Research Article

Autism Spectrum Disorders and Evidence Based Practices: A Statewide Exploration of Public School Programming

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Abstract

Objective: The purpose of this investigation was to provide a preliminary exploration of (a) Public school programming provided to students with Autism Spectrum Disorder (ASD) across the state of Michigan, (b) The extent to which public school approaches were evidence-based practices (EBP) and (c) How such practices vary by school district.

Method: A systematic sampling process was used to collect information from 194 school professionals from various socioeconomic backgrounds and geographical regions statewide. Educators used an online survey to report on practices they used with a single child with ASD in their classroom.

Results: All teachers report using at least one EBP, and four of the top five most commonly reported practices are empirically supported. However, not all of these practices are used frequently, and their use varies by geographic location.

Conclusions: The infrequent use of EBPs suggests a need for more training for educators. More research is needed into what factors predict the use of EBPs and how to better equip school professionals to work with students with ASD.

Keywords: Autism spectrum disorders; Evidence-based practices; Public school programming

Abbreviations

ASD: Autism Spectrum Disorder; IDEA: Individuals with Disabilities Education Ace; NPDC-ASD: National Professional Development Center on Autism Spectrum Disorders; PECS: Picture Exchange Communication System; TEACCH: Treatment and Education of Autistic and Communication related Handicapped Children; REP: Registry of Education Personnel; EBP: Evidence Based-Practices

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder manifesting in infancy or early childhood and is characterized by

(a) Persistent deficits in social communication, and

(b) The demonstration of restricted, repetitive, and stereotyped patterns of behavior, interests, or activities [1].

Current prevalence estimates are growing; the Center for Disease Control (2014) indicated that 1 out of 68 children in the United States are diagnosed with ASD. This was in stark contrast to prevalence rates of approximately 4 to 5 per 10,000 approximately 25 years ago [2,3]. The prevalence rates of ASD translate to nearly 16,000 students with ASD in Michigan's public school system [4], representing a large population of students who may need specialized instructional practices. Currently, all children have the right to receive a Free and Appropriate Public Education under the Individuals with Disabilities Education Ace (IDEA), in the least restrictive environment possible. Many public schools now serve as the primary source of intervention for children and adolescents with ASD. Providing services to this growing population of students who have a plethora of unique needs can be challenging for schools, administrators, and teachers [5]. There are many different intervention and treatment approaches available to address the academic, behavioral, communication and social skills needs of individuals on the spectrum [6]. However, intervention effectiveness remained relatively unclear until 2009 when the National Autism Center released the National Standards Project [7]. The NSP expert panel reviewed 775 studies examining treatment and interventions for individuals with ASD; each treatment was then categorized based on the amount of research evidence to support its efficacy. Approaches were classified as

(a) "Established", meaning the treatment produced beneficial effects and was considered effective,

(b) "Emerging", meaning a few studies found the treatment to be effective, but more studies are needed,

(c) "Unestablished", meaning there is little to no evidence regarding the treatments' effectiveness, or

(d) "Ineffective/harmful", meaning evidence suggested the intervention was not beneficial or produced negative effects.

The National Professional Development Center on Autism Spectrum Disorders (NPDC-ASD) further defines the Evidence Based-Practices (EBP) as those whose efficacy has been established through peer-reviewed research in scientific journals, meeting one or more of the following benchmarks:

1) Two high-quality randomized or quasi-experimental design studies,

2) Three different investigators or research groups producing at least five high-quality single-subject design studies

3) One high-quality randomized or quasi-experimental group design study and three high quality single subject design studies conducted by at least three different researchers or groups [8].

The NPDC-ASD currently recognizes 27 evidence-based practices for individuals with ASD [9]. Though evidence-based practices are mandated in schools by No Child Left Behind [10], current research shows that many of the practices used for students with ASD are not established. A similar study conducted in Georgia [11] found that the top five strategies used by public school teachers – including Gentle Teaching, sensory integration, cognitive behavioral modification, assistive technology, and Social Stories – did not qualify as evidence-based. Similarly, a study in California found that less than one-third of practices used by the preschool teachers surveyed had any evidence of efficacy for children with ASD [12]. Though Michigan has issued a statewide plan for individuals with ASD, the usage rate of evidence-based practices in Michigan public schools are not yet known. When studying practices for students with ASD, it is important to acknowledge that various school-level factors may influence educator decisions. In a qualitative study of teacher beliefs when working with students with ASD, [13] found that the availability of personnel and resources were related to teacher beliefs, indicating that school funding or measures of economic status may impact practices. Additionally, some researchers [14,15] have pointed out the potential differences in rural vs. urban schools, suggesting that factors related to geographic setting may also play a role in the experience of students with ASD and their teachers. Finally, [11] survey of strategies used with students with ASD showed differences based on grade level, indicating that teachers may change their practices based on student age.

Current Study

Research shows that evidence-based practices have significant benefits for individuals with ASD [16]; and such practices are required by law [10]. However, there are many factors that influence the use of EBPs in schools, including the varying abilities and symptoms of individuals with ASD, limited ASD-specific training for teachers in public schools, and the large number of available treatment options, paired with limited large-scale reports on the effectiveness of such interventions. The current study aimed to quantify the classroom practices used by teachers who work with children with ASD. By understanding what strategies are most frequently used with students with ASD, as well as the school-level factors that relate to the usage of said strategies, policy makers and educators can better identify the gaps in teacher training and improve school-based service delivery for individuals with ASD. To our knowledge, this kind of study has only been conducted in one other state [11]. The present study used a statewide survey in Michigan to address the following research questions:

1) Are the services provided to students with ASD in Michigan similar to those that have been identified as evidence-based practices?

2) What specific programs and instructional strategies are most commonly used?

3) How frequently are the most common programs and strategies used?

4) What school factors (e.g. location, SES, grade level) are related to the use of evidence-based practices?

Methods

Procedure

Sample development: Michigan does not provide a statewide dataset of individual students with ASD receiving special education services. Therefore, we chose to create our sample from a dataset containing names and school districts of special education personnel: the Registry of Education Personnel (REP), provided by the Michigan Center for Educational Performance and Information. By combining the REP dataset with information on the number of students with ASD served in each intermediate and local school district, we sought to select more professionals from districts with a greater number of students with ASD, and fewer professionals where there were fewer students with ASD. Based on interactions with parents and educators, we knew that many students with ASD were provided special education services by individuals without specific training in ASD. Therefore, we included the following categories of special educators in our sample: "Autistic Impaired" (AI teachers), "Teacher Consultant: Autistic Impaired" (AI consultants), "Mildly Cognitively Impaired," "Moderately Cognitively Impaired," "Severely Cognitively Impaired," "Emotionally Impaired," "Learning Disabled," Hearing Impaired," "Visually Impaired," "Physically Impaired or Otherwise Health Impaired," "Severely Multiply Impaired," "Preprimary Impaired," "Speech/Language Impaired," "Resource Room," and "Physical Education for the Handicapped." Although the majority of our sample were categorized as AI teachers and AI consultants, we selected additional special education professionals from the remaining categories within districts where the number of AI teachers and AI consultants were proportionally lower than expected considering the number of students with ASD in those districts. That is, every n^{th} teacher was selected based on the list of other special education professionals until the intended sample size was reached. Before completing the survey, we notified all potential participants that in order to participate, they needed to currently serve a student with ASD who was currently enrolled in kindergarten through 12th grade within a public school. The initial list of 1,000 special education professionals was alphabetized and split into two 500-person matched sets (i.e. the first educator alphabetically was assigned to the first sample set, the second person was assigned to the second set, the third person to the first set, etc.) The first set was designated the "primary" sample and the second was the "secondary" sample. Contact information for each person in the two datasets was sought through school district websites, and each member of the primary sample was e-mailed a short description of the study and a link to the online survey. If there was no contact information given for a member of the primary sample, another special educator from the

Table 1: Respondent's positions within the school.

Respondents' Positions	Percent
Special Educator	82%
Consultant	11%
Paraprofessional	4%
Unreported	2%
General Educator	1%

Table 2: Comparison of respondent sample to planned sample.

County Median Household Income	Respondent Sample	Planned Sample
Low	40%	44%
Medium	33%	25%
High	27%	31%
Geographic Region	**Respondent Sample**	**Planned Sample**
Southeast (Excluding Tri-County Area)	11%	9%
Southwest	24%	18%
Tri-County Area (Oakland, Macomb, Wayne)	42%	52%
Thumb/Mid-Michigan	19%	15%
Northern/Upper Peninsula	4%	6%

same school district was contacted. If a member of the primary sample indicated they did not work with any students with ASD, they were asked to provide the name and contact information of a special education professional in the same building or school district who did work with students with ASD. In this way, we ensured that each participant could report about students with ASD with whom they worked. If a member of the primary sample did not respond to the survey request after one month and two reminders from the research team, we contacted the matched educator from the secondary sample. At the end of the survey, special educator participants were asked to provide contact information for special education consultants, general educators, and paraprofessionals that also worked with the student who they chose to report about as part of the survey. These individuals were then also asked to complete the survey. To obtain information about the students with ASD, we asked each responding educator to select one student with ASD with whom they currently worked who was: a) enrolled in a public school in grades K-12 and b) had a last name that began with the letter closest in the alphabet to the last name of the responding special education professional. This systematic approach ensured that respondents were not biased in their reporting in terms of selecting students who were the most or least challenging. Additionally, to prevent inclusion of multiple sets of data on the same student with ASD from multiple educators within the analysis, we chose to report data from one educator for each student. In some cases, substantial missing data were evident from special educators, therefore we selected out a different school professional's responses about a given student with ASD. Our preference order for respondents' roles was special educator, special education consultant, general educator, and finally paraprofessional. Specifically, if a special educator responded about a student with ASD, we used that respondent's data. If a special educator did not fully respond, we used the special education consultant who reported about the given student. If neither a special educator nor a special education consultant fully responded, we used the responses from the general educator or paraprofessional associated with the target

student. To summarize, in order to be included in the current analysis, the responding individuals had to be

(a) Identified through the sampling process described above,

(b) A school professional who reported currently serving one or more students with ASD enrolled in a public school as a kindergarten through 12th grade student, and

(c) The individual had to provided the most complete information on the selected student among the various school professionals who completed the survey for a given student with ASD.

Survey completion: All respondents completed the survey online using a link sent from the researchers. The questionnaire took approximately 20 minutes to complete, and respondents were offered $15 for their participation. Survey completion took place over a period of one academic year.

Measures

Demographics: General background information was gathered about the school districts, school professionals, and students with ASD, including county median household income (categorized as low, medium, or high), geographic region within the state of Michigan (Tri-county Area, Southwestern lower peninsula, Southeastern lower peninsula, thumb and central lower peninsula, and upper and Northern lower peninsula), educational role (special educator, general educator, paraprofessional, or consultant), student diagnosis, student grade, student race/ethnicity, and student free or reduced-price lunch.

Practices used for students with ASD: To ensure inquiries to school professionals about interventions, strategies, techniques, and approaches were maximally inclusive, a comprehensive review of empirical literature on educational services and interventions provided to students with ASD was conducted. The final list included 65 different approaches, including those with and without empirical support. Respondents indicated whether or not they used the given approach with the student with ASD, as well as how many hours per week they utilized each strategy with that particular student. Because the present study was developed before the NSP report [7] was published, the list of strategies included in the survey does not directly align with the language used to categorize interventions according to the NSP report. Therefore, to determine the level of empirical support for each of the included strategies, two independent reviewers with doctoral degrees, and extensive knowledge in ASD analyzed the approaches against both the NSP and the NPDC-ASD classifications [7,8].

Sample

Respondents: Our final sample included 194 education professionals, which represents 26% of the intended sample. The majority of the respondents (82%) were special educators; 11% were special education consultants, 4% were paraprofessionals, 1% were general educators, and the remaining 2% did not report their affiliation Table 1.

We intended to represent services provided across the state as accurately as possible; therefore, we compared our respondents' district characteristics to those in the original primary sample in terms of category of median household income and geographic region. Our

Table 3: Respondent's reported diagnosis category of student.

Student's Diagnosis Category	Percent
Autism Disorder	79%
Asperger's Syndrome	10%
Pervasive Developmental Disorder, Not Otherwise Specified	1%
Rett's Disorder/Childhood Disintegrative Disorder	0%
Respondent Reported "Don't Know"	8%
No Response	2%

Table 4: Respondent's reported race/ethnicity of student.

Student's Race/Ethnicity	Percent
White/Non-Hispanic	68%
African American/Non-Hispanic	21%
Hispanic	4%
American Indian/Alaskan Native	2%
Asian American	1%
Chicano/Mexican-American	1%
Other	1%

Table 5: Respondent's reported grade levels of student.

Student's Grade Levels	Percent
Elementary	37%
Middle	33%
High	20%
Other/Ungraded	9%
Unreported	1%

sample was slightly higher in terms of those from school districts in counties categorized as having a medium median household income and lower in terms of those from school districts in counties categorized as high and low median household income. Regarding geographic region, our respondent sample closely resembled our planned sample, with the exception of a slightly greater proportion of respondents from the southwest and less from the tri-county area than planned. Comparison of the respondent sample to the planned sample can be found in Table 2.

Students: Each participating educator chose a single student with ASD from his or her class. Nearly four-fifths of the chosen students were male (79%), which is to be expected given the 4:1 gender ratio for ASD. The specific diagnoses of ASD were: autism disorder (79%), Asperger's syndrome (10%), pervasive developmental disorder, not otherwise specified (PDD-NOS; 1%), respondents reported "don't know" (8%), and no response (2%). The students were primarily white (68%), though a range of races/ethnicities was represented, including African-American (21%), Hispanic (4%), Chicano/Mexican-American (1%), Asian American (1%), American Indian/Alaskan Native (2%) and other (1%). Students from all grades were included, with 37% in elementary (grades K-4), 33% in middle school (grades 5-9), 20% in high school (grades 10-12), 9% other or ungraded, and 1% unreported Table 3, 4 and 5.

Results

Research question 1

Are the services provided to students with ASD in Michigan

similar to those that have been identified as evidence-based practices?

Of the 65 strategies used by survey respondents, 30 were similar to strategies classified as "established" or "emerging" by the NSP or "evidence-based practice" by the NPDC on ASD. Three practices (facilitated communication, auditory integration training, and sensory integration training) were classified as "unestablished" by the NSP and were not listed by the NPDC. The remaining 22 practices were not similar to anything listed by either the NSP or NPDC. The mean number of empirically-supported practices used per respondent was 11.72, and all professionals in the sample reported using at least one EBP. The full list of empirically-supported practices can be found in Table 6; unestablished and unlisted practices can be found in Tables 7 and 8, respectively.

Research question 2

What specific programs and instructional strategies are most commonly used?

Respondents used a variety of strategies to teach academic skills to students with ASD. The five most common academic practices reported for target students were structured teaching (68%), direct instruction (61%), applied behavior analysis (59%), naturalistic teaching (53%), and Treatment and Education of Autistic and Communication related handicapped Children (TEACCH; 50%). Reported use for all academic strategies can be found in Figure 1. Of the five most commonly reported strategies, all are classified as EBPs except for direct teaching. Additionally, respondents reported on the use of many different types of therapies and interventions in addition to those specifically considered academic skill instruction. The ten most highly reported practices for the target students were visual supports (69%), Social Stories™ (56%), Picture Exchange Communication System (PECS; 51%), peer social groups (48%), independent living skills training (47%), multi-sensory environments (45%), weighted supports (45%), peer buddies (45%), social decision making (45%), and sensory integration (44%). Full lists of these additional approaches can be found in Figure 2. Of the most commonly endorsed functional or developmental skills strategies, five are classified as empirically supported: visual supports, Social Stories™, PECS, peer social groups, and peer buddies. The NSP categorizes sensory integration training as "unestablished;" the remaining strategies are not listed in either the NSP or NPDC on ASD.

Research question 3

How frequently are the most common programs and strategies used?

Although at least half of the respondents reported using one of the top five academic practices, the number of hours per week that the practices were reportedly used varied across practices. The greatest number of respondents reported using applied behavior analysis (32.5%), direct instruction (39.5%), and naturalistic teaching (32.4%) between 1 and 5 hours per week. In contrast, the greatest number of respondents reported using TEACCH (27.8%) and structured teaching (38.6%) 20 or more hours per week for the target student, with over half of educators who used structured teaching spending more than 10 hours per week.

Frequency of use was similarly varied for the most commonly endorsed non-academic strategies. The vast majority of respondents

Table 6: Classification of established or supported strategies.

Practice	Number (Percentage) Reported Use for Target Student	NSP	NPDC on ASD
Established, Emerging or Evidence-Based Practice: Academic			
Applied Behavior Analysis	114 (59%)	Established (antecedent or behavioral package)	EBP (antecedent package, DR, extinction, FBA, FCT, prompting, task analysis, reinforcement)
Cognitive Therapies	37 (19%)	Emerging (cognitive behavioral intervention package)	Not listed
Discrete Trial Training	62 (32%)	Established (behavioral package)	EBP
Naturalistic Teaching Strategies	102 (53%)	Established	EBP
Pivotal Response Training or Natural Language Paradigm	25 (13%)	Established	EBP
Structured Teaching	132 (68%)	Emerging	EBP (structured work stations)
Treatment and Education of Autistic and Communication related handicapped Children (TEACCH)	97 (50%)	Emerging (structured teaching)	EBP (structured teaching)
Established, Emerging or Evidence-Based Practice: Social			
Social Stories™	109 (56%)	Established (story based intervention package)	EBP (social narrative)
Theory of Mind	53 (27%)	Emerging	Not listed
Established, Emerging or Evidence-Based Practice: Developmental/Relational			
Developmental Individual Difference Relationship Based Approach (DIR®/Floortime™)	47 (24%)	Emerging	Not listed
Social Communication, Emotional Regulation, and Transactional Support (SCERTS®)	50 (26%)	Emerging (developmental relationship-based treatment)	Not listed
The Son-Rise Program®	16 (8%)	Emerging (developmental relationship-based treatment)	Not listed
Established, Emerging or Evidence-Based Practice: Peer-Based			
Peer Tutoring	82 (42%)	Emerging (peer-mediated instructional arrangement)	EBP (peer-mediated instruction and intervention)
Peer Assisted Learning Strategies (PALS)	36 (19%)	Emerging (peer-mediated instructional arrangement)	EBP (peer-mediated instruction and intervention)
Peer Buddies	87 (45%)	Established (peer training package)	EBP (peer-mediated instruction and intervention)
Peer Social Groups	93 (48%)	Established (peer training package)	EBP (peer-mediated instruction and intervention)
Established, Emerging or Evidence-Based Practice: Self-Management			
Self-Evaluation and Reinforcement	59 (30%)	Established (self-management)	EBP
Self-Goal Setting	56 (29%)	Established (self-management)	EBP
Self-Monitoring	62 (32%)	Established (self-management)	EBP
Established, Emerging or Evidence-Based Practice: Augmentative Alternative Communication			
Picture Exchange Communication System (PECS)	99 (51%)	Emerging (AAC)	EBP
Sign Language Training	56 (29%)	Emerging (AAC)	Not listed
Voice Output Communication Device	30 (15%)	Emerging (AAC)	EBP
Established, Emerging or Evidence-Based Practice: Technology			
Computer Assisted Instruction	82 (42%)	Emerging (technology-based treatment)	EBP (computer aided)
Education Software	52 (27%)	Emerging (technology-based treatment)	EBP (computer aided)

Interactive Websites	(73 38%)	Emerging (technology-based treatment)	EBP (computer aided)
Personal Digital Assistant (PDA) Training	7 (4%)	Emerging (technology-based treatment)	EBP (computer aided)
Video Modeling	27 (14%)	Established	EBP
Visual Supports or Strategies	134 (69%)	Not listed	EBP
Established, Emerging or Evidence-Based Practice: Other			
Dance Therapy	40 (21%)	Emerging (exercise)	Not listed
Music Therapy	76 (39%)	Emerging	Not listed

Table 7: Unestablished strategies.

Practice	Number (Percentage) Reported Use for Target Student	NSP	NPDC on ASD
Unestablished: Augmentative Alternative Communication			
Facilitated Communication	16 (8%)	Unestablished	Not listed
Unestablished: Physiological			
Auditory Integration Training	18 (9%)	Unestablished	Not listed
Sensory Integration Training	85 (44%)	Unestablished	Not listed

who used Social Stories™ (88.1%), classwide peer tutoring (86.6%) peer buddies (83.9%), weighted supports (80.5%), social decision making (80.5%), peer social groups (77.4%), independent living skills training (73.9%) and multisensory environments (67.0%) did so for 5 hours per week or less. Though nearly half of respondents who reported using visual supports did so for 11 hours or more per week (49.2%), and around one-third used PECS (35.4%) for 11 hours or more per week, the overall results show comparatively infrequent usage of evidence-based practices. The breakdown of how many hours per week respondents reported spending on each of the top academic and other strategies can be found in Figures 3 and 4, respectively.

Research question 4

What school factors are related to the use of EBPs?

All school professionals reported the use of at least 1 EBP in their work with the target student. However, respondents did differ on the total number of EBP's used. Professionals in districts classified as having medium-level median income used slightly fewer empirically-supported strategies on average (mean = 10.35) than professionals in low (mean = 12.19) and high-income districts (mean = 12.65), though the difference was not statistically significant (F=2.70, p=.07). There were also no significant differences in the mean number of EBPs used by elementary (mean = 12.64), middle (mean = 11.23), and high school respondents (mean = 11.20; F = 1.31, p=.27) Figure 5. However, results did show differences by geographic location (F=5.67, p<.001). Post hoc tests revealed that respondents in the tri-county area (Macomb, Oakland, and Wayne counties) used significantly more empirically-supported strategies (mean = 13.51) than those in all other geographic areas, while respondents in the upper and Northern lower peninsula area used fewer empirically-supported strategies (mean = 5.50) than those in all other geographic areas, with the exception of respondents in the Southeastern lower peninsula.

Discussion

Summary of findings

School professionals reported on whether or not they used a

specific practice for the target student they had in mind as they completed the survey. The five most highly reported academic practices were structured teaching (68%), direct instruction (61%), applied behavior analysis (59%), naturalistic teaching (51%) and TEACCH (50%). Of these practices, all but one were classified as either established or evidence-based by NSP or NPDC on ASD. The exception was direct instruction, which was not categorized by either NSP or NPDC on ASD. It is encouraging that teachers reported using research-supported practices so frequently. This finding is in contrast to the practices in Georgia reported by Hess et al. [11]. There are several potential reasons for this increase in the use of EBPs. First, it's possible that knowledge of EBPs and ASD-specific practices in general has increased in the years since Hess and colleagues conducted their investigation, and that many educators across the country are now making an effort to use more established and supported practices. Second, because both surveys were conducted with educators in the public school system, it is possible that variability in state laws and practices contribute to the differences in reported practices. Finally, it is likely that the wording of the main survey questions led to some differences in responses. While the current study analyzed whether or not respondents used each given strategy with a certain student, Hess and colleagues [11] asked teachers to choose which strategy they used most frequently throughout their classroom from a given list. It is possible that educators in Georgia used more EBPs, but not as the most frequently used strategy in their classroom. However, it is important to note that only half of the most commonly endorsed functional or developmental skills practices are empirically supported (visual supports, Social Stories™, PECS, peer social groups, and peer buddies). Sensory integration training, which 44% of educators reported using, is classified as "unestablished" by the NSP, meaning that, though the practice has been tested, researchers have found little to no empirical support for its effectiveness. The current findings indicate that, though special education professionals in Michigan are likely to use evidence-based academic practices for students with ASD, the practices used for social, functional, and other skill training are not as well researched or supported. Additionally, the

Table 8: Strategies not listed in the NSP or NPDC on ASD.

Not Specifically Listed in Either NSP or NPDC on ASD: Functional			
Independent Living Traiing	92 (47%)	Not listed	Not listed
Skill Teaching in the Community	83 (43%)	Not listed	Not listed
Toilet Training	38 (20%)	Not listed	Not listed
Vocational Training	49 (25%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Social			
Comic Book Conversations	36 (19%)	Not listed	Not listed
LEGO® Therapy	22 (11%)	Not listed	Not listed
Role Playing	79 (41%)	Not listed	Not listed
Social Decision Making	87 (45%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Developmental/Relational			
Gentle Teaching	82 (42%)	Not listed	Not listed
Holding Therapy	23 (12%)	Not listed	Not listed
Pet/Animal Therapy	7 (4%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Physiological			
Conductive Education	19 (10%)	Not listed	Not listed
Craniosacral Therapy	20 (10%)	Not listed	Not listed
Integrated Movement Therapy™	25 (13%)	Not listed	Not listed
Irlen Lenses	2 (1%)	Not listed	Not listed
Multisensory Environments	88 (45%)	Not listed	Not listed
Prism Lenses	2 (1%)	Not listed	Not listed
Rhythmic Entrainment Intervention™	13 (7%)	Not listed	Not listed
Weighted Supports	87 (45%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Other			
Art Therapy	59 (30%)	Not listed	Not listed
Interactive Metronome	3 (2%)	Not listed	Not listed
Play Based Therapy	53 (27%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Functional			
Independent Living Training	92 (47%)	Not listed	Not listed
Skill Teaching in the Community	83 (43%)	Not listed	Not listed
Toilet Training	38 (20%)	Not listed	Not listed
Vocational Training	49 (25%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Social			
Comic Book Conversations	36 (19%)	Not listed	Not listed
LEGO® Therapy	22 (11%)	Not listed	Not listed
Role Playing	79 (41%)	Not listed	Not listed
Social Decision Making	87 (45%)	Not listed	Not listed
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Multisensory Environments	88 (45%)	Not listed	Not listed
Prism Lenses	2 (1%)	Not listed	Not listed
Rhythmic Entrainment Intervention™	13 (7%)	Not listed	Not listed
Weighted Supports	87 (45%)	Not listed	Not listed
Not Specifically Listed in Either NSP or NPDC on ASD: Other			
Art Therapy	59 (30%)	Not listed	Not listed
Interactive Metronome	3 (2%)	Not listed	Not listed
Play Based Therapy	53 (27%)	Not listed	Not listed

Figure 1: Proportion of respondents using the top five academic strategies.

Figure 2: Proportion of respondents using the top ten functional and developmental skill strategies.
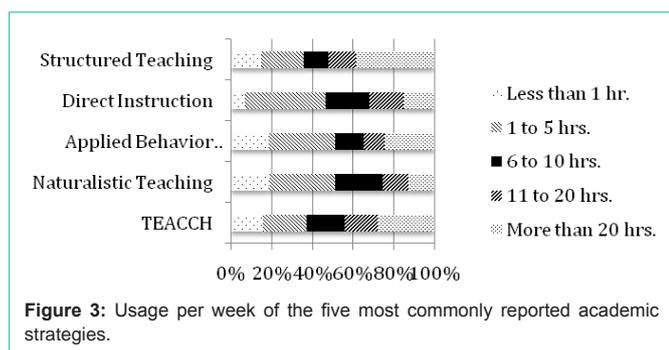

Figure 3: Usage per week of the five most commonly reported academic strategies.

Figure 4: Usage per week of the ten most commonly reported functional and developmental skill strategies.

[4]. It is important to note the possibility that the indicated student receives additional EBP support from non-respondent educators and therapists. However, research has shown many children receive more school-based services than individual services [17], which suggests that the frequency of EBP receipt reported here is an acceptable reflection of the general level of evidence-based strategies used with each student. It is also of note that the use of evidence-based practices overall varied greatly by geographic location. While respondents in the Detroit metro area reported using an average of over 13 empirically-supported strategies, respondents in the more rural Northern part of the state, including the Upper Peninsula, reported using less than six. Though it is encouraging that such differences were not related to district SES, it is still a concern that students with ASD in certain parts of Michigan are receiving far fewer evidence-based practices. More research is needed to determine what other factors predict the use of EBPs and how that translates to both geographic location and potential interventions.

Limitations

Although researchers were able to recruit a methodologically sound sample in this investigation, the process of such as task remains the primary limitation of the present study. Given increasing reporting and large-scale assessment requirements associated with the standards-based reform movement (e.g., Michigan Education Assessment Program), as well as the increasing technologies available to collect and organize related data in an efficient manner, we originally anticipated that resources would exist from which we could (in collaboration with others) draw a representative sample of students with ASD for our study. However, rules surrounding the confidential nature of disability status understandably prevent the development and maintenance of a state-level data system that explicitly list students with ASD and the educators with whom they

frequency with which respondents report using EBPs is somewhat concerning. Though it is exciting that at least half the educators in the current study report using ASD-specific practices such as TEACCH and applied behavior analysis, that still leaves 50% and 41% of special education professionals, respectively, that are not using those strategies. The greatest number of respondents reported using applied behavior analysis (32%), direct instruction (39%) and naturalistic teaching (32%) between 1 and 5 hours per week. Practices that are either established or evidence-based (per NSP and NPDC on ASD) should be incorporated for a minimum of 25 hours per week
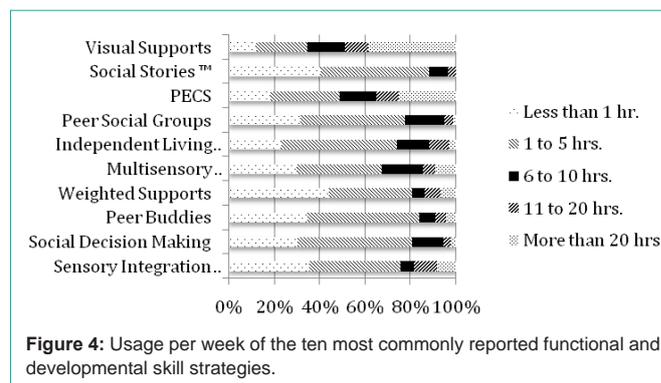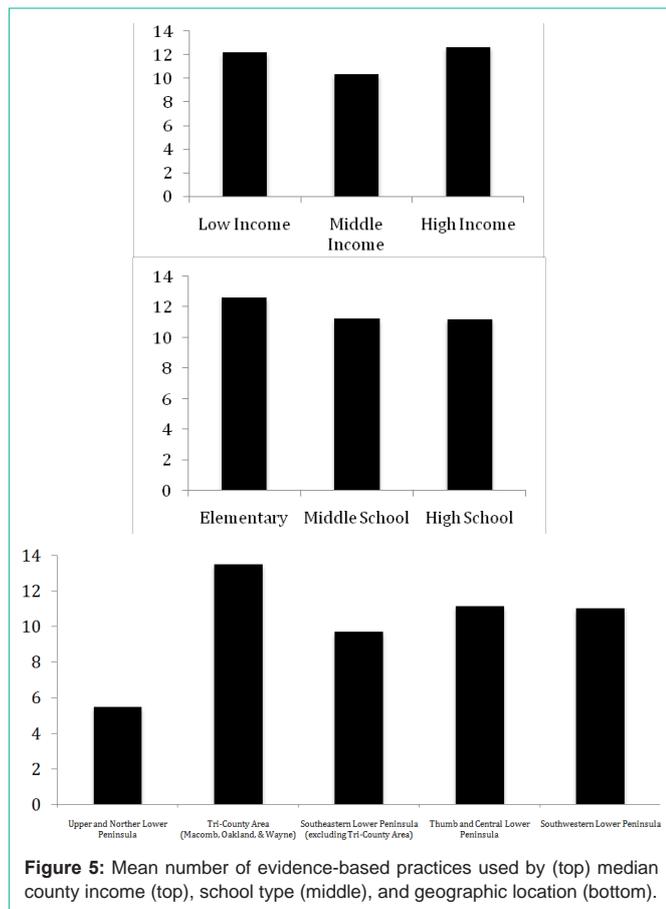
Figure 5: Mean number of evidence-based practices used by (top) median county income (top), school type (middle), and geographic location (bottom).

work. As a result, we utilized statewide datasets with information on special education employees and the general distribution of students with ASD to inform our sampling, though such databases are not comprehensive. Our sampling plan took into account the variety of professionals who may work with students with ASD within school settings (e.g., consultants, paraprofessionals, instructors in self-contained programming), we had no way of ensuring that the professionals included in our original sample actually worked with students with ASD. Therefore, we relied on the individuals in our sample to provide alternate names of potential participants who did serve such students. Additionally, in order for us to both survey and potentially observe a student within the same academic year, many special permissions and consents were needed (e.g., school district, parent, teacher, student assent). To ensure ample time for data collection, we planned to finalize the sample early in an academic year. Unfortunately, the dataset of special education professionals was not completed until much later in the academic year, meaning that the information we had access to was from the previous year. Due to the fact that many special education professionals change placements from year-to-year, the districts and positions listed in the data set may not have been accurate for each educator.

Furthermore, we had to rely on the selected special education personnel to forward information about the study to general educators and paraprofessionals to participate. We unfortunately had very limited total responses among these professionals. Given the multiple responsibilities educators have, it may be the case that completing

a survey, even if it is brief, goes beyond what they can feasibly accomplish. Regardless, more collaboration is needed to improve the process of collecting accurate and reliable data on teacher practices for students with ASD. Finally, the self-report nature of educator practices may not be the ideal methods for assessing strategies. Though the survey included brief definitions of the various practices, we cannot be sure that the respondents were implementing all given strategies with integrity. Future research is needed to determine levels of educator fidelity with evidence-based practices.

Importance and Implications

Despite the limitations of the recruitment process, the current study has many strengths and implications for research, policy, and practice. First, though the number of responses was lower than anticipated, our final sample closely resembled the state population in terms of percentage of respondents from each geographic region as well as county median household income. Additionally, students from all grades were represented, allowing us to determine the practices used for students with ASD at each level of education. The final sample size was similar to that of Hess et al.'s [11] survey in Georgia, which puts the current study in line with previous examinations of teacher practices with students with ASD, yet expands on the current literature by examining practices in a different geographic region. The present study marks an important addition to the literature on EBPs in schools. By using a state-wide, diverse sample of schools, we were able to create a comprehensive picture of teacher strategies for working with children with ASD. Schools represent the primary service site for many children and adolescents with ASD (CITE), understanding what practices teachers use with said students, and how those practices align with the current body of evidence, is essential to best serve students on the spectrum. Though the current study found that four of the five most commonly reported academic strategies used by Michigan teachers are classified as either "emerging" or "established," more research is needed to determine how frequently and accurately such practices are used. Just over half of the responding professionals reported using ABA, but few of those respondents spent more than 10 hours per week on said strategies. Therefore, future research would benefit from discovering barriers to using these and other evidence-based practices for students with ASD in the classroom, as well as determine the level of treatment fidelity in which they are implemented. In terms of policy and practice, we hope that our data collection process and the challenges of such can inform the creation of reliable, accessible databases of school-based service providers for individuals with ASD. These databases would be invaluable in supporting collaborations between educators and researchers to help address the needs of students and schools in the future. Naturally, the creation of such repositories would require quite a bit of work to ensure a balance between confidentiality and accessibility, but we believe that effective security measures are possible. Additionally, by making participation easier on instructors while also informing such participants of the benefits of research may very well help improve response rates to studies such as this one.

Conclusion

The diagnostic rate of ASD continues to rise [2,3,18] meaning there is an ever growing number of students with substantial difficulties in communication, behavior, and social skills [1]. In

addition to the challenges provided by autism-specific symptoms, many students with ASD are also diagnosed with learning disabilities [19]. Per federal law (IDEA), schools are required to provide free and appropriate education to all students, including those with ASD, enabling such students to learn skills necessary to function in and contribute to society. More recent legislation has led to greater accountability for schools to report adequate academic progress for all students, including those with ASD and other disabilities [10]. However, such laws do not necessarily provide the framework for improving services specific to students with ASD. Therefore, other organizations have worked to compile research on various treatments and interventions for these students [7]. Though the present study offers important information on the use of EBPs for students with ASD in the state of Michigan, more research is needed to analyze factors related to such practices, including teacher training and parent involvement. Ultimately, the current results show promise in the number of EBPs used most frequently by educators, but more work is needed to ensure that special education professionals are implementing such practices consistently and effectively.

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