Title: Predictors of Communication and Socialization Improvements in Children with Autism Spectrum Disorder Who Attended an Afterschool Autism Program

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Introduction: An afterschool autism program was specially designed for children with autism spectrum disorder (ASD). This study aims to investigate (a) communication and socialization improvements in children with ASD who have attended an afterschool autism program, and (b) the factors predictive of communication and socialization improvements in these children.

Perspectives/theoretical framework: A large proportion of children with typical development (TD) participate in organized activities (Hjorthol & Fyhir, 2009). Organized activities (e.g., extracurricular activities, after-school programs, community programs) refer to adult sponsored activities that have regularly scheduled meetings (Bohnert, Fredricks, & Randall, 2010). Participating in organized activities has been studied extensively in individuals with TD. These activities have been suggested to be important for the physical, psychosocial, cognitive, and educational functioning development of individuals with TD (Mahoney & Vest, 2012). Children who are more involved in organized activities show better emotional, social, and academics outcomes (Bohnert & Garber, 2007; Gardner, Roth, & Brooks-Gunn, 2008; Guevremont, Findlay, & Kohen, 2014; Randall & Bohnert, 2009). Individuals with TD make friends through participating in organized activities, and those who have participated in these activities show lower levels of problem behavior and better grades than those who do not (Poulin & Denault, 2013). Different types of organized activities (e.g., faith-based, sports, arts, service community) help youth with TD develop different experiences (e.g., identity, emotional regulation, initiative, teamwork and social skills, interpersonal relationships)(Hansen, Skorupski, & Arrington, 2010; Larson, Hansen, & Moneta, 2006). However, compared to children with TD, children with ASD have fewer opportunities to participate in these activities and participate in these activities less frequently (Hochhauser & Engel-Yeger, 2010; Ormonds, Krauss, & Seltzer, 2004).

Individuals with autism spectrum disorder (ASD) are characterized by deficits in social communication and social interaction (American Psychiatric Association, 2013). Compared to students with learning disability and students with speech/language impairment, students with ASD are less likely to be actively involved with friends and participate in organized activities (Wagner, Cadwallader, Garza, & Cameto, 2004). Few out-school organized activities have been specially designed for individuals with ASD (Haney, 2012) and limited studies have focused on the effects of organized activities on these individuals. Some summer programs and out-of-school programs have been offered to individuals with ASD. For example, Boyd et al. (2008) reported that the number of social interactions between children with disabilities (including autism) and children without disabilities was increased after 2 weeks in an inclusive summer camp. Walker, Barry, and Bader (2010) reported that children with ASD showed improvements in communication and social interaction after attending a 4-week summer camp. Brookman et al. (2003) reported that children with ASD displayed social interactions with children with TD during summer camp activities (e.g., swimming, dance, rock climbing, gymnastics, art). Carter et al (2004) reported children with Asperger syndrome enjoyed the activities in an after-school friendship club. The results of these studies demonstrate positive outcomes of organized activities on children with ASD. An after school autism program was designed for children with ASD. This program used the methods used in the Treatment and Education of Autistic and Related Communication-Handicapped Children (TEACCH) program (Mesibov & Shea, 2010) and the pivotal response treatment (PRT) (Koegel, Koegel, Harrower, & Carter, 1999). It also adopted the thematic content learning theory. Previous studies have reported that thematic content learning could foster the development of children’s literacy skills (Gelzheiser, Hallgren-Flynn, Connors, & Scanlon, 2014), mathematical abilities (Henderson & Landesman, 1995), and socio-emotional skills (Pataki, Metz, & Pakulski, 2014).

Methods: Fifty children (43 males; 7 females) with an ASD between the ages of 3 and 12 years old (mean age = 6 years) participated in this study. The inclusion criteria for children with ASD in this study included: (a) the child had a clinical diagnosis of pervasive developmental disorder, autistic disorder, Asperger’s disorder, or pervasive developmental disorder-not otherwise specified (PDD-NOS); (b) the child was between the ages of 3 and 12 years; and (c) the child’s score on the Childhood Autism Rating Scale, Second Edition (CARS-2) was ≥ 30. The mean CARS-2 score for these children was 37.96 (range 30-54).

Measures: Expressive One-Word Picture Vocabulary Test-Fourth Edition (EOWPVT-4; Martin & Brownell, 2011a ). The EOWPVT-4 was used to assess expressive language skills of children with ASD in this study. This assessment can be administered to individuals aged 2 to 95 years old. This assessment was conducted by trained research assistants. The raw score of the EOWPVT-4 was used in this study.

Receptive One-Word Picture Vocabulary Test-Fourth Edition (ROWPVT-4; Martin & Brownell, 2011b). The ROWPVT-4 was used to assess receptive language skills of children with ASD. This assessment can be administered to individuals aged 2 to 95 years old. This assessment was conducted by trained research assistants. The raw score of ROWPVT-4 was used in this study.
Vineland Adaptive Behavior Scales, Second Edition-Parent/Caregiver Rating Form (VABS-II-Parent/Caregiver; Sparrow, Cicchetti, & Balla, 2005). The VABS-II-Parent/Caregiver was used to assess communication and social skills of children with ASD. The VABS-II can be administered to individuals aged from birth to 90 years old. The VABS-II-Parent/Caregiver form asks parents to rate their child’s behaviors across four domains, including communication, daily living, socialization, and motor skills. For the purpose of this study, only the scores in the communication and socialization areas were reported and raw scores were used.

Social Skills Rating System-Parent Form (SSRS-Parent; Gresham & Elliott, 1990). The SSRS-Parent was used to assess social skills of children with ASD. It has two forms, including one for children at the preschool level and another for children at the elementary level. The SSRS-Parent is a questionnaire that asks parents to answer questions about their child’s social skills. All parents were asked to complete the SSRS-Parent on their children. Parents were instructed to read each question and answer how often their child did a behavior (0 = never, 1 = sometimes, 2 = very often). The raw scores of social skills and problem behaviors were used in this study.

Research Design and Procedure: This study employed a pre-test/post-test design and was conducted after receiving the ethical approval from the institution of the author of this study. Following advisement of the study via a local community organization in New York, parents who were interested in having their children participated in this after school program were invited to attend an information session and provided with a consent form. The children with a signed consent form were then undertook pre-tests. During the pre-test session, the research team of this study interviewed parents of participants of this study to identify their children’s interests (like, preferences, favorites) and confirmed their children’s diagnosis by checking their diagnosis documents and conducting the CARS-2 on their children. This after school program was offered once per semester. The post-test was conducted at the end of each semester after students have completed the program. This study included participants from 2012 Spring semester to 2014 Fall semester.

The After School Autism Program: This program was conducted over 10 weeks per semester, one session per week. Each session was 2-hours in duration. Each session had a theme and all learning activities were associated with the theme. Each session was composed of four 30-minutes sequential segments: (a) dance party and greeting, (b) an interactive story and stations, (c) language, mathematics, and science, and (d) arts projects and goodbye. During the first segment, the theme of the week was introduced to children and children danced to theme related music. During the second segment, one teacher interactively read a story to the group; he/she had interaction with students while he/she was reading it. Student engagement was encouraged by acting out the story and answering the questions related to the story. The weekly story was specially chosen to match the theme of the week and appropriate to the reading level of the students in the program. After the story was finished, students participated in story related station activities (e.g., playing games, watching videos, doing role-play, reading books, playing play-doh, playing LEGOs). During the third segment, the first ten minutes was language instruction. Vocabulary, reading, and writing related to the weekly story were taught to students. During the second ten minutes, children were instructed to learn mathematics. Mathematics concepts (e.g., numeracy, calculation, measurement, distance… etc) related to the weekly story were taught to students. During the last ten minutes, students were instructed to work together on a science project. During the fourth segment, students were instructed to complete one arts project related to the weekly theme. The last ten minutes of this segment was to wrap-up. The activities of the day were reviewed. Students were encouraged to show each other their arts project and were asked whether they had made any new friends that day. A best helper for the day was identified during this time.

Statistical Analysis: Paired-samples t tests were used to determine the pre-test and post-test differences in communication and social interaction. Regression analyses were conducted to determine the factors predictive of improvements in communication and social interaction.

Results: Communication. Communication skills of children with ASD from pre-program to post-program are presented in Table 1. Communication skills as measured by EOWPVT, ROWPVT, and Vineland-II communication at post-program were significantly higher than those at pre-program (see Table 1).

Socialization. Social skills of children with ASD from pre-program to post-program can be found in Table 1. Social skills as measured by SSRS-Parent on their children were instructed to answer questions about their child’s social skills. All parents were asked to complete the SSRS-Parent on their children. Parents were instructed to read each question and answer how often their child did a behavior (0 = never, 1 = sometimes, 2 = very often). The raw scores of social skills and problem behaviors were used in this study.

Predictors of Improvements. Communication and socialization improvements ranged widely across individuals with ASD. Thus, stepwise multiple regression analyses were performed to determine whether the improvements could be predicted by age, gender, and/or CARS-2 (i.e., autism severity) at pre-test. The results of the regression analyses revealed that CARS-2 was predictive of the improvements in communication as measured by EOWPVT ($\beta = -0.25, t = 2.20, p < .05$) and Vineland-II communication ($\beta = -1.39, t = 2.80, p < .01$) as well as in social interaction as measured by Vineland-II socialization ($\beta = -1.15, t = \ldots$)
Discussion: This study found that children with ASD showed improvements in communication and socialization skills after attending an afterschool program. Children’s autism severity at pre-treatment was predictive of communication and socialization improvements at post-treatment. Previous studies have reported summer programs (e.g., Boyd, et al., 2008; Brookman, et al., 2003; Walker, et al., 2010) and after-school program (Carter, et al., 2004) showed positive outcomes on children with ASD. The results of this study and those from previous studies (e.g., Boyd, et al., 2008; Brookman, et al., 2003; Walker, et al., 2010) suggest that out-school organized activities can be adapted to meet the needs of children with ASD and be considered as an alternative way of providing treatments to these children.

References/Citations:


Table 1
Means and Standard Deviations of the Scores on the Dependent Measures at Pre- and Post-Program.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>Significance Test</th>
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<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
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<tr>
<td>EOWPVT-4***</td>
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<td>32.65</td>
<td>44.14</td>
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<td>ROWPVT-4***</td>
<td>45.82</td>
<td>30.12</td>
<td>58.28</td>
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<td>Social skills***</td>
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<td>Problem behaviors***</td>
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<td>6.33</td>
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<td>Vineland-II</td>
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<td>Communication**</td>
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<td>Socialization**</td>
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Note. * p < .05; ** p < .01; ***p < .001