
<td>73 (range, 61–80)</td>
<td>78 (range, 67–85)</td>
<td>90 (range, 87–97)</td>
<td>93 (range, 87–97)</td>
</tr>
<tr>
<td>Whole Class</td>
<td>67 (range, 57–73)</td>
<td>77 (range, 71–83)</td>
<td>86 (range, 81–92)</td>
<td>91 (range, 87–96)</td>
</tr>
</tbody>
</table>
Figure 2. Eddie’s percentages of intervals on task.

Figure 3. Reginald’s percentages of intervals on task.
Figures 5 and 6 present Baer and Austin’s individual percentages of intervals of on-task behavior during baseline and PRM conditions, respectively. Both students’ data levels for all three conditions were at about 100% with no variability.

Figure 7 shows the teacher’s specific praise rates per minute during baseline and the PRM conditions. During baseline, her average rate of praise per minute was 1.31 (range: 0.8–1.8 per min). For the 1 per min condition, she maintained a rate of 1 specific praise statement per min. For the 4 per min condition, she maintained a rate of 4 praise statements per minute for five out of six sessions ($M = 3.94$ per min; range, 3.75–4 per min). For the 8 per min condition, the teacher’s mean praise rate was 7.06 per min (range, 6.6–7.5 per min).

**Social Validity**

On the social validity questionnaire, the teacher reported that the 4 per min praise rate was the easiest to implement because it was the most similar rate of praise that she typically used and it allowed her to praise and reinforce more occurrences of desirable behavior. The teacher reported that the 1 per min praise rate was the most difficult to implement because if a behavior that she wanted to reinforce was emitted during that one minute interval, in order to comply with treatment integrity, she could not deliver a praise statement. She also stated 1 praise statement per minute was probably least effective for maintaining on-task behavior. “Many times the students would point out that they were following directions, but did not receive praise for it (e.g., “What about me? I’m sitting in my seat too?”).” She also indicated that she will “absolutely!” use an increased rate of praise in the future. In response to which praise rate resulted in her students being on-task the most, the teacher said it depended on the student, but 4 per min seemed to be the best praise rate overall. Finally, the teacher reported that she had been using more specific praise outside of the study’s observations and her rate of specific praise is definitely close to 4 per min.

**Interobserver agreement.** IOA data for each student’s on-task behavior were collected for 33% of baseline sessions and 33% of PRM
Figure 5. Baer’s percentages of intervals on task.

Figure 6. Austin’s percentages of intervals on task.
sessions. IOA for baseline was 74%. Average IOA for PRM was 87% (range, 76%–94%).

Treatment integrity. In order to assess treatment integrity, IOA data were also collected on the teacher’s praise rate which was 100% for both baseline and PRM conditions.

Procedural fidelity. Procedural fidelity of experimenter procedures were collected for 66% of baseline sessions and 33% of PRM sessions. Procedural fidelity was 100% for baseline and 100% for PRM.

Discussion

The purpose of this study was to examine the differential effects of specific praise rates for five elementary students with autism during direct instruction lessons. Three of the five participants showed higher rates of on-task behavior during the 4 and 8 praise statements per min conditions compared to the 1 praise statement per min condition, with slightly higher percentages during the 8 praise statements per min condition. The other two participants (Baer and Austin) showed nearly 100% on-task behavior during all three PRM conditions, demonstrating possible ceiling effects. Because intervals of on-task behavior for Baer and Austin were consistently high from the beginning, differentiated effects of praise rates were not evident for these two participants.

Individual differences in student data may be attributed to the types of off-task behaviors the students emitted. Eddie’s most frequent off-task behavior was either looking away from the teacher during instruction or not answering on signal. His on-task behavior seemed more responsive to the delivered rate of praise, as the changes in level of his behavior were most varied across conditions. This could be an indication that his on-task behavior was maintained by attention. Meaning, with a richer schedule of reinforcement (i.e., more than 1 praise statement per min) his on-task behavior is reinforced more often than not.

Reginald’s off-task behavior consisted of running around the room, lying on the floor, or screaming and crying. His data also show his on-task behavior could have been maintained by attention. However, it is possible that different establishing operations and setting events may have confounded with that day’s praise rate. For example, if he brought
gum to school, he would often spend time chewing it and playing with it instead of responding. If he or the class was working towards earning a special activity at the end of the day, he may have been more on task. Ned’s most frequent off-task behavior was putting his head down when the teacher was calling on other students for individual practice. However, he usually put his head up immediately once he was called on again.

Austin and Baer demonstrated the most on-task behavior at almost 100% of intervals across sessions both in baseline and PRM. One possible explanation for their high percentages of on-task behavior despite low rates of praise is that both students found participating in board and fluency work itself reinforcing.

This study contributes to the body of literature examining praise as a behavior management tool and provides some evidence that an effective rate is 4 or more specific praise statements per minute. Rather than attempt to increase the teacher’s rate of praise or the students’ on-task behavior as in previous studies (e.g., Myers et al., 2011; Piscareta et al., 2011), the goal of this study was to observe what differences, if any, the various rates of praise had on the students’ behavior. The data show that 1 praise statement per min resulted in students being on-task the least amount of intervals and that higher rates of praise are more effective than lower rates for increasing and maintaining on-task behavior. Additionally, the teacher reported that her pace of instruction was faster and smoother when using higher rates of praise.

Limitations and Future Research

The limitations of this study were related to baseline, treatment integrity, IOA, ceiling effects, possible carryover effects, and external validity.

Baseline. The baseline phase consisted of only three sessions. Although baseline phases are not required for alternating treatments designs, this experiment’s baseline condition was intended to capture a brief snapshot of what the on-task behavior and praise rates were prior to manipulation. More baseline data may have shown different trends in either on-task behavior, teacher’s praise statements, or both. Future research should consider a longer baseline phase in order to capture a larger picture of the on-task behavior of the participants as well as the teacher’s baseline rate of praise.

Treatment integrity. The teacher was able to consistently achieve 1 and 4 praise statements per min in those respective conditions, but fell short in the 8 per min condition. Although the MotivAider® prompted her to provide praise 8 times per minute, the teacher’s mean rate of praise during this condition was actually 7.06 praise statements (range, 6.6 to 7.5). The teacher’s report that 4 praise statements per min was the most feasible to implement is consistent with the treatment integrity data. Future research should attempt to increase treatment integrity by identifying praise rates that are more easily attainable.

IOA. One of the quality indicators of single subject research design identified by Horner et al. (2005) is a minimal standard of 80% IOA for each dependent variable. In this study, mean IOA for on-task behavior in baseline was below the minimal standard at 74%. Although mean IOA for intervention exceeded the minimal standard at 87%, future research should attempt to achieve higher even percentages of IOA in intervention. It should be noted that this level of agreement is consistent with other studies examining on-task behavior (e.g., Myers et al., 2011; Piscareta et al., 2011). IOA may be relatively low for this dependent variable in general because on- and off-task behaviors can be difficult to clearly identify; some are subtle and easy to miss. For example, one student placed his head down on his desk, but he was still oriented towards the teacher. One observer may have scored him as still being on-task, while another scored him as being off-task. Another possible explanation for low IOA is the fact that primary data were recorded in real time while a secondary observer scored IOA later by watching a video. The secondary observer may not have been able to see some subtle behaviors on video that the primary observer observed in the classroom. Additionally, a large number of recordings were required (i.e., 20 minutes divided by 10 sec intervals per session) which may have presented some difficulty to the observers. Future research should attempt to achieve higher percentages of IOA,
possibly by have both primary and secondary observers score in real time or later on by watching videos.

**Ceiling effects.** Two of the five participants demonstrated ceiling effects so it was not possible to determine differential effects of praise rates on their on-task behavior. Austin and Baer were both on task for nearly 100% of intervals during all phases and sessions. Future research should investigate varying praise rates of students who may in engage in more frequent off-task and challenging behaviors. Perhaps future research could also examine individualized praise rates for students depending on their baseline levels of off-task behavior.

**Possible carryover effects.** Although the randomization of the conditions may have controlled for sequence and treatment effects, it is possible there were carryover effects. Alternating the 4 per min and 8 per min conditions could have served as intermittent schedules of reinforcement and therefore serving as more powerful reinforcement than if the phases had been continuous. Future researchers should consider using multiple classrooms with different orders of the PRM schedule. Moreover, they could use a variation of a reversal design to run the same rate for a number of days in a row. For example, each phase could last a week as follows: start off by running a baseline condition, then 1 per min, then 4 per min, then 8 per min. Revert back to baseline and then implement the three conditions in a different order. This design would take longer to implement, but would reduce the possibility of carryover effects. Alternately, implementing a final phase in which only the best treatment was continued may address limitations related to carryover effects.

**External validity.** In this study, the effects of varying schedules of teacher delivered praise statements was used during reading instruction with a small group of second to fourth graders with autism. The results of this study indicate 4 per minute was the most feasible for maintaining on-task behavior and more than 4 per minute produced even higher percentages of on-task behavior. However, the optimum praise rates may be different for different populations in different settings. Future research should investigate the effects of various praise rates for students from preschool to adult, with different disabilities (e.g., learning disabilities, ADHD, intellectual disability), and in different settings (e.g., public elementary schools).

**Implications for Practice**

Decades of research have demonstrated teacher praise is an effective and low cost reinforcer for increasing desired behavior and decreasing challenging behavior across a wide range learners (e.g., Brophy, 1981; Hall et al., 1971; Noell et al., 2005; Pisacreta et al., 2011). Special education teachers and behavior analysts have long understood the power of praise for behavior change, but no published research to date has examined exactly how much praise is needed to be an effective proactive classroom and behavior manager. It is likely that different populations of students in different settings may require different praise rates based on their individual needs. Based on the results of this study, we recommend practitioners examine their current rate of praise during instruction and attempt to identify optimum praise rates that result in the greatest benefit for their students.

In busy classrooms, it may be difficult for teachers to remember to praise students as frequently as needed. For this reason, we recommend teachers implement a self-management system for delivering praise. In this study, the MotivAider® served as a prompt for the teacher deliver a specific schedule of praise statements. Teachers could use a MotivAider® or any other electronic visual or auditory self-promoting device. Teachers could even set goals for increasing their praise rates, self-graph, and self-reinforce for reaching their pre-set praise goals. Frequent use of contingent and specific praise can be powerful proactive behavior management tool across a wide range of learners and settings.

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