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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September 2017

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Teacher Perception of the Importance of Friendship and Other Outcome Priorities in Children with Autism Spectrum Disorder

Neysa Petrina, Mark Carter, and Jennifer Stephenson
Macquarie University

Abstract: This study investigated perceptions of teachers of children with autism spectrum disorder (ASD) on the importance of friendship development in comparison to other outcome priorities. Perceptions of teachers working in special classes were compared to those of teachers of mainstream classes. Friendship was rated of similar importance to social skills and emotional development, whereas intellectual and academic skills, physical skill and motor development, and creativity were rated of lower importance than friendship. When teachers were asked to force-rank priorities, friendship was third, preceded by emotional development and social skills. Special class teachers assigned higher ranks to learning outcomes that relate to the core deficits of ASD, namely social skills, friendship, and emotional development, as compared to mainstream class teachers. Furthermore, teachers prioritized friendship differently according to student levels of autistic symptomatology. When perceptions of teachers and parents were compared, both perceived social skills, emotional development, and friendship as the three most important outcomes. The implications of these findings for future educational service delivery are discussed.

Friendship is a specific peer relationship characterized by a bond that is voluntary and reciprocal, involving a degree of mutual affection and preference (Freeman & Kasari, 1998). Friendship is associated with a greater degree of positivity in interactions as compared to interactions with non-friends, specifically with regard to positive engagement, effectiveness in task completion, and resolution of conflict (Newcomb & Bagwell, 1995). The diagnosis of autism spectrum disorder (ASD) involves an impairment in social skills, which often affects the ability to develop and maintain meaningful friendship relations (Fuentes et al., 2012). Children with ASD characteristically have fewer friends compared to their matched typical peers (Bauminger & Shulman, 2003; Rowley et al., 2012) and a lower level of friendship quality in areas of companionship, security-intimacy, closeness, and help (Bauminger & Kasari, 2000; Calder, Hill, & Pellicano, 2013; Solomon, Bauminger, & Rogers, 2011).

Teachers of students with ASD have the responsibility for assessment of each student’s needs, strengths, and weaknesses, to formulate appropriate curriculum to address those needs, and to ensure successful learning. Identifying curriculum priorities for children with ASD is a complex process, due to their diverse educational needs (Humphrey & Parkinson, 2006). Previous researchers have suggested the use of specialized curriculum elements that target areas of deficits specific to ASD (including language, communication, social interaction, and adaptive goals) as one of the components of effective practice for children with ASD (National Autism Center, 2015; Reichow, Doehring, Cicchetti, & Volkmar, 2010).

The need for the implementation of specialized curriculum adaptations in a school setting requires that teachers understand the needs and learning characteristics of children with ASD. This understanding of their student
learning characteristics and educator perceptions of outcome priorities shapes their teaching approach and classroom behaviors (Trigwell, Prosser, & Waterhouse, 1999). Nevertheless, due to limited time and resources, teachers may prioritize some learning outcomes over others and may emphasize particular areas of the curriculum that they perceive to be important. Mavropoulou and Padeliadu (2000) investigated how teachers perceived different curriculum priorities in children with ASD. They reported that special education teachers who have received specific training in ASD were more able to match curriculum priorities specific to student needs, as compared to mainstream class teachers, who tended to focus on broader areas of well-being. No other research has been identified examining teacher priorities for children with ASD.

There is a limited amount of literature regarding teaching friendship skills to children with ASD within school settings (e.g., Chang, Shih, & Kasari, 2016). As a result, teachers might feel unequipped in addressing the development of friendship skills in their students as a curriculum focus. It is possible that teachers implicitly recognize the need for improvement in student friendship skill, but might focus instead on other outcome priorities with better-defined teaching procedures (e.g., social skills, academic skills). Thus, it is of interest to see the extent to which teachers view friendship as an important priority.

There are a number of reasons for examining the degree of alignment between teacher and parent priorities. First, perceptions of teachers may differ from parent perceptions in regards to student behavioral problems and social functioning (Jepsen, Gray, & Taffe, 2012). This might influence how teachers and parents prioritize the different learning outcomes. The key role of parents in the planning and decision making process for individual programming for students with disabilities has been recognized widely (Rioux, 2013) and is a legal requirement in several countries (e.g., Individuals with Disabilities Education Improvement Act, 2004, in the U.S.; Disability Standards for Education, 2005, in Australia). In Australia, where the majority of children with ASD are educated in mainstream school settings (Australian Bureau of Statistics [ABS], 2012), it is crucial for teachers and parents to align students’ educational priorities. Second, the majority of interventions targeting socially related skills have generally been conducted in school environments (Bellini, Peters, Benner, & Hopf, 2007). Only a small number of those studies measured generalization effects, and researchers often reported the lack of generalization of learned social skills across trained and untrained contexts (e.g., home and community settings) (Reichow & Volkmar, 2010; Wang & Spillane, 2009). For that reason, a close collaboration between teachers and parents could therefore be a crucial component for newly learned social skills to be maintained and generalized successfully across multiple settings.

There appears to have been no research examining correspondence between teacher and parent curriculum priorities for children with ASD. However, in children with a range of other disabilities (learning disabilities; moderate, severe, and multiple disability), Baumgart, Filler, and Askvig (1991) found that parents rated the importance of social skills instruction significantly lower than either special education teachers or experts in special education. Furthermore, in typically developing children, Knudsen-Lindauer and Harris (1989) reported greater emphasis by parents on the development of intellectual skills than teachers within kindergarten curricula. Thus, in other groups there is evidence of discrepancy between parent and teacher priorities, but this issue does not appear to have been addressed in children with ASD.

Parental knowledge of their children’s characteristics as learners may be valuable, especially in children with ASD, where symptomatology and capacities can vary extensively across individual students. Active involvement of parents has been shown to be crucial, specifically in regards to the development of friendship-related behaviors (Frankel et al., 2010; Frankel & Whitham, 2011). It could be problematic when teacher priorities are misaligned with the needs of the child or in conflict with parent priorities. Given that parents may contribute to the educational planning and support instruction, the process of aligning the perceptions of both teachers and parents in outcome priorities for students with ASD might contribute to a coherent service
delivery, which may enhance the students learning opportunities.

The aim of this study is to explore how teachers perceive the importance of friendship as compared to other learning priorities. Specifically, perceptions of teachers working in special classes will be compared to teachers of mainstream classes. In addition, teacher perceptions of the importance of friendship will be compared across students with severe autism and students with mild to moderate impairment. Finally, data from teachers will be compared with previous research examining parent priorities (Petrina, Carter, & Stephenson, 2015).

Method

The data used in this study were collected as part of a larger multiyear study (“Autism Educational Outcomes Study”) examining the efficacy of two different models for education service delivery for students with ASD in Australia. The first model was a special class that involved the use of satellite classes as implemented in New South Wales (NSW) by Autism Spectrum Australia (Aspect). In this model, students were placed in a segregated special class within a regular school prior to a gradual transition into mainstream classrooms. The other model was a consultative support model as implemented in South Australian (SA) by Autism SA, where children were supported within regular mainstream classes from the point of school entry. The satellite model in NSW was offered as an option to parents, who could also choose mainstream class placement. Only the data regarding perceptions of curriculum priorities will be addressed in this paper.

Participants

Participants were teachers of children currently enrolled in Kindergarten (Reception) to Year 3 with a formal diagnosis of Asperger’s disorder or autistic disorder by a pediatrician or psychologist using DSM-IV diagnostic criteria and who were of normal intelligence or within the mild range of intellectual disability. There were 50 boys and 12 girls with a diagnosis of ASD in the age range of 6.9 to 11.2 years ($M = 9.40, SD = 1.10$) at the time of data collection, with a mean full scale IQ of 84.59 ($SD = 16.85$). Thirty of the students were enrolled in satellite classrooms, and the other 32 attended mainstream classrooms. A range of assessments was completed on participants, including the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003), Vineland Adaptive Behavior Scales-II (VABS-II; Sparrow, Cicchetti, & Balla, 2005), and Social Responsiveness Scale (SRS; Constantino & Gruber, 2005). A summary of the children’s characteristics is presented in Table 1.

Demographic information for the teacher participants is presented in Table 2. A total of 54 teachers contributed to the study, of whom 22 were satellite class teachers and 32 were mainstream class teachers. The 22 satellite teachers who agreed to participate in the study reported on 30 participating students in NSW. The mainstream class teachers each reported on one student. Sixteen of the teachers had completed university equivalent training in special education, and 17 more had received special education training through in-service modules. In addition, three of the NSW teachers reported having specific training in autism at a university level. The majority of these teachers in NSW reported receiving on-going autism specific training specifically through Aspect.

Survey

Two approaches may be taken to establish curriculum priorities. Rating allows respondents to assign a weighting to each of the outcome priorities, but similar ratings may be given to more than one priority. Ranking forces respondents to differentiate and prioritize the importance of each outcome relative to others (Carty & Shrum, 2000; Vanleeuwen & Mandabach, 2002). Furthermore, the process of ranking might provide the best reflection of outcome priorities in school settings that may be characterized by limitations in resources and time. That is, ranking might provide the best reflection of priorities when there are competing and difficult decisions regarding resource allocation to be made. In this study, teacher perceptions were investigated using a survey, which incorporates both rating and ranking.

The survey was designed specifically for the
current study to examine teacher perceptions of the importance of six outcome priorities for their students. These were: (a) social skills (the ability to behave and interact with adults and peers in an age appropriate manner); (b) physical skill and motor development (the ability to perform age-appropriate physical activity involving both gross and fine motor skills in the child’s muscular coordination); (c) intellectual & academic skills (the ability to form and understand concepts, problem solve, possess an age appropriate concentration level which is manifested in the child’s ability to do well at the level set out by the child’s school); (d) creativity (the ability to demonstrate the use of divergent thinking and imagination to

### TABLE 1

Demographic characteristics of children with ASD

<table>
<thead>
<tr>
<th></th>
<th>Satellite (n = 30)</th>
<th>Mainstream (n = 32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls: Boys</td>
<td>6:24</td>
<td>6:26</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>9.37 (1.07)</td>
<td>9.40 (1.14)</td>
</tr>
<tr>
<td>Range</td>
<td>3.99</td>
<td>4.18</td>
</tr>
<tr>
<td>Full Scale IQ (SD)</td>
<td>78.70 (16.64)</td>
<td>95.32 (11.51)</td>
</tr>
<tr>
<td>SRS Scores (Parents form)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>76.17 (13.23)</td>
<td>83.63 (11.18)</td>
</tr>
<tr>
<td>Social Awareness</td>
<td>68.83 (11.23)</td>
<td>71.24 (11.24)</td>
</tr>
<tr>
<td>Social Cognition</td>
<td>73.33 (12.73)</td>
<td>81.09 (11.03)</td>
</tr>
<tr>
<td>Social Communication</td>
<td>73.13 (13.16)</td>
<td>78.33 (10.33)</td>
</tr>
<tr>
<td>Social Motivations</td>
<td>64.57 (14.30)</td>
<td>69.70 (11.44)</td>
</tr>
<tr>
<td>Autistic Mannerism</td>
<td>82.83 (16.70)</td>
<td>86.64 (13.40)</td>
</tr>
<tr>
<td>VABS Scores (Parents form)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>85.52 (11.20)</td>
<td>84.28 (11.74)</td>
</tr>
<tr>
<td>Socialisation</td>
<td>81.28 (10.80)</td>
<td>79.83 (13.67)</td>
</tr>
<tr>
<td>Adaptive behavior composite</td>
<td>80.03 (7.98)</td>
<td>80.83 (11.43)</td>
</tr>
</tbody>
</table>

### TABLE 2

Demographic characteristics of teachers who completed the questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Total (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Satellite (n = 22)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>25 or under</td>
<td>1</td>
</tr>
<tr>
<td>26–40</td>
<td>11</td>
</tr>
<tr>
<td>41–55</td>
<td>8</td>
</tr>
<tr>
<td>56 or older</td>
<td>2</td>
</tr>
<tr>
<td>Highest Educational Qualification</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor</td>
<td>17</td>
</tr>
<tr>
<td>Master</td>
<td>2</td>
</tr>
<tr>
<td>Length of teaching experience (years)</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>11.70 (10.01)</td>
</tr>
<tr>
<td>Range</td>
<td>39.5</td>
</tr>
<tr>
<td>Teachers with training in special education</td>
<td>15</td>
</tr>
<tr>
<td>Teachers with specific training in autism</td>
<td>19</td>
</tr>
</tbody>
</table>
Data Collection Procedures

The majority of the data were collected by trained research assistants through face-to-face interview, with the exception of two teachers who completed the survey through telephone interview. Prior to the interview, teachers were sent an information sheet containing the 5-point scale and the list of the outcome priorities and their descriptions. As the interviewer read out the instructions, followed by the priorities and their descriptions, teachers were asked to select their answers according to the scale presented on the information sheet. Each teacher had to complete one survey for each of his/her participating students. Teachers were also asked to provide demographic information about themselves, such as age, years of professional experience, and their highest level of education.

Data Analysis

In the first part of the survey, teachers were asked to rate the importance of each outcome on a 5-point scale, ranging from 1 (not at all important) to 5 (very important) for each student participating. The mean score and standard deviation for the ratings of each outcome were then calculated to give indication of the level of importance that teacher placed on each individual outcome.

In the second part of the scale, teachers were asked to assign a rank to each outcome (e.g., 1 was assigned to the most important outcome and 6 was assigned to the outcome with the lowest importance). In reporting data on ranking, the numbers were reversed to maintain consistency with the reporting of the rating scale. Thus, higher values were always associated with higher rankings of importance.

Data from the current study was compared with parallel data collected from parents six months earlier (see Petrina, Carter, & Stephenson, 2015). Parents were asked to rate and rank the same curriculum priorities as teachers using the same procedures as the current survey. Comparisons were limited to the 55 children for whom data were available from both teachers and parents. Comparisons were made in two ways. First, overall differences were explored by examining the mean ratings and rankings for each group. Second, differences at an individual level were examined by deducting the scores of teacher’s ranking from parent’s ranking for the same student. Frequency distributions of differences were then plotted.

Results

Initially, it was of interest to determine whether there were differences in the priorities of teachers in satellite support classes and those who were in mainstream classes. Some of the satellite class teachers reported on multiple students: hence, data were not independent and inferential analysis was not conducted.

It can be seen from Figure 1 that teachers in satellite classes and in mainstream classes rated friendship as similar in importance to social skills and emotional development, and mean scores for all these areas were within a 0.25 range. Intellectual and academic skills, physical skill and motor development, and creativity were rated approximately a half point lower than friendship. When teachers were forced to rank areas in order of priority, friendship was third, preceded by emotional development and social skills for both groups of teachers. As seen in Figure 2, satellite teachers assigned higher ranks to learning outcomes that relate to the core deficits of ASD, namely social skills, friendship and emotional development as compared to mainstream teachers. Mainstream teachers rankings of intellectual and academic skills were considerably higher than that of satellite teachers (mean score difference = 0.89).

Teacher priorities for different outcomes
were compared based on student level of autistic severity as measured by the Social Responsiveness Scale (SRS; Constantino & Gruber, 2005). As shown in Figure 3, all teachers, regardless of the severity of their students’ autism, rated friendship, social skills, and emotional development as the top three outcome priorities. Teachers ranked friendship
as the third priority behind social skills and emotional development for both students with mild to moderate autistic symptomatology and severe autistic symptomatology (see Figure 4). A large difference was observed in the ranking of intellectual and academic skills (mean score difference = 0.76) and friendship across the two groups (mean score difference = 0.70). Higher importance for intellectual and academic skills was reported for students with severe autistic symptomatology compared to those with mild to moderate

![Bar chart showing mean ratings of curriculum priorities grouped by autistic severity](image1)

**Figure 3.** Teachers' ratings (and standard deviation errors) of curriculum priorities as grouped according to their student's level of autistic severity.

![Bar chart showing mean rankings of curriculum priorities grouped by autistic severity](image2)

**Figure 4.** Teachers' rankings (and standard deviation errors) of curriculum priorities as grouped according to their student's level of autistic severity.
level of autistic symptomatology. Friendship was ranked as more important in the group with mild to moderate levels of autistic symptomatology as compared to those with severe levels.

Teachers and parents reported similar patterns in their rating and ranking of the outcome priorities. Both teachers and parents rated and ranked social skills, emotional development and friendship as the three most important outcomes when compared to intellectual and academic skills, physical skill and motor development, and creativity (see Figures 5 and 6). Parents consistently rated all curriculum outcomes as more important in their children’s development than did teach-
ers. When forced to rank, friendship was ranked similarly across parents and teachers. Furthermore, parents ranked social skills and emotional development, and physical skill and motor development as lower priorities than teachers.

The agreement levels between teacher and parent rankings of outcome priorities are presented in Figure 7. Positive scores indicate that teachers viewed a particular outcome as more important than did parents. Conversely, negative scores indicate a greater importance for a particular outcome as viewed by parents as compared to teachers. A score of zero indicates that teachers and parents give the same importance to the rating or ranking of a particular outcome. Thus, the more closely clustered the graph is around a score of zero, the greater the degree of agreement between parents and teachers. The majority of the differences in rank were of one point in both positive and negative directions. There was a very high level of absolute agreement with regard to creativity and a high level of agreement for social and motor skills. Agreement on remaining curriculum priorities was lower and the lowest level of absolute agreement (i.e., scores of zero) was between teacher and parent perceptions of friendship.

Discussion

The goal of this study was to investigate teacher perceptions of the importance of friendship in relation to other outcome priorities in children of ASD with varying level of autistic symptomatology across satellite and mainstream classroom setting. In addition, where available, teacher views of the importance of friendship and other outcome priorities were compared to those of parents of the same children. The investigation of teacher perceptions was conducted using both rating and ranking approaches. In rating, teachers were able to assign a weighting to the importance of each outcome priority. Ranking, however, required teachers to prioritize and differentiate the relative importance of each outcome. Teachers rated all of the outcome priorities as highly important, but a greater differentiation of outcome priorities was seen when teachers were asked to rank the importance of the outcomes.

Overall, both mainstream teachers and satellite class teachers rated and ranked friend-
ship, social skills, and emotional development as the top three most important outcome priorities. This may reflect recognition of the broad learning needs of children with ASD in the area of social and emotional development as well as friendship, all of which may be seen as related to core socio-communicative deficits.

Teachers of satellite classed ranked friendship, social skills, and emotional development for students with ASD as more important compared to mainstream class teachers. It is possible that specialist satellite teachers had a greater depth of knowledge regarding core deficits of ASD, even though similar percentages of satellite and mainstream teachers reported having completed specific training in ASD. It should be noted that satellite class teachers were provided with extensive autism-specific systemic curriculum and pedagogical support structures from Aspect and a lower teacher to student ratio (typically a teacher and aide per six to eight children). Given that social skills programming is likely to need to be individualized, satellite teachers might give it a higher priority as they have better support and resources to address socio-communicative need. Only 11% (5 out of 44) of children in the mainstream classroom received itinerant support, which ranged from 1.25 hours to 16.42 hours in one academic year, so the level of autism specific support was far more limited in this setting.

Mainstream students were more cognitively able (as reflected in the FSIQ) but had higher SRS scores, indicating greater severity of autistic symptomatology. Nevertheless, their teachers ranked intellectual and academic skills to be of greater importance than teachers in satellite classes. It is possible that this reflected a view that students in mainstream classes would benefit to a greater extent from a focus on academic instruction. This result might suggest that mainstream teachers’ perception of their students’ potential to progress in a certain area might influence the way they prioritize the importance of learning outcomes. Teachers might possibly have prioritized areas where students were more likely to be successful.

Friendship was ranked third by teachers from both satellite and mainstream classes behind emotional development and social skills. Despite its importance for children with ASD, friendship development and maintenance may not necessarily be seen as a focus of instruction. Fostering successful friendship relations requires the mastery of a complex set of skills (e.g., social cognition, language, emotions). Although it is possible that teachers may consider friendship as one aspect of the broader curriculum area of social skills, teaching of social skills may be necessary but not sufficient to facilitate friendships (Laugeson, Frankel, Mogil, & Dillon, 2009). Another possible reason that friendship was ranked lower than social skills and emotional development could be because friendship is a concept that is difficult to operationalize (Gifford-Smith & Brownell, 2003). There are limited intervention studies that target friendship as an outcome (e.g., Solomon, Goodlin-Jones, & Anders, 2004; MacKay, Knott, F., & Dunlop, 2007; Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008). As a result, teachers have limited guidance on how to facilitate friendships. This might cause teachers to feel less capable to target improvements in the area of making and keeping friends, and thus to make it a lower priority.

The curriculum priority areas (i.e., social skills, emotional development, and friendship) related to core socio-communicative deficits of children with ASD were rated and ranked higher for children with mild to moderate levels rather than those with severe level of autistic symptomatology, as measured by the SRS. This result is unexpected and counterintuitive, and we do not have an explanation other than that, as previously noted, in this sample, children showing higher levels of autistic symptomatology were in mainstream settings where teachers may have had less specific knowledge of ASD.

When examining central tendency, teachers and parents in this study similarly rated and ranked social skills, emotional development, and friendship as the three top learning outcomes, followed by intellectual and academic skills, physical skill and motor development and creativity. Comparison of mean rankings between the two group showed similar results to that of Baumgart et al. (1991), who found that parents rated the importance of social skills instruction slightly lower than either special education teachers or experts in
special education. In regards to intellectual skills, parents reported greater emphasis on the development of academic and intellectual skills than teachers, which is consistent with previous study of typically developing children by Knudsen-Lindauer and Harris (1989).

The understanding of how each stakeholder views the importance of specific learning outcomes is a good starting point in the process of aligning priorities for a cohesive service delivery. Further analysis at the individual level, however, shows considerable variation in the level of agreement between the perceptions of teachers and parents with regards to ranking of learning outcomes. In terms of outcome of absolute agreement, friendship was ranked as one of the learning outcomes where teachers and parents had the least number of complete agreements ($n = 18\%$). In general, teachers ranked friendship skills to be of higher importance than parents. Teachers might be more likely to observe the child in social situations with a broader range of peers, necessitating behaviors pertaining to friendship skills. Hence they might be more aware of the need to prioritize friendship skills.

It has been previously noted that in the Australian context and internationally, it is mandated that parents play a key role to assist in the process of programming for personalized learning and support. When parents and teachers priorities are not clearly aligned, a number of issues could arise. The first one could be that parents often report a low satisfaction in the service being provided because it does not fulfill their expectation of what needs to be targeted. Second, the lack of teacher-parent collaboration might jeopardise the effectiveness of the program implementation across school and home settings (Carter et al., 2014; Hurth et al., 1999), hindering the process of skill generalization.

**Future Research**

Further research is needed to replicate and extend the findings reported in this study. A comparison study of teachers and parents perception of the importance of friendship, using a larger and broader sample of parents and teachers of children with ASD is needed to extend the current preliminary data presented. This data will clarify further the level of congruency in perceptions between these two stakeholders. In addition to quantitative data, it would be beneficial to collect qualitative data on stakeholder perceptions of the importance of friendship and their reasons for their perceptions. Furthermore, it is of interest to investigate the relationship between teacher training and the depth of their knowledge in core deficits of ASD and how this impacts on the way they prioritize friendship skills in relation to other outcome priorities. It would also be valuable to examine the perceptions of students with regard to priorities.

**Limitations**

Several limitations of the present study should be noted. Samples of teachers and parents were recruited from schools across two states in Australia. Hence, the results of this particular study might not be reflective of broader teacher and parent perceptions. Furthermore, the data on the importance of friendship and other outcome priorities in the current study relied on teacher reports of their perceptions, and not on their actual practice. Finally, an unavoidable six-month time gap existed between the collection of parent data and teacher data. Nevertheless, the data collected was within the same academic year, so a degree of consistency within perceptions would be expected.

**Conclusion**

This is the first study to compare the perception of teachers and parents on the importance of friendship and other learning outcomes in children with ASD. Three major conclusions arise from the results of this study. First, friendship was ranked as a less important outcome priority by both teachers and parents in comparison to social skills and emotional development. Second, satellite class teachers ranked the outcomes that relate to the core deficits of ASD as higher in priority as compared to the mainstream class teachers. This might indicate that in mainstream class, teachers might be less sensitive to the needs of students with ASD, hence as compared to satellite teachers, they rated intellectual and academic skills as higher priorities as compared to other areas of core deficits, namely...
social skills, friendship, and emotional development. Third, significant disparities in teacher and parent perception were observed, especially in the areas of friendship, emotional development, and intellectual and academic skills. This lack of alignment in perception of priorities can impact on the success of learning both in and outside of the school. This finding highlights the need for schools to examine the alignment of school and parent priorities in the development of educational programs.

References


Developing Friendships and an Awareness of Emotions Using Video Games: Perceptions of Four Young Adults with Autism

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Abstract: This article explores emotional expression and awareness in the context of a virtual environment specific to young adults with autism spectrum disorder (ASD) and how emotional awareness and expression can support postsecondary outcomes. A qualitative study was conducted with five young adults with ASD who actively played a massively multiplayer online role playing game (MMORPG) in a virtual environment. All participants were enrolled in a large urban university where interviews were conducted in the campus library. One of the most significant findings was related to the emotional awareness and expression of the participants. Advancements in virtual environments hold the potential to support social skills, friendship development, and emotional awareness and expression that will ultimately increase successful transitions through the development of support networks such as friendships and work-related relationships.

Since the 1970’s it has been consistently reported that individuals with autism spectrum disorder (ASD) are known to be less emotionally expressive in social situations and struggle with emotional recognition (Attwood, Frith, & Hermelin 1988; Langdell, 1978; Rieffe, Terwogt, & Kotronopoulou, 2007). Rieffe and colleagues (2007) note that children with ASD might not strategically use or appreciate emotional expressions in terms of communication value. These researchers further state that there is no reason to assume that children with ASD are less emotional than other children. It is important to recognize that very little has been reported about self-awareness and expression of emotions for children on the autism spectrum. Therefore, even though researchers in the field of autism widely recognize that children with autism struggle recognizing and expressing emotions, it would be inappropriate to assume that children with ASD do not experience emotions similar to their typically developing peers (Alpern & Zager, 2007).

Current Interventions

An array of objectives for communication and socialization underlie current interventions for social skills acquisition, such as facial recognition, emotional recognition, reciprocal communication, and appropriate behavior. Emotional recognition and reciprocation play an important role in social skill and friendship development, one that supports educational outcomes along the P-12 transition continuum. Social-emotional development includes a person’s experience, expression, and management of emotions as well as the ability to establish positive and rewarding relationships with others.

The core features of emotional development include the ability to identify and understand one’s own feelings, to accurately read and comprehend emotional states in others, to manage strong emotions and their expression in a constructive manner, to regulate
one’s own behavior, to develop empathy for others, and to establish and maintain relationships (National Scientific Council on the Developing Child 2004, p. 2). Eussen, Van Gool, Verheij, Verhulst, and Greaves-Lord (2012) noted that students with healthy social, emotional, and behavioral adjustments are more likely to have good academic performance in elementary school.

Current evidence-based practices (EBP) are based on classical interventions such as applied behavior analysis techniques (e.g., reinforcement, extinction, prompting), assessment and analytic techniques (e.g., functional behavior assessment, task analysis), and combinations of systematic behavioral practices designed to be easily replicable and target externalizing behaviors (Wong et al., 2013). Those evidenced based practices (EBP) are not designed to support an increase in emotional recognition, awareness, and expression in the context of a naturalistic setting or during self-initiated interactions with peers and friends.

Cognitive behavioral training is currently the only EBP that addresses emotions. Cognitive behavioral training is designed to teach individuals to recognize their own thoughts and emotions, particularly negative thoughts and emotions that can escalate and exacerbate maladaptive behavior (Beck, 2011). As individuals learn to recognize negative thoughts and emotions, they are taught strategies to reframe negative thinking and change resulting behaviors. It is possible that individuals with ASD have a greater awareness of self and emotions than previously thought, which leads the author to hypothesize that when individuals are place in an environment that is well suited to their social and emotional needs, emotional recognition and reciprocity occurs.

Virtual environments include any medium that is has a digital format in which individuals, represented as avatars, interact with other avatars or agents controlled by the computer (Fox et al., 2014). Virtual environments potentially eliminate extraneous variables often experienced in a face-to-face situation, such as additional noises, movement of people, and body language (Yee, 2006).

Virtual environments have generated interest as a promising practice to support social skills acquisition (Parsons & Cobb, 2011; Parsons, Mitchell, & Leonard, 2004). The virtual environments that support MMORPG are diverse and require players to understanding complex systems, demonstrate creative expression with digital tools, and develop social networks to communicate and collaborate with other gamers (Gallup, Duff, Serianni, & Gallup, 2016; Gee, 2007; Prensky, 2006). Virtual environments may circumvent face-to-face challenges for young adults with ASD; experiences in a controlled virtual environment can allow for increased comfort in reciprocal relationships and support greater access to postsecondary education (Gallup et al.).

Virtual environments have been used to teach basic well defined and scripted social skills in the context of one virtual setting. Specifically, emotional awareness such as happiness, proximity to others, and anxiety have

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The Internet provides opportunities for repeated engagement within virtual communities in the context of virtual environments such as MMORPGs (Gallup et al., 2016). Virtual environments require a unique set of communication and digital skills to support immersion in a virtual community. A MMORPG can provide a medium for interaction that may be more comfortable for individuals with ASD (Cheng, 2005) and support the acquisition of skills that can be generalizable to a face-to-face environment (Yee, 2006). Some MMORPG’s include Minecraft, World of Warcraft, Ark, Jump Start, or Dungeons and Dragons to list a few. Currently, 200 million people play MMORPG’s worldwide (Granic, Lobel, & Rutger, 2014); it makes sense to harness the power of these environments to support social outcomes for individuals with ASD.

Virtual environments have been used to teach basic well defined and scripted social skills in the context of one virtual setting. Specifically, emotional awareness such as happiness, proximity to others, and anxiety have
been scripted for adolescents with ASD (Parsons et al., 2013). Parsons and colleagues noted that it was possible the participants in the study were just learning to master the game and did not learn what emotions were or how to appropriately express emotion. In their study that involved teaching students with ASD rules about emotion, Hadwin, Baron-Cohen, Howlin, and Hill (1996) noted that the learning of students in the study was confined to the specific domain in which the skills were taught. Several researchers noted that it is possible that young adults with ASD engaged in the virtual environment specific to the scripted emotions were simply using directions and rules to pass tasks or beat challenges (Hadwin et al.; Parsons et al.). While others have noted that contextual understanding of current interactive, evolving environments is necessary to support the development of innovative solutions that support social skills acquisition. To date, emotional awareness and recognition have been studied in face-to-face settings, skills used and emotional expression and reciprocation in virtual environments have yet to be reported.

Many studies mention the potential of virtual environments; but few have studied their impact on social skills acquisition. As of this writing, no study has described and reported emotional recognition and reciprocity of emotions in the context of a MMORPG.

During gameplay, players in MMORPGs are represented as avatars. Those avatars can be customized to represent players’ own individual characteristics and preferences. For example, in the game World of Warcraft, players go through a series of choices to create their personalized avatar. First they choose to associate themselves with a faction, either the Alliance (good) or the Horde (evil). Then they choose a gender and class from choices such as Night Elf, Pandaran, Dwarf, Elf, and Human, among others. Next players customize the appearance of their avatar (hair, skin color, clothing, and facial expressions) and then choose a name. Once these superficial attributes are chosen, players can choose special skills and interests that add depth of character to their avatars, choices include first aid, fishing, tailoring, mining, blacksmithing, engineering, or herbalism. Once these decisions are made the players, through their avatars are ready to enter the game and engage with other players (Sasaki, 2007). Player interactions often take place in a guild or clan; a collective group of individuals that work collaboratively together to accomplish specific tasks within the game. Often, friendships are developed as a result of the continued interactions within a guild or clan (Gallup et al., 2016). It is important to understand that players of MMORPGs are not able to control other players in the same game. Sometimes players may interact with other players who may not exhibit appropriate social game play or may be considered rude. These players are called trolls.

**Trolls**

A troll, in the context of a virtual gaming environment, is a person who is controversial, inflammatory, or off-topic in online discussions through message boxes, chat-rooms, or online game play with the primary intent of provoking other users into an emotional response or generally disrupt normal on-topic discussion (Juul, 2011). A troll can also be a player in the virtual gaming environment who actively engages in combat or harasses a player during a time that is not designated for combat (Juul).

**Virtual Environments and Emotional Awareness**

During gameplay many opportunities arise to interact with other players in the game through questioning, running raids, dungeons, or pet battles within their guilds or clans. These interactions support complex communication that can be described as rapid, intense, frustrating, or exciting, (Gallup et al., 2016). The purpose of this research was to examine the social interactions and emotional awareness specific to young adult college students with ASD who socially engage in the virtual environments of MMORPGs.

**Method**

A phenomenological study was conducted to explicate the meaning and structure of the phenomenon associated with socialization in the context of a virtual environment. The researchers sought to describe in depth the so-
cial interactions of young adults with ASD as they occur and the friendships developed within a virtual environment.

Setting
The institutional review board at a large urban university approved the research. Interviews were conducted in private conference rooms at a local library and a campus library. Observations took place in the local library or over the Internet using Skype or in-game log-in.

Procedure
Data were collected through personal interviews, scheduled observations that took place over the Internet in the context of the gaming environment, and document analysis. Document analysis consisted of documents provided by the participants such as online blogs, forums, and chat boxes. Researchers transcribed and coded interviews, developed codes, and identified themes that were subsequently reviewed by the participants to ensure accuracy of the researchers’ interpretations. This qualitative inquiry produced rich data that allowed the researchers to develop an understanding of the social influences and contextual relevance that exist for young adults with ASD while participating in MMORPGs.

Participants
Five participants with autism between the ages of 18–24 were selected from a large urban university. Participants were recruited through an “all-call” email sent out by the office of disability services to individuals with ASD who were registered in a STEM track. (See Table 1 for demographic information.)

Sam
Sam was a 23-year-old Caucasian male diagnosed with ASD and Attention Deficit Disorder (ADD). He graduated from high school with a standard diploma under an IEP that provided services to develop social, emotional, and functional living skills. Sam was a third year college student enrolled as a sophomore and lived in a dorm room with one other roommate. As a science major, Sam was enrolled in two classes, Zoology and Biology.

Seth
Seth was a 24-year-old Caucasian male diagnosed with ASD and Attention Deficit Disorder (ADD). He graduated from high school with a standard diploma under an IEP that provided services to develop social, emotional, and functional living skills. Seth was a second year college student enrolled in applied mathematics, with a focus on statistical analysis. Seth lived in the dorm room with one other roommate. He was enrolled in two classes, Calculus with Analytic Geometry I and History of Mathematics.

Rain
Rain was a 22-year-old Caucasian female, diagnosed with ASD, ADHD, a hearing impairment, and Alports Nephritis. Rain completed high school with a standard diploma. She had an IEP that provided services for social skills

<table>
<thead>
<tr>
<th>Participant Code</th>
<th>Pseudonym</th>
<th>Years in College</th>
<th>Declared Major</th>
<th>Gender</th>
<th>Age</th>
<th>Primary Diagnosis</th>
<th>Ethnicity</th>
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<tr>
<td>P-1 Sam</td>
<td>3</td>
<td>Biology focus: Zoology</td>
<td>Male</td>
<td>21</td>
<td>Autism</td>
<td>Caucasian</td>
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<tr>
<td>P-2 Seth</td>
<td>2</td>
<td>Mathematics focus: Statistical Analysis</td>
<td>Male</td>
<td>24</td>
<td>Autism</td>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>P-3 Rain</td>
<td>1</td>
<td>Biology focus: Biological Engineering</td>
<td>Female</td>
<td>22</td>
<td>Autism</td>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>P-4 Aspen</td>
<td>1</td>
<td>Technology focus: Computer Design</td>
<td>Female</td>
<td>19</td>
<td>Autism</td>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>P-5 Mell</td>
<td>2</td>
<td>Computer Engineering</td>
<td>Male</td>
<td>19</td>
<td>Autism</td>
<td>Caucasian</td>
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</tbody>
</table>
development, medical care for Alports Nephritis, and services for the hearing impairment. She was a first year college student and lived in the dorm. She was enrolled in Biology and English I.

Aspen

Aspen was a 19-year-old Caucasian female diagnosed with ASD and ADHD. Aspen completed a General Education Diploma (GED) after being removed from public school for violent behavior (e.g. repeatedly throwing chairs at people). Aspen spent one month in the juvenile detention and rehabilitation center in a southwest state where she worked on her GED. Aspen received services under her IEP for emotional and social behavior, executive functioning, and reading comprehension. She was in her first year of college pursuing a degree in computer technology under a technology major. Aspen was enrolled in two courses, a computer design class and English I.

Mell

Mell was a 19-year-old Caucasian male diagnosed with ASD and ADHD. He was enrolled as a second year freshman in computer engineering. Mell finished high school with a standard diploma with IEP services focused on social and emotional skill development. In high school, he was enrolled in all advanced or honors courses for mathematics, science, and history. In college he was enrolled in two courses, pre-Calculus and a computer design class, as an engineering major.

Data Sources

The collected data were intended to reflect the multiple realities that exist and thoroughly reflect participant perspectives in contextually relevant ways (Hayes, 2011). Data included participant interviews, observations of game play, and document analysis of blogs, forums, and chat boxes submitted by participants.

Data Analysis

Once the interviews and observations were transcribed and reviewed by the participants, analysis was conducted using Moustakas’ modified Van Kaam method (Moustakas, 1994). Moustakas’ analysis method was used in conjunction with emergent coding to organize and code text gathered from interviews. Moustakas transcendental or psychological phenomenology is focused less on the interpretations of the researcher and more on a description of the experiences of participants. Each statement made by the participants was listed and considered as having equal value.

Data analysis was conducted through bracket assumptions that identify non-repetitive and non-overlapping statements with interviews and transcripts; the transcripts reflected textural and structural descriptions of the experiences (Creswell, 2013; Hayes, 2011). Trustworthiness was developed through member-checking, triangulation of data sources, the researcher’s journaling, and thick descriptions of the participants and the setting (Bloomberg & Volp, 2012; Creswell). Finally, data were presented through a list or model of constructs that relate to textural and structural descriptions.

Clusters were formed from the similarities between descriptive labels for each invariant constituent as they related to the research question. The identified labels (see Table 2) were combined to form final in the research (see Table 3). Emergent coding was used to help identify and confirm themes. Five themes emerged from the thematic codes: (a) seeking social interaction, defining friendship, and overcoming challenges, to include barriers to friendship; (b) comfort in socializing through a virtual environment; (c) roles in life, increased socialization, and friendships; (d) emotional awareness; and (e) skills learned and generalized. It is the unexpected theme of emotional awareness that is the focus of the discussion in this manuscript.

Findings

The central phenomenon of this study was social interactions, to include emotional awareness and reciprocation of young adults’ communicating with multiple people and de-
Developing relationships in a virtual environment. The findings further revealed that participants were using soft-skills recognized as being necessary for success in the STEM fields. Under the primary phenomenon several subthemes were identified. A prominent theme was reflected throughout the interviews, observations, and document analysis as recognizing and reciprocating emotions and emotional awareness.

Participants described emotions 145 times throughout the 703 coded sentences from the interviews. Qualitative analysis revealed that 20% of the coded sentences revealed emotional recognition or reciprocation. Emotions are internal feelings attributable to some causes recognizable to others through emotional behaviors, particularly facial expressions (e.g., Ekman, 1992). Emotions can encompass feelings such as happiness, sadness, enthusiasm, anxiety, love, or anger.

As observed during guild gaming events, participants were able to identify what emotion they were feeling, such as frustration, happiness, excitement, trust, and relate those feelings to face-to-face interactions described during the interviews. Additionally, all participants described settings and occurrences that might cause them anger, anxiety, frustration, or fear. Figure 1 represents the feelings described and synonyms used by participants in this study. All participants described using the environment as a way to recognize their emotions and express emotions appropriately in relation to the specific gaming experience.

### Gaming and Emotional Management

Prior to becoming an online gamer, all participants discussed a level of frustration related to social interactions augmented by fear and anxiety that directly related to their struggle with emotional and social connections in a face-to-face setting. Aspen explained, “It [gaming] helps get out the aggression I feel towards some people in life through a way that does not harm anyone in reality, it’s cathartic for me.”

Participants described feeling happy and excited when engaged in daily online battles.
within the MMORPG. They described a feeling of being able to be "themselves" and reveal their true identity. For example, Sam discussed how he had learned that it is acceptable to feel frustrated, scared, or overwhelmed and asking for help was acceptable.

I don’t have to do everything on my own. I learned that it was ok to ask for help on things I needed help with, from my friends online or face-to-face. If I was frustrated, it became OK [to get help].

In-game Support for Emotional Awareness

Emoticons are an in-game feature that allow gamers to insert a small image of a facial expression to accent conversations in a chat-box during game play in the virtual environment. Emoticons were used by participants to support their emotional awareness in the virtual environment and served two distinct purposes: to express their own emotions and to understand the emotions of others in the game. During the study, all participants described expressing their emotions while communicating online with their peers in live video chats (via Google+ hangouts, Skype, mumble, and oovoo) and using the chat-box feature within the game. Participants were familiar with emoticons and described using them as a tool in the game to fill in verbal discussions with fellow gamers, often inserting an emoticon into a chat-box to emphasize how they were feeling. Participants also described using the emoticons and online conversations as a tool to interpret what others may have been feeling based on their understanding of the text. Seth explained:

It is really hard to pick up sarcasm over text. But if someone has a smiley face with its tongue sticking out [emoticon] or something like that, it is a little bit of a red flag that something is going on.

Social interactions within the game helped participants glean emotional understanding in the game as well, including voice-chats supported by the in-game text and experiences with players who engaged in trolling. Participants reported that they experienced a range of emotions during gameplay including anger, happiness, excitement, and sadness.

Absence of Social Interactions and Negative Emotions

As individuals with ASD develop and age into adulthood, social demands become more complex intensifying the social challenges they experience (Rao et al., 2008). There is
limited research in the area of emotional awareness for individuals with ASD and how it influences daily living (Stichter, O’Connor, Herzog, Lierheimer, & Ghee, 2012). All participants indicated that a lack of social interaction, both inside the virtual environment and face-to-face environment, negatively affected their psyche. Participants noted that they experienced increased feelings of loneliness and depression when they had little or no social interactions. Seth explained:

I feel like, I mean, nobody is an island, we have to interact with people on a regular basis and honestly having been in a position where I have been isolated from face-to-face interaction and there was a while a couple of years ago where I was even isolated from, I mean I shut myself off to those online communications as well. I have learned that I feel depressed, sad, if I don’t interact, the impact on my personal psyche and my mental health and wellbeing was disastrous like it was not good.

As evidenced by the direct quotes of the participants and Figure 1, each recognized and expressed emotions within the context of the virtual gaming environment. All participants were acutely aware of how they felt, what elicited a specific emotion, and discussed emotions that the other gamers were playing during game play within the virtual gaming environment. Emotional awareness and expression has been heavily reported as a direct challenge for those on the autism spectrum, but those related studies have been conducted in face to face environments (Anderson, 2011). It is possible that expressing and recognizing emotions in the context of a face-to-face setting may be more difficult for individuals with ASD than in a virtual gaming environment. A co-morbid diagnosis of ASD and anxiety disorder compounds the challenges of understanding and expressing emotion in the context of a social situation (Eussen et al., 2012).

Overcoming Anxiety

The extant literature largely reports anxiety as a co-morbid disability with ASD (Joshi et al., 2014). Anxiety is a strong emotion that can impede a person’s ability to feel comfortable interacting and expressing emotion. Therefore, it makes sense that all participants would describe using the virtual environments as a place to release anxiety and a place to set aside the fears associated with anxiety. As Seth describes:

When I am gaming it feels like it is a safe space, where I can kind of just be myself and I can be very comfortable and it is casual. Yes, and I feel a lot more comfortable with them online and part of it is I have a lot of discomfort with traveling and I have issues with directions and that. So I have a GPS and that but traveling from point A to point B is something that can cause me a lot of anxiety. I have been comfortable in online communities for a long time even before I was out and about driving and things.

Travel concerns were also mentioned in participant interviews. Their responses indicated that travel caused increased fear and anxiety that augmented the participant’s challenges with socialization and communication. Three of the five participants (Aspen, Mell, and Spuce) discussed wanting to interact in an online gaming environment with their friends. Mell made a comment that typifies what he and his peers described: “So if you have a frustrating day you can go home and vent, it’s a safe place.”

Socialization to Remain Positive and Overcome Anxiety

All of the participants described socializing as an enjoyable event and a necessary part of a healthy lifestyle. All participants actively sought out social situations both inside and outside of the virtual environment. When describing social interactions and socializing to help overcome stress and anxiety, all participants described playing MMORPGs purely for the social interactions.

Like I feel that socialization is really important to allow you to consistently reframe and cope with new experiences. My ultimate reason for gaming is not so much for the game itself; I describe myself as a social gamer. Like if my friends stop playing a particular game I probably won’t be playing it.
During the interviews the participants all described socializing as exciting, and related the gaming experience to real world situations where emotions play a factor in interpreting experiences. For example, Aspen related gaming with friends to watching a football game with friends in real-life. She explained, “Like if your team is winning you are on top of the world and if your team is losing, emotions run high and it’s that same kind of thing for me when I am gaming.” In addition to communicating in an online environment, the participants felt comfortable with their emotions when they were online. Online gaming interactions were the initial and reliable point of contact.

For these participants gaming has been an instrumental part of life with respect to social encounters, learning to interact, and sustaining emotional wellbeing. Based on the rich data gathered in this study, it can be suggested that MMORPGs and virtual environments remove extraneous variables that impede the social ability of individuals with ASD and ultimately increase community involvement. Increased community involvement is directly related to social interactions that create support networks that enhance emotional wellbeing.

Discussion and Limitation
Phenomenological studies are highly involved; they describe a phenomenon that occurs for a specific group of people in detail. Participants were selected using purposeful sampling to ensure that participants accurately represent the studied phenomenon (Creswell, 2013). Participant sampling at the university setting yielded a homogeneous group, which limits diverse perspectives but allowed researchers to describe a phenomenon across a collective group of people with ASD. The amount of information participants share can be extensive and involved, which may present challenges when identifying themes and coding a large amount of data (Creswell). Challenges also include ensuring that the lines coded are maximally relevant to the research question and phenomenon under study. In addition, qualitative research is heavily dependent on the individual skills of the researcher and may be influenced by the researcher’s personal biases and idiosyncrasies. Therefore, bracketing procedures during interviews were completed to identify biases (Creswell).

Summary of the Results
The findings represent a rich description of social interactions of individuals with ASD in a virtual gaming environment [e.g. MMORPG]. A virtual environment may support greater interactions for individuals with ASD due to the reduction in extraneous variables [e.g. sound, large groups of people, travel, and face-to-face communication with unknown entities] (Cheng, 2005; Gallup et al., 2016). Emerging literature from various researchers discussed the potential use of virtual environments to teach specific social skills (Cheng; Gallup et al.; Parsons & Cobb, 2012; Parsons et al., 2004). The analyses described the social interactions of young adults with ASD as active participants in MMORPG settings engaging in emotional awareness and reciprocation.

Online role-playing games allow thousands of gamers to play in the game’s expanding virtual world at the same time via the Internet (Yee, 2006). Young people are dexterous collaborators, navigating digital gaming and social networking with ease: they are capable of generating and manipulating content and actively using social skills, recognizing emotion, and engaging with others in online social sites and games (Craft, 2012; Durkin et al., 2013). Within the virtual environments, participants comfortably interacted with others and could circumvent face-to-face challenges through the context of a virtual gaming medium (Cheng, 2005; Gallup et al., 2016; Parsons et al., 2013). As evidenced by the findings, virtual gaming connections can be a powerful conduit to increase socialization, friendships, emotional awareness and reciprocation, that hold the potential to support transitions to postsecondary settings. As described in the data analyses, it is common for gamers to seek out a guild or clan to actively work together and solve complex problems using their advanced digital literacy skills and communication within the game. In addition, the findings presented information related to learning to communicate within a MMORPG and to apply those skills to real-life settings. By leveraging the use of current technology, specifically
MMORPG’s used by young adults with and without ASD, virtual gaming environments present a unique opportunity to explicate social skills, specifically emotional awareness and practice communication skills that may directly relate to authentic interactions (Bricker & Bell, 2012; Durkin, 2010; Durkin et al.; Gallup et al.).

Recommendations

Given the multiple factors that affect socialization and friendships within the context of virtual environments, understanding and acknowledging connections between virtual environments and characteristics of social interactions, specifically emotional awareness will support future research specific to adolescents and young adults with ASD. It should be noted that a multitude of virtual environments exist that entail complex systems requiring socialization and communication that can support friendships through developing social skills (Gallup et al., 2016). Considering that a majority of adolescents and young adults play virtual games at least one hour a day (Granic et al., 2014), it is important to focus on the potential positive social and emotional outcomes, including recognizing and reciprocating emotions, for individuals with ASD when connecting with their typically developing peers within a virtual environment. As described in this study, advancements in virtual environments hold the potential to support social skills acquisition, friendships, and express emotions that will ultimately increase successful face-to-face interactions and transitions.

The researcher has identified a number of recommendations for further research as a result of the rich descriptions and findings of this phenomenological study. There is a need to a more extensive database of information related to socialization and emotional connections developed through a MMORPG involving individuals with ASD. Future research considerations include:

1. Replication of this study to a larger sample of individuals with ASD.
2. Extend the study to examine the extent to which emotions are recognized and reciprocated by individuals with ASD outside the context of the virtual environment.
3. An attempt to quantify the extent to which gaming in an online virtual environment develops emotional awareness and reciprocation for individuals with ASD.
4. Longitudinal studies of young adults with ASD to identify patterns of social interactions in virtual and face-to-face classes and transitions across multiple settings (e.g., virtual, face-to-face, college, jobs).
5. Identification of correlations between emotional awareness and reciprocation in virtual environments and generalization of soft skills learned specific to culture, gender, race, and socioeconomic status.

Conclusion

In light of the reports in current literature, the most unexpected finding in this study was the demonstrated emotional awareness by participants. Participants recognized when they were frustrated, happy, excited, anxious, or depressed, and also identified when their virtual and real life friends were sad, happy, stressed, or depressed. All participants used the virtual environment to manage fear, anxiety, and frustration and anxiety, engage in social interactions, as well as simply enjoy the action and interaction of game play.

A second finding that can be drawn from this study is that individuals with ASD possess the ability to self-reflect and relate activities in the context of the MMORPG to similar situations in a face-to-face setting. This study considers the perceptions from only five participants and therefore cannot be generalized; however further study of emotional recognition in virtual environments could be important to the field of ASD.

Given the multiple factors that affect socialization and friendship within the context of virtual environments, understanding and acknowledging the connections between virtual environments and characteristics of social interactions can support future research specific to adolescents and young adults with ASD. This research should focus on potential positive outcomes and social learning for individuals with ASD in these environments and how those skills generalize to face to face environ-
ments and relationships. There are a plethora of virtual environments with complex systems that require socialization and communication between players. Advancements in virtual environments can support the acquisition of social skills that hold the potential to promote friendship development and ultimately more frequent and satisfying face-to-face interactions for individuals with ASD.

The unexpected outcomes and rich descriptions and findings from this phenomenological study, lead the researchers to recommend a purposeful effort to conduct further studies with the goal of developing a larger database of information targeting more comprehensive understanding of the socialization and skill development for individuals with ASD as well as other populations including individuals with intellectual disabilities, younger populations, and those with more severe and profound disabilities ASD.

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Understanding Participation: Secondary Students with Autism Spectrum Disorder and the Accountability System

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Michigan State University

Abstract: All students are expected to participate in accountability systems and multiple options exist for students with disabilities, including taking the general large-scale assessment with and without accommodations and taking an alternate assessment. Using a secondary analysis of the National Longitudinal Transition Study-2 (NLTS2), the researcher conducted frequency distributions, descriptive statistics, and Chi Square Tests of Association to understand the participation of secondary students with autism spectrum disorder in standardized assessments. The results indicate that the most frequent means secondary students with autism spectrum disorder participate in standardized assessments is via an alternate assessment, although individual (i.e., functional skills) and educational factors (e.g., time in general education setting) mediate. The researcher also found low rates of accommodations provided on standardized assessments. Additional research is needed regarding the participation of students with autism spectrum disorder in the accountability system, but the results of this study suggest a relationship between both a student’s time in general education and his/her functional skills and his/her type of participation in the accountability system.

Following the reauthorization of the Individuals with Disabilities Education Act (IDEA) in 1997, and significantly strengthened in the 2004 reauthorization of IDEA, was the inclusion of students with disabilities in accountability systems (Turnbull III, 2005; Yell, 2012). Prior to 1997, students with disabilities could be excluded or waived from participation in statewide assessments (Malgren, McLaughlin, & Nolet, 2005; Thurlow & Johnson, 2000). The 1997 reauthorization of IDEA stipulated for the provision of alternative assessments for students with disabilities who did not take the general large-scale assessment (Yell & Shriner, 1997). After the reauthorization of IDEA in 2004, all students were to be included in states’ and districts’ accountability systems – including all students with disabilities – and, in alignment with No Child Left Behind (2002), were to be tested every year in grades 3–8 and once again in high school (Yell, 2012).

In the current accountability system, there are multiple avenues for participation for students with disabilities. Students can take the general large-scale assessment, the general large-scale assessment with accommodations, and an alternate assessment (Thurlow, Lazarus, Thompson, & Morse, 2005). Alternate assessments were designed for students for whom participation in the general large-scale assessment, even with accommodations, was not appropriate (U. S. Department of Education, 2003). All states were to develop an alternate assessment based on alternate achievement standards (AA-AAS). The AA-AAS was designed to target students with severe disabilities, including but not limited to, students with moderate and severe intellectual disability. Under NCLB (2002), up to 1% of students could take the AA-AAS and have their scores count towards a school’s adequate yearly progress (AYP; Branstad et al., 2002; Perner, 2007; Yell, 2012).

In 2007, states were allowed but not required to develop and offer an additional alternate assessment option – the alternate assessment based on modified achievement standards (AA-MAS; Burling, 2007; Council for Exceptional Children, n.d.; Lazarus, Thurlow, Christensen, & Cormier, 2007; U. S. De-
partment of Education, 2007). The AA-MAS allowed for an additional 2% of students to take this separate alternate assessment and have their scores count towards a school’s AYP. The AA-MAS targeted students who were missed by the limiting 1% of the AA-AAS, including students with mild intellectual disability and severe emotional-behavior disabilities (Harper, 2005; Kleinert & Thurlow, 2001; Thompson, Quenemoen, Thurlow, & Ysseldyke, 2001). At the present time, however, the AA-MAS is being phased on in light of new general common assessments that are considered more inclusive (i.e., ones from the Partnership for Assessment of Readiness for College and Careers [PARCC] and the Smarter Balanced Assessment Consortium; National Center on Educational Outcomes, 2014; The Center on Standards and Assessment Implementation and National Center on Educational Outcomes, 2014).

A more common option for students with disabilities in general is to take the general large-scale assessment with accommodations (Lindstrom, 2010; Towles-Reeves, Kampfer-Bohach, Garrett, Kearns, & Grisham-Brown, 2006). An accommodation is something that changes the assessment administration to create a level playing field. In other words, an accommodation allows students with disabilities to demonstrate their ability or knowledge but without impacting an assessment’s validity (Cox, Herner, Demczyk, & Nieberding, 2006). Although accommodations enable students with disabilities to more successfully participate in an accountability system, they are not without issues. For example, not all accommodations can be provided to a student on an assessment. Some accommodations are not allowed on an assessment, even if they are allowed in daily classroom activities (e.g., reading aloud the reading portion of an assessment or providing a calculator on the mathematics section). If a student uses an invalid or non-standard accommodation on an assessment, his/her score on the assessment would count as zero towards a school’s AYP. Different states can consider accommodations valid or invalid for assessment purposes (Cox et al., 2006; Thurlow et al., 2005).

Although the field is rich with research on the accountability system for students with disabilities, including alternate assessments and accommodations, little previous research examined accountability participation and students with autism spectrum disorders (Witmer & Ferreri, 2014). Prior research suggested teachers believe participation in large-scale assessments is mediated by the severity of a student’s autism spectrum disorder. In other words, students with more severe autism spectrum disorder should take an alternate assessment or not participate in the accountability system (Simpson, Griswold, & Myles, 1999). More recently, Witmer and Ferreri (2014) found that a large frequency of students with autism spectrum disorder across the grade levels participated in alternate assessments. The researchers also found alignment between greater access to the general education curriculum and an increased likelihood of a student taking the general assessment, as opposed to an alternate assessment.

This study focused on the participation of secondary students with autism spectrum disorder in the standardized assessments through a secondary analysis of the National Longitudinal Transition Study-2 (NLTS2). The purpose of this secondary analysis was to understand the assessment practices as well as school and individual characteristics associated with the different assessment participation options for secondary students identified with autism spectrum disorder. The research questions included: (a) with what frequency do secondary students with autism spectrum disorder participate in mandated assessments? (b) what are the relationships between participation in the accountability system and educational and individual factors? (c) what factors predict the participation of a secondary students with autism spectrum disorder from taking an alternate assessment versus the general large scale assessment with accommodations? and (d) what accommodations are provided to students with autism spectrum disorder on assessments?

**Method**

**Participants and Setting**

The participants in this study represent a subset of those included in the NLTS2. In addition, all data reported in this article are

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weighted to represent the population, rather than the sample. The reader can refer to Javitz and Wagner (2003) and Wagner, Kutash, Duchnowski, and Epstein (2005) for additional information relative to weighting data from the NLTS2.

The analyses in this article represent a population size of 16,007 students with autism spectrum disorder. To be included in the analyses, students in the sample met the following characteristics: included the original NLTS2 data collection (i.e., randomly selected from local educational agencies and state-supported schools); between the ages of 13–16 and enrolled in at least seventh grade; responded to surveys in Wave 2 of data collection; had a primary disability of autism spectrum disorder as recorded on their Individualized Education Program (IEP); and parents or youth indicated the primary disability with autism spectrum disorder (SRI International, 2000a; Wagner et al., 2005). In addition, students for whom the response to the question regarding participation in mandated standardized testing was “not at this grade” were excluded; students whose responses included does not take, takes an alternate assessment, takes the general large-scale assessment with accommodations, and takes the general large scale without accommodations were included.

Of the 16,007 students with autism spectrum disorder represented in this secondary analysis, the majority were Caucasian (66.6%, SE 4.3), followed by African-American (14.3%, SE 2.2), Hispanic (12.4%, SE 3.1), Asian (5.4%, SE 2.5), multi-racial/ethnic (0.9%, SE 0.5), and then American Indian/Alaskan Native (0.5%, SE 0.5). The majority of students represented were also male (84.0%, SE 16.0) and the average age within a range of 16 to 20 was 17.7; only 3.8% (SE 1.4) were aged 20. At the time of data collection, the most frequent grade students were enrolled in was eleventh (40.9%, SE 5.1), followed by twelfth (36.0%, SE 4.6), tenth (15.9%, SE 2.9), ungraded (4.0%, SE 1.0), and then ninth (3.2%, SE 0.8). The most frequently reported annual household income for the population was families earning over $50,000 (57.8%, SE 3.7), followed by between $25,000 and $50,000 (25.4%, SE 3.2), and finally less than $25,000 (21.8%, SE 3.5). Students were largely educated in suburban school districts (59.5%, SE 4.1), followed by urban schools (33.6%, SE 4.4), and then rural (7.0%, SE 1.2).

All students represented in this secondary population analysis were identified with autism spectrum disorder. However, no IQ data existed in the NLTS2. To substitute as an indicator of level of support potentially needed by the students with autism spectrum disorder, the researcher used students’ mental or functional skills, as referred to in the NLTS2 (Wei, Wagner, Hudson, Yu, & Shattuck, 2015). This was a sum of four variables from the parent/youth survey; these questions asked the youth or parent to rate the student’s skills on telling time on a clock, reading signs, counting change, and using a phone based on a scale from 1 (not at all) to 4 (very well). The range of functional skills was 4 to 16; a score between 4 and 8 is typically considered low, 9–14 medium, and 15–16 high. The average across the represented population was 11.33 (SE .394). The most frequent score was 16 (18.1%, SE 3.4), followed by 12 (15.7%, SE 3.7); the frequencies for all other scores were less than 10%. Categorized, 47.8% (SE 5.0) received a medium functional skills score, 26.3% (SE 4.8) a low functional skills score, and 25.9% (SE 3.5) a high functional skills score.

Data Collection/Procedures

To conduct the secondary analysis, the researcher used raw data from the NLTS2 data files obtained through a restricted use license from the Institute of Education Sciences (IES). NLTS2 was a national, longitudinal study sponsored by the Department of Education (SRI International, 2000b). It was conducted between 2000 and 2009 and contains five waves of data with each wave consisting of 2 years. The NLTS2 involved six different data sources, including parent and youth surveys, school program surveys, school characteristics surveys, teacher surveys, direct assessments, and transcripts; not every survey was collected at every wave. For this secondary analysis, the researcher focused on Wave 2 of the original data collection (i.e., data collected between 2002 and 2004) and three data sources: the school program survey, the transcript survey, and the parent/youth survey. The researcher selected Wave 2 because the school program...
survey – the survey from which a substantial portion of the variables for this secondary analysis came – was not administered past Wave 2.

To conduct the analyses, the researcher first needed to create one database with all relevant variables. To start, the researcher identified the relevant variables from the Wave 2 school program database (refer to Table 1). All non-relevant variables were deleted. The same was done with the transcript database and the parent/youth Wave 2 database. Next, the researcher merged the three databases using SPSS 21 via add variables. When all three databases with the relevant variables were merged into one, the researcher then

<table>
<thead>
<tr>
<th>Variables</th>
<th>NLTS2 Variable ID</th>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>ID</td>
<td>All</td>
<td>Randomized number assigned to student</td>
</tr>
<tr>
<td>Weight</td>
<td>Tr_wt</td>
<td>Transcript</td>
<td>Weight (for weighting)</td>
</tr>
<tr>
<td>Disability</td>
<td>np2D2b</td>
<td>School program</td>
<td>Primary disability of student on IEP</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>w2_Eth6</td>
<td>School program</td>
<td>Ethnicity of each student: white; African American; Hispanic; Asian; American Indian/Alaska Native; multiple races</td>
</tr>
<tr>
<td>Age</td>
<td>w2_Age2004</td>
<td>School program</td>
<td>Student age at the time of data collection</td>
</tr>
<tr>
<td>Grade</td>
<td>w2_Grade</td>
<td>School program</td>
<td>Grade in school: 9, 10, 11, 12, ungraded (13)</td>
</tr>
<tr>
<td>Income</td>
<td>w2_Incm3</td>
<td>School program</td>
<td>Family income categories: $25,000 or less; $25,001–$50,000; more than $50,000</td>
</tr>
<tr>
<td>Gender</td>
<td>w2_Gend2</td>
<td>School program</td>
<td>Gender of each student: male, female</td>
</tr>
<tr>
<td>School location</td>
<td>w2_Urb3</td>
<td>School program</td>
<td>Location of school: suburban, urban, rural</td>
</tr>
<tr>
<td>Functional skills</td>
<td>np2g3_[a–d]</td>
<td>Parent/Youth</td>
<td>How well the student can tell time, read signs, count change, and look up telephone numbers in a phonebook (scale 1 to 4)</td>
</tr>
<tr>
<td>Setting for LA instruction</td>
<td>np2A5a_[1–4r]</td>
<td>School program</td>
<td>Setting in which student received Language Arts instruction: general education, special education, individual instruction, community setting</td>
</tr>
<tr>
<td>Setting for Math instruction</td>
<td>np2A5b_[1–4r]</td>
<td>School program</td>
<td>Setting in which student received mathematics instruction: general education, special education, individual instruction, community setting</td>
</tr>
<tr>
<td>% General education time</td>
<td>ntgPctHrs_PGI</td>
<td>Transcript</td>
<td>% time in general education: raw and categorized (0–39.9, 49–79.9, &gt;80)</td>
</tr>
<tr>
<td>Special education curriculum</td>
<td>np2D9</td>
<td>School program</td>
<td>Curriculum in special education class: academics, basic academics, life skills, or study skills</td>
</tr>
<tr>
<td>Accountability participation</td>
<td>np2A5a</td>
<td>School program</td>
<td>Student participates in mandated standardized testing: not at this grade, does not participate, alternate assessment, general with accommodations, general without accommodations</td>
</tr>
<tr>
<td>Assessment accommodations</td>
<td>np2A5b_[01–07]</td>
<td>School program</td>
<td>Accommodations on general and alternate assessment: reader, dictation, shortened, different form, alternative setting, alternative format,</td>
</tr>
<tr>
<td></td>
<td>np2A5b_aa_[01–07]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accommodations</td>
<td>np2D3a_([01–08])</td>
<td></td>
<td>Classroom accommodations students received</td>
</tr>
</tbody>
</table>
sorted the database for students whose primary disability with autism spectrum disorder; all cases whose primarily disability was not autism spectrum disorder were deleted. Next, the author deleted any cases in which the response to student participation in mandated tests was not at this grade. The researcher next recoded specific variables within the database, including categorizing the percent of time in general education (i.e., 0–39.9, 40–79.9, and >80), functional skills (summing the responses to the four questions of telling time, reading signs, counting change, and using a phone), received instruction in math and language arts in the general education setting (both, one, or neither), participated in the accountability system (general large scale with accommodations and alternate assessment), and curriculum (academics and life skills).

Data Analysis

The researcher conducted the majority of data analyses with the Complex Samples option within IBM Statistics (SPSS) 21.0. Complex Samples allowed the researcher to weight the data to represent the population rather than just the sample, as previously discussed.

First, to get the demographics regarding participants (e.g., grade, gender) and the setting, the researcher ran frequency distributions and descriptive statistics (i.e., mean), where appropriate. To answer the first research question regarding the frequency with which secondary students with autism spectrum disorder participate in mandated assessments, the researcher also ran frequency distributions. The researcher calculated the frequency distributions for all students as well as subdivided by different categorization (or subpopulations), including special education curriculum, percent time in general education setting, language arts and mathematics instruction received in general education setting, and functional skills (refer to Table 2). Frequency distributions were also conducted to answer the fourth research question that examined the accommodations provided to students with autism spectrum disabilities (see Table 3).

To answer the second research question, the researcher ran separate Chi Square Tests of Association to determine the association between educational factors (e.g., curriculum, percent time in general education) and individual factors (i.e., functional skills) and participation in the accountability system (i.e., does not participate, alternate assessment, alternate assessment with accommodations, general large scale with accommodations, general large scale without accommodations).

### TABLE 2

<table>
<thead>
<tr>
<th>Does not take assessments</th>
<th>Alternate assessment</th>
<th>General with accommodations</th>
<th>General without accommodations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Special Education Curriculum</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>1.1% (0.7)</td>
<td>44.2% (5.7)</td>
<td>38.8% (5.4)</td>
</tr>
<tr>
<td>Basic academic</td>
<td>2.7% (2.7)</td>
<td>63.5% (11.8)</td>
<td>33.8% (11.6)</td>
</tr>
<tr>
<td>Life skills</td>
<td>13.0% (4.4)</td>
<td>61.5% (10.4)</td>
<td>25.5% (10.4)</td>
</tr>
<tr>
<td>Study skills</td>
<td>0%</td>
<td>1.0% (1.1)</td>
<td>90.6% (30.0)</td>
</tr>
<tr>
<td><strong>Percentage of Time in General Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–39.9</td>
<td>10.5% (5.0)</td>
<td>55.6% (10.5)</td>
<td>33.3% (10.5)</td>
</tr>
<tr>
<td>40–79.9</td>
<td>3.8% (11.9)</td>
<td>44.7% (5.3)</td>
<td>45.1% (5.6)</td>
</tr>
<tr>
<td>&gt;80</td>
<td>0.3% (0.3)</td>
<td>4.0% (1.6)</td>
<td>63.9% (4.8)</td>
</tr>
<tr>
<td><strong>Language Arts and Mathematics in General Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td>11.6% (2.6)</td>
<td>60.9% (5.6)</td>
<td>25.3% (6.9)</td>
</tr>
<tr>
<td>One</td>
<td>0%</td>
<td>21.4% (9.4)</td>
<td>57.6% (14.5)</td>
</tr>
<tr>
<td>Both</td>
<td>0%</td>
<td>9.0% (8.3)</td>
<td>68.0% (8.6)</td>
</tr>
</tbody>
</table>

Note: Data with low unweighted count are not reported (i.e., represented by dashes in the table). The number in the parenthesis represents the standard error. The percentage is based on those in each category who responded to the question (i.e., some individuals did not have responses to every question).
general assessment with accommodations, and general assessment without accommodations). The researcher then also ran a Chi Square Tests of Association to analyze the relationship between accommodations provided on the standardized assessments and those listed on a student’s IEP for daily use, where congruence existed. Two Chi Square Tests of Association were conducted: extended time on tests and tests read aloud.

Finally, to answer the third research question regarding factors predicting the participation of secondary students with autism spectrum disorder in the accountability system, the author conducted a logistic regression. To do so, the researcher used the condensed accountability participation variable to reflect only participation via an alternate assessment and general large-scale with accommodations; note, a logistic regression analysis can only be conducted on a binary variable (Peng, Lee, & Ingersoll, 2002). The researcher ran correlations between the demographic factors and the dependent variable to determine relevant covariates. The final logistic regression model included the binary assessment participation variable with the following factors (functional skills, time in general education, and a condensed curriculum variables of academics or life skills) and covariates (ethnicity, gender, grade, and family income as covariates).

Results

Research Question One

Of the 16,007 students with autism spectrum disorder represented in this secondary analysis approximately 50% (47.8%, SE 5.1) took an alternate assessment. The next most frequent means of participation was the general large-scale assessment with accommodations (36.0%, SE 5.9), followed by does not participate (8.5%, SE 2.5), and then the general large-scale assessment without accommodations (7.5%, SE 1.9). The Chi Square Test of Association revealed a statistically significant relationship between the two categorical variables: functional skills and assessment participation ($X^2(6) = 263.458, p < .000$, Cramer’s $V = .405$, indicative of a moderate to relatively strong relationship; Rea & Parker, 1992).

Higher frequencies for participation in the general large-scale assessment were found for individuals with higher functional skills (refer to Table 4).

Research Question Two

Table 2 depicts the frequencies of the association between educational factors on the participation within the accountability system. The association between special education curriculum and student participation the accountability system was statistically significant ($X^2(9) = 320.117, p < .000$, Cramer’s $V = .352$, suggesting a moderate relationship; Rea & Parker, 1992). While the frequencies indicated a trend in that students who received a life skills or basic academics curricula were more likely to not participate as well as participate via an alternate assessment than students who received an academic curriculum, the most frequent responses for all three of the curriculum choices was an alternate assessment (refer to Table 2). Students who did receive an academic curriculum more frequently reported taking the general large-

<table>
<thead>
<tr>
<th>Accommodations on Assessments</th>
<th>General Assessment</th>
<th>Alternate Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reader for instructions, clarification and test items</td>
<td>34.2% (7.5)</td>
<td>44.0% (13.0)</td>
</tr>
<tr>
<td>Student dictates responses, another records/writes</td>
<td>11.9% (5.5)</td>
<td>36.7% (14.0)</td>
</tr>
<tr>
<td>Shortened test</td>
<td>5.6% (3.0)</td>
<td>18.2% (11.2)</td>
</tr>
<tr>
<td>Different form of the test</td>
<td>5.2% (2.9)</td>
<td>61.9% (9.9)</td>
</tr>
<tr>
<td>Alternative setting</td>
<td>65.5% (6.2)</td>
<td>40.8% (12.4)</td>
</tr>
<tr>
<td>Additional time</td>
<td>74.4% (4.8)</td>
<td>50.8% (11.6)</td>
</tr>
<tr>
<td>Alternative format for responding</td>
<td>20.2% (6.2)</td>
<td>17.7% (11.0)</td>
</tr>
</tbody>
</table>
scale assessment without accommodations. In terms of percent time in general education and participation in the accountability system, a clear pattern emerged in the frequencies (refer to Table 2) and supported by the Chi Square Test of Association ($\chi^2(6) = 263.543$, $p < .000$, Cramer’s V = .428, suggesting a relatively strong relationship; Rea & Parker, 1992). Not surprisingly, the same association was also seen in examining the relationship between students receiving language arts and mathematics instruction in a general education environment and participation in the accountability system ($\chi^2(6) = 459.172$, $p < .000$, Cramer’s V = .464, a relatively strong relationship; Rea & Parker, 1992; refer to Table 2).

**Research Question Three**

The logistic regression model conducted for student participated in alternate assessments or general large scale with accommodations indicated the following factors and covariates had a predictive relationship: percentage of time in general education ($p = .06$), curriculum (academic vs. life skills, $p = .047$), and one’s grade in school ($p = .007$). The greater the amount of time a students with autism spectrum disorder was in general education, the more likely he/she was to participate via the general large-scale assessment with accommodations. In other words, students who were in the general education environment over 80% of the time were more likely to take the general large scale with accommodations and students who were in a general education setting less than 40% of the time were more likely to take the alternate assessment. Similarly for the condensed curriculum variable, students who received an academic curriculum were more likely to take the general large-scale assessment with accommodations and students who received a life skills curriculum were more likely to take an alternate assessment. Finally, students in older grades (e.g., 12th) were more likely to take an alternate assessment than those in younger grades (e.g., ninth).

**Research Question Four**

Of the accommodations examined, for only two did 50% of the respondents indicate this accommodation was provided to them on the general large-scale assessment (refer to Table 3): test taken in alternative setting (65.5%, SE 6.2) or with additional time (74.4%, SE 4.8). Likewise, for only two accommodations did over 50% of students who participated in an alternate assessment indicate they were provided as such: additional time (50.8%, SE 11.6) and alternative formatting for responding (61.9%, SE 9.9). For only two types of accommodations did data exist on the provision of the accommodation on both a standardized assessment (general or alternate) and its inclusion on a student’s IEP for daily use: extended time on tests and tests read aloud. For both accommodations, the relationship between use on a standardized general assessment and provision on IEP for daily use was statistically significant ($\chi^2(1) = 217.470$, $p < .000$, Cramer’s V = .715 [i.e., strong relationship] for extended time and $\chi^2(6) = 182.528$, $p < .000$, Cramer’s V = .655 [i.e., strong relationship] for test read aloud; Rea & Parker, 1992). The same is true for the use on an alternate assessment ($\chi^2(1) = 17.90$, $p < .000$, Cramer’s V = .414 for extended time [i.e., relatively strong relationship] and

Table 4

<table>
<thead>
<tr>
<th>Functional Skills</th>
<th>Does not take assessments</th>
<th>Alternate assessment</th>
<th>General with accommodations</th>
<th>General without accommodations</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–8: Low</td>
<td>9.0% (1.9)</td>
<td>81.0% (3.8)</td>
<td>10.1% (2.7)</td>
<td>0%</td>
</tr>
<tr>
<td>9–14: Medium</td>
<td>11.8% (4.7)</td>
<td>43.0% (5.7)</td>
<td>41.4% (6.6)</td>
<td>3.8% (2.3)</td>
</tr>
<tr>
<td>15–16: High</td>
<td>1.4% (1.4)</td>
<td>12.7% (4.3)</td>
<td>57.8% (8.9)</td>
<td>28.1% (8.1)</td>
</tr>
</tbody>
</table>

TABLE 4

Frequency Data for Mandated Assessment Participation as Associated with Individual Factors

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Discussion

This study represented a secondary analysis of data from the NLTS2 to understand the participation of secondary students with autism spectrum disorders in standardized assessments and the relationship between individual and educational factors and participation in standardized assessments. Three main results were found from this study: (a) secondary students with autism spectrum disorders were participating in standardized assessments, although most frequently via alternate assessments; (b) participation in standardized assessments is associated with individual and educational factors; (c) student’s time in general education predicted their assessment participation; and (d) low rates of accommodations are provided to students with autism spectrum disorder on standardized assessments but consistency exists between the allowance of accommodations on said assessments and in daily use.

Results from this secondary analysis suggest less than 10% of students with autism spectrum disorder did not participate in the accountability system. The 10% of students who did not participate, yet were eligible (i.e., not excluded because the assessment was not offered), needs to be viewed in context. For one, 10% is less than the 17.4% of secondary students with mild intellectual disability who were found not to participate in standardized assessments in a similar analysis by Bouck (2013). While it is more than the frequency found in a recent analysis of assessment participation of students with autism spectrum disorders across elementary, middle, and high school by Witmer and Ferreri (2014) in one state, the data collected for this analysis occurred shortly after the passing of NCLB (2002) and prior to the implementation of IDEA (2004). Yet, per IDEA 1997, alternate assessments were provided as an option for students with disabilities and the inclusion of students with disabilities in the accountability system – via the general large scale or through an alternative assessment – was emphasized (Yell & Shriner, 1997). One clear argument for all students participating in accountability systems is then that all students count; in other words, the education of all students with disabilities is taken more seriously if their scores are included in an assessment of schools (Hardman & Nagle, 2004).

For almost half of the secondary students with autism spectrum disorders represented in this secondary analysis, an alternate assessment was their means of participating in the accountability system. In the recent study by Witmer and Ferreri (2014), the authors concluded that the majority of students, across elementary, middle, and high school, took the alternate assessment in the state they analyzed. Alternate assessments offer an appropriate means of secondary students with autism spectrum disorder to participate in standardized assessments, provided these were students for whom the general large-scale assessment with accommodations was not appropriate. The statistically significant association found between a student’s assessed functional skills and one’s participation in standardized assessments suggests those taking an alternate assessment were students who would benefit from such an assessment (i.e., lower functional skills) and conversely those taking the general-large scale were students with higher functional skills. While a limitation of this secondary analysis is the lack of ability to discern students with autism spectrum disorders with intellectual disability versus those without, the use of the functional skills as an approximation or substitution has been used in other research (Wei, Wagner, Hudson, Yu, & Shattuck, 2015).

From the data analyzed, educational factors and students’ participation in standardized assessments were associated, although directional impact is unable to be discerned from the Chi Square Tests of Association. However, the logistic regression results indicate that the more a student with autism spectrum disorder was in the general education setting, the more likely s/he was to take the general large scale assessment with accommodations, as compared to an alternate assessment. Conversely, the less time a student was in the general education setting (i.e., less than 40%), the more likely s/he was to take an alternate assessment. Students who are in the general education setting to a greater extent (i.e., over 80% of their time) are, in theory, getting...
greater access to the general education curriculum and general standards and therefore it is more appropriate for them to be assessed with the general assessment. It is actually students who are enrolled in general education to a lesser extent (i.e., 0–39.9%) or have neither language arts or mathematics in the general education setting and who take the general large scale assessment with or without accommodations that are concerning. It seems unfair to have students participate in the general large scale assessment aligned with general education curriculum and general education standards if they have not had access to such in school (Bouck, 2009).

Of course alternative hypotheses are possible for the predictive relationship between time in the general education environment and participation in the accountability system as found in the logistic regression. Rather than students who receive more education in the general education setting are more likely to take the general education assessment, the opposite may be true – students who take the general large-scale assessment are more likely to get access to the general education curriculum. While the general education setting offers many benefits, including positive post-school outcomes of post-secondary education participation (Lombardi, Doren, Gau, & Lindstrom, 2012; Rojewski, Lee, & Gregg, 2015), it also typically does not offer a functional curriculum, which may be more accessible in special education environments. This concern is that assessment policies, such as the 1% cap of who can take an alternate assessment and still have scores count towards a school’s AYP, are driving placement and curriculum, rather than the individual needs of students (Carr-George, Vannest, Willson, & Davis, 2009; Crawford & Tindal, 2006). Although recent research found that receipt of a functional curriculum did not result in improved post-school outcomes for secondary students with autism spectrum disorders (Bouck & Joshi, 2015), other researchers noted the value of life skills and social skills for students with disabilities, including students with autism spectrum disorders (Elksnin, Elksnin, & Sabornie, 1994; Salzberg, Lignugaris-Kraft, & McCuller, 1988; Wehman et al., 2014).

The association between instructional environment and assessment participation is not consistent with the recent study of one state from Witmer and Ferreri (2014). Witmer and Ferreri found that a considerable portion of students who had access to the general education curriculum took an alternate assessment. The lack of consistency between the studies may be a result of the focus on secondary education in this study (i.e., Witmer and Ferreri examined elementary through high school) or the national picture from this study as opposed to the one state examined by Witmer and Ferreri. It may also be the difference the authors of the two studies took in examining general education. For this study, the author examined percent time in general education based on students’ transcripts as well as school reported instructional setting for language art and mathematics. Witmer and Ferreri also collected similar data in terms of percentage of time in general education but analyzed the alignment between general education and assessment participation via the frequency with which students who received general education services were reported to have access to curriculum and materials.

Finally, the results suggested low rates of accommodations provided to students with autism spectrum disorder on the general assessment (i.e., only two over 50% – alternative setting and additional time). The lower rates for certain accommodations, such as a reader for instructions, clarifications, and test times, likely reflect the different policies across the states in regards to the validity or consideration of this accommodation as a standard one; invalid or non-standard accommodations often result in a student’s assessment being scored as a zero (Christensen, Braam, Scullin, & Thurlow, 2011). The most common accommodation for the general large-scale assessment and the second for the alternate assessment was additional time; researchers suggested additional or extended time is a common accommodation provided to students with disabilities (Bolt & Thurlow, 2004). However, researchers have questioned the validity of this accommodation, often noting it helps students with and without disabilities (Elliott & Marquart, 2004; Lewandowski, Cohen, & Lovett, 2013).

A positive finding was the positive – and strong or relatively strong – association between the two accommodations examined re-
garding the provision on an assessment and written into students’ IEP for daily use: additional time on tests and tests read aloud. Following IDEA 2004, IEPs were to reflect consistency between the accommodations provided to students with disabilities on standardized assessments and in daily use (Yell, 2012). The limited data here (i.e., few accommodation options for reported for both standardized assessments and written into IEPs for daily use) suggest consistency for students with autism spectrum disorder.

Implications for Practice

The results suggest important implications for practice. For one, it suggests that IEP teams need to carefully consider educational instructional environments for students with autism spectrum disorder. Given the relationship between the time in general education and participation in general large-scale assessments with accommodations and the requirement in some states to pass the test or not earn a diploma and the negative consequences of not earning a diploma (Guy, Shin, Lee, & Thurlow, 2000; Johnson & Thurlow, 2003), IEP teams must clearly consider the intended and unintended consequences of instructional environments decisions. While not to imply that life skills are not important and valuable to students with disabilities, parents, students, and educators need to make informed decisions regarding secondary instructional environments and subsequent accountability system participation, particularly in states in which the accountability system is a high-stakes system.

Limitations and Future Directions

This study represents a secondary analysis of an existing data set. The limitations of the original data collection, study, and design exist within the secondary analysis, including missing data from attrition or participants opting not to answer as well as data not asked (i.e., IQ data). An additional limitation could be viewed as the relationships between the educational factors we examined, most notably time in general education setting and receipt of language arts and mathematics in general education environments. A final limitation noted is that data collection occurred during the 2003–2004 academic year. Hence the data can be viewed as older as well as that collection occurred prior to the full implementation of IDEA 2004 and shortly after NCLB in 2002. Future research should continue to understand the participation of students with autism spectrum disorders in the current accountability system as well as factors that are related to one’s means of participation (i.e., alternate assessment vs. general large-scale assessment). Additional research should continue to understand the participation of students with autism spectrum disorder in the accountability system at different grade levels, such as elementary with the Special Education Elementary Longitudinal Study (SEELS) as well as through the collection of current primary data. Researchers should also compare the participation of students with autism spectrum disorder to students with other disabilities to gain a better sense of the context of the participation of this group within standardized assessments.

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Supported Decision Making: A Synthesis of the Literature across Intellectual Disability, Mental Health, and Aging

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Abstract: Supported decision making (SDM) has begun to receive significant attention as means to enable people to exercise autonomy and self-determination over decisions about their life. Practice frameworks that can be used to promote the provision of supports for decision making are needed. This paper integrates the literature across intellectual and developmental disability, mental health, and aging populations to synthesize issues that should be considered in future research on building systems of supports for SDM. The literature suggests that considering (a) contextual factors relevant to decision making, (b) environmental demands for decision making, and (c) supports needed for decision making is important in the context of considerations of promoting SDM, as is using operational definitions of decision making and supported decision making frameworks. While there has been theoretical and empirical work in each of these areas, no work has comprehensively brought together these areas specific to decision making across multiple life domains. Implications for future research and practice are provided.

Supported decision making (SDM) has begun to receive significant attention, nationally and internationally, because of growing concerns raised by advocates and legal scholars about the limitations substituted decision making arrangements (e.g., legal guardianship or conservatorship) place on the ability of people to act as causal agents in their lives and to exercise autonomy and self-determination (Blanc & Martinis, 2015; Davidson et al., 2015). Within the disability field, the United Nations Convention on the Rights of Persons with Disabilities (CRPD) states that signatories needed to “take appropriate measures to provide access by persons with disabilities to the support they require in exercising their legal capacity” (United Nations, 2006). In describing ways to implement these requirements, SDM is named and described as a “process whereby a person with a disability is enabled to make and communicate decisions with respect to personal or legal matters” (United Nations, 2007). Other legal scholars have elaborated on SDM, describing it as an individualized process (Kohn & Blumenthal, 2014) that can include supports such as informal conversations with peers, meetings with a designated supporter, and a personal board of advisors to help make decisions to enable a person to exercise their legal capacity (Dinerstein, 2012). Several countries have begun to conceptualize and, in some cases, implement SDM as an legal alternative to guardianship (Gooding, 2013; Gordon, 2000; Richardson, 2012), and SDM has been mentioned in recent U.S. court decisions related to guardian-
ship (Ross et al. v. Hatch, 2013). Supported decision making builds on other processes in the disability field, such as person-centered planning, but focuses more explicitly on identifying and implemented supports needed for decision making, and enhancing legal agency and self-determination.

Despite the growing attention directed to SDM as a potential process or framework to increase the participation of people with disabilities in decisions about their life, scholars have acknowledged that “articles with extensive discussions of the benefits and potential drawbacks of SDM provide little or no empirical support for their claims” (Kohn, Blumenthal, & Campbell, 2013, p. 1128–1129) and that SDM is “used in many different contexts, and it is often unclear exactly what people mean when they refer to it” (Browning, Bigby, & Douglas, 2014, p. 36). SDM has been used to refer to a legal framework to enable people with intellectual and developmental disabilities to exercise legal capacity as well as to refer to a process for providing decision making supports and enabling people with disabilities to access supports that promote maximal participation in decisions related to their lives. There is a need, therefore, for (a) legal frameworks that define SDM as an alternative to guardianship and address issues related to legal capacity and legal determinations, and (b) practice frameworks that can be used to promote the provision of supports for decision making that enable people to be agentic and maximally involved in all decisions about their lives. Providing supports that enable maximal involvement in decisions has the potential to promote valued outcomes, including greater self-determination and autonomy (Shogren & Wehmeyer, 2015) for people with disabilities, mental health needs, and who are aging, as well as facilitate access to alternative legal arrangements by creating supports for decision making in the community that potentially reduce the need for substituted decision making arrangements. Thus, it is necessary to develop frameworks and assessment tools that enable the identification of the specific supports a person needs to engage in SDM.

Such work can be informed by emerging work in related fields including aging and mental health, where increased attention has been placed on the practice frameworks to enable supported and shared decision making, particularly in relation to episodic mental health needs in the mental health field (Crickard, O’Brien, Rapp, & Holmes, 2010; Duncan, Best, & Hagen, 2010; Goording, 2013) and aging-related needs when cognitive changes occur (e.g., dementia) (Moberg & Rick, 2008; Rudman, Friedland, Chipman, & Scioritto, 2006; Samsi & Manthorpe, 2013) and when end-of-life decision making is occurring (Trevena & Barratt, 2003; Vladeck & Westphal, 2012; Winzelberg, Hanson, & Tulsky, 2005) in the aging field.

**Supported Decision Making Framework**

Shogren and Wehmeyer (2015) introduced a practice-oriented framework for SDM that emphasizes how “SDM can be understood and supported within the context of supports planning and a social-ecological model of disability” (p. 18). This framework situates SDM in social-ecological models of disability, which recognize that disability is not a static condition inherent to the person, but results from the interaction of personal characteristics and environmental demands (Schalock et al., 2010). When there is a mismatch between the demands of the environment (e.g., the need to make decisions in key life domains) and contextual factors (i.e., personal and environmental factors that mediate or moderate the demands of the decision), this creates a need for supports (Thompson et al., 2009). Shogren and Wehmeyer (2015) suggested that to understand and apply supports for decision making to enable SDM, there is a need to understand (a) contextual factors relevant to decision making, (b) environmental demands for decision making, and (c) supports needed for decision making. Based on an understanding of these three domains, personalized systems of support for decision making can be developed that facilitate self-determination and causal agency in decision making, matched to the specific demands of the environment, personal characteristics, and support needs of each person.

In addition to these three domains, there is also a need to understand the definitional frameworks adopted in the fields of intellectual and developmental disabilities, mental health, and aging for gaining skills and com-
petencies related to SDM. In the general psychological literature, frameworks have been introduced to define decision making, specifying the steps undertaken to make a decision. Decision making has been defined as making choices among competing courses of action (Baron & Brown, 1991; Hickson & Khemka, 2013), and the process of making decisions has been described as a judgment about which solution is best at a given time, which typically involves: (1) recognition of the circumstances that are creating the threat or opportunity that leads to a decision needing to be made; (2) awareness of the need to make a decision; (3) identification of the goal in which the decision is in service of; (4) identification of action alternatives; (5) determination of consequences of each action alternative; (6) determination of the probability of each consequence occurring if the action were undertaken; (7) establishing of the relative importance of each relative action alternative and consequence; and (8) integration of the probability and importance determinations to identify the most attractive course of action (Beyth-Marom, Fischhoff, Quadrel, & Furby, 1991; Furby & Beyth Marom, 1992; Hickson & Khemka, 2013; Wehmeyer & Shogren, in press). Understanding the degree to which these frameworks are being used to understand contextual factors, environmental demands, and supports for decision-making will enable a synthesis of literature-based factors that affect SDM.

Purpose of the Review

In introducing their theoretical framework, Shogren and Wehmeyer (2015) defined three domains (contextual factors, environmental demands, and supports needed). They also highlighted the importance of understanding decision making skills and competencies at the individual level to understand relevant contextual factors, environmental demands, and supports needed. There is a need, however, for a broad synthesis of the literature to identify what is known about contextual factors, demands, and supports that influence SDM as well as existing definitional frameworks for skills and competencies related to SDM. Such a synthesis could then be used to guide the development of assessment and intervention frameworks for building systems of supports for SDM. While reviews focused on what is known about SDM, primarily in the legal context, have been published (Davidson et al., 2015), syntheses of existing knowledge in the educational and psychological literature have not been conducted. Further, common considerations across related fields, namely disability, mental health, and aging have not been explored despite overlap in emerging research related to supports needed to enable decision making. Thus, we sought to address the following questions:

1. What definitional frameworks for decision making skills and competencies have been described in the literature relevant to people with intellectual disability, mental health conditions, and/or people who are aging?

2. What contextual factors (i.e., personal and environmental factors) and environmental demands have been identified in the literature as influencing decision making for people with intellectual disability, mental health conditions, and/or people who are aging?

3. What supports and support needs for decision making have been described in the literature for people with intellectual disability, mental health conditions, and/or people who are aging?

Method

To address our three research questions, we engaged in a series of systematic searches of social science databases (Academic Search Complete (EBSCO), Web of Science, ERIC, and PsycInfo). The search terms varied based on the research question, however, across searches we restricted our searches to articles published between 2004 and 2015 that were peer-reviewed, in English. In the following sections, we describe the searches and synthesis procedures for each of our research questions, including the criteria and number of articles identified. The purpose was to provide a broad overview of key findings related to each research question published over the past ten years. The third author led the search procedures and the screening of the articles to determine their fit with the focus of the
research question, the fourth author replicated all searches and screening, and the first author reviewed all search findings and integrated the findings in consultation with the second author. In presenting our findings and implications, we focus on providing a general overview and implications of what the current literature base suggests about key factors that influence SDM. It is our hope that this overview can then be used to develop systematic research questions to be addressed in further research and the development and evaluation of practice-based frameworks for SDM.

Definitional Frameworks

As described previously, there is a need to understand the definitional frameworks adopted in the fields of intellectual and developmental disabilities, mental health, and aging for promoting skills and competencies related to decision making. Specifically, we were interested in exploring if frameworks used in the fields of psychology and education were adopted, or if other definitional frameworks had been developed or adopted. Thus, we screened articles to determine if they explicitly state a definition or definitional framework for decision making that guided their research. To identify articles a keyword search was performed using “decision making” and “defin*.” That search resulted in over 10,000 articles total. To narrow the results, we searched for the definition of decision making in our target populations. For the area of mental health, we used “mental health”, “mental* ill*”, and “schizophren*” which resulted in approximately 300 articles. For the area of intellectual and developmental disabilities, we used “physical* disab*”, “development* disab*”, and “intellectual* disab*” which resulted in approximately 300 articles. For the area of aging we used “aging”, “elderly”, and “older adult” resulting in approximately 100 articles. The third and fourth authors searched the text of all identified articles. While many articles included the term “definition,” ultimately, only five articles were found that included a specific, operationalized definition or framework of decision making in the text.

Contextual Factors and Environmental Demands

Researchers have defined context as the “totality of circumstances that comprise the milieu of human life and human functioning” (Shogren, Luckasson, & Schalock, 2014, p. 110) and state that context can provide a framework for describing personal and environmental factors that influence human functioning. Using this definition, we conducted a systematic search of the literature to identify personal and environmental factors that were identified in the literature across populations of people with intellectual disability, mental health conditions, and/or who are aging as influencing decision making. The intent was to begin to catalogue these influencing factors that might be important to understand when attempting to build systems for supports for decision making that cut across disability populations. Because of the close association of environmental factors and environmental demands when considering factors that influence decision making, we made an a priori decision to combine these two aspects of the supported decision making framework for the purposes of this review, recognizing that future research will need to examine the role of the demands encountered by people in creating personalized supports.

We searched for articles that examined and described personal and environmental factors and demands that impacted decision making in the target populations. We only focused on articles with a direct link to decision making. Thus, our search terms included “decision making”, “factor*”, “influence*” resulting in approximately 2,400 articles across all populations (using the population terms described previously). After screening the articles, thirty-nine articles were identified that explicitly examined “factors” that influenced decision making. Because of the number of articles, a listing was made of all the factors named in the articles by the third author, grouped under the broad headings of personal and environmental factors and demands. Within these two broad groupings, similar factors were then grouped together independently by the third and fourth author. Then, the first, third and fourth authors reviewed the groupings and addressed any discrepancies, coming to con-
sensus on the grouping of factors identified in Table 1.

**Supports and Support Needs for Decision Making**

In a social-ecological model of disability, support needs is defined as a “psychological construct referring to the pattern and intensity of support a person requires to participate in activities associated with typical human functioning” (Thompson et al., 2009, p. 135). Supports, then, are resources and strategies that enhance human functioning (Luckasson et al., 2002) and should be individualized and directly related to the specific support needs of a person with a disability. Related to decision making, understanding decision making support needs will enable the creation of systems that promote individualized supports for decision making based on an understanding of the needs of the person. Therefore, we also searched the decision making literature across our target populations to synthesize existing work on support needs assessment and supports for decision making.

We specifically focused on articles in the educational and psychological literature that emphasized individualized, person-level supports or supports assessments for decision making, not organization or policy level supports (e.g., policy frameworks for supported decision making) to focus on what could be done to enable decision making among people with disabilities, creating the supports necessary for alternatives to substituted guardianship. We then searched using a combination of “decision making”, “support,” “support needs assessment,” and “decision support”

### TABLE 1

**Categories of Personal and Environmental Factors and Demands Identified in the Literature as Influencing Decision Making**

<table>
<thead>
<tr>
<th><strong>Personal Factors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic characteristics</strong> Age, gender, education level, race/ethnicity, language</td>
</tr>
<tr>
<td><strong>Decision making Experience</strong> Exposure to previous decision making opportunities, experience with previous treatments or interventions and outcomes</td>
</tr>
<tr>
<td><strong>Disability characteristics</strong> Cognitive functioning or cognitive decline, presence of active symptoms (i.e., delusions, suicidal ideation)</td>
</tr>
<tr>
<td><strong>Co-occurring conditions</strong> Secondary medical conditions, medication side effects, substance use, lack of treatment adherence</td>
</tr>
<tr>
<td><strong>Emotional factors</strong> Perceived quality of life, level of stress, fear of making decisions, beliefs about decision making capacity, concerns about burdening others</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Environmental Factors and Demands</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accessibility of information</strong> Accessibility of information, manner of communication, complexity of intervention presented, time provided for communication, level of concreteness</td>
</tr>
<tr>
<td><strong>Complexity of Decision</strong> High vs. low stakes decisions, costs associated with treatment, risk associated with treatment, timing of decisions (long term vs. crisis)</td>
</tr>
<tr>
<td><strong>Relationships with Providers</strong> Trust/existing relationship with medical or support provider, influence of support providers on decision making (e.g., does the provider direct or facilitate)</td>
</tr>
<tr>
<td><strong>Living Arrangement</strong> Living in congregate vs. integrated settings; presence of trusted support provider in living arrangement</td>
</tr>
<tr>
<td><strong>Opportunities for Decision making</strong> Degree to which personal preferences are respected in the environment, opportunity for choice in the environment, living in integrated settings (vs. congregate settings)</td>
</tr>
<tr>
<td><strong>Family Attitudes about Decision making</strong> Processes used by family of origin for making decisions, level of involvement of family in decision making, attitudes toward decision making of those with disabilities</td>
</tr>
</tbody>
</table>
across all our population key terms, resulting in approximately 5,000 articles initially. All of the articles identified above were then reviewed, and narrowed to those that described specific supports or assessments that had been evaluated for enabling decision making. Again, the third and fourth authors reviewed all the article abstracts and identified all that focused explicitly on supports and supports needed.

Findings and Implications

Definitional Frameworks

Generally, we found that most articles that discussed issues related to decision making in these populations did not provide formal definitions of decision making. The term definition may have been used in articles, but an explicit definition was rarely provided. Instead the articles tended to describe contextual factors or support strategies related to decision making (described in greater depth subsequently), but did not specifically identify a definition or conceptual framework for understanding decision making. The small number of articles that did provide explicit definitions of decision making used definitions in line with the general frameworks accepted in the psychological literature. For example, Fisher, Bailey, and Willner (2012) used the following definition of decision making, “the ability to select an advantageous response from among an array of available options” (p. 588), to describe their framework for creating a decision making aid for people with intellectual disability. Salkovskis and colleagues (2010), when exploring different ways of presenting information related to decision making about genetic testing for schizophrenia, used the following definition of decision making: “balancing value and likelihood of possible outcomes, assessing their probabilities and utilities and then combining them to make a suitable choice” (p. 203). Brohan, Henderson, Slade, and Thornicroft (2014) identified defining factors that influenced human action, including attitudes, norms, and perceived control, focusing on developing decision aids that addressed the consequences of human action. Related to the aging population, Rise and colleagues (2013) described decision making as being founded on mutual respect, carried out through dialogue suggesting that decision making process is viewed as a joint effort necessary to reach good results. Related to individuals with dementia, Boyle (2014) described the importance of “deliberative agency” when making decisions.

Overall, however, there is a lack of emphasis in the current literature base on operationalizing decision making. When building frameworks for SDM, it will be important to include clear definitions of decision making and the steps involved in a decision making process to allow for assessment of a person’s support needs related to each of the steps, as this will be a critical element in building systems of support for decision making. Based on our review of the literature, as well as generally accepted definitions of decision making, we suggest the following definition of decision making: the act of choosing among competing courses of action based on an understanding of the probable outcomes of those courses of action. This necessitates an understanding that multiple factors influence the decision making process.

Contextual Factors and Environmental Demands

Table 1 provides an overview of the categories of contextual factors and environmental demands identified from the literature, organized into personal and environmental factors that impact decision making. It is important to note that these are factors that were identified in the literature, thus, they may not represent all of the factors that potentially impact decision making particularly as to make the searches manageable we use the key words of influence* or factor, which may have missed articles that were examining influencing contextual factors or demands, but did not use this terminology. Despite these limitations, this study provides an initial step in identifying contextual factors that should be analyzed when considering systems of supports for decision making across and within disability populations. In the following sections, we summarize key findings related to these influencing factors. Interestingly, more articles discussed decision making in relation to aging populations (frequently in response to issues related to cognitive changes or declines experienced by
older adults), followed by those with mental health conditions and those with intellectual disability.

Personal Factors - Sociodemographic factors. Researchers identified a variety of sociodemographic factors that potentially influenced decision making, and should be understood in building supports for people with disabilities. Age was a factor, as people who were aging were identified as potentially more conservative in their decision making compared to people who were younger and maybe less aware of risks (Shao & Lee, 2014); 13 factors, such as race/ethnicity, language, and communication preferences (e.g., directed vs. non-directed questions) were also identified (Boyle, 2014; Rodriguez, Cavaleri, Banon Jr, & McKay, 2008). Researchers have also suggested that females make more decisions than males, particularly related to issues of aging (Lukens, Solomon, & Sorenson, 2013), and that financial status and changes in financial status can impact feelings of empowerment in decision making (Griffiths & Harmon, 2011).

Decision making experience. A critical factor can be the previous experience with decision making of the person with a disability, particularly in the context within which the current decision is being made. For example, researchers discussed that, for people with intellectual disability making decisions about career activities, prior exposure to a range of job activities particularly in school was critical to the process of developing personal preferences and making decisions (Trevena & Barratt, 2003). For people with mental health needs, researchers highlighted that there are multiple decision points at different stages of the condition (e.g., is this the first episode or has the condition been episodic over time) and have treatment decisions been made in the past using similar modalities or are the modalities new (Watson, Kelly, & Vidalon, 2009).

Disability characteristics. The literature also highlighted specific disability-related characteristics that could impact decision making. For example, for people who were aging and experiencing cognitive decline, the rate of cognitive decline (Lighthall, Huettel, & Cabeza, 2014; Waldrop, 2014) and presence of dementia (Widera, Steenpass, Marson, & Sudore, 2011) were identified as critical factors to understand pertaining to decision making, particularly in relation to high stakes decisions focused on, for example, financial matters. However, researchers also suggested that even when dementia was present, adults could still participate in decision making (Moye, Karel, Azar, & Guerrero, 2004) with appropriate supports. For people with intellectual disability, level of intellectual functioning was identifying as a factor important to understand, with specific support needs related to the level of intellectual functioning. For example, researchers suggested the importance of issues related to gullibility and vulnerability for people with higher IQs (Snell et al., 2009). With regard to mental health conditions, the episodic or non-episodic nature of the condition as well as the presence of active delusions or suicidal ideation was a critical factor to understand, as researchers have found that people who are in a delusional state have been found to overestimate and use less information to make a decision (Chan & Mak, 2012; Rubio et al., 2011).

Co-occurring conditions. The presence of additional diagnoses, such as seizure disorder in people with intellectual disability (Vallenga, Grypdonck, Tan, Lendemeijer, & Boon, 2006) or a history of substance abuse in people with mental health conditions (Eliacin, Salyers, Kukla, & Matthias, 2015) were mentioned by researchers as factors that influenced the decisions that needed to be made, particularly about health matters that could be influenced by the need for medication and treatments for secondary conditions. Additionally, when co-occurring illnesses result in pain-related symptoms and the need for medications, the side effects can impact decision making (Bravo et al., 2013). Researchers have also suggested a decline in physical functioning, as well as changes in sensory factors, both of which can be associated with the aging process, may also affect the decision making ability of older adults (Griffiths & Harmon, 2011; Waldrop, 2014).

Emotional factors. The ways that people with disabilities perceived their ability to make decisions and potential impact of their decisions on others all emerged as emotional considerations that could influence the decision making process. For example, in the aging
population, researchers have suggested that as changes in functioning occur (e.g., decline in functional and cognitive abilities) affective factors often came into play, including fear of burdening loved ones (Winzelberg et al., 2005) and lack of comfort with current technology-based tools that support decision making (Reifova & Fiserova, 2012). For people with mental health issues, feeling stressed (Rubio et al., 2011), unsure about the best decision (Halpern & Arnold, 2008), or feeling afraid of being judged (Eliacin et al., 2015) were all identified as factors that could impact the decision making process, particularly in relation to treatment and medication options.

Environmental Factors and Demands - Accessibility of information for decision making. Several factors emerged related to the accessibility of the information provided or available to people with disabilities in making decisions. This ranged from literature or information on medication not being provided in the native language of the person to insufficient time being provided for the person to process the information and ask questions (Daid & Delaney, 2011). Additionally, the way that information is communicated can make a difference. For example, Salkovskis and colleagues (2010) found that people who were given information about positive outcomes of genetic testing for schizophrenia were more likely to undergo testing that those given negative info. Researchers have also found that people with dementia who are only presented with the most relevant and salient information about a decision are more able to participate in decision making (Moye et al., 2004). For people with intellectual disability, using specific decision making aides can enable greater participation in the decision making process (Carney, 2013; Fisher et al., 2012). Further, different cultural groups may have unique preferences related to the ways in which information is communicated and the degree to which direct questions and explicit advice is viewed as helpful (Cortes, Mulvaney-Day, Fortuna, Reinfeld, & Alegria, 2009).

Complexity and risk associated with decisions. The complexity of decisions and the stakes associated with the decision are also important to understand. High stakes and/or complex decisions like financial decisions (Widera et al., 2011), medical decisions and driving decisions (Moberg & Rick, 2008) are particularly salient for people with disabilities. Further, the costs associated with different treatment options also influence decisions, as well as the recommendations of others for highly complex decisions related to selecting medications and treatment adherence (Laplante-Lévesque, Hickson, & Worrall, 2010) and the level of risks, specifically side effects, associated with a given medication or treatment (Bravo et al., 2013). Part of the complexity can also relate to the timing of decisions. Understanding if the decision is a long-term decision, with planning that can occur over a period of time (i.e., decisions about what a person wants to occur at the end of life) (Waldrop, 2014) or must occur quickly, as a crisis is occurring, is important. For example, if a person with a mental health condition is in crisis, this requires different considerations (Davis-Sowers, 2012; Hunt, Watkins, & Eisenberg, 2012).

Relationships with providers. The degree to which trust and support characterized the relationship with a support provider influenced decision making (Farrelly & Lester, 2014; Daid & Delaney, 2011; Mishra, Gioia, Childress, Barnet, & Webster, 2011). For example, researchers found that relationships with medical providers can influence adherence to recommended treatments for people who are aging (Mukhtar, Weinman, & Jackson, 2014) and that when people with mental health conditions felt their providers had empathy for them, this enhanced decision made with regard to medications (Daid & Delaney, 2011). For people with intellectual disability, relationships with support providers and school-based staff have been identified as factors that influence decision making (Timmons, Hall, Bose, Wolfe, & Winsor, 2011; Wennberg & Kjellberg, 2010).

Opportunities for decision making. The degree to which the settings people live in support decision making also makes a difference. For example, for people with mental health conditions in treatment facilities opportunities to participate in consumer councils and to inform performance improvement led to increased opportunities for participation in organizational decision making (Linhorst, Eckert, & Hamilton, 2005). For people with
intellectual disability, researchers have found that more opportunities are provided for decision making in community-based settings, whereas in more congregate settings limited opportunities to participate in decision making are provided (Lakin et al., 2008).

**Family attitudes about decision making.** Attitudes and expectations regarding decision making of people with disabilities impacted decision making opportunities, particularly the attitudes of family members. For example, the degree to which families modeled decision making could make a differences in the personal attitudes of a son or a daughter with disabilities toward decision making (Thorkildsen, 2007). Further, the degree to which families emphasized risk and protection, vs. opportunities to take risks, and / or had negative attitudes about the decision making capacity of their family member with a disability could influence decision making opportunities and capacities of people with intellectual disability (Colvin & Larke, 2013; Timmons et al., 2011; Wennberg & Kjellberg, 2010).

**Supports and Support Needs for Decision Making**

Support needs assessment has received attention in the intellectual disability field, with the introduction of assessments like the Supports Intensity Scale – Adult (SIS-A; Thompson et al., 2015). However, the SIS-A focuses on support needs across multiple domains of human functioning and not decision making specifically. In other populations, the assessment of support needs (vs. assessments of health status, behavior, or functioning) has received very little specific attention. Thus, more work is needed to explore strategies to identify support needs related to the steps associated with making decisions, considering the contextual factors identified in the previous section. This will allow for individualized supports to be created, based on assessment information about decision making skills and support needs as well as contextual factors.

There were, however, several studies across populations that described or evaluated supports that could be used to enable decision making. A number of studies emphasized the importance of peer support, suggesting that when provided in a safe or non-traumatic environment, peer support could enable decision making regarding treatment and medication use for people with mental health needs (Crickard et al., 2010; S. Watson, Thorburn, Everett, & Fisher, 2014). The role of social support was also emphasized in more comprehensive programs. For example, Pickett and colleagues (2012) described an intervention to empower mental health consumers to be more active participants in the treatment decision making process through training in self-advocacy, communication, and problem-solving skills as well as social support, and they found that people who received the intervention, in comparison to controls who did not, were more actively involved in the treatment decision making process. Cortes and colleagues (2009) suggested, however, that such tools needed to teach questioning and communication skills in a culturally competent way aligned with the contextual factors that impacted people with mental health conditions.

The role of decision making aids in supporting people was also identified. Brohan et al. (2014) found that a decision making aid that guided consumers to identify the consequence of decisions was useful for people with mental health conditions attempting to determine the costs and benefits of disclosing their disability to an employer. Similarly, Bailey, Willner, and Dymond (2011) found that when making financial decisions people with intellectual disability were more able to provide justifications for their decisions when provided with visual aids (e.g., graphic and color-coded information) about financial issues, as did Fisher et al. (2012) when comparing visual calculators versus paper and pencil versions of decision aids. However, Wennberg and Kjellberg (2010) found that while decision aids were generally effective, negative attitudes of support providers (e.g., family members, staff) could influence the use of such aids. Researchers have also found when people who were aging felt supported by providers to participate in the decision making process about medical interventions and end of life decisions, they were more comfortable with their treatment plan (Isaacs et al., 2013; Wagemans et al., 2013). Research with older adults has also suggested that decision aids that provided comprehensive but accessible information on health care decisions were useful in making
decisions about treatment and screenings (Lewis et al., 2010). Further, for older adults considering nursing home placement, researchers found that peer support was also important to both the adult and their family members (Chang, 2011; Johnson, Popejoy, & Radina, 2010).

Overall, despite the lack of attention to assessments of the support needs for decision making, a number of researchers have investigated decision making supports ranging from curricula to teaching skills that enable greater participation in decision making processes to decision aids for specific types of decisions such as medical or financial decisions. This body of work provides promise to direct ongoing activities to identify and develop effective supports for a range of types and complexities of decisions. However, future work is needed to better understand how to assess the support needs of people with varying types of disability for decision making and the best process to align supports to those needs particularly given individualized needs and contextual factors for each person with a disability.

Conclusions

Across populations, there is a growing recognition of the need for effective supports to enable people with intellectual and developmental disabilities, mental health needs, and who are aging to be causal agents over decision making across life domains, with individualized supports matched to the demands of the decisions and the contextual factors that impact decision making. Providing decision making supports, or SDM, represents a fundamental shift from traditional guardianship or substituted decision making models, where people lose their right to be self-directed in decision making because it is determined that they do not have the legal capacity to engage in decision making, thus restricting self-determination. However, to prevent the loss of legal capacity practice-based frameworks are needed that guide the creation of systems of supports for decision making.

To inform the development of practice based frameworks, Shogren and Wehmeyer (2015) introduced a SDM framework and this review conducted a broad synthesis of the literature aligned that the SDM framework to identify what is known about factors that influence SDM, as well as existing definitional frameworks for skills and competencies related to SDM adopted in this context. The intent is that this broad synthesis could inform future research and be used to guide the development of assessment and intervention frameworks for building systems of supports for SDM.

Overall, the findings and implications of the broad synthesis reported in the previous sections highlight the importance of adopting specific definitional frameworks for decision making and supported decision making in future research to enable shared communication and integration of diverse literature bases. Further, there are a range of personal and environmental factors and demands that influence decision making and have been researched, although there is are also factors that appear to be under researched or that use different terminology in representing research purposes and results. For example, research on cultural factors that influence self-determination, including issues related to familial decision making, exists (Shogren, 2011), and is clearly an important factor to consider in building practice frameworks for SDM. Further, research on choice-making opportunities and the impact of restricted opportunities for choice making on the development of decision making skills and self-determination should be considered. Thus, ongoing research and practice strategies are needed to catalogue the contextual factors that influence decision making, as well as how to assess the factors and demands that are relevant for each person and should be considered in the development of individualized systems of supports for decision making that match each person’s specific decision making support needs and preferences, and lead to enhanced self-determination.

Overall, there is general consensus that considering (a) contextual factors relevant to decision making, (b) environmental demands for decision making, and (c) supports needed for decision making is important in the context of considerations related to SDM, and empirical and theoretical literature address each of these areas. Future research is needed to comprehensively bring together research
on decision making and factors that influence it across multiple life domains to inform the development of assessment and interventions that enable each person to engage in supported decision making.

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Use of Video Modeling to Teach Adolescents with an Intellectual Disability to Film Their Own Video Prompts

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Abstract: Self-instruction for individuals with an intellectual disability can be viewed as a pivotal skill in that once learned this skill has collateral effects on future behaviors in various environments. This study used a multiple probe across participants design to evaluate video modeling to teach high school students with an intellectual disability to film their own video prompts which could then be used for self-instruction. Results indicated that three out of four participants acquired the filming behavior and generalized it to a novel setting with a novel model revealing potential for use in video based self-instruction. However, quality of the video (i.e., percentage in-frame) varied across these participants and may impinge upon their ability to learn skills from the video. Implications for practitioners to teach individuals with an intellectual disability to prepare their own self-prompts and carry out self-instruction are discussed.

In many programming models for individuals with an intellectual disability (ID) practitioners often emphasize acquisition of narrowly defined skills for achieving independence (e.g., managing personal hygiene, like washing hands) and accessing general education curriculum (e.g., learning facts related to science content). Broader skills related to communication and social interactions are woven into the curriculum but much of direct instruction focuses on isolated skills that have utility in specific contexts. The value of these skills is a function of how often they will (or will not) be needed in an individual’s current or future environments. Much of this tradition follows a discrete trial training instructional approach which has wide ranging empirical support related to skill acquisition (Leaf & McEachin, 1999).

Educational programming focused on isolated skills may serve a limited purpose for middle and high school students with ID (i.e., their use is heavily restricted by context) and may fail to provide the most useful skills needed for overall independence and success.

For example, if in four years of high school a student with ID learns the range of discrete and chained responses required for working in an office, a garden center, or health club, they will have a strong resume when applying for jobs in very similar environments. They may or may not have acquired skills that generalize far outside of those specific environments or to post-secondary settings depending on the types of skills they learned in those training environments. Continuing the example, repotting plants and pointing a customer to the basil are important skills in a plant nursery, but their utility is limited by that context. Narrow skill sets, even if well developed within a specific context, may unnecessarily limit individuals’ opportunities and post-secondary outcomes. However, more generative programming models exist that promote pivotal skills, whereby the learner acquires responses and response variations that have use across a broad range of contexts. An example of a pivotal skill that would have collateral effects in both secondary and post-secondary environments for individuals with ID is self-instruction.

Wehmeyer and Palmer (2003) noted that students in high school who exhibited more self-determined behavior achieved better post school outcomes one and three years post-
Teaching individuals ways to establish their own self-prompting systems can extend the autonomy achieved through self-prompting alone. Duttlinger, Ayres, Bevill-Davis, and Douglas (2013) examined the use of visual schedules created by the participants themselves to increase task completion. Duttlinger et al. (2013) moved from more traditional applications (e.g., Bryan & Gast, 2000) by teaching participants to use picture symbols to assemble their own schedule and then follow it instead of relying on a teacher provided visual schedule. The participant’s role in managing the self-instruction system therefore increased, and they had less of a need to rely on adults in their environment.

Conceptualizing the process of self-prompting to include a) creating the prompt, b) training an individual to self-prompt, and c) allowing the individual an opportunity to learn from a self prompt; researchers have only begun documenting effective procedures for achieving the last two (Bereznak et al., 2012; Cannella-Malone et al., 2013; Payne et al., 2012). The purpose of the current study was to isolate the first component of this self-prompting sequence, creating the prompt, which was absent from existing research in an effort to evaluate a means to increase independence in self-prompting. With preliminary evidence from these studies documenting effective methods for teaching self-prompting, the attention here focuses on examining a means of teaching students to record their own videos for use in self-prompting. A growing body of literature suggests promise of video prompting via mobile technology as a means of prompt delivery. The current study addressed the question: What effect does video modeling have on acquisition of video recording skills by adolescents with ASD and ID? Answering this particular question can extend the literature by documenting a procedure to teach the first step in video-self prompting.

**Method**

**Participants**

Four high school students between the ages of 16 and 20 years old participated in the study.
All participants attended public high schools in the southeast and were served in self-contained classrooms for individuals with disabilities. Inclusion in the study required the following prerequisite skills: (a) ability to follow multistep directions, (b) fine motor skills to push small buttons and touch icons on an iPhone®, (c) passing scores on most recent vision and hearing tests, (d) ability to maintain attention to a task for at least 10 min, (e) imitation skills, and (f) regular attendance at school. Participant demographics and assessment results can be found in Table 1. None of the participants owned their own smartphone at the time of study, however, Ross and Chandler had previous experience with video modeling via an iPhone® to learn a simple vocational task (Smith, Shepley, Ayres, & Alexander, 2015).

**Settings**

Sessions occurred in each school’s home living center. Joey and Phoebe’s home living center was L-shaped and consisted of two 20 ft × 10 ft areas that contained a small table, sink, refrigerator, stove and oven combination, microwave, dishwasher, cabinets and drawers filled with kitchen dishes and utensils, washing machine, and dryer. Ross and Chandler’s home living center was 50 ft × 15 ft and contained a large conference table, sofa, two refrigerators, stove and oven combination, dishwasher, sink, washing machine, and dryer. This area also contained multiple cabinets and drawers full of various kitchen supplies.

Sessions occurred three to five times each week with at least one hour in between sessions if conducted on the same day. Sessions lasted between 5 and 15 min, depending on the condition. Probes occurred near the microwave. The researcher, a special education doctoral student, stood beside the participant as they navigated the phone and then moved in front of the microwave to perform the task of making popcorn. If present, the reliability data collector, a trained teacher (Joey and Phoebe) or another special education doctoral student (Ross and Chandler), stood behind and to the left of the participant. A camera was set behind the participant and an additional hand-held camera was used to film the participant as they navigated the phone during sessions in which reliability data were recorded via video. All data collectors were able to see each step of the task analysis performed. Video modeling sessions started at the table. The participant was asked to sit down and the researcher placed an iPad® in front of them. They viewed the entire video model at the table and then performed a practice session identical to probe sessions.

**TABLE 1**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Sex</th>
<th>Race</th>
<th>Diagnosis</th>
<th>IQ Score</th>
<th>Adaptive Behavior Score</th>
<th>Autism Rating Score</th>
<th>Communication Anecdotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joey</td>
<td>19.25</td>
<td>M</td>
<td>Caucasian</td>
<td>Williams Syndrome</td>
<td>42&lt;sup&gt;a&lt;/sup&gt;</td>
<td>62&lt;sup&gt;b&lt;/sup&gt;</td>
<td>NA</td>
<td>Social; Spoke in full-sentences</td>
</tr>
<tr>
<td>Phoebe</td>
<td>20 y 7 m</td>
<td>F</td>
<td>Caucasian</td>
<td>Seizure disorder</td>
<td>47&lt;sup&gt;c&lt;/sup&gt;</td>
<td>54&lt;sup&gt;d&lt;/sup&gt;</td>
<td>NA</td>
<td>Social; Spoke in full-sentences</td>
</tr>
<tr>
<td>Ross</td>
<td>16 y 1 m</td>
<td>M</td>
<td>African American</td>
<td>ASD</td>
<td>61&lt;sup&gt;e&lt;/sup&gt;</td>
<td>63&lt;sup&gt;f&lt;/sup&gt;</td>
<td>79&lt;sup&gt;g&lt;/sup&gt;</td>
<td>Rarely initiated; One to two word responses to questions</td>
</tr>
<tr>
<td>Chandler</td>
<td>17 y 6 m</td>
<td>M</td>
<td>Caucasian</td>
<td>ASD</td>
<td>42&lt;sup&gt;h&lt;/sup&gt;</td>
<td>43&lt;sup&gt;i&lt;/sup&gt;</td>
<td>91&lt;sup&gt;j&lt;/sup&gt;</td>
<td>Echolalic statements; One to two word responses to questions</td>
</tr>
</tbody>
</table>

Materials and Equipment

The nature of the study required multiple technology components. The students filmed videos with an iPhone®. They viewed a video model to teach them how to film on an iPad®. The particulars of each are described below.

**iPhone®.** Participants used an iPhone® 4S to film all skills. The camera application was located on the first page, in the second row of applications on the far left of the screen. The phone was set up prior to all sessions to go to the first page and set to take a picture instead of record a video in the camera application. Other specific settings included airplane mode enabled (i.e., so sessions were not interrupted by calls or text massages) and auto-lock set to never.

**Task materials.** Baseline and intervention sessions included the iPhone®, microwave, a bag of microwaveable popcorn, and a trashcan. Generalization sessions included the iPhone®, a single dollar bill, and a vending machine stocked with items. Social validity sessions included the iPhone®, a tabletop laminating machine, a lamination pouch, and a 4 in × 4 in index card. The researchers collected and arranged the necessary materials prior to all sessions.

**Video model.** The video model for how to film was shot using a handheld digital video camera. The videos were filmed using performer’s perspective and showed the researcher’s hands modeling the task of navigating the phone to film a video. Each participant’s lead teacher served as the actor in the video model and performed and narrated all steps to make popcorn. Acting was portrayed through the iPhone® screen as if the performer was recording the video. This video was uploaded to iMovie® to add voiceover narration of the seven steps in the task analysis (see Table 2) as well as two additional statements, “move camera if subject and materials move” and “move closer if you need to see something.” The video was uploaded to an iPad® for viewing. The total duration of the video was 3 min 34 s, however actual steps to navigate the phone only lasted 47 s; the remainder of the time was the actor making microwaveable popcorn.

**iPad®.** The researchers used an iPad® 2 to display the video model showing students how to film. The video was stored in the Video Library application. The researcher selected the video and placed the iPad® in front of the participant prior to the video modeling sessions. Once the participant was seated, the researcher told the participant to “watch this video” and pressed play. The iPad® was used in vertical screen as it allowed for maximum view of the targeted task.

### Table 2

<table>
<thead>
<tr>
<th>Step</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Push home button</td>
<td>Use finger or thumb to press home button on iPhone®; correct when lock screen displays</td>
</tr>
<tr>
<td>2. Slide to unlock</td>
<td>Use finger or thumb to swipe screen from left to right; correct when home screen displays</td>
</tr>
<tr>
<td>3. Touch camera icon</td>
<td>Use finger or thumb to touch camera icon on home screen; correct when camera application opens</td>
</tr>
<tr>
<td>4. Slide switch to video</td>
<td>Use finger of thumb to slide switch in bottom right corner from camera icon to video icon; correct when record button turns red</td>
</tr>
<tr>
<td>5. Press record</td>
<td>Use finger or thumb to touch red record button; correct when sound beeps and time starts counting up</td>
</tr>
<tr>
<td>6. Put shot in-frame</td>
<td>Move phone to get part of actors hands and materials in-frame; correct if recording and served as actors cue to start performing skill</td>
</tr>
<tr>
<td>7. At end of skill, press record</td>
<td>When the actor says “I’m finished,” use finger or thumb to press red button; correct when sound beeps and time stops</td>
</tr>
</tbody>
</table>

Response Definitions and Data Collection

The target skill of filming a video using an iPhone® was task analyzed into individual
steps (see Table 2). Across all conditions, participant responses to each step of the task analysis were scored as correct or incorrect. A response was scored as correct if the participant engaged in the correct topography of a specific step within the total allotted time (i.e., 1 m 45 s). The total allotted time was based on 5 s to initiate each step and 10 s to complete each step after initiation (i.e., 15 s per step for seven steps). Steps were scored as incorrect if the participant engaged in an incorrect topography, if the participant did not respond for a consecutive 30 s, made consecutive errors for 30 s, or the total allotted time elapsed. Researchers provided general praise for correct responding in all conditions (e.g., “Great!”) and incorrect responses were ignored.

Correct responses were divided by the total number of steps and multiplied by 100 to report a percentage of steps correct. Although percentage of video in-frame was not a dependent variable, it was assessed post-hoc and reported because it reflects a level of usability for what participants produced. Researchers watched the video created by the participant and data were collected on percentage of steps in-frame. A correct in-frame response was defined as the beginning and end of each step including part of the actor’s hand and part of the critical materials. If a step involved pressing a button, a correct response was scored if the print on the specific button was readable (e.g., video should clearly read “START” on the microwave button when pressing the start button). The total number of steps in-frame were divided by total number of steps in the task analysis performed by the actor and multiplied by 100 to report a percentage of steps in-frame.

Experimental Design and General Procedure

The study used a multiple probe across four participants design (Gast & Ledford, 2014) to evaluate the effects of video modeling to teach participants to film a video using an iPhone®. With this design, the independent variable (i.e., video modeling) was sequentially introduced across participants to experimentally demonstrate inter-subject replication. Researchers conducted three to five sessions each week, with a maximum of three sessions in a single day and a minimum of one hour between sessions. After the first VM session in which a participant reached 100% correct, the remaining participants were baseline probed and VM was introduced to the next participant. Criterion for mastery was 100% correct during three VM sessions. After reaching criterion, maintenance probes were conducted every fifth session until all participants reached mastery.

Natural opportunity probes. All sessions (both baseline probes and VM sessions) were conducted using natural opportunity probes (NOP). A NOP began with the task direction, “Film me <insert task>” (e.g., “Film me making popcorn”), while handing the participant an iPhone®. The task analysis to navigate the iPhone® to film a video was seven steps; participants had a total of 1 m 45 s to complete the target skill (i.e., 5 s to initiate and 10 s duration per step). However, this does not include the acting time. General praise (e.g., “Great”) was provided contingent on correct responses, incorrect responses were ignored, and no additional prompting was provided. A session ended when (a) a participant did not engage in a correct step for 30 s, (b) the participant stated he or she was finished, or (c) the total session time ended.

Baseline/Probe Conditions

Prior to viewing the video model, researchers collected data on participants’ ability to film a video using an iPhone®. Baseline sessions were implemented using a NOP (described above). Baseline data were collected for a minimum of three sessions or until data represented a contratherapeutic or zero-selerating trend. Baseline performance was assessed on an average of every five sessions or when a previous participant initially reached 100% steps correct.

Video Modeling

Each session in intervention began with a cold probe, similar to a simultaneous prompting procedure (Wolery, Ault, & Doyle, 1992). This probe was identical to a baseline probe and results counted towards criterion. If a participant performed less than 100% correct on the cold probe, the video model was played for the participant. To view the video model of
the target behavior, the researcher asked the participant to sit down at the table, placed the iPad® in front of the participant, said, “Watch this video,” and pressed play. After viewing the video model, a practice session was conducted identical to a baseline probe. Practice session data did not count towards criterion and are not represented on the graph.

Maintenance and Generalization

A maintenance condition was introduced to assess participants’ ability to maintain a previously obtained skill without video support. Maintenance probes were identical to baseline sessions. Researchers assessed maintenance on the average of every five sessions until all participants reached mastery in the video modeling condition. After reaching criterion, participants were assessed for generalization of the task. A novel researcher asked the participant to film them using the vending machine (see task analysis in Table 3). This task was performed in the hallway of each participant’s school. The target skill was identical to baseline and cold probe video modeling sessions, following the same task analysis outlined in Table 2.

Reliability

A second observer collected reliability data on the dependent variable to calculate interobserver agreement (IOA) and on the researchers’ behavior to calculate procedural fidelity (PF) for an average of 32% of sessions. IOA was calculated using the point-by-point method, in which number of agreements was divided by number of agreements plus disagreements and multiplied by 100 (Ayres & Ledford, 2014). Agreement across data collectors was 100% in baseline, intervention, maintenance, and generalization sessions. It should be noted that Joey did not participate in maintenance or generalization sessions. Specific IOA data, by participant and condition, are located in Table 4.

PF data were collected on the following researcher behaviors: (a) no additional prompting provided, (b) general praise for correctly...
performed steps, (c) phone set up correctly (i.e., screen locked, set to main screen, and camera set to take a picture), (d) correct task direction provided, (e) NOP implemented correctly (i.e., given 1 m 45 s to complete task unless error as described in NOP section), and (f) correct task materials available. Researchers calculated PF data by dividing total number of observed behaviors by number of planned behaviors and multiplying by 100. Mean PF was 99.1% (range 83.3–100%) across all conditions and participants. The only procedural error made during the study consisted of the phone not being set up correctly (i.e., phone was not set to the main screen, so when the participant slid the unlock button, he was already in the camera application). Specific PF data are located in Table 4.

Social Validity
At the completion of the study, participants completed a four-item survey related to using the iPhone®. Questions were: (1) Did you like working with the iPhone®?; (2) In the future, would you like to use the iPhone® to help you learn new skills?; (3) When learning new skills at school, would you rather work with your teacher or alone with the iPhone®? and; (4) When learning a new skill in the community, would you rather work with your teacher or alone with the iPhone®? All questions were read aloud to the participants, along with the two answer choices. Participants either circled their answer on the typed survey or provided a verbal response.

Researchers were also interested in participants’ ability to learn a novel skill from their own video models. Participants were initially screened on their ability to use a laminator to laminate a small card using a NOP (see task analysis in Table 3). After a single baseline session, participants filmed the researcher completing the task. While completing the task of laminating, the researcher narrated the steps aloud. The participant was then probed on the skill again after at least three days. This second probe was used to identify any change in acquisition from simply viewing the skill while filming. Following this probe, the researcher instructed the participant to watch the video they filmed a few days prior. The same NOP procedure was then used to assess acquisition of the laminating skill after watching their video model.

Results

Video Modeling
Figure 1 depicts data on the primary dependent variable. Overall, the results from the study show three demonstrations of effect at three points in time (i.e., baseline to intervention for Phoebe, Ross, and Chandler) indicating a functional relationship between video modeling and acquisition of steps to film a video using an iPhone®. Researchers collected at least three sessions of baseline data for all participants at the start of the study. Video modeling instruction began for Joey after his fourth baseline session. Participants in later tiers of instruction participated in baseline sessions intermittently until their time

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### Table 4

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<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Intervention (VM)</th>
<th>Maintenance</th>
<th>Generalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%Age of Sessions</td>
<td>Mean IOA</td>
<td>Mean PF</td>
<td>%Age of Sessions</td>
</tr>
<tr>
<td>Joey</td>
<td>25%</td>
<td>100%</td>
<td>100%</td>
<td>25%</td>
</tr>
<tr>
<td>Phoebe</td>
<td>20%</td>
<td>100%</td>
<td>100%</td>
<td>33%</td>
</tr>
<tr>
<td>Ross</td>
<td>33%</td>
<td>100%</td>
<td>100%</td>
<td>33%</td>
</tr>
<tr>
<td>Chandler</td>
<td>25%</td>
<td>100%</td>
<td>91.7%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Note. VM = Video Modeling, IOA = Interobserver agreement, PF = Procedural fidelity
to begin video modeling instruction. All participants maintained stable zero-celerating baseline data across initial consecutive baseline sessions and intermittent baseline sessions prior to starting video modeling instruction. It should be noted that all participants could perform at least two of the seven steps of the task analysis in baseline. They all knew how to press the home button of the iPhone and slide the screen to the right to unlock and open the home menu.

Joey received four sessions of video modeling instruction. The first three sessions did not show a change in level or trend, therefore on the fourth session, the researcher added a verbal prompt during the video model. The

Figure 1. Performance data for all participants.
verbal prompt included the researcher pausing the video after each step in the video model, restating the previous step (e.g., “Slide to record”), then asking Joey, “What did they just do?” Once Joey correctly repeated the step directive back, the researcher played the video. This process was repeated for all seven steps of the task analysis. Joey demonstrated no change in performance from the baseline condition to the video modeling condition, therefore the researchers decided to teach the skill using error correction and verbal prompting during repeated practice sessions. Ethically the researchers felt they could not continue to use a strategy that was not effective for Joey. Joey completed 100% of steps for one session, then researchers did not conduct any additional sessions with Joey.

Video modeling instruction for the remaining participants began after each participant in the preceding tier of instruction reached 100% correct responding for one session. Across conditions, there was not an immediate shift in level after the introduction of the independent variable, however video modeling data were consistent across the remaining participants, with an accelerated therapeutic trend to reach criterion. Phoebe’s data were variable but accelerating, reaching 100% correct after nine video modeling sessions and mastery after 12 sessions. Performance maintained at 100% correct after 2 weeks from Phoebe’s last video modeling session (session 22) to her first maintenance session (session 27). One week after her first maintenance session Phoebe’s data dropped to 29% correct. During this session, Phoebe performed the first two steps, and then swiped the screen to the left bringing up the Search screen on the iPhone®. Phoebe did not return to the home menu therefore she did not respond for a consecutive 30 s, ending the session.

Ross and Chandler’s data both demonstrated stable accelerating trends in a therapeutic direction following implementation of the independent variable. They reached mastery after nine and six sessions respectively. Maintenance was assessed 1 week after mastery for both participants, with Ross performing 86% of steps correctly (i.e., he did not press the record button to end the video when the actor was finished) and Chandler maintained performance at 100% correct. All participants were able to generalize recording a video of a novel task across settings and actors at 100% correct responding.

In-Frame
Grey bars in Figure 1 depict in-frame data. No participant was able to record a video with the iPhone® during the baseline condition. After three to five sessions of video modeling instruction, Phoebe, Ross, and Chandler recorded a video. Percentage of steps in-frame for recorded videos throughout the video modeling condition varied across participants. Phoebe’s data indicated a variable accelerating trend with an average of 39% of steps recorded in-frame (range 0–68%) between sessions 15–25 (i.e., sessions during which she first recorded a video to when she reached mastery of the target skill). Additionally, Phoebe had two sessions in which she did not record a video (sessions 18 and 20). When Phoebe recorded a video in maintenance sessions, she averaged 67.5% of steps in-frame and during her generalization session, she filmed 100% of steps in-frame. Ross’s in-frame performance was slightly variable with a range of 0–68% (mean of 35%) throughout the sessions between his first recorded video and target skill mastery (sessions 23–28). Both his maintenance and generalization sessions fell within this range, with 28% and 40% in-frame respectively. Chandler’s data demonstrated a decelerating trend from his first recorded video session to mastery of target skill (sessions 28–31) with a range of 35–78% (mean 56%). Chandler’s maintenance session fell in range with 67% of steps in-frame, however his generalization session dropped to 20% of steps in-frame. The actor in Chandler’s generalization session was a preferred teacher and Chandler often stared at her feet. Eighty percent of the video he recorded in the generalization session was of the actor’s feet. Eighty percent of the video he recorded in the generalization session was of the actor’s feet. All participants maintained a percentage of recorded steps higher than their average during video modeling instructional sessions in their final maintenance sessions.

Social Validity
All participants reported enjoying using the iPhone®, and all except Phoebe were inter-
ested in using the iPhone® in the future to learn new skills. All of the participants who completed the study reported to prefer using the iPhone® alone to work at school and in the community, as opposed to a teacher instructing them. Joey reported a preference for teacher instruction both at school and in community settings.

To briefly assess the functionality of the student created videos, the researchers conducted a brief assessment to see if participants might be able to learn a novel skill from a video they created. During baseline, Phoebe, Ross, and Chandler did not know how to complete any of the steps required to laminate a notecard. The videos they shot ranged from 40 to 100% in-frame. When probed again to see if they acquired any steps from simply viewing a live model, no participants increased from their baseline performance. After viewing the student-created video one time, Phoebe, Ross, and Chandler increased to 50%, 80%, and 100% correct responding. Table 5 contains individual information on social validity results.

### Discussion

This was the first study that examined a systematic way to teach individuals with a disability the pivotal skill of creating their own instructional prompt. This first step of self-instruction is essential in decreasing reliance on other instructors to acquire new skills and can be used in various environments and with a variety of people and materials. The more individuals with ID can do for themselves the more autonomy and control they have over their learning. This increase in self-determination will lead to better post-school outcomes across many transition relation domains (e.g., employment, independent living).

Results of this study suggest that with systematic instruction, specifically video modeling, individuals with ID can learn to create their own video prompts. In past work, researchers arranged pictures in a book (Frank, Wacker, Berg, & McMahon, 1985; Wacker, Berg, Berrie, & Swatta, 1985), recorded audio of a step-by-step task analysis (Steed & Lutzker, 1999; Trask-Tyler, Grossi, & Heward, 1994), and filmed video models (Bereznak et al., 2012; Kellems & Morningstar, 2012; Mechling & Seid, 2011) prior to teaching participants to use the prompts to instruct themselves. Any form of self-instruction reduces the need for outside support from other people, thus increasing an individual’s independence while saving instructor resources. Results from this study suggest that with systematic instruction (i.e., video modeling) individuals with ID can learn to create their own video prompts using an iPhone®. Although the process of students creating their own prompts needs further evaluation, particularly given the poor in-frame results, this evidence expands the benefits to self-instruction for individuals with ID in that they become more self-determined.

### Limitations

This study had several limitations related to task analyzing steps to film a video with an iPhone® and generalization of the skill. Although in-frame was assessed post-hoc, it was not targeted in the overall acquisition of the skill. Future research should embed this criti-
cal component as a step in the task analysis to film a video, as this step may be necessary when persons with ID use their own videos to learn a novel skill, particularly when the actor performs a task that requires movement and/or multiple objects. This also may help address situations in which competing stimuli (e.g., actor’s feet) in the environment are not required to be in-frame for the targeted skill.

In the video model, researchers could have drawn more attention to the discriminative stimuli from one step to another step, particularly where Joey plateaued (i.e., step 4). This change in stimuli, the record button turning from black to red, may not have been salient enough in the video model, especially since all other stimuli remained the same, meaning Joey could still see people and objects moving within the frame. Additionally, the researchers did not address how to troubleshoot in the event a learner pressed an incorrect button (e.g., Phoebe swiping left to the Search screen). By adding a step in the task analysis to press the home button to return to the iPhone® main menu, learners would know how to solve many problems that may arise when using Apple mobile technologies.

Generalization of the filming skill was assessed in one session towards the end of the study, however this does not provide reliable evidence that participants generalized the skill. The researchers could have continued to assess generalization throughout the study by asking participants to film various tasks across different environments using novel actors. Since the steps to film a video would remain the same, this change in study design would provide stronger evidence that individuals with ID can learn to create their own video prompts through the use of video modeling.

**Implications for Practice and Future Research**

If instructors and caregivers teach individuals with ID to create their own prompts, these learners may be able to acquire novel skills completely independent of others. In comparison to teacher- or parent-created video models, the time to create the prompts and the skills learned using student shot films might take more time and sessions to acquire, however the resources saved assisting the individual with a disability increases independence and could arguably outweigh the efficiency of instruction. Future research should evaluate if persons with ID can acquire novel skills after viewing self-created video prompts, particularly for students who have poor in-frame percentages. Furthermore, practitioners may save time by teaching learners with ID to locate readily available video prompts (e.g., YouTube clips) in lieu of creating their own video, as this may not always be an option in environments where a colleague or peer is not available to act (e.g., unclogging the sink in an apartment when your roommate is not home or does not know how). Regarding the in-frame component of filming a video, researchers may want to evaluate quality of the video required to acquire a new skill. For example, if the actor is narrating his or her behaviors while modeling them, perhaps being out-of-frame will not affect acquisition of the novel skill. Lastly, once individuals with ID have acquired the behavior of creating their own prompts, instruction on when the skill is necessary may be required. This specifically involves teaching the individual to discriminate when they do and do not know how to perform a task and asking to film a video if they do not.

**References**


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Use of a Creative Dance Intervention Package to Increase Social Engagement and Play Complexity of Young Children with Autism Spectrum Disorder

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Abstract: Play skills are central to development of children’s language and cognitive skills. However, social, symbolic, and object play skills of children with autism spectrum disorder (ASD) are frequently impaired. This study examined the effects of a strategy that utilized preferred play materials, antecedent creative dance activities, and priming of complex play with preferred play materials within dance activities on play behaviors of children with ASD during learning centers in inclusive preschool classrooms. Measured play skills included social play, specific social play levels, and play complexity. The strategy was successful in increasing skills in all three areas. However, skill maintenance was limited.

Children with autism spectrum disorder (ASD) frequently display delays in social skills as well as unusual or repetitive behavior (American Psychiatric Association, 2013) and in early childhood, these core deficits are frequently seen during play. Play skills of children with ASD are often severely impaired (Rogers, 1998) and when compared to their peers without disabilities, qualitative differences, as opposed to delays alone, are seen in both object and symbolic play (Lam & Yeung, 2012; Williams, Costall, & Reddy, 1999; Wulff, 1985). Additionally, play behavior of children with ASD is more likely to involve repetitive or stereotyped behaviors (Honey, Leekam, Turner, & McConachie, 2007). However, children’s play has been demonstrated to increase language, motor, and cognitive skills and is central to peer interactions (Bruner, 1986; Parten, 1932). A recent longitudinal study of children with autism found that children with ASD who received intervention targeted at increasing symbolic play demonstrated significantly greater language and cognitive skills at five-year follow-up when compared to children with ASD who were assigned to a control group. In addition, the complexity of play attained by the intervention group during treatment was a significant predictor of functional language skills (Kasari, Gulsrud, Freeman, Paparella, & Hellemann, 2012). Given the importance of play in skill development and the likelihood of play impairment in children with ASD, intervention to increase play skill development in children appears critical to positive outcomes. Moreover, determination of existing play skills is central to such intervention.

Measuring the quality of a child’s play for the purpose of monitoring progress made in intervention can be accomplished through assessment of length of child engagement in play activities and assessment of level of play sophistication (William & Casey, 2008). Engagement is defined as “time children spend interacting with the environment in a developmentally and contextually appropriate manner” (William & Bailey, 1995, p. 123) and is widely viewed to be necessary for learning (McCormick, Noonan & Heck, 1998; Raspa, McWilliam, & Ridley, 2001). Children with ASD typically display lower levels of play engagement than their peers with and without other developmental delays (Wong & Kasari, 2012) and in the absence of intervention to increase engagement during play, may miss critical learning opportunities in early childhood.

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classrooms. In addition to time spent engaged in play, social levels and complexity of play are important aspects of play quality (Linder, 2008; Parten, 1932). Parten’s levels of social play includes solitary play, onlooker behavior, parallel play, associative play, and cooperative play (Parten, 1932). Parallel play was considered by Parten to be a bridge between non-social and social play (Saracho & Spodek, 2007). In 1980, Howes developed an alternative taxonomy of social play that focuses on the complexity of children’s social interaction and the degree to which their activities are organized. This scale, the Peer Play Scale, consists of (a) simple play, (b) parallel play, (c) parallel aware play, (d) simple social play, (e) complementary play with mutual awareness, and (f) complementary social play (Howes, 1980). A study using the Peer Play Scale (Howes & Matheson, 1992) found that the proportion of parallel play decreases with age but parallel aware play does not. Definitions of play complexity are numerous, but the scales commonly used include interpersonal, exploratory/sensorimotor, functional-relational, constructive, dramatic, games-with-rules, and physical/rough-and-tumble play (Linder, 2008; Piaget, 1962; Smilansky, 1968). Dramatic or symbolic play in particular has been identified as important in emotional and cognitive development (Linder, 2008; Piaget, 1962). Although levels of social play and play complexity can be seen as hierarchical, all remain important throughout childhood and each serves a role in development of cognitive, motor, communication, and social skills (Linder, 2008). Therefore, ensuring child utilization of a variety of play levels is important. There are several empirically validated strategies for increasing social play engagement and play quality, including the use of preferred play materials, priming, and creative movement and dance activities.

**Study Interventions**

**Preference**

Toy preference has been shown to be important in the development of intervention targeting increased play engagement. Children are significantly less likely to engage in play when presented with nonpreferred materials (Reinhartsen, Garfinkle, & Wolery, 2002). However, allowing a child to choose his or her own play materials and making those materials available for play is associated with increased subsequent engagement and decreased inappropriate or unengaged behavior (Carter, 2001; Reinhartsen et al. 2002). Additionally, an engagement-based preference assessment that involves both developmentally-oriented items and assessment of quality of engagement with stimuli has been shown to be an effective guide for selection of reinforcers for children with autism. Such developmentally-oriented materials help prevent child interaction with materials solely for sensory purposes (Keen & Pennell, 2010). Therefore, consideration of quality of child engagement with chosen materials, in addition to assessment and incorporation of child choice, is important to promotion of engagement, play, and learning.

**Priming**

In teaching play behaviors to children with ASD, interventions that use modeling have been demonstrated to be effective at sustaining long-term behavior change (Stahmer, Ingersoll, & Carter, 2003) and may increase the child’s motivation for playing with varied objects (Leaf et al., 2012); however, the time and structure involved in such interventions may be prohibitive in inclusive classrooms unless they can be incorporated into classroom routines. Priming is an intervention technique in which modeling and exploration of the desired skill is conducted in a high-reinforcement, low-demand condition prior to the context or activity in which the skill is expected to be demonstrated (Bainbridge & Myles, 1999; Zanolli, Daggett, & Adams, 1996). Through priming, children can be familiarized with educational materials prior to activities (Wilde, Koegel, & Koegel, 1992). The use of priming in inclusive settings to teach various social skills to children with ASD has support in current research. It has been used to increase initiations with peers (Gengoux, 2009; Zanolli et al., 1996) and increase toy sharing (Sawyer, Luiselli, Ricciardi, & Gower, 2005). However, selecting a context for priming within natural preschool routines may be difficult.
Creative Dance

Creative movement activities are frequent components of preschool educational settings and can thus serve as contexts for priming and subsequent embedded instruction. Additionally, activities incorporating music and physical activity have been shown to provide distinct benefits to children with ASD. Approximately 8-12% of all school-based interventions for children with ASD involve music-based activities and therapies (Hess, Morrier, Heflin, & Ivey, 2008; Srinivasan & Bhat, 2013) and rhythmic and whole body movements have been identified as critical elements of musical experiences with young children with ASD (Srinivasan & Bhat, 2013). Much of what is known and practiced in dance intervention with children with ASD has come from the field of dance/movement therapy (DMT). In DMT, movement, body awareness, dance, and relaxation techniques are used to facilitate developmental changes (Tortora, 2006). Group creative dance therapy sessions with children with autism typically begin with a warm-up phase where children begin to feel comfortable with each other. The next phase includes thematic dances that can include embedded concepts, motor development, and social skills. The final period brings closure to the session and assists children to relax and settle after the activities. Throughout, there is attunement with the emotional level of the child and assistance with state regulation as needed (Devereaux, 2012). In a study of social competence and young children with ASD, dance therapist Greer-Paglia (2006) compared use of creative dance activities with traditional circle time activities and found the social competence performance gap between verbal and non-verbal children with autism was less in the creative dance condition than in the circle time condition. In addition, the results of her study supported the efficacy of creative dance activities in assisting children with autism to develop social skills within school programs.

Study Rationale and Research Questions

While priming and use of preferred toys have been demonstrated to be effective strategies for increasing engagement with children with ASD, and creative dance activities are natural and advantageous contexts for intervention, there is limited quantitative research into the effectiveness of group dance/movement interventions with children with ASD (Devereaux, 2012; Martin, 2014). There is also limited research on the combination of the three elements and particularly, the role antecedent dance activities that include priming might play in increasing social play engagement and complexity. Given the deficits in play skills and subsequent development seen in children with ASD, it is important to investigate how higher level and increased variety of play skills can be facilitated naturally within inclusive preschool activities and play centers. The purpose of this study was to evaluate the effectiveness of an intervention package that included priming of social play and more complex use of preferred toys within creative dance activities on increasing quantity and quality of engaged play of young children with ASD within subsequent free-choice play or “learning” centers. Specific research questions asked were: (a) When social and more complex uses of preferred items are primed in a creative dance activity that is followed by placement of the items in learning centers, is there an increase in social play of young children with ASD within learning centers? (b) When social and more complex uses of preferred items are primed in a creative dance activity that is followed by placement of the items in learning centers, is there an increase in the sophistication of social play levels within the learning centers? and (c) When social and more complex uses of preferred items are modeled or primed in a creative dance activity that is followed by placement of the items in learning centers, are there changes in complexity of play levels within the learning centers?

Method

Settings

All sessions occurred during large group and free-choice learning center activities in three different inclusive public preschool classrooms located within an early childhood program in a metropolitan school district. All classrooms enrolled children with and without disabilities between 3 and 5 years of age and had developmentally-appropriate learning centers.
and activities within the curriculum. The classes had approximately 16 children each and the majority of the children were typically developing. The classes each had one lead teacher with a Childhood Development Associate (CDA) license and one teaching assistant. In addition, an early childhood special educator consulted in each of the classroom and was often present during study phases. Preschool sessions were each one half day in length. Two of the children attended an afternoon session and one child, a morning session. In two of the classes, sessions opened with play on the rug as all children arrived followed by a large group circle time. In the third class, circle was at the beginning of the session. In all classes, circle time was followed by a 45 minute learning center time that consisted of four to five thematic, developmentally appropriate learning centers that children freely rotated among.

Participants

Three preschool-aged children identified by preschool staff as having difficulty engaging in free choice activities in the preschool classroom participated in this investigation. Each child had an Individualized Education Plan (IEP) with special education and related services provided in the preschool classroom as well as (a) a formal diagnosis of ASD obtained by a physician, or licensed psychologist, or (b) identified as having characteristics of ASD by the participant’s school education team. Participants were free of visual or hearing impairments not already corrected with assistive devices such as glasses or hearing aids. In addition, none of the three was identified as having delays in gross motor skills.

Participant 1 “Latisha” was a 4-year-old African American female identified as having developmental delays and ASD. She was diagnosed as having ASD at age 3. She was in her second year of preschool and attended preschool four days per week. She had no outside services. Latisha had limited expressive language, although at times, repeated sentences in immediate or delayed echolalia. She could follow simple verbal directions given to her by her teachers. During baseline, Latisha would engage in select learning centers such as the sand and water table but play within learning centers was mostly repetitive in nature. Her primary level of play was solitary and she would move away if other children joined the learning center. Latisha frequently disengaged from center activities and moved to the periphery of the room where she would watch other children or engage in self-stimulatory activities such as rubbing her sweater.

Participant 2 “Mason” was a 3-year-old Caucasian male in his first year of a three day per week preschool program. He had been identified as having ASD at age 2 and was classified as having developmental delay. At the time of the study, he did not have outside services. Mason could say many single words and some sentences but they were not used in a contextually appropriate manner. He had significant difficulties in social communication and reciprocity. At the onset of the study, Mason did not participate in class activities and would move to an isolated part of the room and engage in self-stimulatory activities such as twirling beads in front of a mirror. During learning center time, he would engage with sensory toys but would move away if other children approached.

Participant 3 “Landon” was a 4-year-old Caucasian male in his second year of preschool which he attended three days per week. He had no additional services. Landon was identified as having ASD at age 2 and his preschool classification was developmental delay. He had significant delays in all developmental areas except for the motor domain. For the most part, with the exception of very occasional single word utterances, Landon’s speech was not intelligible. Over the baseline phase of the study, he did not participate in class activities without significant adult prompting. During learning center time, Landon frequently engaged in repetitive, sensory behaviors and often left the learning center area to engage in behaviors such as flipping the lid of the trash bin. If involved in a favored sensory center, he did not move away from peers who joined the center, but also, did not acknowledge their presence or reference what they were doing.

Interventionist

A licensed early childhood special education teacher, who was a researcher on this project, provided intervention for all participants. The
interventionist had a graduate degree in early childhood special education and was a licensed and experienced teacher of children with ASD. In addition, she had extensive experience as a creative dance educator with young children with a variety of disabilities. The interventionist led the creative dance activity and prompted participating children to enter learning centers. She did not have prior experience with any of the participating children.

**Experimental Design**

A multiple-baseline probe design across participants was used to assess the effects of the intervention strategy on social play quality in free choice activity centers for preschool children with ASD. In a multiple-baseline design across participants, the investigator sequentially applies an intervention across several participants. Experimental control is demonstrated when there is a change in level and trend of the dependent measure contingent on the staggered introduction of the independent variable (Gast & Ledford, 2010). Kazdin (1982) asserted this design is well suited for situations in which reversal of behavior is unlikely and where maturation could be a potential confound. Baseline data probes were used to measure performance across participants prior to the introduction of intervention. Daily intervention probes were used to evaluate the impact of the intervention. Intermittent probes of post-intervention behavior served as maintenance checks to determine if experimental effects were durable over time. The independent variables were preferred items placed in learning centers, ten minute creative dance activities, and priming of social and more complex use of preferred items within the dance activities. Examples of preferred play materials and priming activities are included in Table 1.

**Measurement**

Dependent measures were (a) percent of engaged time participants engaged in social play as measured in 15 second intervals, (b) percent of engaged time participating children were involved in the various social levels of play as measured in 15 seconds intervals, and (c) percent of engaged time participating children were involved in various levels of complexity of play as measured in 15 second intervals. Operational definitions of the dependent measures of social play and play complexity are included in Table 2.
TABLE 2

Definitions of Social Play and Play Complexity Levels

Categories of Social Play (Modified from Parten, 1938 and Howes, 1980).
1. **Solitary play.** Child plays alone and independently with toys, does not reference what other children are doing.
2. **Onlooker behavior.** Child spends most of the time watching others play, may talk to observed children but does not overtly enter the play. He stands or sits within speaking distance of the group.
3. **Parallel play with social awareness.** Child plays independently, but activity brings him among other children, plays with toys that are like those of other children and in a similar manner. He does not try to modify or influence the activity of the other children. He plays within one foot of other children and references what they are doing. He does not attempt to control the comings or goings of children in the group but does acknowledge them. Parallel play is not counted if child does not look at other children or reference what they are doing at least once in interval.
4. **Associative play.** The child plays with other children. Conversation concerns the common activity with borrowing and loaning of play material. Children engage in similar activity but there is no division of labor and no organization of the activity around any goal or product.
5. **Cooperative play.** The child plays in group organized for the purpose of making a material product or to obtain a competitive goal, or of dramatizing situations or playing formal games. There is a division of labor, taking of different role members, and organization or activity so that the efforts of one child are supplemented by those of another.

Complexity of Play (Linder, 2008).
1. **Interpersonal play.** Visual and vocal exchanges, imitation of facial expressions and rhythmic body movements.
2. **Exploratory/sensorimotor play.** Mouthing, looking, touching, or repeating an activity in repetitive fashion. Child appears to engage in action because he/she likes the sensations received from this action.
3. **Functional-relational play.** Child uses objects for purposes for which they were intended (using comb for combing hair, rolling a ball). In relational play, child combines objects that are functionally related such as a car and driver, and bowl and spoon.
4. **Constructive play.** Manipulation of objects for the purpose of constructing or creating something. There appears to be an end goal and objects are transformed into new configurations.
5. **Dramatic play.** Child pretends to do something or be someone. Child may pretend with real objects, substitute objects, or without objects.
6. **Games with rules.** Child plays in an activity with accepted rules, limits, and expectations. It can be a standard or made up game.
7. **Physical activity and rough and tumble play.** Play might be boisterous or physical involving running, jumping, chasing, fleeing, and wrestling. It does not include aggressive behaviors such as closed fisted hits, shoves, and kicks.

materials in a developmentally and contextually appropriate manner or interacting with peers in the center. Therefore, manipulation of play materials in a manner solely self-stimulatory and not developmentally or contextually appropriate was not counted as engaged time. Acting-out behaviors such as hitting, having tantrums, or crying were also not counted as engaged time. Social play was counted when the 15 second interval primarily consisted of (a) contextually appropriate play within one foot of another child throughout the interval and looking at peer(s) and regarding their play at least once in the interval, (b) associative play, or (c) cooperative play. Computation of social play was an aggregation of parallel play with awareness, associative play, and cooperative play. Levels of play were modified from the scales of Parten (1932) and Howes (1980) and included solitary play, onlooker behavior, parallel play with awareness, associative play, and cooperative play. The decision to use Howes’ category of parallel play with awareness was made because children with autism may play alongside other children without acknowledging their presence or otherwise referencing what they are doing. Therefore, if the child failed to look at peers and/or their
play materials, the interval was counted as solitary play and not included in social play computation. Levels of complexity of play (Linder, 2008) included (a) interpersonal play or play involving face-to-face interactions, social games, or routines (b) exploratory/sensorimotor play (c) functional-relational play (d) constructive play (e) dramatic play (f) games with rules play, and (g) physical activity and rough and tumble play. In addition, data were taken on levels of prompting participating children needed in order to enter learning centers and types of errors encountered.

Data Collection and Analysis

Data collection. A tablet computer-based data collection system (Nexus 7) using a custom software application (AEN Software; Nelson & Nelson, 2013) was used for data collection. The software stamped the time in which data was entered allowing for point-by-point reliability between data collectors. After each session, data were uploaded to a database and reports generated using (Microsoft SQL Server with Reporting Services).

Data were collected on-site during baseline, intervention, and maintenance sessions. The first screen of the data collection system contained a list of prompts from least to most intrusive that were used by the interventionist to assist participants to notice and enter learning centers. Data collectors tapped on each prompt as it occurred. If a partial physical prompt was given and the child still did not engage within a center or moved away before the prompt, an error icon was tapped and a screen appeared with the following error choices: no response, aggression, hovering, or moving away. When a participant entered a learning center and engaged within it, the data collector touched an icon on the tablet computer that activated a timer to record engagement time. Once the engaged icon was selected, an audible beep sounded every 15 seconds and a divided screen appeared. The first column listed level of social play primarily used by the participant in the interval. The second column listed complexity of play used primarily by the participant during the interval. Data collectors clicked on one icon in each column that best described the child’s primary play level during each 15 second interval. When the participating child disengaged, the data collector touched an icon that stopped the timer.

Data analysis and interpretation. The percentage of each observation spent engaged in contextually appropriate play behaviors and the dependent measure of social play were plotted on a multiple baseline graph. Data on social play were examined by visual analysis for changes in level, latency of change between phases, and changes in trend within phases. Engaged time and social play are presented on the same graph because social play was computed as a percentage of engaged time. However, study phase changes were made based on data on social play. Dependent variables of specific levels of social play and complexity of play were analyzed by frequency and mean percentages of their occurrence across conditions were compared.

Inter-observer agreement and treatment fidelity. Two observers, an assistant professor in early childhood special education and a doctoral student in early childhood special education collected data simultaneously on-site during at least 20–25% of all baseline, intervention, and maintenance conditions for each participant. Training was conducted by the first author of the study. Prior to the study, the observers practiced with the devices in a classroom until they reached 80% agreement. Inter-observer agreement was computed as the number of agreements divided by the number of agreements plus disagreements and multiplied by 100. All dependent measures were included in the reliability measures and a tolerance of five seconds (plus or minus two and one half seconds) was set as an acceptable level of agreement for each event. The mean of inter-observer agreement measures for each child is reported here. If agreement data were only collected once during a given phase, the mean of measures for that data point is reported; otherwise, a mean range is provided. Mean agreement for Latisha across all phases was 89% (mean in baseline = 98%, mean across interventions = 83%, mean range = 80–86%, mean in maintenance = 96%). Mean agreement across phases for Mason was 93% (mean in baseline = 83%, mean range = 81–88%, mean across interventions = 91%, mean range = 86–95%, mean in maintenance = 85%). Mean agreement across phases for London was 97% (mean in baseline = 90%, mean
range = 83–97%, mean across interventions = 96%, mean range = 95–97%, and mean in maintenance = 100%).

The degree to which study procedures were implemented as planned was calculated by dividing the number of interventionist behaviors exhibited by the number of planned interventionist behaviors and multiplying by 100. Procedural fidelity data included the measurement of the following planned interventionist behaviors when appropriate: (a) conducting a 10 minute, large group creative dance session that included an opening sequence with a “hello song” and warm-up movement activities, an active motor sequence, and a closure activity. When priming was added, the creative dance session included the participants’ preferred theme and use of three items associated with the theme; (b) placement of each of the items in one of the learning centers (e.g., blocks, dramatic play, sensory); (c) modeling the use of the material in each learning center for the large group; and (d) if child did not make a choice to enter a learning center, a least to most prompting sequence that began with joint attention and ended with partial physical prompt or the child moving away, resisting, or entering learning center. Mean procedural fidelity for Latisha was 100%, for Mason, 99% (range 98–100%), and for Landon, 97% (range 95–100%).

Procedure

Preference testing. A preference assessment based on the research of Keen and Pennell (2010) was used to identify materials for each child that were both preferred and developmentally oriented. Teachers and parents were interviewed to determine each child’s preferred toys and activities. They were also asked about child interactions with each of the items and toys used only in a self-stimulatory manner (e.g., sensory tubes) were not utilized. The identified toys and accompanying accessories (e.g., trains and train tracks) were then placed in an array in a separate room and the child was brought to the room and asked, “what do you want to play with?” When a child approached a given toy, the interventionist attempted to engage in social play using the object with the toy and otherwise attempted to model higher levels of play. This occurred prior to intervention and again after five days of intervention. Length of time engaged in a contextually appropriate manner with each toy was tabulated as well as level of complexity of play with each of the items. Three toys and accessories (e.g., trains and train track, horses and stables, small cars and road mats) for each participant that corresponded to the longest length of engaged time and/or highest complexity of play were identified as preferred and selected for intervention. Themes that involved the toys, accessories, and various ways to use the materials were designed around each of the selected items.

Baseline. During baseline, children were exposed only to their normal classroom routine that consisted of 45 minutes of play center time preceded by a large group circle time activity. The large group activity generally involved some singing but dance activities were not used. Baseline data collection observations occurred during all play centers including block, dramatic play, and sensory areas of the preschool classroom. The preferred objects were not available during the baseline condition and classroom teachers were asked to engage in routine interactions with the participating children. Percentage of observation time spent engaged in available learning centers was collected on the tablet devices. Additional information gathered included types and levels of play the participant used within the centers and levels of prompting children required to enter play centers. Baseline data were taken for 20 minutes each day participating children attended preschool. Baseline ended after a minimum of four data points and stable trend was seen in social play.

Intervention. Intervention began with a 10-minute creative dance activity conducted by the study interventionist. The dance activity was inserted during the regular circle time to avoid undue disruption of typical routine. The dance activities varied each day but unfolded in a predictable sequence with an opening hello song and a warm-up movement activity followed by dance activities that involved movement throughout the classroom, and finally a closure activity with a slow tempo, transition back to the rug, and a goodbye activity as materials were put away. The interventionist varied the tempo, rhythm, and intensity
during each dance activity based on the participating child’s reactions and perceived emotional regulation. Child behaviors such as jumping were incorporated into the dances (e.g., a jumping train). After the dance session, the three identified preferred objects were placed in three different play centers and highlighted to all children in the class. Instruction on use of preferred objects was not provided and their use was not modeled or primed during the dance activity. The study interventionist was instructed to use a naturalistic least to most prompting hierarchy (i.e., no prompt, establishment of joint attention, repeat of model, indirect verbal or gestural prompt, direct verbal prompt, and finally a partial physical prompt) if children did not appear aware of center choices. A five-second delay was inserted after each prompt. The partial physical prompt consisted of the interventionist offering her hand to lead a child to the various centers. The hierarchy ended if children resisted or otherwise moved away and the interventionist waited approximately two minutes before prompting again. The children were not otherwise physically prompted to enter a given center and play within learning centers was not prompted.

Insertion of Priming. Across all three children, priming was inserted after a predetermined five-day period of intervention without priming. To ensure participating children had not tired of play materials, a preference assessment was conducted again. However, play material themes appeared to still be of interest to all three children and were not changed. In an attempt to increase complexity and social play level, the interventionist continued to conduct the ten minute creative dance activity with all children in the class as described above, but also incorporated the participants’ preferred toys themes within the activity. Therefore, contextually appropriate and social uses of three preferred objects were modeled or primed within the dance activity. Immediately following the activity, the interventionist placed each of the preferred items in one of three areas of the preschool classroom (e.g., blocks, dramatic play, sensory) and briefly modeled the use of the material in each activity. Children were then released from dance activity.

All intervention sessions occurred between three and four days per week depending on how frequently each participant attended preschool and holidays or other special events within the preschools were excluded. Classroom teachers were present during the intervention and interacted with the children during learning center time; however, they were asked not to prompt children either to enter centers or prompt play within the centers.

Maintenance. Follow-up maintenance probes began one week after intervention and continued for three to four weeks. Maintenance probes were conducted during learning center time with the same materials that were available during baseline. In the maintenance phase, preferred toys were available but classroom teachers were not given specific directions on what to do with them or how to conduct the preceding large group activity. Teachers were not specifically trained on the study procedures although they were present during all sessions of the intervention condition. The same information collected in baseline was collected on a weekly basis during the maintenance condition.

Results

Data presented in this section examine the dependent variables of (a) percentage of engaged time children participated in social play, (b) percentage of engaged time participating children engaged in various social levels of play as measured in 15 second intervals, and (c) percentage of engaged time participating children engaged in various levels of play complexity as measured in 15 second intervals. In addition, percentage of time spent engaged in learning centers is displayed in Figure 1 and discussed because the dependent variable computations were computed based on total engaged time.

Impact on Social Play Engagement within Learning Centers

Data pertaining to social engaged time is summarized as the percent of engaged time participating children met the criteria for social play. Figure 1 presents such summarized daily data for the baseline, intervention, and maintenance conditions for all participating children. Although baseline engaged time was
lower for all three children than during intervention, it varied depending on available learning center activities. In particular, new sensory centers resulted in spikes of higher engagement. However, play was uniformly solitary in nature and a stable baseline of the dependent variable of social play engagement was seen. Mason did have a slight increase in the social behavior at the end of baseline.

Intervention resulted in marked increases in trend and level of social play, particularly, parallel play with awareness. The first day of the addition of priming saw lower engagement of Latisha and Mason while Landon remained at near 100% engagement. Mason’s engaged time increased on days subsequent to the first day of priming as did his social play. Latisha’s engaged time demonstrated an upward trend but was not
higher than before priming and this was also true of her social play. In summary, engaged time for the three children increased from baseline through intervention, and experimental control was demonstrated for the dependent variable of social play from baseline through intervention. Priming appeared to have a positive effect for engaged time and social play of Mason and Landon but was limited with Latisha. Increases in engaged time only persisted in one child in maintenance condition (Landon) and social play trended downward for all three children in maintenance.

**Impact on Specific Social Play Levels**

In order to determine the impact of the intervention package on specific social play levels, the occurrence of each level of social play (i.e., on-looker behavior, solitary play, parallel play with awareness, associative play, and cooperative play) was measured in 15 second intervals of engaged time. The mean percent of engaged time, measured in 15 seconds intervals, that participating children predominately engaged in each level of social play across baseline, intervention without priming, intervention with priming, and maintenance conditions is presented in Table 3.

Across the three children, solitary play predominated during the baseline condition. In the intervention condition that did not include priming, parallel play with awareness, defined as play within one foot of other children and looking at the children and referencing their play, predominated. However, Latisha and Mason persisted in some solitary play. Both parallel play with awareness and associative play increased for all children when priming was instituted; however, parallel play with awareness saw the largest increase. Landon also engaged in cooperative play when cooperative examples of play were primed during the dance/movement activities. In the maintenance condition, all three children engaged in solitary play for the majority of measured intervals. However, parallel play with awareness was higher for the three children than was seen in baseline. Associative and cooperative play behaviors were rarely seen in maintenance.

**Impact on Play Complexity**

The impact of the intervention package on complexity of play (i.e., exploratory/sensory-motor, functional relational, constructive, interpersonal, dramatic, rough and tumble, and games with rules) is presented in Table 4. Data displayed in the table are mean percent of engaged time, measured in 15 second intervals, that each child predominately en-

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**TABLE 3**

<table>
<thead>
<tr>
<th>Child/Condition</th>
<th>Onlooker Behavior</th>
<th>Solitary Play</th>
<th>Parallel Play w/ Social Awareness</th>
<th>Associative Play</th>
<th>Cooperative Play</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Latisha</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>1.1</td>
<td>97.8</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intervention without priming</td>
<td>12.5</td>
<td>33.9</td>
<td>47.8</td>
<td>3.9</td>
<td>0</td>
</tr>
<tr>
<td>Intervention with priming</td>
<td>5.5</td>
<td>32.6</td>
<td>53.5</td>
<td>7.5</td>
<td>0</td>
</tr>
<tr>
<td>Maintenance</td>
<td>4.3</td>
<td>50</td>
<td>41.4</td>
<td>3.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Mason</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>5.8</td>
<td>82.7</td>
<td>10.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intervention without priming</td>
<td>10.7</td>
<td>42.0</td>
<td>46.4</td>
<td>0.9</td>
<td>0</td>
</tr>
<tr>
<td>Intervention with priming</td>
<td>18.3</td>
<td>26.8</td>
<td>52.8</td>
<td>3.1</td>
<td>0</td>
</tr>
<tr>
<td>Maintenance</td>
<td>16.3</td>
<td>55.8</td>
<td>27.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Landon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>18.3</td>
<td>76.4</td>
<td>5.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intervention without priming</td>
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<td>21.3</td>
<td>61.2</td>
<td>1.8</td>
<td>0</td>
</tr>
<tr>
<td>Intervention with priming</td>
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<td>12.4</td>
<td>49.6</td>
<td>3.4</td>
<td>19.9</td>
</tr>
<tr>
<td>Maintenance</td>
<td>7.0</td>
<td>58.5</td>
<td>32.3</td>
<td>1.6</td>
<td>0</td>
</tr>
</tbody>
</table>
gaged in given levels of play complexity. If a child entered a learning center but did not engage within for a 15 second interval, “not identified” is listed in the table.

In the baseline condition, Mason and Landon most frequently engaged in exploratory/sensorimotor play. Landon also engaged in functional relational play as he pushed toy cars on the floor. Latisha predominately engaged in functional relational play although this was limited to repetitively placing stickers on a paper in the art center or using implements in the sand and water table. In the intervention condition without priming, Latisha engaged in less functional relational and more exploratory/sensorimotor play, but also engaged in some dramatic play (10.5%) and some physical play (9.3%). She also referenced and copied what other children were doing. She continued with the same basic pattern of play when priming was added. Mason shifted to primarily engaging in functional relational play in the intervention condition without priming and this continued when priming was added. As was seen with Latisha, Mason also engaged in some dramatic play (10.5%) and some physical play (9.3%). She also referenced and copied what other children were doing. She continued with the same basic pattern of play when priming was added.

In summary, across children, the range of play complexity increased during intervention, and for two of the children (Mason and Landon), priming resulted in an increased percentage of dramatic play. Mean play complexity of the three children fell in the maintenance condition.

Discussion

Study results suggest that the intervention package was successful in increasing the dependent variables of (a) social play, (b) specific social play levels, and (c) range of complexity of play categories exhibited by young children with ASD within learning center activities. Most of the gains were seen in the area of parallel play with awareness and although parallel play with awareness is an early social skill, it did bring the children into closer proximity to peers and they...
demonstrated increased eye contact and increased attention to peer play. Additionally, given the importance of dramatic play in development, it is pertinent to note that all three experienced gains in time spent in dramatic play. However, gains were limited in the absence of the specific interventions.

Study of play is multifaceted and involves numerous considerations including the nature of play materials, presence and characteristics of peers, and motivation to persist in play with other children. Each of the three components of the study, (a) provision of motivating materials within learning centers, (b) creative dance activities preceding learning center time, and (c) priming use of motivating materials within creative dance activities, appeared to play a role in the play of participating children.

Selection of Motivating Materials

In this study, children with ASD more readily entered and engaged within learning centers if activities and materials were of high interest. However, selected toys also needed to allow for interactive and more complex levels of play and encourage peer usage. In baseline and maintenance conditions, the three children gravitated to toys primarily used for solitary and sensory play. Therefore, observation of play of children during preference testing and selection of toys that had more complex play possibilities was of interest. Additionally, selection of favored materials within play themes appeared to allow for increased complexity and sociability of play. For example, jack-in-the-boxes were identified as interesting to Landon and Mason and preference testing confirmed the interest. In an attempt to make the toys interactive, additional jack-in-the-boxes were added to a center and turn-taking among children was encouraged. Although, Latisha appeared interested in musical instruments in preference testing, they were generally not available during learning centers. In addition, she often went to the sensory table during baseline. Therefore, small musical instruments such as shakers and tambourines were added to the sensory table. In baseline, Mason frequently stood in front of a mirror and pretended to play an “air guitar.” His parents identified music as one of his primary interests and he engaged with musical instruments in the preference testing. In the intervention condition without priming, multiple musical instruments including different types of drums and small guitars were selected for a music learning center. Such musical instruments attracted other children and Mason readily entered the center and stood close to peers as he demonstrated use of the drums to peers. Across classrooms, use of age-appropriate, thematically based materials of interest to participating children with ASD did not appear to be a deterrent to participation by peers; a finding that increased the probability of interactions and concomitant increases in social play levels.

Creative Dance Activities

The children in the three classrooms, including children with ASD, participated enthusiastically in creative dance activities that preceded learning center time. However, initially, the three participating children with ASD stood back and observed what others were doing. Dance activities included both time on the circle time rug and time engaging in large motor activities, moving around the classroom. Further, creative dance activities proceeded each day according to a predictable pattern that the children with ASD appeared, by their actions, to anticipate. Moreover, in the course of dance activities, participating children with ASD moved closer to their peers and joined with them in the variety of activities. Creative dance activities also appeared to result in more complex and interactive play within learning centers than did the materials alone that were, for the most part, readily available in the classroom prior to intervention. One possible explanation for this finding is the presence of behavioral momentum which is the “tendency for behavior to persist following a change in environmental conditions” (Mace et al., 1988, p. 123). Specifically, it seems plausible that engaging in parallel, associative, and cooperative activities with peers in the context of movement activities increased participants’ propensity to engage in these types of play as they transitioned into free choice activities.

Priming Use of Preferred Toys within Creative Dance Activities

Two of the children, Mason and Landon, appeared to benefit from modeling of both so-
cial and more complex play with preferred materials in the priming intervention condition. Mason’s interactions with peers increased and he engaged in dramatic play when use of musical instruments in a “band” format was modeled or primed in the creative dance activity prior to placement of instruments in a new “band” center. In baseline, Landon often played with small cars but such play was solitary and sensorimotor in nature. During the priming condition, children pretended to drive cars around the room with hula hoop steering wheels. They pretended to stop and go and visit locations such as the library and school. Subsequently, a play mat was added to the small car learning center with the practiced locations graphically displayed on it and Landon played with his peers as they stopped at the various locales and talked about them. Landon’s interest in jack-in-the-boxes was built upon in the music and movement activity as children jumped out of scarves representing jack-in-the-boxes while Landon turned the handle of a real jack-in-the-box. The materials were then put in a learning center on the rug and Landon engaged in cooperative and dramatic play with his peers. Latisha, however, saw less benefit from priming. It is possible that priming within music and movement attracted more peers to learning centers than she was comfortable with. At times, Latisha would go to the centers and begin imitating what had been modeled, but would leave when numbers of children increased. It is also credible that she was not developmentally ready for the more complex play levels modeled.

Limitations

There are some limitations associated with the study that could affect the extent to which results can be generalized to other settings or children. To ensure intervention was constant across settings, an interventionist not associated with the classrooms conducted creative dance activities and modeled activities within centers. The study interventionist was not present during the maintenance condition. In addition, three separate classrooms were utilized in the study, but without systematic replication, it is difficult to say that the sites were representative of inclusive preschool classrooms or that the three participating children were representative of the population of children with autism. Social play and play complexity levels were computed as a percentage of engaged time and particularly in baseline and maintenance conditions when engaged time was low, opportunities to record play levels were infrequent. Finally, the social validity of the study was not measured.

Implications for Further Research

The results of this study lend themselves to several research activities in the area of antecedent dance activities and their ability to effect positive change in play behaviors of young children with autism in inclusive preschool classrooms. As delineated in the literature, several studies have demonstrated positive effects of preferred materials (e.g., Carter, 2001; Reinhardt, Garfinkle, & Wolery, 2002) and priming (e.g., Gengoux, 2009; Zanolli et al., 1996). At the same time, although there has been some quantitative inquiry into the efficacy of group creative dance activities (Greer-Paglia, 2006), the research base is less robust in the area of group antecedent dance/movement activities. Accordingly, systematic inquiry into use of creative dance activities alone in increasing engagement and play skills of young children within ensuing learning activities would be of interest. Second, this study utilized a least to most prompting hierarchy as a means to ensure participating children were aware of learning center choices. However, although children’s engagement within learning centers increased, adult prompting was, for the most part, ineffective. Across children, 78% percent of successful learning center entries were unprompted and an additional 12% of entries were minimally prompted either through joint attention (83%), repeat of model (5.4%), or indirect verbal or gestural prompt (5.6%). Moreover, 27% of prompts resulted in either no response, aggression, or moving away. Hence, further research into methods that naturally pique children’s interest in play with peers and are not reliant on adult prompting has potential to contribute to the knowledge base of the field. In addition, it would be useful to know if positive effects from the intervention would generalize to other activities and settings. Finally, more research into
effective methods for achieving teacher change appears important if results such as were seen in this study are to be sustained.

**Implications for Practice**

The outcomes of the study, while not definitive, offer several implications for practitioners and administrators in early childhood classrooms serving young children with ASD. First, during baseline, toys were available that attracted the interest of the participating children. However, many of the attractive toys were self-stimulatory in nature and did not easily lend themselves to social and/or higher levels of play. The participating children gravitated to such materials and played with them to the exclusion of other materials. Therefore, in effect, the sensory toys often further isolated the children. In the same vein, it appeared important that preferred play materials be interesting to both participating children and their typically developing peers. Second, in the maintenance condition, teachers put identified preferred toys in learning centers but did not model or extend on children’s play with them. As a result, typically developing children appeared to tire of toys and activities and move on to other learning center activities, leaving the children with ASD with no peers with whom to interact. Thus, the results of this study suggest that play materials require periodic “refreshing” and expansion if peer interest is to be maintained. Third, in baseline and maintenance conditions, teachers engaged children in large group circle activities that included reading stories and singing songs. However, large motor movement activities were not included in either condition. The results indicate that dance activities are motivating and can result in child change, yet although teachers observed the dance activities over several weeks, they appeared reluctant to incorporate them into circle time activities. Additional training and on-going support might increase teacher skill and comfort level in implementation of such activities and thereby increase the likelihood of their inclusion. Finally, because the interventions described here are very child-specific, there are no out-of-the-box programs available.

In summary, the results of the study support other research that has demonstrated positive effects from using interactive, attractive materials, creative dance and movement activities, and priming within the context of typical preschool activities. The study extended the research by suggesting gains in children’s play from the combination of strategies in a manner that was motivating and developmentally appropriate for all children in the inclusive classrooms.

**References**


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Let's Go Under! Teaching Water Safety Skills Using a Behavioral Treatment Package

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Abstract: Drowning is a leading cause of unintentional death among children worldwide. Children with autism spectrum disorder (ASD) are at higher risk for incidents of drowning than their non-disabled peers. Mastering water safety skills, such as underwater submersion, has been associated with a decreased risk for incidents of drowning. Using a combined multiple-baseline and changing-criterion design, this study examined the effects of a behavioral treatment package consisting of shaping, prompting, and positive reinforcement utilized to teach three young children to demonstrate underwater submersion during weekly swimming lessons. During baseline, none of the participants submerged their head underwater despite previous modeling and instruction. Following the implementation of the behavioral treatment package, all three participants submerged their entire head underwater. Each participant maintained this skill following instruction and later developed more advanced swimming abilities utilizing the mastered skill of underwater submersion.

There are many reported potential benefits of teaching children to swim. These include health and safety benefits, developmental advantages, improvements in academic performance, and a strengthening of social-emotional abilities. Reported health benefits include a decreased risk for chronic illness (Chase, Sui, & Blair, 2008), improvement of the symptoms of arthritis (Westby, 2001), weight management (Gappmaier, Nelson, & Fisher, 2006; King, Wasse, & Stensel, 2011; Tremblay, Inman, & Willms, 2000), and a decreased risk for heart disease later in life (Brinks, Franklin, & Spring, 2009). The ability to swim also improves personal safety, as swimming ability has been associated with a decrease in the risk for drowning (Asher, Rivera, Felix, Vance, & Dunne 1995; Smith, 1995). The Center for Disease Control (CDC, 2104) lists drowning as the fifth highest cause of unintentional death in the United States. Swimming ability is especially critical for children, as drowning is noted as a leading cause of death among children under age 15 worldwide (Peden & McGee, 2003; Petras & Blitvich, 2014; World Health Organization (WHO, 2008), with the highest rates reported in children under the age of five. Teaching children to swim is recommended to minimize the risk for incidents of drowning (Asher et al., 1995; CDC, 2014; Smith, 1995). Related to developmental benefits of learning to swim, Jorgensen (2013) reported that early swimming participation by children is associated with earlier achievement of a range of developmental milestones, including those in motor, cognitive, linguistic, and social-emotional categories. Regular participation in swimming is credited with improved attention and academic performance (Frankl, 1996) and improved psychological and social benefits in adulthood (Berger & Owen, 1992; Tremblay et al., 2000). For example, swimming is associated with a decreased risk for depression and anxiety (Tomas-Carus, Gusi, Hakkinen, & Ortega-Alonso, 2008) and improved self-
Improved family connections and relations are reported when swimming occurs as a family recreational activity (Rogers, Hemmeter, & Wolery, 2010). Learning and regularly participating in swimming can be beneficial to individuals of all ages and for a variety of reasons.

Increasing opportunities for physical activity can especially benefit children with special needs, including children diagnosed with ASD. Children with special needs often have limited access to leisure activities and lower than typical performance in motor skills (Murphy & Carbone, 2008; Smith, 2001); learning to swim can address both of these limitations. In addition, children with ASD often exhibit high rates of stereotypical behaviors which have been successfully decreased by teaching physical activities and games, such as swimming (Leaf & McEachin, 1999; Smith, 2001).

Most importantly, teaching a child with ASD to swim increases safety and decreases risk for injury around water. Children with ASD have been reported to demonstrate an increased tendency to wander from supervised locations, often near water environments such as pools or ponds (Italie, 2015). Increasingly, incidents of wandering are associated with incidents of drowning. McIlwain and Fournier (2012) report the wandering behavior of children with ASD as up to four times that of non-ASD siblings; 91% of the deaths reported in children with ASD in the United States between the years 2009–2011 were attributed to drowning that occurred following an incident of wandering or elopement. For all of these reasons, swimming is an important and beneficial skill for children with ASD, and increased attention has been devoted to funding and providing for effective swim instruction for children with a diagnosis on the autism spectrum (Italie, 2015).

The tactics and methods of applied behavior analysis have been used to successfully teach children, including children with special needs, a variety of swimming skills in situations where other methods have failed. Yilmaz, Konukman, Birkan, and Yanardag (2010) taught three autistic boys simple swimming skills using most-to-least prompting. Rogers et al. (2010) taught three foundational swimming skills (kick, front crawl arm strokes, and head turn) to children with autism using a response promoting with constant time delay procedure. Fueyo, Saudargas, and Bushell (1975) examined the effect of specific and non-specific feedback on teaching swimming skills to four handicapped teenagers. Koop and Martin (1983) utilized a behavioral treatment package consisting of modeling, error correction, and positive reinforcement to decrease persistent errors in swim strokes demonstrated by five teen-age competitive swimmers. Each of these studies demonstrated the success of using systematically planned behavioral tactics to develop swimming skills.

Underwater submersion and reorienting one-self after unintended underwater submersion are identified as critical skills for decreasing the risk of drowning among young children (Lifesaving Society, 2012; Smith, 1995). Previous studies using behavioral tactics to teach swimming skills did not target underwater submersion. This skill, while critical for the safety of all individuals, is often resisted by young children. Shaping is a behavioral tactic that is often used to develop new skills when an individual is resistant to practicing a skill or no portion of the skill is within the individual’s repertoire, making the delivery of prompts, praise, or error correction difficult (Cooper, Heron, & Heward, 2007).

This study adds to the existing literature on using behavioral tactics to teach safety skills, specifically water safety skills, to children, including those diagnosed with ASD. In this study, the water safety skill of underwater submersion was taught to three children using a behavioral treatment package consisting of shaping, prompting, and positive reinforcement.

Method

Participants and Setting

Three children enrolled in swimming lessons at a local recreational center participated in this study. All three were selected by the swimming instructor for participation as they had continually resisted underwater submersion in previous lessons. Subject one, Allison, was a typically developing 4-year-old girl who had been enrolled in swimming lessons for approximately one year. Subject two, Izzy, was a
4-year-old boy diagnosed with pervasive developmental disorder, not otherwise specified (PDD-NOS) who had been enrolled in swimming lessons for one year. Subject three, Kaleb, was an 8-year-old boy diagnosed with pervasive developmental disorder (PDD) who had been enrolled in swimming lessons for three years. Each participant was able to enter the water and swim independently or swim with a floatation device but did not demonstrate underwater submersion, despite previous modeling and instruction. One female swim instructor conducted all aspects of the instruction. At initiation of the study, the instructor was 32 years old, had been a certified swim and water safety instructor for 18 years, and was also enrolled in a local university as a graduate student in applied behavior analysis (ABA). The instructor was employed part-time for the organization at which the swimming lessons were conducted.

The lessons were held at a private, local recreation center in western Massachusetts, in a six-lane, heated, 25-yard pool. The pool measured 3 [1/2] feet deep at one end and slowly descended to 11 feet deep at the opposite end. The lessons took place in an open area of the pool where two side-by-side lanes were accessible. The shallow section of the pool held stairs to descend into the water, while the deeper section of the pool used a ladder attached to the wall. On one side of the room, a glass wall ran parallel to the pool; on the other was a solid wall with bleachers. Instruction was conducted during the participants’ regularly scheduled swimming lessons.

Research Design

Instruction took place over approximately one year of weekly swimming lessons, each lasting 30 minutes in duration and held once per week. A combined multiple-baseline and changing-criterion design (Kazdin, 2011; McDougall, Kawkins, Brady, & Jenkins, 2006) was used to evaluate the effects of a treatment package combining shaping, prompting, and positive reinforcement on the skill of underwater submersion. This combined design was selected due to the presence of multiple participants enrolled in different swim classes with the same instructor who were resisting underwater submersion, a situation suited to the use of a multiple-baseline design across individuals. In addition, the changing criterion design is well-suited to situations in which mastering the target skill requires gradual progression toward a terminal goal, such as in this case, where the target skill was resisted (Kazdin, 2011). The intervention package was implemented successively across the three participants. For each participant, baseline preceded an intervention phase. The length of the baseline condition varied across participants, with baseline measurement continuing for participants two (Izzy) and three (Kaleb) while the treatment package was implemented with subject one (Allison) to allow for inferences to be drawn about the effect of the intervention on the dependent variable (Kazdin, 2011). Further, baseline measurement continued for subject three (Kaleb) while intervention was initiated with subject two. The intervention phase for each participant was divided into sub-phases, with each sub-phase requiring a more complex approximation of the dependent variable in order to access reinforcement. Seven sub-phases were planned, each corresponding to a step of a task analysis of underwater submersion. During intervention, instruction began with step one only (sub-phase 1); each subsequent sub-phase added one additional step of the 7-step task analysis to instruction from the highest step mastered in the previous sub-phase. The seven targeted steps were: 1) chin wet, 2) chin and lips wet, 3) chin, lips, and nose wet, 4) chin, lips, nose, and ears wet, 5) chin, lips, nose, ears, and eyes wet, 6) chin, lips, nose, ears, eyes, and forehead wet, and 7) whole head submerged and wet. The total number of sub-phases varied for each participant as in some cases a participant exceeded mastery criterion within a sub-phase. Each sub-phase continued until the targeted step or steps were demonstrated for three consecutive sessions, at which point instruction advanced to the next sub-phase and the criterion for reinforcement was increased in the following lesson.

Measures

The dependent variable measured was underwater submersion, defined as any occurrence of the swimmer submerging the whole head underwater, including their chin, mouth,
nose, ears, eyes, and hair, for at least five consecutive seconds. Non-occurrences included any attempt at underwater submersion where the participant wet only their face, leaving their hair dry, or leaving the tip of their head out of the water. For measurement purposes, successive approximations of the dependent variable were listed as consecutive steps on the data sheet. Data was recorded on each step completed correctly during each lesson; the total number of steps correct was calculated, recorded, and graphed for analysis purposes. Due to measurement occurring near water, Revlar® waterproof paper (available through Relyco®) was utilized during lessons and the data from each lesson was transferred to a summary sheet at the end of the lesson.

Baseline data was gathered prior to introducing the intervention for all three participants. With participant one, baseline measurement was conducted for three lessons. Baseline measurement continued for participants two and three while the intervention was implemented for participant one. With participant two, baseline continued for 23 lessons and with participant three, baseline continued for 51 lessons. One trial only per lesson was conducted during baseline. If the child did not imitate underwater submersion at that time, the instructor recorded zero steps completed and moved to another skill or activity according to the swimming curriculum. A single trial of underwater submersion per lesson was conducted during baseline due to the participants’ resistance to this skill. Previous to beginning the intervention phase introduced in this study, each of the participants demonstrated resistance in the form of crying (participants one and two) or loud vocal refusal (participant three) when underwater submersion was prompted. As lessons were only one-half hour in duration and other swim skills were targeted for each participant, the instructor wanted to assure that the aversive nature of the skill of underwater submersion would not prevent the remainder of the lesson from succeeding.

In each sub-phase of instruction, a plus mark was recorded on the data sheet next to the steps of underwater submersion correctly demonstrated during each 30-minute swim lesson. During intervention, the swimmer was given three opportunities per lesson to demonstrate underwater submersion: at the beginning, middle, and end of the lesson. This was possible as resistance to underwater submersion no longer occurred. A correct response on any of the steps during any of the three opportunities resulted in a single recording of correct for those steps in that lesson. At the conclusion of the lesson the data for that lesson was transferred onto a paper summary sheet in order that the waterproof data sheet could be re-used. The summary sheet listed the number of steps completed correctly for each participant. The primary swim instructor recorded data during all lessons while in the pool with a grease pencil; the data sheet and pencil were positioned at the side of the pool.

Three additional swim teachers, one lifeguard, and a supervising Board Certified Behavior Analyst (BCBA®) were trained as independent observers by the primary swim instructor on how observe, measure and record data for each step or approximation of the target skill. To gather additional data on inter-observer agreement, each subject was also videotaped during several lessons.

Measurement of inter-observer agreement (IOA) occurred during 30% of the total number of intervention sessions (4 of 27 lessons with subject two and 8 of 13 lessons with subject three). Two different independent observers gathered IOA data for subject two; three different independent observers gathered data for subject three. IOA measured 100% across all measured sessions.

Procedure

During baseline, the instructor verbally directed the swimmer to submerge their head underwater and modeled this skill for the child. Praise was delivered if the child correctly imitated the skill; if the child refused or did not demonstrate the skill, the instructor continued with the lesson, focusing on other swim skills.

Within each sub-phase of instruction, prompting using verbal direction and modeling was used to evoke the targeted approximation of underwater submersion, based on the step targeted and the criterion established for reinforcement in that sub-phase. Following correct imitation of the targeted approxima-
tion by the swimmer, positive reinforcement in the form of praise was delivered and access to a brief preferred activity or game was allowed. These activities varied with the lesson and as swim skills advanced, began to include underwater activities such as retrieving items underwater on the pool’s steps. Any trial that resulted in a refusal or an incorrect performance of any part of the targeted step resulted in a repeat of the model combined with a stimulus prompt in the form of a touch to the body part that was supposed to be wet. A second incorrect response resulted in moving to a different swimming skill and returning for a 3rd attempt a few minutes later in the lesson. This sequence was repeated at the beginning, middle, and end of the lesson. After three consecutive lessons with correct performance of the targeted step for that sub-phase, a step was added to instruction and the criterion for reinforcement was increased in the next scheduled session.

Results

Figure 1 displays the results of the intervention across participants and sub-phrases of instruction. The ordinate shows number of steps completed correctly and the abscissa displays consecutive swim lessons. During the baseline condition, none of the three participants demonstrated underwater submersion, or any approximation of underwater submersion as defined in the methods section of this study; all three resisted imitating or attempting this skill. Following intervention, all three participants in this study successfully demonstrated
underwater submersion without resistance. Each individual swimmer progressed at a different pace through the instructional sequence. Participant one, Allison, required 20 lessons following baseline to reach the targeted goal (entire head under water). Following baseline, Allison achieved mastery of step one within three lessons, and in fact exceeded criterion in sub-phase one in each lesson. The final sub-phase required eight swim lessons before mastery was achieved. Subject two, Izzy, required 27 lessons beyond baseline to achieve mastery. Sub-phase four, which required complete underwater submersion, was the longest phase; 18 swim lessons were required before mastery criterion was met. Ka-leb, subject three, required 13 lessons beyond baseline to demonstrate mastery of the target skill. Maintenance probes conducted 6, 12, and 24 months after mastery for each participant noted that all three participants maintained the skill of underwater submersion and advanced on related swim skills that required underwater submersion. All three participants, for example, later learned to swim underwater, jump in the pool and submerge underwater from the jump, and swim with their face in the water.

Discussion

Participation in physical activities, such as swimming, is beneficial for many reasons. Among these benefits, swimming can improve health, psychological well-being, attention, academic performance, and social competence. The specific swimming skill targeted in this study, underwater submersion, has the added benefit of potentially increasing an individual’s physical safety when in or near water, as individuals who can right themselves after sudden, unexpected underwater submersion decrease their risk for drowning. The behavioral tactics used in this study successfully taught underwater submersion to three children, two with a diagnosis of ASD, where other methods had failed. Specifically, the results of this study demonstrate that a treatment package including shaping, prompting, and positive reinforcement can successfully teach children to demonstrate specific swimming and water safety skills. Further, this study demonstrated the successful use of behavioral intervention in a community-based recreational facility with typical staffing, as the treatment package was utilized by a swim instructor in the context of regularly scheduled swim lessons. Finally, this study presents an application of a combined multiple-baseline and changing-criterion design in a recreational setting, adding to the literature supporting the usefulness of single-case experimental methodologies in conducting systematic, data-based instruction. Risks associated with use of this treatment package were minimal, but included risks associated with any water exposure for children. In this study, these risks were minimized by the presence of a certified lifeguard in the pool area during lessons and the swim instructor’s certification as a water safety instructor through the American Red Cross®. Further, aquatics experts note the risk that an increase in swimming skills may give parents a false sense of security in regards to the safety of their child around water; consequently, even for a child who can swim and submerge underwater, close continuous supervision of children while swimming is recommended (American Red Cross, 2014).

Desired outcomes of behavioral instruction include generality and maintenance (Baer, Wolf, & Risley, 1968), both of which were achieved in this study. All three participants, including the children diagnosed with ASD, not only mastered the skill of underwater submersion, but maintained this skill for several years beyond instruction and generalized this skill to other swimming skills and water activities. For example, two of the participants later demonstrated more advanced swimming skills that require underwater submersion, including diving, jumping in the pool, and swimming underwater.

There are several limitations to the experimental design utilized and hence the inferences drawn about the intervention effect in this study. The number of participants was small and, therefore, limits the external validity of the overall treatment claims. However, demonstration of the effectiveness of this procedure systematically across three participants, including a typically developing child and two children diagnosed with ASD, suggests that this treatment may be useful for swim instructors in typical recreational facilities offering swim lessons with minimal disrup-
tion where other methods have failed. Other limitations to the conclusions inferred in this study include the varying number of trials conducted during baseline compared to the number of trials during intervention phases, due to swimmer resistance of underwater submersion during baseline, and the rapid changes in performance that exceeded criterion for each of the participants in specific sub-phases of intervention, potentially impacting the evaluation of intervention effect. The use of a multiple-baseline design, and specifically the failure of participants two and three to demonstrate any step of the dependent variable correctly until the intervention was introduced balances these limitations and adds evidence to support the inferences made.

The use of a combined multiple-baseline and changing-criterion design with demonstrated reliable measurement in an inclusive, recreational environment supports the conclusion that behavioral technologies can be flexible and manageable in a range of settings and for a range of target behaviors and skills. This study adds to decades of research that promote the utility of behavioral intervention in teaching socially valid outcomes for individuals with and without developmental disabilities. Furthermore, this study replicates previous research demonstrating the effectiveness of behavioral intervention for teaching swimming and water safety skills, and advances this research, effectively applying a behavioral treatment package to the instruction of underwater submersion.

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“I Should Have Big Dreams”: A Qualitative Case Study on Alternatives to Guardianship

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Abstract: This qualitative single case study explored (a) the underlying beliefs of the connected individuals involved in determining guardianship or alternatives to guardianship for a young adult with intellectual disability; (b) the attitudes, resources and skills needed for educators and families to develop transition plans that address alternatives to guardianship; (c) barriers that may exist in the school setting for the young adult’s development of self-determination skills; and (d) derive lessons and best practices needed to maximize student self-determination skills and implement alternatives to guardianships. Findings were that the implementation of alternatives to guardianship for the young adult was related to many factors including a K-12 inclusive education, the value of interdependence, connection to advocacy organizations and utilizing resources outside of the school.

The Individuals with Disabilities Education Improvement Act of 2004 (IDEIA) requires school staff and parents to work together to begin transition planning for students with disabilities as they approach the age of majority. This planning should focus on developing necessary skills for life after high school (Gutierrez, 1999; IDEIA, 2004; Pierangelo & Giuliani, 2004) including self-determination skills and independence (IDEIA, 2004; Shogren, Wehmeyer, Palmer, Rifenbark, & Little, 2015). In addition to requiring transition planning, the IDEIA mandates that all rights accorded to parents under the IDEIA “transfer” to the student once he or she reaches the age of majority, so that the student will be able to make his or her own independent decisions. However, according to the IDEIA such rights will not transfer if the young adult’s “competence” is questioned, whether by teachers, professional staff, or parents (section 300.514). In such cases, the school transition team may encourage parents to become the legal guardian of their adult child, including decisions about work, school, housing, food, and friends (Millar, 2007), and individuals with guardians often lose their right to vote, marry, sign contracts, file lawsuits, consent to medical treatment, or possess a driver’s license (Gutierrez, 2015).

Research shows that the decision to obtain guardianship is often made with good intentions to protect the young adult (Millar, 2007; Payne-Christiansen & Sitlington, 2008). However, because the young adult must be designated “incompetent” or “incapacitated” to obtain guardianship, whereupon his or her rights are legally removed, the practice of guardianship can reify ableist beliefs regarding who is valued enough to participate in the rights of citizenship (Agran & Hughes, 2013) and may impact the development of self-determination, autonomy, and independence (Frolik, 2002; Millar, 2007). Therefore, the appointment of a guardian during the transition process appears to violate the language, if not the spirit, of the IDEIA (Kanter, 2015).

Several studies support the conclusion that guardianships interfere with the development of important independent living and self-determination skills of young adults with intellectual and developmental disabilities (IDD) (Millar, 2003, 2007, 2008; Millar & Renzaglia, 2002). Research also suggests that students who receive frequent adult assistance that does not help to foster student independence...
or honor student preference and choice often develop learned helplessness (Bos & Vaughn, 2002), which can lead to loss of personal control and identity, fewer interactions with non-disabled peers, and a failure to develop self-determination skills (Giangreco, Edelman, Luiselli, & MacFarland, 1997).

Theoretical Framework

This study is grounded in disability studies theory, which generally refers to disability as a social, cultural, and political phenomenon in which disability is the result of an individual’s interactions with society (Danforth & Gabel, 2006; Davis, 2006; Siebers, 2008). Disability studies challenges the dominant medical model that views disability as a “problem” within the person, as something to be fixed or cured by “experts” in order to conform to normative values. Instead, disability studies uses the social model to frame disability, which recognizes disability as something caused by the way society is organized rather than by the person’s impairment. Specifically, the social model seeks to discover ways to remove those barriers that restrict people with disabilities in order to help them become equal in society, with choice and control over their own lives.

The practice of guardianship is largely based on a medical model of disability that labels a person as unequal and incompetent, socially excluding them simply because they may need support when making decisions. While limited research exists about young adults and guardianship experiences, the existing research suggests that these young adults often had guardianships appointed even though other less intrusive systems of support could have sufficed (Jameson et al., 2015; Millar, 2007; Payne-Christiansen & Siftington, 2008). Studies also evidence that often parents would prefer not to have to resort to guardianships, but they believe they have no choice (Millar, 2008). Parents often consult with educators and transition teams for advice, but studies illustrate that neither parents nor educators are very knowledgeable about what guardianship entails or what alternatives to guardianship may exist (Jameson et al., 2015; Millar, 2013; Millar & Renzgalia, 2002). In a recent study in which 1,223 participants completed a survey about guardianship practices, full guardianship was evidenced as the most consistently discussed option with parents of students with disabilities (Jameson et al., 2015).

Alternatives to guardianship provide less restrictive ways to offer people with disabilities the support they may need and want when making decisions (Millar, 2013). These alternatives include informal support from family and friends, often referred to as supported decision-making, as well as more formal instruments like trust funds, specialized bank accounts, powers of attorney, representative payees, and case management services (Millar, 2013). However, the study by Jameson et al. (2015) found that when educators and families determine the transfer of rights for a student, guardianships remain the most frequently discussed option. Alternatives, like supported decision-making, are the least frequently discussed.

When considering the extant, but limited research, these collective findings are troublesome. Guardianship alternatives that use person-centered planning models have the potential to allow the student to assume the intended roles and responsibilities of adulthood with support (Agran & Krupp, 2011) and without the stigma of control and incompetence that can be attached to the appointment of a guardian. Many of these alternatives also allow the person with a disability to identify another person or group of people to assist them (Millar, 2003). By providing support to young adults during decision-making, rather than making decisions for them, these alternatives align with the social model of disability by helping to remove barriers to full inclusion of people with disabilities (Kanter, 2015). In addition to aligning with the social model of disability, guardianship alternatives, like supported decision-making and person-centered planning, are also more consistent with the framework of IDEIA.

Purpose of Study

Alternatives to guardianships occur naturally in many different forms within the family or within formalized networks. Research about alternatives to guardianship is only just emerging and therefore there is much to be investigated. Few studies have explored the pro-
cesses or outcomes of supported decision-making in order to suggest best practices for families and educators. Similarly, few studies have explored the beliefs and attitudes necessary to help educators and families, and the students themselves, to more effectively implement supported decision-making. This study intends to add to the emerging evidence base in this area by examining the perspectives of those involved in the process of creating alternatives to guardianship for one young man with an intellectual disability. The purpose of this research is focused on (a) understanding the underlying beliefs of the individuals involved in determining alternatives to guardianship; (b) understanding the attitudes, resources and skills needed for educators and families to develop transition plans that address alternatives to guardianship; (c) exploring how families and schools facilitated the young adult’s development of self-determination skills; and (d) deriving lessons and best practices needed to maximize student self-determination skills and implement alternatives to guardianships.

Method

This study is grounded in the traditional qualitative approach (Taylor & Bogdan, 1984) in order to focus on the beliefs and perspectives of those involved in the process of transition to adulthood and its relation to alternatives to guardianship for one young man with an intellectual disability. I chose to explore this topic using a case study method. I drew from Biklen and Attfield’s (2005) qualitative inquiry to examine the way a small group of connected people view the complex issue of guardianship and Dehyle’s (2009) mutual collaborative approach in order to highlight the perspective and expertise of the young man with a disability. The emphasis on the young man’s beliefs and attitudes toward guardianship and its alternatives is an essential aspect of this study and seeks to build on prior studies in which stakeholder perspectives regarding guardianship have been addressed (see Millar, 2008, Payne-Christiansen & Sitlington, 2008). In order to emphasize the importance of his voice, I adopted an epistemological stance that sees the participant as the expert, or collaborative researcher, and the researcher as someone who learns from the expert, rather than someone who develop theories about the subject (Knox, Mok, & Parmenter, 2000).

Therefore, I asked the young man to participate as an expert and collaborative researcher, explaining that if he so chose, he could be involved in the collection of data and analysis of data. He agreed to participate as an expert and collaborative researcher and was subsequently involved in many of the decisions about whom to interview (i.e., his parents, teacher, and friend) and the questions we might ask them. He assisted me during the interview of his friend and high school teacher. I consulted with him on the interpretation and analysis of all interview data, including his own interview and relevant document data. Together we explored meanings participants gave to certain concepts and life events (i.e., inclusion, independence, interdependence, competence, adulthood and transition).

To create a study where the participant is also a collaborative researcher, I strived to develop what Ellis, Kietlinger, and Tillmann-Healy (1997) call an empathetic, safe space, in which the participant feels comfortable and trusts the researcher enough to open up and explore opinions and perspectives about sensitive topics, such as competence and independence. I strived to avoid any clinical relationship of researcher to subject, so that I did not reify the notion that participants with disabilities are seen as an object of research, but instead viewed him as an expert.

Participants

The main participant, Brian, engaged in this study as an expert and collaborative researcher. He was purposefully selected following what Bogdan and Biklen (1998) call the “optimistic approach,” (p. 220) in which the researcher looks at situations that others might consider successful in order to learn from them. I purposefully chose Brian because throughout his life he and his family have utilized supported decision-making and because he has transitioned to adult life without a guardian. Brian has an intellectual disability and is able to communicate independently.
The process of transitioning from high school and determining the use of either guardianship or its alternatives is likely to include the person with a disability, his or her family, teachers, friends, and other supporters. Therefore, the young man and I decided to interview the following participants: his parents, a high school teacher who played a significant role in his transition into postsecondary life, and a friend whom he met during this transition period. Our choice of participants is consistent with previous studies by Millar (2007, 2008) and Payne-Christianson and Sitlington (2008).

Brian. I first met Brian at a university in the Northeast where he worked as a peer trainer for students with intellectual disability and was enrolled at the college in a non-degree program. After graduating high school at the age of 18, Brian attended college through a similarly structured non-degree program and one of many across the country that encourage and support students with intellectual disability to attend college. Due to his own experience in college he was able to provide great insight and assistance to the students.

Brian is a caring and thoughtful 29-year-old who is passionate about disability rights and politics. He requires many supports in his life. For example, Brian reads and writes using technology like screen readers, which read electronic text out loud to him, and voice-to-text software, which types his spoken words. Using these tools, Brian is able to read and send all of his emails and text messages and keep up with all of his favorite political news on the Internet.

He currently lives with a friend in a two-bedroom apartment in a bustling neighborhood near the college where he works. He takes the bus or walks to work because he does not drive. Brian maintains a circle of support (Falvey, Forest, Pearpoint, & Rosenberg, 1997), which I will address in greater detail later in this article. His support circle includes many people in his life, such as friends, family, and colleagues who support him in discussing day-to-day events, important life decisions, goals and future plans. For example, agenda items for a circle meeting from the spring of 2015 included housing updates, health updates, social life (trivia night, dance at the fair), and a social justice conference.

With his Medicaid benefits, Brian employs a case manager and two staff members through a local community living agency. He is fully included in the process of hiring and firing these staff members. They assist him with activities such as cooking, grocery shopping, banking, and apartment hunting. With the support of his parents, Brian maintains a bank account and uses direct bill-pay for rent and utilities. He uses on-line banking to access information about his account and visits a credit union to deposit and withdraw money in person. In addition to the money he earns from his job at the university, his parents maintain a trust for him. With the help of a lawyer they created the trust when Brian was 9 years old.

Brian’s parents. Rita and Anthony Brown live in a suburban area of Michigan. They both self-identify as activists and community organizers, and several years after the birth of Brian, they became involved specifically in disability rights and advocacy. Rita is a social worker, and Anthony has worked as auto-worker and community and labor activist. The Browns have two children, Brian and Stephanie, who are both young adults who have moved out of the family home and who currently live in states on the East coast.

Brian’s teacher. Mary was a special education teacher at Brian’s high school when she first met him. Although she did not teach him in the classroom, she was the case-manager during his Individualized Education Program (IEP) meeting and was extremely involved with Brian and his family during his transition process from high school to postsecondary life. She played an integral part in helping Brian realize his college dream. She worked with Brian and his family, the high school transition coordinator and several adult service agencies to develop a program that supported Brian’s enrollment as a non-degree seeking student at the local university. Mary is now a district-level transition coordinator.

Brian’s friend. Dan and Brian became friends while Brian was in college, a pivotal transition period in Brian’s life. Not only had Brian begun to transition from high school to college life, all of his educational rights had also been transferred from his parents to him.
Dan was initially a social support staff person for Brian but quickly became a close friend. Dan began going with Brian to see him speak about disability advocacy, and eventually Dan joined him on stage. In fact, Dan explains that his friendship with Brian has led him to a career in Disability Law. Today they remain friends and often travel around the country to present about inclusion, disability advocacy, and person-centered planning.

Data Collection

The majority of data were collected over the course of six months through in-depth interviews (via phone, Skype, and in-person). Document analysis was used primarily to elaborate and verify information. Brian worked with me to create guiding questions and assisted in asking questions during interviews with both Mary and Dan; he chose not to participate in the interview with his parents.

Interviews. Interview questions focused on general background, familiarity with guardianship and its alternatives, and experiences and events related to Brian’s transition. Each interview ranged from 80 to 120 minutes in length and was audio-recorded and transcribed verbatim. After the first read through and annotation of transcripts, I sent clarification questions via email and requested documents to review (i.e. high school Individualized Education Programs and Circle of Support meeting minutes). I then conducted 10 to 30-minute follow-up interviews with each participant.

Document data. After my request for archival IEP documents, Anthony sent a copy of Brian’s IEP from his senior year of high school. This IEP document included the section detailing his transition goals, action steps required to achieve these goals, and parties responsible for implementing these steps. I then requested recent Circle of Support meeting minutes from Brian. He gave me nine consecutive monthly Circle of Support meeting minutes recorded from the summer of 2014 through the spring of 2015. These meeting minutes detail topics and issues discussed during these meetings, any decisions made, and any action items needed to be completed by Brian or his supporters.

Data Analysis

After all interviews were transcribed, totaling over 200 pages of data, I began a content analysis procedure (Merriam, 1998) to organize and begin an initial inductive analysis of all data. Each data set (e.g., interviews, meeting minutes, and IEP document) was analyzed separately using this process, wherein I read and re-read the data to identify small units that expressed an idea (Minichiello et al., 1990) relating to my research questions. Each unit of meaning was assigned a code, for example “self-determination” or “resources”, and I created a codebook including all codes and emerging themes (La Pelle, 2004). I completed coding 25% of the data before asking a fellow researcher interested in guardianship to review this first 25% of coded data. She utilized my codebook as a guide with the intention of confirming consistency in the application of the codes. We met to discuss differences of opinion and we addressed our coding disagreements by either creating new codes or collapsing codes (Strauss & Corbin, 1994). I then went on to analyze the remainder of the data using a constant comparative method. I developed categories that cut across the multiple sources of data and compared these categories across data sets to determine any convergence and divergence within data sets. After these categories were created, I met separately with my colleague and with Brian to discuss the grouping of categories, for example “resources” into themes, such as “resources for building community”. During conversations with Brian I utilized appropriate quotes from the transcripts and documents to help convey the essence of each category in order to facilitate our analyses discussions.

Self as Researcher

I entered this study with many pre-theoretical dispositions regarding the concept and practice of guardianship, so I used best practices in qualitative analysis to address the authenticity and credibility of my findings, interpretations and conclusion (Bogdan & Biklen, 1998). I sought to integrate various sources of data (i.e., interviews and documents) not for purposes of verification, but to ensure that the account is rich, comprehensive, and well-de-
veloped. Data incorporated information from different periods of Brian’s life (i.e. childhood, high school, college, and present day) and various settings (i.e. school, home, Circle of Support) but also compared people with differing points of view (i.e. Brian, teacher, friend, parents, supporters). I utilized multiple researcher collaborators in the analysis process to various degrees (i.e. Brian and myself were directly involved with data collection while my colleague was not involved in data collection). I conducted stakeholder checks from each one of my participants as well as from two outside researchers who have a specific interest in the topic of guardianship. The stakeholder comments and insights I received on preliminary drafts were incorporated into this final version. Finally, having Brian as a collaborator and sounding board throughout the entire process was invaluable, as always I could refer back to his “sense and understanding of the world” (Cherryholmes, 1998, p. 108).

Findings

The Brown’s Story

I met Brian’s parents, Rita and Anthony Brown, on a Tuesday night via a Skype video call. I began the open-ended interview by asking them to tell me about Brian’s history. They explained that at 3 months old Brian was diagnosed with “failure to thrive” syndrome and a few months later diagnosed with development delays. When he was 13 months old he showed difficulty in motor motive planning, sensory integration, low muscle tone, delayed speech, and began receiving therapy and early intervention services. When Brian was 5 years old, his neurologist explained that he had a neurological or cognitive impairment, though no doctors could explain what had caused the impairment. The neurologist explained that Brian would always struggle in school but that supports and interventions should be continued in order to help him progress and succeed. As the Browns realized Brian had what the doctors called “delays,” they connected with Bonnie, a family advocate from a local advocacy organization. Bonnie encouraged them to seek out a financial advisor familiar with disability law, so that they could create a trust for Brian that would not impact his disability benefits. She also suggested that Brian should be fully included in general education.

But when it came time for grade school, Brian was initially placed in a self-contained classroom, separated from his peers without disabilities. As Brian moved through the early years of elementary school he struggled greatly in reading, writing, and math and had many academic delays. He scored a 40 on the Stanford-Binet I Test and his Individualized Education Program (IEP) identified him with the label “trainable mentally impaired,” what is today known as intellectually disabled (ID). Rita explained that Brian began to notice the difference in his self-contained class and told them he wanted to be in the “regular” classroom. So in the third grade, his parents moved Brian into the general education classroom, leaning upon the Individuals with Disabilities Education Act (IDEA, 2004) and the timely legal decision (Oberti v. Board of Education, 1993) that determined all children with disabilities have the right to be educated in the least restrictive environment (LRE), alongside their general education peers, with appropriate supports and services. The Browns explained that while Brian’s inclusion was never perfect, often inadequate, and sometimes very difficult, they believed that his inclusion provided people involved in Brian’s transitions to middle school, high school and adulthood with a positive framework for understanding Brian and his needs and strengths. They also explained his inclusion provided him with ongoing opportunities to engage in the classroom and in the community. This constantly challenged his supporters (family, teachers, friends, and advocates) to seek new ways to facilitate the development of his interests, desires, and self-determination.

The first time the concept of guardianship came up occurred when Brian was in middle school. In conversations about transition planning with the local advocacy center, Rita and Anthony learned that Brian would not need a guardian when he reached the age of majority (age 18 in their home state). IDEIA mandates that when children turn 18, the rights accorded to their parents transfer to them, unless a child is “determined to be incompetent under State law” (2004, 34 CFR §300.520). However, at that point in time, Rita and Anthony didn’t fully grasp what guardianship
meant. Rita said that for much of his adolescence guardianship wasn’t even discussed. They were “focused on getting him through the day, getting him through middle school and high school, making sure he received the support he needed, and that he was fully included in meaningful ways with the best supports and accommodations.” In fact, Brian’s parents believed that because he “was fully included, he didn’t have a lot of special ed teachers and so guardianship just didn’t come up.” Similarly, Brian explained, “I don’t really remember hearing about it at school” and recalled truly learning about the term legal guardianship for the first time “from other self-advocates and um, like in my summer internship” with the Youth Leadership Network.

When Brian approached the age of majority the issue of guardianship was still not considered by the Browns nor encouraged by any members of Brian’s school transition team. His caseload teacher, Mary, remembered that guardianship was only briefly discussed during the annual review of his Individualized Education Program (IEP) during his senior year and only so that she could check a box on the IEP documenting that, as mandated by IDEIA (2004, 34 CFR §300.520), she had informed Brian and his parents of the rights that would transfer to him at age 18. Mary said that, “The focus of the IEP is about so much more than guardianship, and so it’s something that we actually discuss with one breath, with one sentence.” She added, “We probably asked the question, got the answer, checked the box and went onto bigger things.”

The team’s brief attention to the issue of guardianship was not because they believed Brian didn’t need help with decision-making. In fact, the “bigger things” the team went on to discuss at his IEP meeting were the many supports for decision-making and daily living that he needed then and will likely continue to need throughout his life. For example, an “adult living” transition goal on the IEP reads that Brian, with support from both a nonprofit human services agency and the college he would attend the following year, would “discuss adult living opportunities on campus” using an “ongoing” timeline. It is clear that the Browns envisioned a self-determined life for Brian and they believed guardianship would be “antithetical to raising Brian as someone who would not be excluded from making decisions that affected his life.”

Beliefs and Perspectives of the Participants

After interviewing, transcribing, reading and re-reading transcripts, reviewing documents, coding and discussing codes with Brian, I identified several important themes: the presumption of competence, the importance of interdependence, the use of advocacy, and a rethinking of traditional “transition” for students with intellectual disability. In the following sections, I elaborate on and substantiate this assessment.

Presumption of competence. An implicit statement regarding a young adult’s competency is made with the advocacy for or appointment of a guardian. The guardianship law in Brian’s home state determines an individual “legally incapacitated” if appointed a full guardian (MCL §700.5306). It is therefore essential to consider the social and political context regarding the determination of “competency” or “incompetency” for an individual person. Legal definitions of “incompetence” vary by state and county and are largely rooted in the historic bias that individuals with intellectual disability are often believed to be incompetent (Agran & Hughes, 2013). The assumption that a label of intellectual disability (ID) correlates to incompetence is even exemplified by the definition of ID in the American Psychiatric Association’s (APA) DSM-5 (2013) which reads that “a failure to meet developmental and sociocultural standards for personal independence and social responsibility” (p. 33).

The laws of guardianship therefore seem to exclude people from legal participation in society based on an assumption that they have “failed” to meet the standards for independence and social responsibility even though likely they simply require various levels of support throughout their lives. This assumption of failure creates what Biklen and Burke (2006, p. 167) refer to as the need for “demonstrating-competence-in-order-to-be-granted-it.” In Brian’s case, rather than assume the DSM-V’s “incompetence” or “failure” due to difference, Brian’s family, educators, and supporters rightly questioned the DSM-5’s very
standards for personal independence and social responsibility” (2013, p. 33).

Literature in DS and DSE has long discussed the social construction of disability labels and how once labeled, teachers and supporters often perceive a student through a lens that focuses on their deficits (Baglieri, Bejoian, Broderick, Connor, & Valle, 2001). But Brian’s family presumed competence and shared this vision with his school team. They believed that Brian could and would grow despite any perceived deficits attached to his disability label. As Anthony explained, “in relation to other people giving him opportunities and not them controlling what he did.”

Because of these supported opportunities, Brian demonstrated complexities in thought, actions and relationships that might not have necessarily been anticipated. For example, his parents always acted as if he would one day be able to travel on his own, but they were never sure if he actually would. But by providing him with supported opportunities and purposeful practice, Brian now flies by himself. Rita was very proud but remained amazed by the logistics: how did he handle the complexities of changing planes and dealing with layovers? She said she once asked him, “Brian, how do you do that?” And he looked at me, baffled by my stupid question, and said, ‘mom I just ask for help!’” In her reflection on this story, Rita explained that Brian’s clear understanding of his own needs and his ability to ask for help are key components for her perception of him as a “competent” person and skills they practiced and nurtured throughout his life.

Similarly, Brian stressed that he always felt his parents believed in him. He said that they always told him, “I should have big dreams.” He believes the presumption of competence has greatly contributed to his success as a young adult. He emphasizes that because he is without a guardian he is able to make his own decisions. When I asked why he thinks it is important for him to make his own decisions, he said, “it means I am capable of doing stuff, knowing when I can and should do things, and knowing where I want to work and live.”

Building purposeful community. The Browns had concerns for Brian when he was a child, and continue to have concerns for him now that he is a young adult. But rather than focus on protecting or shielding Brian, they emphasized the importance of acknowledging their concerns and then reaching out to the community and professionals for support. Throughout the interviews, participants discussed helping Brian to build a community and support network in order for him to succeed. Anthony explained that,

Guardianship is this concept that only an individual can provide security for someone. Our general belief was the opposite of guardianship; that you believe the person can grow and make mistakes, but that there is a community of people around him that care about him and will intervene if necessary.

Brian echoed this sentiment, explaining that when it comes to living independently, the most important thing for him is “having a good community and having people that are able to help me and believe in me. It’s also important to have people to go talk to—to help me make decisions.” Building a community for Brian was an intentional and ongoing process for the Browns. As early as third grade, the Browns facilitated person-centered planning (PCP) tools for Brian, such as a Circle of Support, Making Action Plans (MAPS) and Planning Alternative Tomorrows with Hope (PATH) (Falvey, Forrest, Pearpoint, & Rosenberg, 1997). PCP is a concept built around values of inclusion and seeks to understand the supports a person needs to be included and involved in their school and community. Particularly, PCP rejects the medical model of disability, in which Brian’s needs would have been assessed, and services and decisions allocated for him, not with him. Instead, PCP is grounded in the social model of disability and aims to empower by giving individuals the power to make their own decisions with support.

The Browns first used PCP tools when Brian was in the third grade by establishing a Circle of Support, which consisted of peers from school as well as important adults in his life. His “Circle” meetings were held both at school and at home, and Rita explained that for the meetings “the kids would come over here and sit in the basement and talk about his [Brian’s] strengths, and that was just who he was. Those were intentional ways to make sure there were people around him.” When Brian
and I talked about his Circle of Support he explained, “like if I have a problem or if I need something I can go to them and try to explain it and get like help from them.”

During one of our reviews of the notes from each of this year’s monthly Circle of Support meetings, Brian and I noted that while there are various supports discussed during his meetings (i.e., help to find a new roommate, advice about going on romantic dates, where to throw an upcoming birthday party, feedback on a presentation he gave, etc.), they are basically the same supports that most adults seek from their friends, family and colleagues.

I mentioned that it seems like the Circle of Support simply provides a reliable structure of support, Brian said, “yes, but I lead it,” referring to the very important fact that he leads each meeting, determines the agenda ahead of time with support from one of his circle members, delegates a meeting note-taker and emails out the meeting notes after reviewing them with the note-taker. He is fully in charge.

This leadership was corroborated by an example Rita’s shared. She explained that several years before, Brian had flown by himself to a city on the east coast where he had presented his life story and advocated for inclusion at a conference for educators. When he returned home, Rita remembered him saying, “I’m going to move there and here’s what I have to do---the first thing that I have to do there is make a circle of friends.” Rita elaborated, “It was an absolutely stunning example of how something that we started in third grade that wasn’t perfect—and at times, I didn’t think was going to work—helped him to develop the skill of knowing that if he was going to live in this world, he would do it interdependently with others helping him. I mean, you can’t get a higher IQ than that in my opinion.” When Brian and I discussed Rita’s story, he added that, “oh ya, I knew I had to have a Circle of Support if I was going to do something big like move.”

Mary echoed the idea that students with complex needs like Brian should be a part of their community. She explained that students “should have regular social recreational opportunity and they should have a certain amount of ability to navigate their community.” Additionally, when Mary discussed Brian’s transition to postsecondary life she explained that much of it had to do with providing opportunities in the community. She said, “all the way along we were trying to provide Brian with different experiences because that’s how we find out about what we want to do—we wanted him to have the opportunity to try things.”

Interdependence serves independence. All of the participants stressed that Brian would need supports in order to be successful and interdependent. His friend Dan explained that, “he [Brian] really demonstrates that through community you can reach independence and you can reach your goals, you can have success through the support of community, and be an individual, be independent.”

When Brian and I were preparing our questions for our interview with Dan, Brian suggested I write down the following question, “Dan, do you see me as more independent now than you did when you met me?” When I read it back to Brian he paused. Then he said, “Well, I like the word independent but I need to ask for help for things. And I am able to do that.” Here, Brian’s ability both to recognize his needed supports and to ask for those supports illustrates valuable self-determination and self-advocacy skills.

When I asked Brian about the specific supports, he explained that some of the areas in which he feels he needs support are “banking, my checkbook, food shopping; though I know how to cook some food.” He also said, “I need help figuring out where to live, and help with dating.” His parents echoed his expressed areas of support. And his friend Dan elaborated on this concept of support for daily living. He said that Brian helps him understand that “achieving independence is not an individual act”. Instead, Dan now believes that independence is really a collective concept, where someone like Brian can be empowered, make choices and lead his own life with the support of community. With this understanding we can move away from the misconception or overuse of independence to the more honest and realistic goal of interdependence. Dan explains further, “I think community is the foundation for advocacy in general and the idea that we share space with others and we are consistently benefitting from those around us.”

Guardianship, then, lies in direct contrast to the idea of achieving independence.
through community support. Relying on the medical model, guardianship designates a person deficient and incapable of making decisions. When Brian and I discussed this particular idea, I asked him whether or not he believed people could be “capable” and simultaneously need many supports. In response he asked me to first explain “capable.” After we looked the word up and discussed it, he decided that capable, “makes me think of what I’m trying to do in life and what I’m trying to get done.” Once he had determined his definition of capable, we decided together that we believed it was possible for a person with an intellectual disability, or in fact, any person at all, to be considered capable and simultaneously rely on community support. He said insightfully, “Maybe someone would say, ‘oh, well you should do it all on your own’, but the thing is, everyone needs help with some things in their life.”

Advocacy, agencies and experts. Brian’s teacher Mary explained that for students with more complex needs, the transition process has many parts and can become complicated and overwhelming for both the family and the teachers. “I cannot be the expert on everything,” Mary said, “I can be the expert on education and IDEA, but there is something about guardianship and social security that evades me.” In fact, Mary’s experience working with the Browns to facilitate Brian’s transition “was a whole new level” of complexity for her. Therefore, while she explained she doesn’t have all of the answers, she understands the need to be aware of local agencies and professionals that focus on areas of transition that may be beyond her scope of expertise (i.e., alternatives to guardianship, social security benefits, or financial planning for students with more complex needs). She said that staying informed means, “even when I can’t answer a question eloquently, I know what direction to point the parents in; I have a brochure or a card to hand them.” She also explained that she, “creates workshop opportunities and learning opportunities for the families in my district, and I learn alongside them.” She believed providing in-school access to outside agencies and experts is a proactive way for her to support families and students while benefitting her own ongoing professional development. She said, “the biggest help is having all the voices and all the experts in the different areas at the table, together. It helps to fill in all those gaps and answer all those questions.”

In addition to professional experts, Brian was also connected with self-advocates who introduced him to the culture of disability in a way his able-bodied parents and educators could not. Rita explained that Brian’s experience with youth leadership programs such as Kids As Self Advocates (KASA) and the National Youth Leadership Network (NYLN) were “life changing moments.” She told a story about the time Brian created a timeline of his life in which only two dates were present, “when he was born, which was also when the Detroit Tigers won the world series, and then, the next thing was when he was in 10th or 11th grade and he went to our state’s Youth Leadership Forum for four days . . . as if there was nothing else in between!” In 11th grade, Brian also became a national board member for KASA and learned a great deal about disability culture and history. When Brian talked about his experience with KASA he said,

KASA was important to me because I met some great self-advocates with disabilities and I met great friends that I still have today. And it like helped me to know my rights, and learn about self-advocacy skills, and just, it did a lot of great things.

These advocacy organizations were grounded in the social model of disability and in the beliefs that all people with disabilities should maintain self-control, foster notions of self-worth and have the opportunity to develop self-determination. Rita explained that these organizations thought “guardianship was absolutely not an option and so at a very young age he was around folks that knew guardianship was not the road for him.” And while the Browns may not have always used the words “self-advocate” or “self-determined,” these concepts were integral to the way they raised Brian. Anthony expressed that they push and nudge Brian forward, just as any parent might with their child, they also have to be careful because they are navigating both their understanding of how Brian is defining his own world and the world they envision for him. Anthony explained, “there’s this fine line between what’s real for everybody and what’s particularly real for your child with a disability.”

When I spoke to Brian about this data, I asked
him whether or not he was ever worried that people in his life, even though they cared about him, might try to sway one of his decisions.

**Brian:** Well I try to talk to them, and say, “ok . . . I can make my own decisions and if I need more help then I’ll come to you.”

**Researcher:** What happens if someone you care about gives you advice that you completely disagree with?

**Brian:** What my parents say is, if I agree or disagree, I should just talk to the person and say, “I’m gonna think about it and then I’ll let you know.”

Our conversation illustrates that Brian knows how to navigate difficult conversations with his supporters. Brian said he thinks this ability means he is a self-advocate. When I asked him how he thinks he developed these self-advocacy skills he said, “I learned it from having great parents that helped with stuff. I saw them advocating for me when I was younger and then they taught me how to advocate for myself.”

**Discussion and Recommendations**

The conclusion that Brian would not need a legal guardian was decided due to many ongoing factors. Brian was provided with continual opportunities to develop supported decision-making skills, dream, and plan for his future. These opportunities proved essential in supporting Brian to become a highly self-determined individual. This is consistent with previous research on the effective links between self-determination and successful post-secondary transition (Sitlington & Clark, 2006; Wehmeyer, 1997). Based upon interview data, on-going analytic discussions with Brian, and previous research in this area, I make the following recommendations for schools and families related to the role of guardianship and its alternatives for students with intellectual and developmental disabilities.

**Presume That Students Can Be Included**

Inclusion in the general education classroom had a positive impact on Brian’s transition planning process and the development of skills required for postsecondary life. These findings support previous research that inclusion in general education significantly correlates with improved post-school outcomes in the areas of education, employment, and/or independent living (Test et al., 2009) and the already substantial research that evidences greater academic and social outcomes for students with disabilities who are included in the general education classroom (Causton & Theoharis, 2008; Cosier, 2010; Fisher & Meyer, 2002).

These findings, however, are contrary to the recent study by Jameson et al. (2015), which evidenced that educational setting had minimal influence on whether guardianship was deemed necessary for students with disabilities. This discrepancy between Brian’s experience and the participants in Jameson et al’s large study could be because the driving forces behind Brian’s inclusion was the presumption that Brian was competent and could be included. These assumptions of competence and inclusion greatly helped to support him in the development of communication and academic performance skills; self-determination; interpersonal relationship skills; and integrated community participation skills, all skills identified by Sitlington and Clark (2006) as important domains related to the concept of effective transition.

**Establish Person-Centered Planning (PCP)**

Previous research has shown that when the need for guardianship is determined, alternatives have generally not been fully explored during the transition process (Payne-Christiansen & Sitlington, 2008). This study is therefore consistent with the recommendations of Payne-Christiansen and Sitlington (2008) that alternatives to guardianship should be explored in tandem with an ongoing assessment of the student’s strengths, needs, preferences, and interests. Brian’s story highlights effective strategies for this ongoing assessment in the form of specific PCP tools: Circles of Support, MAPs, and PATH planning (Falvey, Forest, Pearpoint, & Rosenberg, 1997). The use of PCP placed Brian at the center of his educational and transition planning and this led to increased self-determination, self-advocacy skills, and ultimately more positive postsecondary outcomes for Brian.
These findings support prior research by Shogren et al. (2007), which suggests that there is an increase in student levels of self-determination when they feel empowered to be a part of their education and transition planning. Prior research has shown that PCP is most effective when the individual with disabilities is near his or her family (Robertson et al., 2006). However, this study evidences that by establishing PCP tools early and using them consistently throughout Brian’s youth, he was able to effectively establish and lead his own PCP tools (i.e., Circle of Support) even after moving half-way across the country from his family.

Create Peer and Community Connections

Consistent with findings by Test and colleagues (2009) and Landmark, Ju, and Zhang (2010) who identified family involvement, social skills and community collaboration as key indicators for positive student transition, this study found that the establishment of peer and community connections helped Brian to develop social skills, daily living skills and connections with his community. While the Browns facilitated much of these connections without teacher initiation, instructional and support staff can also implement these connections for students. IEP goals for transition planning can even specify these supports. For example, an IEP goal might state, “the school will work with the student to create peer connections throughout the school day (i.e., partner work, group work and lunch bunches)” or “the parent will work with the student to establish community connections (i.e. with a personal banker, a community center, and neighborhood stores).”

It Takes a Village: Use All Available Resources

This study affirms research by Millar (2003, 2007) and Jameson et al. (2015), which has suggested school teams require more training and information about alternatives to guardianship as well as the promotion of self-determination for young adults with disabilities. This study also supports previous studies (Jameson et al., 2015; Millar, 2003, 2007, 2008) that teachers and school teams should not be expected to be the experts on every factor related to transition, particularly for students like Brian who have more complex needs, and should instead be knowledgeable and up-to-date about the local agencies, professionals and networks with whom to connect families and students. Like Brian’s teacher, school teams should make the effort to bring these agencies and professionals to the school whenever possible (i.e. facilitating transition fairs, alternatives to guardianship workshops, connecting students with self-advocates, and inviting agency representatives to IEP meetings). Families and school teams can write this type of professional preparation directly into the IEP, for example, that “the instructional and support staff will receive training about alternatives to guardianship.” (See IDEIA 2004, § 300.703(b)(1)). This is a mandated way that families and teachers can seek professional development from agencies and professionals who are experts in the areas related to guardianship alternatives.

Rethink Transition

Participants in this study expressed concern that high school to postsecondary transition can often be a prescribed process, one in which educators and families can let their fears and uncertainties for their child with a disability outweigh the need for him or her to grow and become self-determined. However, the language of the IDEIA (2004) mandates that transition should be an individualized process, based on the student’s needs and goals in order to help the student improve their self-determination and postsecondary quality of life (Wehmeyer, 1997). In order to achieve the IDEIA’s goals for transition, the staff must take into account that students like Brian will likely continue to need supports and services for the remainder of their lives, particularly with decision-making. While this concern may lead families to appoint a guardian for their child in order to protect them (Millar, 2014), research has found that guardianships do not automatically address these issues of concern (Millar, 2003). This study shows that when families and educators expect and plan for interdependence during transition students with disabilities have many opportunities to partake in making the decisions with support that lead to growth and maturity.
Although this study utilized inter-coder reliability checks, stakeholder checks, integrated-data sources, and ongoing collaboration with the main participant, various limitations remain. I chose to use the optimistic approach (Bogdan & Biklen, 1998) to understand how and why an individual and his supporters decided not to appoint guardianship. This decision, however, means that the experiences of the participants may not be reflective of others in similar situations and questions of whether Brian’s experience was an exception still remain. However, the research in understanding the use and outcomes of alternatives to guardianship is still relatively new and this qualitative case provides an in-depth look at the process and outcomes for one young man. I hope, therefore, that the lessons learned from this study can assist in the design of future research studies in which researchers can examine a greater number of individuals using a variety of alternatives to guardianship.

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Comparison of Mathematics Performance of Children and Adolescents with and without Down Syndrome

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Abstract: Mathematics is an area of difficulty for most children and adolescents with Down syndrome (DS). Researchers have suggested tailoring academic interventions based on the behavioral phenotype of DS could improve mathematics outcomes. The purpose of this review was to examine whether children and adolescents with DS perform differentially compared to individuals without DS on mathematics tasks. Findings favoring differential performance may support the notion that the behavioral phenotype is important to consider in future mathematics intervention research. We identified eight studies published between 1989 and 2013 that compared mathematics performance of children and adolescents with DS to another group of individuals. No consistent pattern of differential performance for children with DS was found in the studies. More research is necessary to understand the connection between the behavioral phenotype of DS and mathematics performance.

Most children with Down syndrome (DS) experience difficulty with mathematics and fail to achieve adequate mathematics competency (Rynders et al., 1997; Turner & Alborz, 2003). Mathematics competency is critical, as children who demonstrate strong skill with mathematics demonstrate improved adulthood outcomes over children who experience difficulty with mathematics (Dougherty, 2003; Faragher & Brown, 2005; Murnane, Willett, Braatz, & Duhaldeborde, 2001). Despite evidence suggesting that infants with DS exhibit differential performance on numerosity tasks compared to infants with other genetic syndromes (e.g., Williams syndrome; Patterson, Girelli, Butterworth, & Karmiloff-Smith, 2006), recent calls to adapt academic intervention based on the behavioral phenotype, or pattern of probabilistic behavioral outcomes (e.g., Fidler, 2005; Lemons & Fuchs, 2010), have not addressed the mathematics performance of individuals with DS. Moreover, no review has synthesized differential patterns of performance between individuals with and without DS.

The role of the behavioral phenotype for DS is well documented in language, social-emotional functioning, and various cognitive domains (e.g., Fidler, Most, & Philofsky, 2009; Jarrold, Purser, & Brock, 2006; Steele, Scerif, Cornish, & Karmiloff-Smith, 2013). Attempts to describe the phenotypic profile as it relates to mathematics, however, must take into account the various control groups featured in comparative studies. Evidence of a singular profile of behaviors associated with DS is generally derived from comparisons to control groups matched across chronological age, mental age, or other cognitive characteristics. Chapman and Hesketh (2000) suggest that the selection of the comparison group may skew within-group performance differences on tests of ability that serve as the basis for the DS phenotype. Matching on the basis of intelligence quotient (IQ), for example, may be problematic as patterns of specific cognitive deficits vary within ranges of mental functioning.

This review explored mathematics skills in individuals with DS relative to other groups (i.e., individuals without DS). A systematic search of empirical research identified studies...
comparing the mathematical performance of individuals with and without DS. Matched groups included individuals with disabilities other than DS as well as individuals without a disability. In this introduction, we describe the concept of a behavioral phenotype and how this phenotype may influence intervention work for children with DS. Then, we delineate current mathematics expectations for children in the United States, mathematics instruction for individuals with intellectual disabilities (ID), and the typical mathematics profiles of children with DS. Finally, we present the research questions guiding this study.

Behavioral Phenotype

The behavioral phenotype of children with DS includes relative strengths in social communication and visual processing as well as deficits in fine motor skills, language, and working memory (Chapman & Hesketh, 2000; Fidler, 2005). Although research in the area of literacy indicates that modifying reading instruction based on the behavioral phenotype may be beneficial for children with DS (Fidler & Nadel, 2007; Lemons, Mrachko, Kostewicz, & Paterra, 2012; Lemons, King, et al., 2015), the behavioral phenotype is not currently an explicit consideration when designing mathematics interventions for children with DS (Lemons, Powell, King, & Davidson, 2015). As with the general population, however, the responsiveness of individuals with DS to intervention may be predicted by established patterns of cognitive, language, and sensory performance.

In addition to the general intellectual deficits (e.g., Mean IQ = 50), individuals with DS exhibit relative weaknesses in verbal working memory, recall, and attention (Chapman & Hesketh, 2000; Fidler & Nadel, 2007; Jarrold et al., 2006). Individuals with DS also demonstrate limited task persistence and increased distractibility (Fidler, 2005). Task avoidance is associated with deficits in strategic thinking and other aspects of cognitive functioning. In contrast, individuals with DS have demonstrated relative strengths on visual short-term memory (Hodapp & Freeman, 2003). Ratz (2013) found that individuals with DS (n = 190) exhibited considerably higher levels of alphabetic recognition—a skill highly dependent on visual short-term memory—than students with ID (n = 1,419) matched on the basis of ID severity (e.g., severe, profound). Additional studies have demonstrated strengths in visuospatial processing (Fidler, 2005; Jarrold, Baddeley, & Hewes, 1999).

Individuals with DS also demonstrate significantly weaker expressive language relative to receptive language (Fidler & Nadel, 2007; Miller, 1999). Individuals with DS exhibit deficits in grammar (Fidler, 2005) and phonological awareness when compared to typical peers matched on reading-ability and mental or chronological age (Lemons & Fuchs, 2010; Steele et al., 2013). Multiple areas of motor functioning, including motor skills, motor planning, and precise movements of limbs are also apparent areas of difficulty for individuals with DS (Fidler, 2005). Further, Spanò and colleagues (1999) observed that a sample of children with DS between the ages of 4 and 14 demonstrated severe impairments across areas of motor functioning with no improvement over time.

The established characteristics of the DS phenotype are likely to influence the performance of individuals with DS in mathematics. Deficits in working memory, for example, were a significant predictor of numeration skills for typically developing students at the end of third grade (Fuchs, Geary, Fuchs, Compton, & Hamlett, 2013). Likewise, Robinson and Temple (2011) linked deficits in the area of listening comprehension, receptive vocabulary, and grammatical comprehension, with poor outcomes in mathematics. Mathematics for students with DS, however, is infrequently distinguished from the instruction provided to students with ID (Lemons, Powell, et al., 2015).

Mathematics for Children with ID

The content of mathematics instruction in the United States is driven by standards from organizations (e.g., National Council of Teachers of Mathematics [NCTM], 2006; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) and high-stakes assessments. The overwhelming majority of children, including children with disabilities, are expected to meet or exceed standards of proficiency (Katsiyannis, Zhang, Ryan, & Jones, 2007). On high-stakes
standardized assessments, a small percentage of children with disabilities may qualify to take an alternate assessment (Thurlow, Lazarus, Thompson, & Morse, 2005). Typically, children with ID (such as DS) make up more than 40% of children who qualify for the alternate assessment option (Kearns, Towles-Reeves, Kleinert, Kleinert, & Thomas, 2011); nonetheless, the majority of students with ID are expected to meet or exceed grade-level standards.

As a result of the current emphasis on the general education curriculum, interventions for students with ID involve both academic and functional mathematics skills (Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakenman, 2008). Whereas academic interventions generally emphasize computation skills or numeracy skills (e.g., Hitchcock & Noonan, 2000), functional interventions overwhelmingly involve purchasing or other money-related tasks (Browder et al., 2008). Individuals with moderate-to-severe ID benefit from intensive, systematic instruction featuring prompting, consistent response-dependent consequences (e.g., error correction, praise), and multiple opportunities to respond (Browder et al., 2008; Kroesbergen & van Luit, 2003).

The extent to which the mathematical profile of individuals with DS differs from the general population of students with cognitive disabilities is uncertain (Lemons, Powell, et al., 2015). Children with DS—like many children with ID—demonstrate low mathematics performance on standardized assessments (Pieterse & Center, 1984; Turner & Alborz, 2003). Nonetheless, researchers have specifically focused on the development of numeracy and higher-level mathematics skills for individuals with DS (e.g., Martinez & Pellegriini, 2010).

Mathematics for Children with DS

Difficulty with mathematics for children with DS often begins with early numeracy concepts, and many children find early numeracy skill more challenging than early literacy skill (Buckley, 2007). Early numeracy concepts include quantity recognition and creating (e.g., “there are three dinosaurs”), numeral recognition and writing (e.g., “that is the number 7”), and counting (Nye, Clibbens, & Bird, 1999). Although ostensibly simplistic, counting requires an understanding of stable order (i.e., the number names in order), one-to-one correspondence (i.e., each item gets only one count), and cardinality (i.e., the last number counted represents the amount of the set). Children with DS exhibit more problems with stable order than one-to-one correspondence, and very few children with DS connect their counting to cardinality. Problems children with DS exhibit in remembering digit spans for counting (Hick, Botting, & Conti-Ramsden, 2005) potentially stem from deficits in working memory (Lanfranchi, Baddeley, Gathercole, & Vianello, 2012). On another early numeracy skill, comparing quantities, infants with DS exhibited difficulty in comparing two sets of dots (Ansari & Karmiloff-Smith, 2002).

Overall, children with DS exhibit a pattern of weakness with early numeracy. Because early numeracy is foundational to all other mathematics, it is unsurprising that children with DS have difficulty in other mathematical areas. For example, children with DS exhibit low performance on whole number facts (Belacchi et al., 2014; Dihoff, Brosvic, Epstein, & Cook, 2005; Herrera, Bruno, González, Moreno, & Sanabria, 2011). Children with DS often require additional instruction on telling time and working with money (Ayres, Langone, Boon, & Norman, 2006; Vinter & Detable, 2008) and encounter difficulties with higher-level mathematics concepts such as rational numbers, solving equations, and solving word problems (Martinez, 1998; Martinez & Pellegriini, 2010).

The evidence base related to the preparation of children with DS is—like instruction for children with non-specific ID—mostly restricted to early mathematics skills, such as counting, matching, basic facts, and measurement (Browder et al., 2008; Lemons, Powell, et al., 2015). For example, teachers can teach early counting and addition and subtraction skills with a variety of tools (e.g., Horner, 2007; Wing & Tacon, 2007). Many of these teaching recommendations, however, have not been validated through high-quality research. Of the nine intervention studies for children or adolescents with DS identified by Lemons, Powell, and colleagues (2015), none satisfied accepted standards of methodological rigor (e.g., Gersten et al., 2005).
Research Questions

The differential mathematics performance of individuals with DS may provide support for incorporating the behavioral phenotype when developing future mathematics interventions. Evaluating comparison studies provides an additional opportunity to assess the influence of matching techniques—including mental age, chronological age, or IQ scores—on observed patterns of difference (Chapman & Hesketh, 2000). The current review examined studies that directly compared the mathematical ability of groups of individuals with DS to groups without DS. Guiding questions included: (1) What are the characteristics of participants with and without DS, and how do researchers match comparison groups?; (2) What mathematical tasks do researchers assess?; and (3) To what extent do children and adolescents with DS demonstrate differential patterns of performance on mathematical tasks when compared to children without DS?

Method

Inclusion Criteria

Selected studies (a) appeared in English-language, peer reviewed journals published prior to 2014, (b) featured quantitative data directly related to mathematics skills, and (c) compared the mathematical performance of children and adolescents (ages 5 to 21 years) with DS and another group. Also included were studies featuring groups with a mean chronological age between 5 and 21 years, provided no participants were more than two years outside of the age range. Designs that did not disaggregate data for students with DS were excluded. Single-case design studies, which do not permit conclusions regarding the influence of group characteristics (Gast & Ledford, 2014), were also excluded.

Search Procedures

We identified relevant articles through a search process consisting of three phases. Specifically, we conducted (1) an electronic database search, (2) a hand search of relevant journals, and (3) an ancestral search of relevant articles. First, we used the PsycINFO, PsycARTICLES, and ERIC databases to identify peer-reviewed, English language articles published between 1940 and 2013 that included Down syndrome or Down’s syndrome anywhere in the article, and at least one from each of the two following sets of terms located in the article abstract (Set 1 [math focus]: addition, arithmetic*, basic facts, cardinality, count*, decimals, division, fractions, geometry, math*, measurement, money, multiplication, number conservation, number sense, numerals, percent, place value, pre-algebra, problem solving, ratio, seriation, subitizing, subtraction, symbol identification, telling time, or word problems; Set 2 [comparison focus]: compare*, diff*, same, OR similar*). This search yielded 509 peer-reviewed articles.


Coding Procedures

In order to address the research questions, we coded key elements of included studies. Participant age and disability status, as well as the number of participants and outcome measures, were derived from author reports. Matching variables were coded using an adapted form of procedures described by Chapman and Hesketh (2000). Chronological age matching occurred when experimenters reported no differences between the ages of individuals with DS and control group participants. Two codes were derived from the use
of cognitive tests in matching participants: mental age matching referred to the matching of individuals with DS controls using chronological estimates of developmental level derived from cognitive assessment; cognitive score matching referred to the use of cognitive scores without reference to an age group associated with a given level of performance (i.e., mental age). IQ matching consisted of matching procedures based on the standardized IQ scores of participants. Skill matching referred to the use of non-standard or researcher developed measures as the basis for group composition. Multiple matching procedures utilized combinations of matching procedures.

Comparing insufficiently matched groups invalidates inter-group comparison studies, as findings may be due to variance in the control variable as opposed to any disparity in targeted characteristics (Mervis & Klein-Tasman, 2004). We assessed reports regarding the absence of statistical differences in a specified outcome between groups—that is, the p value at which researchers accepted the null hypothesis that groups were equivalent on a matching variable—using criteria established by Frick (1995). Reported p values above .50 were deemed large enough to confirm the lack of intra-group differences on matching variables. When reported, p values were used for coding purposes. We derived p values using central tendency data (e.g., M, SD) in all other instances. Additional codes indicated the presence or absence of statistically significant differences (i.e., p \leq .05) and directionality in between-group performance on targeted measures (e.g., DS < TD).

Inter-rater Agreement

Inter-rater agreement was evaluated for search procedures and application of article codes. Following the completion of the database search, two authors independently reviewed abstracts or full articles to determine whether studies met inclusionary criteria. Average inter-rater agreement—calculated using the point-by-point method—was 97% (Gast & Ledford, 2014). For the ancestral search, two authors reviewed the resources cited in previous reviews of the literature. Average agreement for the ancestral search was 97.5% across 92 articles. Disagreements were resolved through consensus following a review of the full article. During the coding process, one author independently completed the coding sheet and a second author reviewed the coding for accuracy for each article. Inter-rater agreement was 98.1%. For all stages of the review process, disagreements were resolved through a review of the study, discussion, and consensus of the authors.

Results

Eight studies were identified in which the mathematics skills of children or adolescents with DS were compared to another group of individuals. The studies evaluated differences in performance between eight groups of individuals with DS and 11 comparison groups. Three studies featured more than one comparison group (Camos, 2009; Sella, Lanfranchi, & Zorzi, 2013; Stith & Fishbein, 1996). The remaining studies (Caycho, Gunn, & Siegal, 1991; Klein & Mervis, 1999; Lister, Leach, & Riley, 1989; Nye, Fluck, & Buckley, 2001; Porter, 1999) compared individuals with DS to one comparison group. Average sample sizes of groups composed of individuals with and without DS were 19.1 (SD = 7.2; Range = 12–36) and 16.5 (SD = 3.3, Range =12–21).

Participant Characteristics and Matching Variables

A summary of demographic characteristics for all participants appears in Table 1. The studies included 153 children or adolescents with DS (age range 3–20 years) and 182 children in comparison groups (age range 2–18 years). Gender was evenly distributed among groups with and without DS (53.6% and 49.5% male, respectively). Participants with DS between the ages of 3 through 13 appeared in the majority of studies (n = 5). Adolescents or young adults with DS were featured in the remaining studies (n = 3). Of the 11 comparison groups, most consisted of children (n = 7), with adolescents or young adults serving as controls in a minority of comparisons (n = 2). The age of comparison participants was not reported for two control groups (Camos, 2009).

Authors reported cognitive scores using a variety of measures in six of the studies; how-
<table>
<thead>
<tr>
<th>Study</th>
<th>Down Syndrome</th>
<th>Comparison</th>
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<tbody>
<tr>
<td></td>
<td>N Gender Mdn Age (R) IQ Scores</td>
<td>Status N Gender Mdn Age (R) IQ Scores</td>
</tr>
<tr>
<td>Camos (2009)</td>
<td>12 6 males 6.1 (4–7) HSD; M = 3.5 yrs (SD = 9 mths, R = 2.7–5.25 yrs)</td>
<td>(1) TD 12 6 males NR NR</td>
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<tr>
<td></td>
<td></td>
<td>(2) TD 12 6 males NR NR</td>
</tr>
<tr>
<td>Caycho et al. (1991)</td>
<td>15 8 males 9.6 (NR) PPVT-R; M = 4.6 yrs (SD = 11.3 mths)</td>
<td>TD 15 6 males 4.5 (NR); SD = 0.7</td>
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<td></td>
<td></td>
<td>Stanford-Binet; M = 48 (SD = 6, R = 4–60)</td>
</tr>
<tr>
<td>Klein &amp; Mervis (1999)</td>
<td>13 4 males 9.8 (9–10) MSCA (raw); M = 120.92 (SD = 27.98)</td>
<td>WS 13 4 males 9.9 (9–10) MSCA; M = 122.85 (SD = 28.4)</td>
</tr>
<tr>
<td>Lister et al. (1989)</td>
<td>36 29 males 15.2 (5–20) NR</td>
<td>TD 20 11 males 5.5 (4–6) NR</td>
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<td></td>
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<tr>
<td></td>
<td>23 12 males 5.3 (3–7) Leiter; M = 39.83 mths (SD = 6.19, R = 29–48)</td>
<td>TD 20 13 males 3.1 (2–4) Leiter; M = 40.90 mths (SD = 4.40, R = 29–48)</td>
</tr>
<tr>
<td>Porter (1999)</td>
<td>16 8 males 10.0 (7–13) BPVS; M = 35.15 mths (SD = 13.19, R = 0–61)</td>
<td>SLD 16 9 males 9.88 (7–15) BPVS; M = 41.38 mths (SD = 15.3, R = 0–67)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sella et al. (2013)</td>
<td>21 9 males 14.2 (NR); SD = 3.4 PPVT-R; M = 56 mths (SD = 13)</td>
<td>(1) TD 21 9 males 14.2 (NR); SD = 3.5</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(2) TD 21 9 males 5.4 (NR); SD = 0.6</td>
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<tr>
<td></td>
<td></td>
<td>Raven (raw); M = 14 (SD = 4)</td>
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<td></td>
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</tr>
<tr>
<td>Stith &amp; Fishbein (1996)</td>
<td>17 6 males 15.3 (10–18) NR</td>
<td>(1) ID 17 9 males 14.2 (NR); SD = 3.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) TD 15 8 males 6.9 (6–7) NR</td>
</tr>
</tbody>
</table>

**Notes**: Mdn = Median, SD = Standard Deviation, R = Range, TD = Typically Developed, WS = Williams Syndrome, SLD = Severe Learning Difficulties, ID = Intellectual Disabilities, NR = Not Reported, HSD = Harvey Scale of Development, PPVT-R = Peabody Picture Vocabulary Test—Revised, MSCA = McCarthy Scales of Children’s Abilities, Leiter = Leiter International Performance Scale, BPVS = British Picture Vocabulary Scale, Raven = Raven’s matrices.
ever, the extent of the participants’ ID (e.g., adaptive behavior) was generally not described. For participants with DS, authors reported mental age equivalent scores in the majority of studies \((n = 5)\). The average difference between the chronological and mental ages of participants with DS was 5.3 years \((SD = 2.8; \text{Range} = 2–9.6)\), suggesting a low level of functioning among participants. Raw cognitive assessment scores provided in two of the studies suggested the cognitive functioning of participants with DS was several deviations below the mean. A summary of IQ scores for participants with and without DS appears in Table 1.

Authors employed a narrow range of comparison groups and matching procedures (see Table 2). Eight comparison groups consisted of typically developing children. Of these, two were matched on the basis of chronological age (e.g., Camos, 2009), four were matched on the basis of mental age (e.g. Caycho et al., 1991), and one was matched on the basis of a non-standardized skill assessment (Stith & Fishbein, 1996). Matching procedures were not reported for one of the comparison groups featuring typically developing children (Lister et al., 1989). Students with alternate diagnoses appeared less frequently in comparison groups \((n = 3)\). Children with ID not attributed to DS appeared in a single study (Stith & Fishbein, 1996) matched on non-standardized numeracy skills. The remaining studies matched individuals with severe learning difficulties (Porter, 1999) and Williams syndrome (Klein & Mervis, 1999) using multiple matching procedures. Porter (1999) matched individuals with severe learning difficulties and DS using numeracy skill test scores and receptive language ability scores from the British Picture Vocabulary Scales (Dunn & Dunn, 2009). Klein and Mervis (1999) matched groups using chronological age and cognitive skill matching procedures.

For the majority of comparisons \((n = 6)\), authors did not provide adequate evidence of equivalence between groups with and without DS. Sufficient evidence was not provided to determine the \(p\) value for four comparisons; two comparisons were accompanied by either (a) partial evidence of a \(p\) value exceeding .50 (Klein & Mervis, 1999) or (b) a \(p\) value below .50 after comparing groups on a matching variable (Stith & Fishbein, 1996). Authors of the remaining comparisons \((n = 5)\) reported \(p\) values large enough to confirm lack of differences on the matching variable (i.e., > .50).

**Target Skills**

The mathematical skill assessments included in the comparison studies were, with one exception (Klein & Mervis, 1999), developed by researchers and primarily involved early numeracy (Table 2). Three studies featured quantity discrimination, conservation of volume, and numeration. Camos (2009) assessed quantity discrimination using booklets featuring six sets of 8, 12, or 16 dots. Children were shown two sets of dots presented side-by-side (8 dots versus 12 dots and 8 dots versus 16 dots). Lister, Leach, and Riley (1989) presented five conservation tasks similar to those designed by Piaget to participating children. In each task, sets of items were transformed, and children had to state whether the original value of the set persisted following the transformation. For example, in one task, children identified knowledge of conservation a fluid that researchers redistributed in four ways. Sella et al. (2013) presented children with computerized tasks that required the identification of quantity (e.g., matching sets of dots that flashed on the screen with numerals).

Counting tasks (i.e., one-to-one correspondence, stable order, cardinality) were featured in four of the identified studies. Caycho et al. (1991) administered a counting task consisting of nine video segments where three hand puppets counted five different toys. Children responded whether the puppet counted “right or wrong” (Caycho et al., p. 577). Similarly, Klein and Mervis (1999) administered three subtests of the McCarthy Scales of Children’s Abilities (MSCA, 1972) pertaining to mathematics: Number Questions, Numerical Memory, and Counting and Sorting. Porter (1999) asked participants to perform tasks related to counting, such as counting objects in sets (e.g., 3, 5). Children were scored based on use of stable order, one-to-one correspondence, and cardinality. On another task, children corrected errors with stable order, one-to-one correspondence, or cardinality made by a puppet. Nye et al. (2001) used puppets on counting tasks. Unlike Caycho and colleagues
## TABLE 2
### Summary of Comparisons in Mathematic Skills of Individuals with and without Down Syndrome

<table>
<thead>
<tr>
<th>Study</th>
<th>Comparison</th>
<th>Matching Variables (Measure)</th>
<th>p</th>
<th>Measure</th>
<th>Skills</th>
<th>Outcomes</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camos (2009)</td>
<td>(1) TD</td>
<td>MA (HSD)</td>
<td>NR</td>
<td>RD; Visual discrimination of 8</td>
<td>Quantity Discrimination</td>
<td>DS = TD</td>
<td>No differences between groups.</td>
</tr>
<tr>
<td></td>
<td>(2) TD</td>
<td>CA</td>
<td>NR</td>
<td>versus 12 and 8 versus 16 dots</td>
<td></td>
<td></td>
<td>All reliably discriminated the 1:2 ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(i.e., 8 vs 16) but not the 2:3 ratio (i.e.,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 vs 12).</td>
</tr>
<tr>
<td>Caycho et al. (1991)</td>
<td>TD</td>
<td>MA (PPVT-R)</td>
<td>1a</td>
<td>RD; Error detection and counting</td>
<td>Counting</td>
<td>DS = TD</td>
<td>Both groups performed similarly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(one-to-one correspondence, stable order, cardinality)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klein &amp; Mervis (1999)</td>
<td>WS</td>
<td>Multiple: CA; CS (MSCA)</td>
<td>NR:.86</td>
<td>MSCA; Number Questions (NQ), Numerical Memory (NM), and Counting and Sorting subtests</td>
<td>Counting</td>
<td>DS &lt; WS on NM DS = WS on NQ and Counting and Sorting</td>
<td>DS and WS groups exhibited similar performance on all measures except numerical memory.</td>
</tr>
<tr>
<td>Lister et al. (1989)</td>
<td>TD</td>
<td>NR</td>
<td>NR</td>
<td>RD; Conservation of number and substance</td>
<td>Conservation</td>
<td>DS &lt; TD</td>
<td>Sample demonstrating conservation less for DS.</td>
</tr>
<tr>
<td>Nye et al. (2001)</td>
<td>TD</td>
<td>MA (Leiter)</td>
<td>.52a</td>
<td>RD; Verbal number sequence; Counting (stable order, one-to-one correspondence, cardinality)</td>
<td>Counting</td>
<td>DS &lt; TD</td>
<td>DS produced shorter verbal number sequences; TD outperformed on all tasks.</td>
</tr>
<tr>
<td>Porter (1999)</td>
<td>SLD</td>
<td>Multiple: SK (count and error detection); MA (Receptive language, BPVS)</td>
<td>.58; .82</td>
<td>RD; Counting and error detection of counting (stable order, one-to-one correspondence, cardinality)</td>
<td>Counting</td>
<td>DS = TD</td>
<td>Both groups performed similarly.</td>
</tr>
<tr>
<td>Sella et al. (2013)</td>
<td>(1) TD</td>
<td>CA (PPVT-R)</td>
<td>1a</td>
<td>RD; Identified whether initial stimulus (dots or Arabic numeral) were same or different from target stimulus (dots)</td>
<td>Numeration</td>
<td>DS &lt; TD (MA); DS &lt; TD (CA)</td>
<td>DS outperformed by MA and CA matched controls on all tasks.</td>
</tr>
<tr>
<td></td>
<td>(2) TD</td>
<td>MA</td>
<td>NR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stith &amp; Fishbein (1996)</td>
<td>(1) ID</td>
<td>SK (competence with counting, cardinality, recognition of written numerals, magnitude, and coin identification)</td>
<td>.62a</td>
<td>RD; Coin counting and comparison of values</td>
<td>Money</td>
<td>DS = ID; DS &lt; TD ID &lt; TD</td>
<td>No differences between students with DS and ID. TD outperformed both groups on all tasks.</td>
</tr>
<tr>
<td></td>
<td>(2) TD</td>
<td></td>
<td>.22a</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Notes**: Mdn = Median, SD = Standard Deviation, TD = Typically Developing, WS = Williams Syndrome, SLD = Severe Learning Difficulties, ID = Intellectual Disabilities, NR = Not Reported, MA = Mental Age, CA = Chronological Age, CS = Cognitive Score, SK = Skill, RD = Researcher Developed, HSD = Harvey Scale of Development, PPVT-R = Peabody Picture Vocabulary Test—Revised, MSCA = McCarthy Scales of Children’s Abilities, Leiter = Leiter International Performance Scale, BPVS = British Picture Vocabulary Scale, *Derived from reported data.*
(1991), Nye et al. (2001) required the children to help the puppets count on a series of tasks (e.g., stars on a card, toys from a basket) in order to demonstrate stable order knowledge and cardinality.

One of the studies extended early numeracy tasks into the realm of functional skills. Stith and Fishbein (1996) prompted children to work on tasks related to money. In the first task, coins were placed in front of stuffed dogs. Children identified the coins next to specific dogs and answered questions about the value of coins. In the second task, pieces of paper with the numerals written on the paper were placed in front of toy dogs. Children were instructed to state the value of the numerals depicted on the paper. On the third task, children were asked to compare amounts between two dogs.

**Relative Performance on Mathematical Tasks**

*Mental age matched comparisons.* In many instances, aspects of mathematical performance were similar when researchers compared children with DS with groups matched by mental age or cognitive scores. Caycho et al. (1991) observed comparable performance between children with DS and typically developing children on counting tasks. A mixed-analysis of variance (ANOVA) analysis employed by Porter (1999) identified no differences in the performance on the counting ability (e.g., errors, length of count string) of groups with DS and severe learning difficulties. Klein and Mervis (1999) found that groups of children with Williams syndrome and DS performed similarly on tests of numerical questioning and counting and sorting. Nye and colleagues (2001) observed matched groups (DS and typically developing) exhibited an inability to perform tasks related to cardinality. When compared to typically developing children matched for mental age, children with DS performed similarly on the task of quantity discrimination (Camos, 2009).

A smaller number of comparisons identified significant differences in the performance of children with DS and mental age matched peers. Children with Williams syndrome exhibited significantly higher scores on tests of numerical memory than children with DS (Klein & Mervis, 1999). Nye et al. (2001) demonstrated that children with DS produced shorter counting sequences, fewer count words, and were less capable of counting objects than typically developing peers. Sella and colleagues (2013) found that children with DS were less accurate than typically developing peers in a visual enumeration task in which participants matched sets of dots to a sample when samples involved 2 versus 3 or 3 versus 4 dots.

**Chronological age, skill, and other matched comparisons.** Studies that compared groups matched on age or other variables without controlling for cognitive ability found few similarities in mathematical performance. Stith and Fishbein (1996) documented similar achievement coin identification, coin counting, and comparing coin value tasks between groups of children with DS and non-specific ID matched on early numeracy skills. Camos (2009) found no differences betweenagematched typically developing controls and children with DS on visual discrimination tasks.

Comparisons of age- or skill-matched participants generally favored the control group. Lister et al. (1989) noted significant differences favoring unmatched, typically developing children on conservation tasks. Stith and Fishbein (1996) found that, when matched on early numeracy skills, typically developing children outperformed children with DS and non-specific ID on measures of coin identification, coin counting, and comparing values. As with mental-age match controls, Sella et al. (2013) observed that typically developing peers outperformed age-matched students with DS on visual enumeration tasks.

**Discussion**

This review examined the participant characteristics, targeted skills, and outcomes of studies comparing the mathematical performance of individuals with DS and without DS. The studies identified for review (n = 8) featured eight groups of individuals with DS and 11 comparison groups. Across studies, both groups were primarily composed of young children. Information related to the cognitive function of participants, when provided, largely consisted of mental age equivalence scores. Typi-
cally developing individuals appeared most frequently in comparison groups (n = 8). Notwithstanding comparison group membership, researchers generally paired participants with and without DS using chronological age (n = 2) or mental age (n = 4). The majority of comparisons (n = 6) featured insufficient information to determine if groups were adequately matched on a control variable. Early numeracy skills were the primary focus of the identified studies. Outcomes of the comparison studies revealed few differences in response that would indicate a distinct mathematical phenotype for individuals with DS; however, issues with the matching procedures—combined with the number of studies—limit the extent to which findings are interpretable.

As explained by Chapman and Hesketh (2000), mental age matching helps researchers compare children by developmental level, and chronological age matching allows for comparisons to societal norms and expectations. Comparison groups consisting of typically developing controls may be ideal due to limited information regarding phenotypic profiles of individuals with nonspecific and syndrome specific ID. However, the use of young children in the majority of comparisons is problematic, as distinct patterns of performance will emerge over time. Consequently, studies attempting to describe the phenotype need to incorporate both young children and adolescents (Hodapp, 2004).

Regardless of comparison group, however, the matching procedures employed by the researchers potentially limit the validity of reported findings. Studies in which matching was not employed (Lister et al., 1989) provide no means of accounting for the multiple factors that may contribute to differences between comparison groups. The results of comparisons in which groups were either insufficiently matched or in which authors did not adequately report matching procedures—as in the majority of identified studies (n = 6)—must be similarly discounted. Matching on the basis of chronological age without accounting for developmental level, although commonly employed in the identified comparisons (n = 2; Camos et al., 1991; Sella et al., 2013), incorrectly associates delays in learning with the phenotypic profile (Chapman & Hesketh, 2000). Mental age matching procedures introduce similar issues. Mervis and Klein-Tasman (2004) suggest that mental age scores will skew statistical analyses in as much as such scores are not true interval variables. That is, the developmental differences indicated in identical durations at different ages (e.g., 1–1.4 years compared to 5–5.4 years) do not correspond with similar changes in development. Moreover, groups matched on mental age with considerable age differences (e.g., > 5 yrs; Caycho et al., 1991) will likely exhibit differences on targeted skills due to age-influenced differences in the development of different abilities.

Issues with instrumentation pose additional challenges in interpreting findings. The use of researcher-developed instruments as outcome measures increases the likelihood that confounding factors (e.g., the verbal abilities of participants) will skew the comparisons between groups (Chapman & Hesketh, 2000). Similar issues arise when matching groups using researcher-developed or otherwise non-standard assessment (e.g., Stith & Fishbein, 1996). Various standardized instruments used in obtaining mental age have the potential to distort the responses of individuals with ID (Glenn & Cunningham, 2005; Gunn & Jarrod, 2004; Phillips, Loveall, Channell, & Connors, 2014).

Most research concerning mathematics for individuals with DS focuses on early numeracy skill (Lemons, Powell, et al., 2015). For the most part, children with DS have more difficulty with early numeracy skills than typically performing peers. While early numeracy is necessary and foundational to mathematics success (Powell, Fuchs, & Fuchs, 2013), other mathematics skills are necessary for competency as an adult. The dearth of studies related to comparing the performance of children with DS to matched peer-groups on mathematics skills taught in school (e.g., basic facts, computation, fraction concepts, word problems) limits the potential value of research for instructors. Only one study moved beyond early numeracy skills (e.g., money; Stith & Fishbein, 1996). While important, the identified studies do not provide an overall account for any differential mathematics performance for children with DS.

Due to the issues with the matching proce-
dures, results of the identified studies—particularly those predicated on groups matched on chronological age—should be interpreted with caution. All of the studies involving counting, however, featured mental-age matched comparison groups. Of these, half of the comparisons involving counting indicated that children with DS exhibit deficits in length of sequences, numerical memory, or other related concepts when compared to groups matched on mental age. Notwithstanding the concerns involving matching procedures or control groups featuring individuals with non-DS ID, issues with counting could stem from deficits in short-term memory and expressive language associated with DS. In general, however, no consistent pattern of differential performance for children with DS was found.

With regard to chronological age matching or other matching variables, children with DS perform lower than typically developing children on tasks about money and conservation. No differences emerged on a task of quantity discrimination as presented in a nonsymbolic (i.e., pictorial representations) form. Aside from the differences in developmental level as a potential explanation for the disparate performance of chronological age-matched groups with and without DS, environmental factors may also account for the discrepant mathematical skills. As quantity discrimination is related to a child’s approximate number system (i.e., an innate sense of number; Feigenson, Libertus, & Halberda, 2013), and skills such as working with money and determining conservation of length are mathematics skills that are taught in schools, it is not surprising that there are differences between these innate and learned skills.

Limitations

Limitations of the current review largely stem from issues with the literature. Impediments to the identification of patterns in differential mathematics performance include the limited number of comparison studies available as well as the variety of comparison groups, mathematical measures, and statistical analyses featured in the identified studies. Moreover, the limited quality of matching procedures featured in many of the studies has the potential to distort conclusions regarding syndrome-specific mathematic performance. Nonetheless, we feel that the issues with previous studies identified in the current review will contribute to more rigorous work in this area.

Future Directions

Research involving the behavioral phenotype has the potential to improve the education services provided to individuals with DS. In addition to including a more diverse selection of participants in terms of age and cognitive disabilities, future studies involving mathematics could address the various issues with matching procedures identified by Chapman and Hesketh (2000). A critical step in this process involves fully reporting information related to the matching and pairing of groups with and without DS on multiple variables.

Claims regarding the salience of phenotypic patterns of performance in mathematics are currently hindered by both the quantity and quality of available studies. Studies concerning the association between the DS phenotype and performance in reading and language, though more plentiful, may exhibit the methodological issues identified in current review. A more detailed examination of the influence of measures, tasks, and matching procedures on outcomes in more established areas (e.g., reading) is warranted given the increasing emphasis on incorporating phenotypic considerations into education interventions (e.g., Lemons et al., 2015). With more effective interventions in place, higher mathematics standards, and greater societal expectations for the outcomes of children with disabilities, descriptive and intervention work conducted more than two decades ago may no longer be relevant.

For studies involving DS and mathematics or other largely unexplored domains, comparison groups composed of typically developing students will continue to be ideal. Comparison to other children with ID, however, would eventually contribute to a greater understanding to whether differential mathematics performance is unique to DS or perhaps a hallmark of ID. Additional research could include multiple comparison groups (e.g., children with DS, children with Williams Syndrome,
and typically developing children) that would enable researchers to better understand the impact of disability on mathematics performance. These findings could help inform intervention, especially as it relates to the behavioral phenotype of DS. As characteristics related to disability may change over time, researchers should conduct longitudinal studies.

Another direction for future research is to learn more about the mathematics performance of children with DS beyond early numeracy skill. As the mathematics expectations for all children have increased over the last decade, it is necessary to understand how children with DS compare to other children on mathematics beyond foundational skills. Specifically, educators must determine whether children with DS can perform specific mathematical computations (e.g., double-digit subtraction) or understand mathematical concepts (e.g., halves, thirds, fourths) that may be necessary for adulthood, and learning how children with DS compare to others may inform the knowledge base about a developmental mathematics trajectory. This trajectory could inform intervention and increase the mathematics expectations for children with DS.

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Friendship 101: Helping Students Build Social Competence

Juliet E. Hart Barnett and Kelly J. Whalon, Editors


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