ACADEMIC AND COGNITIVE PROFILES OF STUDENTS WITH AUTISM: IMPLICATIONS FOR CLASSROOM PRACTICE AND PLACEMENT

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The rising incidence of autism and placement in general education necessitates a greater understanding of the impact of educational placement on academic achievement for adolescents with autism. In the present study, the academic profiles of adolescents with autism who have been educated in inclusive and self-contained settings are described using three measures: cognitive assessments, adaptive behavior, and academic achievement. Findings indicate significant between group differences (inclusion versus self-contained) in academic achievement measures. However, there were no significant differences in intelligence or adaptive behavior assessment scores for those adolescents education. Students who were included in general education obtained significantly higher scores on tests of achievement, including subtests measuring abstract and inferential skills; however, all students demonstrated emerging academic skills on standardized measures. The importance of academic inclusion for adolescents with autism is described.

Introduction

Autism spectrum disorders, including, Autistic Disorder, Asperger syndrome, and Pervasive Developmental Disorders - Not Otherwise Specified (PDD-NOS), are disorders with childhood onset characterized by core deficits in communication, social interaction, and repetitive behaviors (American Psychiatric Association, 1994). Autism may be comorbid with other disorders, including learning disability in approximately 67% of children (Mayes & Calhoun, 2006). The percentage of students with autism who have a below average intelligence (full scale IQ below 70) has been found to range between 30% (Mayes & Calhoun, 2003a) and 75% (Dempsey & Foreman, 2001). Further results suggest that many students with autism have motor and visual strengths (Mayes & Calhoun, 2003b), and mean academic achievement test scores are generally commensurate with IQ for students with autism (Mayes & Calhoun, 2003b).

The *No Child Left Behind Act* of 2001 holds states and schools accountable for student achievement in the core curricular areas of math, reading/language arts and science, including students with autism (Yell, Drasgow, & Lowrey, 2005). Furthermore, the *Individuals with Disabilities Education Act* (IDEA) of 2004 requires that students with disabilities have access to, and make progress in, the general education curriculum (Individuals with Disabilities Education Improvement Act, 2004). It is, therefore, increasingly important that students with autism be taught the core curriculum with accountability measures consistently implemented in order to document their academic progress.

Discussions of access to and progress in the core general education curriculum inevitably bring up the on-going debate of placement in general education, as opposed to special education (self-contained) classes, for adolescents with autism for core general education content instruction. The number of students with autism spectrum disorders being included in general education for instruction in core curriculum is rising each year (Boutot & Bryant, 2005). As of 2003, approximately 27% of all children with autism spent 80% of their full educational day in general education classrooms (*27th Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act*, 2007). The rising rates of inclusion have led some to question the effectiveness of this model (Fuchs & Fuchs, 1994; Zigmond, 2003), particularly for teaching academic skills.

However, the support for inclusive education has received a great deal of attention in the empirical literature (Causton-Theoharis & Malmgren, 2004; Cawley, Hayden, Cade, & Baker-Kroczynski, 2002; Dore, Dion, Wagner, & Brunet, 2002; Fisher & Meyer, 2002; Hedeen & Ayres, 2002; Mastropieri & Scruggs, 2001; McCleskey, Henry, & Hodges, 1998; Meyer, 2001). In a comprehensive review of the inclusion literature, McGregor and Vogelsberg (1998) concluded that placement in inclusive settings is associated with high levels of social interaction, skill development in academic areas, and communication skills for students with and without disabilities (McGregor & Vogelsberg, 1998). Nevertheless, much of the existing literature related to outcomes of inclusion has been based on findings from students with more mild disabilities as opposed to students with autism (Frattura & Capper, 2006; Rea, McLaughlin, & Walther-Thomas, 2002; Vaughn, Elbaum, Schumm, & Hughes, 1998).

Although rates of autism have been increasing dramatically over the past several decades (Centers for Disease Control, 2007), the academic skill development of students with autism is not well known, nor is the impact of placement in general versus special education settings on skill acquisition (Harrower & Dunlap, 2001). The purpose of this research is to address the following questions related to academic skill development in autism: (1) What are areas of relative academic strength and concern for adolescents with autism? and (2) What are the effects of setting (inclusion versus self-contained) on academic skill acquisition for adolescents with autism?

Method

Participants

Fifteen students with autism (12 males and 3 females) participated in this study, as depicted in Table 1. To determine the long-term impact of inclusive or self-contained education, the student participants attended in junior high school at the time of the study, or in 7th, 8th, and 9th grades, and ranged in age from 12 years 3 months to 15 years 9 months old. These students had diagnoses of autism; none of the students had a diagnosis of Asperger Syndrome. All students spoke English as their primary language, although their communication skills ranged from functionally non-verbal (that is they used pictures or tactile icons to communicate), to echolalia, to limited spoken language. All students were continuously

Table 1
Student Assessment Scores & Demographic Information

ID	Program	Grade	Age	School	Gender	IQ	VABS	WJ-3
1	SC	8	14	A	M	62	29	16
2	IE	9	15	C	M	69	48	78
3	SC	7	13	B	M	58	26	1
4	SC	7	12	A	M	63	50	14
5	SC	7	13	A	F	62 †	51	8
6	SC	8	14	B	M	64	53	22
7	IE	8	15	C	M	63	50	85
8	IE	9	15	C	M	68	49	82
9	SC	8	14	B	M	50 †	31	1
10	IE	7	13	C	F	50 †	33	52
11	SC	9	15	B	M	61	54	47
12	SC	9	15	B	M	60	44	8
13	IE	7	12	C	M	67	41	83
14	IE	8	13	D	M	70	47	83
15	IE	7	13	D	F	67	43	65
ID	Program	Grade	Age	School	Gender	IQ	VABS	WJ-3
Mean IE						*64.9*	*44.4*	*75.4*
Mean SC						*60.0*	*42.3*	*14.6*
p-Value						*.66*	*.88*	*.000**
F-Value						*.851*	*1.029*	*56.115*

† TONI was administered, * p < .001, SC: Self-Contained, IE: Inclusive Education

enrolled in special education since Kindergarten, and participated in either an inclusive or self-contained program for the duration of their education. Seven students were enrolled in inclusion programs, spending 80% or more of their instructional day in general education. These students received math and language arts instruction in general education settings. Eight students were in self-

contained settings, spending less than 50% of their instructional day in general education and receiving their math and language arts instruction in special education settings. The students were enrolled in four schools in three suburban school districts in Northern California. As this is a quasi-experimental design, students remained in their current educational placements (inclusion or self-contained); they did not change settings or classrooms as part of this study.

Instruments and Procedure

Three forms of assessment were collected with each student participant to gain a holistic view of their overall abilities in three broad domains: adaptive behavior, cognitive ability, and academic achievement. As the primary purpose of this investigation is to understand the academic achievement of adolescents with autism, the adaptive behavior and intelligence scores of students were collected solely to provide descriptions of students; the results from the academic achievement measures are analyzed for this study. All of the assessments were completed by a qualified administrator, including either school psychologists or credentialed teachers.

Cognitive Assessments. The Wechsler Intelligence Scale for Children, 4th Edition (WISC) or the Test of Non-Verbal Intelligence, 3rd Edition (TONI) was administered to the adolescents with autism, depending upon the language skills of the student. According to the technical manuals of both assessments, the TONI and WISC are both considered valid and reliable measures of intelligence for students with autism (Brown, Sherbenou, & Johnsen, 1997; Williams, Weiss, & Rolfhus, 2003). Students with limited verbal language skills (based on teacher report) were administered the TONI rather than the WISC. All subtests of the WISC or TONI were administered in order presented, following standard administration, ceiling, and basal rules. Administration of the WISC assessment took approximately one to one and a half hours to complete, while administration of the TONI was completed in approximately half an hour.

Adaptive Behavior Assessments. The Vineland Adaptive Behavior Scales, 2nd Edition (VABS), an interview based measurement of adaptive behavior, was administered to provide additional information about the communication, daily living skills, social, motor, and maladaptive behavior of the students with autism in this study (Sparrow, Cicchetti, & Balla, 2005). In addition to being a reliable, valid measure of adaptive behavior, the VABS is commonly administered to school aged students with autism (Charman, Howlin, Berry, & Prince, 2004; Fenton et al., 2003; Tomanik, Pearson, Loveland, Lane, & Shaw, 2007). Teacher rating forms were administered for purposes of this investigation in keeping with the school-based focus of the present study. All five sub-tests of the VABS Classroom Edition were administered individually at a time that was convenient to the teacher interviewee; the interview took approximately 45 minutes to complete with each teacher. The scores collected were compared with the norming sample of same aged peers.

Academic Achievement Assessment. A standardized achievement assessment, the Woodcock-Johnson III Tests of Achievement (WJ-3), was completed with each student following standard scoring, basal, and ceiling rules as outlined in the administration and scoring manuals of the test. The WJ-3 is an individually administered achievement test, is considered a valid measure of achievement for students with autism, and is commonly administered by school districts (e.g. Ozonoff et al., 2005).

Only those subtests of the WJ-3 needed to obtain reading, writing, and math scores (a total of nine subtests) were administered. The testing continued until the ceiling was reached; most students completed the entire assessment in approximately one hour. The scores collected were compared with the norming sample of same grade peers. If a student in the study had recently been administered the WJ-3, the alternate version of the test was administered so as to maintain test validity.

Based on the subtest descriptions provided from the WJ-3 Examiner's Manual, it was determined that some subtests require students to apply rote or procedural skills to solve the tasks, while other subtests require students to apply abstract and inferential reasoning skills to complete the task correctly. Tasks are defined as *rote/procedural* when students reproduce answers using skills previously learned from memory (Mayer, 2002). The Letter-Word Identification, Spelling, Calculation, and Math Fluency subtests are all considered to require rote/procedural skills to obtain correct answers. Tasks are defined as abstract/inferential when students are required to transfer skills previously learned to tasks that are unfamiliar to the learner (Mayer, 2002). The Reading Fluency, Passage Comprehension, Writing Samples, Writing Fluency, and Applied Problems subtests have been deemed abstract/inferential for the purposes of this study.

Data Analysis. Data analysis was completed using a multivariate analysis of variance to explore the impact of setting (inclusion versus self-contained) on the three dependent variables (scores on intelligence assessments, adaptive behavior assessments, and academic achievement assessments). To control for power in this small sample size, the alpha level was adjusted to a .15 level (Stevens, 1996). It is felt that this conservative level is best suited given the small sample size, although as shown in Table 2, a number of scores were significant at the .01 and .05 levels. Both statistical significance and effect size were calculated.

Results

Student Assessment Scores

Students who are fully included in general education had a mean intelligence score of 64.9 and mean adaptive behavior score of 44.4, as shown in Table 1. Those students not included in general education had mean intelligence score of 60.0 and mean adaptive behavior score of 42.3. No statistically significant differences were detected between groups on measures of intelligence or adaptive behavior. This indicates that there is no association between placement in inclusion and self-contained on global measures of intelligence and adaptive behavior; likewise, students did not appear to be placed in inclusion or self-contained settings based on these scores. This conjecture is supported by a review of student Individual Education Program (IEP) records conducted as part of a larger study (Kurth & Mastergeorge, 2009) in which students with autism were placed in inclusion or self-contained programs primarily due to school district philosophy. That is, students who resided in school districts with an inclusion philosophy were included, whereas students who resided in school districts with separate classes for students with special education needs were in self-contained programs.

While all students in the sample had essentially equivalent intelligence and adaptive behavior scores, placement in general education has a significant impact on academic achievement, as measured on the WJ-3. Statistically significant differences were detected using MANOVA between students included in general education and those in self-contained settings: F (1, 13) = 9.382, p = .03 with a large effect size, calculated using eta squared, at .31.

Achievement Scores

A closer inspection of the achievement scores from the WJ-3 reveals further differences between students included and those in self-contained math and language arts classes. In all three subtests of the WJ-3 (reading, writing, and math) those students who are fully included outperformed the students who were not included, as seen in Table 2.

Table 2
Mean Achievement Standard Scores

Subtest	Included	Self-Contained	F-Value	Skill Type
Broad Reading	**67.6***	**13.1**	**24.474**	
Letter-Word Identification	*86.9**	*18.5*	*25.810*	*Rote*
Reading Fluency	*79.3**	*6.5*	*77.226*	*Abstract*
Passage Comprehension	*68.1**	*7.0*	*40.747*	*Abstract*
Broad Writing	**83.6***	**14.1**	**54.376**	
Writing Samples	*84.0**	*22.8*	*18.475*	*Abstract*
Spelling	*94.4**	*16.3*	*36.88*	*Rote*
Writing Fluency	*78.6**	*12.0*	*47.171*	*Abstract*
Broad Math	**77.4***	**8.5**	**49.571**	
Calculation	*96.1**	*20.3*	*32.678*	*Rote*
Math Fluency	*83.6**	*19.3*	*29.707*	*Rote*
Applied Problems	*70.9**	*12.4*	*34.462*	*Abstract*

**Significant at p<.001*

In all cases, inclusion is associated with statistically higher standard scores on subtests of the WJ-3 as measured using MANOVA techniques, with F-values ranging between 18 and 77, p-values at .000

(writing samples is significant at .001), and large effect sizes calculated with eta squared ranging from .58 to .85. Mean scores for the students who were included ranged from within the average range (standard scores above 85) to two standard deviations below the mean (standard scores between 55 and 70). Students who were not included in general education have mean standard scores at least four standard deviations below the mean (standard scores lower than 40) on all subtests of the WJ-3.

Together, these results demonstrate that inclusion is associated with significant academic gains for students with autism. That is, students have comparable intelligence and adaptive behavior, yet made significantly greater academic gains in three broad areas (reading, writing, and math) when included in general education for instruction in these content areas.

Further examination of Table 2 reveals areas of relative strength and weaknesses for students with autism. Within the reading tests, Letter-Word Identification (reading decoding) was an area of relative strength. Reading comprehension, in both Passage Comprehension and Reading Fluency subtests, were areas of relative weakness. Within the writing domain, Spelling was an area of relative strength for both students who were included and were not included, while Writing Fluency was an area of relative weakness. Finally, within the mathematics domain, Calculation was an area of relative strength, while solving Applied Problems (e.g. word problems) was an area of relative challenge for both groups.

Previous research has described students with autism spectrum disorders as having strengths in rote and procedural skills and weaknesses in abstract and inferential skills (Goldstein, Minshew, & Siegel, 1994; Griffin, Griffin, Fitch, Albera, & Gingras, 2006; Myles, Barnhill, Hagiwara, Griswold, & Simpson, 2001; Myles & Simpson, 2002). The current study corroborates these findings in that all students with autism in our study, in both inclusive and self-contained settings, obtained their lowest mean subtest scores in abstract task areas. However, the current study extends these findings by noting that students with autism who are included in general education obtained higher scores in abstract and inferential skill areas than students with autism educated in special education settings. These findings suggest the importance of educational setting and participation in core general education curriculum on skill development for students with autism.

Discussion and Implications

The present study aimed to describe the academic skills of adolescents with autism and the impact of instructional setting (inclusion versus self-contained) on academic skill acquisition. The findings indicate that students with autism have emerging academic skills in all three areas assessed with academic achievement scores that were generally one to four standard deviations below the mean expected based on student grade level. Students with autism in the present study were found to have areas of strength in concrete, procedural academic tasks. Students were less successful in performing abstract and inferential tasks, including passage comprehension, writing passages, and solving applied math problems (e.g. word problems).

In addition to describing the academic achievement profiles of adolescent students with autism, the present study signifies the importance of educational setting on skill development. In all academic areas, students with autism who had received all of their math and language arts instruction in general education outperformed those students who had received their instruction in special education settings in skill areas that are traditionally *difficult* for students with autism (abstract skills). These findings suggest that inclusion is academically beneficial to students with autism in this sample. The small sample size and geographically limited nature of the present study preclude broad generalizations; more research is thus warranted with larger sample sizes in more diverse areas.

These findings are especially interesting in that the participants were in junior high school at the time of this study. During junior high school, curriculum in general education typically becomes more rigorous, increasingly complex, abstract, and inferential (Adreon & Stella, 2001; Mastropieri & Scruggs, 2001). Future studies are warranted to examine the impact of delivery of instruction in special versus general education settings on student outcome in rote and applied tasks across curricular areas. Presumably adolescents engage in different activities and receive different types of instruction in general and special education settings. Understanding the impact of this instruction and instructional activities on student learning of both rote and applied skills is needed.

The results of the present study further indicate the need for a challenging academic curriculum for students with autism. Evidence suggests that adolescents with autism are too often provided disjointed curriculum that focuses on activities, *functional* skills, or specific IEP objectives rather than instruction based on a general education core curriculum. As a result, a scope and sequence of curriculum and learning objectives are often omitted. As evidenced here, students with autism can and do learn academic skills, albeit at an emerging level. Therefore, it is necessary to provide a challenging and appropriate curriculum to students with autism to facilitate their learning of a range of skills, beyond merely functional skills.

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