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National Study of School Psychologists' Use of Evidence-Based Assessment in Autism Spectrum Disorder

Rachel Aiello[a], Lisa Ruble[b], and Amy Esler[c]

[a]University of North Carolina at Chapel Hill, Charlotte, North Carolina, USA; [b]University of Kentucky, Lexington, Kentucky, USA; [c]University of Minnesota, Minneapolis, Minnesota, USA

ABSTRACT

This study aimed to better understand predictors of evidence-based assessment practices for autism spectrum disorder (ASD). Nationwide, 402 school psychologists were surveyed for their knowledge of and training and experience with ASD on assessment practices, including reported areas of training needs. The majority of school psychologists reported that they did not engage in comprehensive assessment of ASD, which was defined as assessments that consider all areas of development in addition to the use of ASD-specific instruments. Results from logistic regression revealed that experience and training, working with young children with ASD, and geographic location predicted use of evidence-based assessment practices. Experience and training with ASD was the strongest predictor of evidence-based assessment. No differences in training needs were indicated by school psychologists whose practices were consistent with evidence-based assessment and those whose practices were not. Overall, the results identified gaps between best and current practices by school psychologists and highlight areas of need for additional training and professional development.

Autism spectrum disorder (ASD) is among the fastest growing developmental disability diagnoses in the United States (Centers for Disease Control and Prevention, 2014), affecting about 1 out of 68 children (Centers for Disease Control and Prevention, 2016). Similarly, 8% of children ages 6–21 years receiving special education services are served under the ASD eligibility category, and the percentage of children served increased by 0.5 of a percentage point between 2003 and 2012 (U.S. Department of Education, 2014, 2015). Although there has been a significant increase in the number of students receiving special education services under the autism category over the past decade, most estimates suggest many students with ASD are underidentified or identified and served under the other special education categories (Brock, Jimerson, & Hansen, 2006; Safran, 2008; Wilkinson, 2010). Thus, there is an increased need for school district special education teams to have

specific expertise in the identification of ASD and implementing evidence-based ASD identification practices (Wilkinson, 2010). For example, Yeargin-Allsopp and colleagues (2003) found that almost 20% of children with a medical diagnosis of ASD in a large metropolitan city in the southeast were not identified as having ASD by their respective special education districts. Likewise, a recent survey of administrators and teachers in Tennessee working with students with ASD indicated that they were not confident in their staff's ability or their ability to implement evidence-based practices including ASD diagnostic practices (Brock et al., 2014).

ASD is a complex condition with significant variability in characteristics across individuals. Although social communication deficits and restricted, repetitive behaviors are its hallmarks (American Psychiatric Association [APA], 2013), ASD affects all aspects of development and often co-occurs with intellectual disability, speech-language impairment, and behavioral and psychological conditions (e.g., aggression, ADHD, anxiety). The symptoms of ASD typically emerge in the first and second years of life (Wetherby et al., 2004; Zwaigenbaum et al., 2005), and it is usually a lifelong disorder (McGovern & Sigman, 2005). Early diagnosis is critical because early identification and early intervention lead to more promising outcomes (Dawson et al., 2010). However, given that the diagnosis of ASD relies on detailed analyses of behavior and development, and given that no straightforward biological marker exists, accurate diagnosis is often delayed or missed by inexperienced practitioners or by using evaluation practices that are not comprehensive (Daniels et al., 2011; Rosenberg et al., 2009). Although ASD can be reliably diagnosed by age 24 months by experienced diagnosticians (Lord et al., 2006), the average age of diagnosis remains much later, with estimates between age 46 and 74 months (Centers for Disease Control and Prevention, 2016). There is also evidence of disparities across race, ethnicity, and socioeconomic status in identification of ASD (Mandell, Ittenbach, Levy, & Pinto-Martin, 2007; Mandell, Listerud, Levy, & Pinto-Martin, 2002; Zuckerman et al., 2015). Non-White children are less likely to be diagnosed with ASD (Mandell et al., 2009), and those who are diagnosed receive a diagnosis more than a year later than White children (Mandell et al., 2002; Travers, Krezmien, Mulcahy, & Tincani, 2012). These statistics argue for the need for improved training on evidence-based assessment of ASD.

The urgency for better prepared professionals to screen and diagnose children as early as possible is a shared responsibility across medical, educational, and community providers (Daniel, Prue, Taylor, Thomas, & Scales, 2009; Help Me Grow National Center, 2013; Honigfeld & McKay, 2006; Hughes & Damboise, 2008; Interagency Autism Coordinating Committee, 2014). Referrals for early intervention for developmental concerns can occur starting at birth, and Part C of the Individuals With Disabilities Education Improvement Act (IDEIA) is an important source of identification and intervention for young children with ASD (U.S. Department of Education, 2004). IDEIA also includes the Child Find mandate, which requires public schools to identify and evaluate all children with disabilities to determine the effect of a child's disability on his or her education performance and the relevance of special education services. Children qualify for special education services by

meeting eligibility criteria under specific disability areas, such as ASD. As such, all school professionals need to be willing and able to engage in Child Find.

All school psychologists should be able to conduct psychoeducational assessments of students with ASD to determine learning strengths and challenges, as well as to help determine special education eligibility and develop Individualized Education Plan goals and objectives (Shriver, Allen, & Mathews, 1999 Williams, Johnson, & Sukhodolsky, 2005). These efforts have resulted in higher demand for effective school-based services (Brock, 2006; Lavelle et al., 2014). Therefore, an in depth knowledge of ASD would allow school psychologists to assess and identify the disorder accurately, develop intervention plans to address all areas of functioning, make recommendations for an appropriate classroom environment, identify effective teaching strategies for students, and recommend further services to take place within the school and by outside agencies. As a result of the rising prevalence rates of children identified or diagnosed as having ASD at school-age, school psychologists are likely to be faced with referrals for ASD identification (Noland & Gabriels, 2004; Wiggins et al., 2006).

For low-income and minority children and children in rural areas, schools are even more important because they often are the only accessible source of services (Broder-Fingert, Shui, Pulcini, Kurowski, & Perrin, 2013). For example, a large epidemiological study of ASD found that 40% of children were identified solely through a school evaluation, whereas only 3% were identified solely by nonschool sources (Yeargin-Allsopp et al., 2003), and a more recent study of ASD in nine U.S. communities found that 38% of children with ASD were identified solely through school evaluations (Pettygrove et al., 2013). A similar study found that 24% of children were not identified with ASD until they entered school (Wiggins, Baio, & Rice, 2006). Children identified in schools only were more likely to be non-White (Pettygrove et al., 2013; Yeargin-Allsopp et al., 2003) and less likely to be from families with higher educational attainment (Bhasin & Schendel, 2007; Pettygrove et al., 2013), emphasizing the importance of schools in capturing and serving diverse children with ASD. However, children assessed in schools only were identified with ASD later than children who were seen in health clinics (62 versus 53 months), and a significant portion was not identified until after age 5 years (Pettygrove et al., 2013), the age at which most children enter elementary school. Accurate and timely diagnosis of ASD is important for the implementation of effective interventions. However, little is known about the actual use of evidence-based assessment (EBA) in ASD in the community, including public schools (Williams, Atkins, & Soles, 2009).

Overview of evidence-based assessment of ASD

The National Association of School Psychologists (NASP) endorses the use of EBA, and guidelines and standards are available for best practices in ASD for school psychologists (Campbell, Ruble, & Hammond, 2014; Esler & Ruble, 2015; Filipek et al., 1999; Ozonoff, Goodlin-Jones, & Solomon, 2005). Elements of EBA practices in ASD include the following: (a) the use of psychometrically sound assessments for

ASD; (b) a developmental perspective that characterizes abilities over the lifespan; (c) assessment of core areas of impairment associated with ASD; and (d) the use of information from multiple sources, including direct and indirect observation from parents and teachers to better estimate skills beyond those that may be dependent on characteristics of the environment (Burack, Iarocci, Bowler, & Mottron, 2002; National Research Council, 2001; Ozonoff et al., 2005). The most accurate and reliable diagnoses of ASD come from experienced clinicians who use well-validated, standardized measures for ASD (Lord et al., 2011) and who make diagnostic decisions based on combining information across multiple measures of behavioral characteristics for ASD (Risi et al., 2006).

To assess behaviors specific to ASD, a standardized parent interview and structured observation of social communication and play are recommended (Esler & Ruble, 2015; Risi et al., 2006). It is also recommended that psychoeducational evaluations for ASD, including evaluations for determination of eligibility for special education services, include a parent interview that covers early history and current behavior (Esler & Ruble, 2015). These recommendations are consistent with both the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5*; APA, 2013) and the disability term of autism as defined by the IDEIA, which allow for ASD symptom criteria to be met on the basis of past and current behavior (U.S. Department of Education, 2004). Detailed parent interviews, such as the Autism Diagnostic Interview-Revised (ADI-R; Rutter, LeCouteur, & Lord, 2003), have demonstrated high diagnostic accuracy with *DSM*-5 symptoms (Huerta, Bishop, Duncan, Hus, & Lord, 2012; Kent et al., 2013).

Brief checklists of ASD symptoms are available, and the Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003) and the Social Responsiveness Scale, Second edition (SRS-2; Constantino & Gruber, 2007) appear to have strong psychometric properties relative to other checklists (Charman et al., 2007; Charman & Gotham, 2013; Witwer & Lecavalier, 2007). However, checklists often underidentify children with mild symptoms (Corsello et al., 2007), overidentify children with challenging behaviors not specific to ASD (Cholemkery, Kitzerow, Rohrmann, & Freitag, 2014; Hus, Bishop, Gotham, Huerta, & Lord, 2013), and/or overidentify children with low cognitive and adaptive functioning (Hus et al., 2013). For the structured observation, the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord et al., 2012), is often recommended as a standardized, validated measure (Huerta & Lord, 2012; National Research Council, 2001). Naturalistic observations in school settings also are recommended, as they may be particularly helpful in adding information that may not be directly observable in standardized tools such as the ADOS, including relationships with peers and deficits in understanding and adjusting one's behavior to a variety of social expectations (Esler & Ruble, 2015).

ASD evaluations need to include assessment of factors not specific to ASD, but that have significant effect on outcomes and intervention decisions, including intellectual functioning, language impairment, adaptive skills, and the presence of other

co-occurring behavioral or emotional disorders or concerns (e.g., ADHD, aggression, anxiety; Esler & Ruble, 2015; Huerta & Lord, 2012). The need to consider co-occurring disorders is salient particularly in light of inclusion of determination of level of support as part of the revised criteria for ASD within the *DSM-5* (APA, 2013). Recommendations are available regarding selection of specific measures of cognitive, language, and adaptive skills for ASD (National Research Council, 2001).

Use of EBA in schools

The research available on assessment practices of school psychologists, although limited, suggests that EBA practices are not implemented in schools with regularity. Pearson (2008), for example, found that 92% of 246 school psychologists reported direct involvement in assessment of students with ASD. Yet, the majority of the respondents (73.1%) relied on ASD screening instruments rather than comprehensive diagnostic measures, a finding supported by other studies (Allen, Silove, Williams, & Hutchins, 2007; Singer, 2008). More specifically, school psychologists in the Pearson study reported using the Gilliam Autism Rating Scales, Second Edition (GARS-2; Gilliam, 2006) in assessment and identification, which has been found to have weak psychometric properties (Norris & Lecavalier, 2010; Pandolfi, Magyar & Dill, 2010). In contrast, evidence-based tools such as the ADOS-2, ADI-R, and Childhood Autism Rating Scales, Second Edition (CARS-2; Schopler, Van Bourgondien, Wellman, & Love, 2010) were used less than one third of the time in ASD assessment (Akshoomoff, Corsello, & Schmidt, 2006).

Research identifying barriers to EBA has acknowledged that the influence of knowledge, beliefs, or misconceptions that practitioners hold about students with ASD may lead to ineffective practice (McDonald, Pace, Blue & Schwartz, 2012). Small (2012) surveyed 101 school psychologists about their knowledge and beliefs specific to autistic disorder as defined by diagnostic criteria from the *DSM, 4th Edition, Text Revision* (*DSM-IV-TR*; APA, 2000). Although impairment in social interaction is a core symptom domain in autistic disorder, 13.8% of the participants did not agree that this was a necessary characteristic to receive a diagnosis. Likewise, nearly half of the respondents (43.6%) did not believe that restricted and repetitive behaviors were required for a diagnosis under the *DSM-IV-TR*. Although school psychologists are often bound to applying IDEIA eligibility criteria rather than *DSM* diagnostic criteria when identifying ASD, knowledge of psychological disorders defined in the *DSM* is expected to be within the realm of their professional knowledge (Tobin & House, 2015). Moreover, while state laws may vary slightly, most will align with federal definitions of the various disability categories as outlined in IDEIA (Barton et al., 2015; U.S. Department of Education, 2004). Impairments in social interaction as well as repetitive activities and stereotyped movements are part of the criteria in the definition of autism from IDEIA (U.S. Department of Education, 2004). This study also demonstrated that only about one quarter (25.3%) of school psychologists consistently used ASD-specific measures during evaluations, and more than half (64.4%) felt that nonstandardized measures (i.e., observations,

interviews with parent and teacher, obtaining a developmental history) were more useful than standardized formal assessments.

Lack of training and opportunities for professional development in assessment of ASD has been identified as barrier to implementation of EBA. A national survey of 662 school psychologists was conducted by Rasmussen (2009) on the level of knowledge and training in ASD assessment and perceived preparation and confidence in providing services to children. Results indicated that training was associated with increased knowledge about ASD, involvement on multidisciplinary teams, and ability to identify ASD. However, in a survey of 72 school psychology graduate programs, very few school psychologists (15%) described their overall graduate training in ASD as adequate (Singer, 2008). Perhaps most training occurs after service, rather than before, as many school districts across the country provide their school psychologists with specialized trainings and in-service workshops related to ASD (Gerbe, 2008). Although there is some preliminary information that suggests practitioners with specialized training are more prepared and involved in ASD evaluations than those without training, research is lacking regarding the amount of training and experience necessary for application of EBA (Akshoomoof et al., 2006; Hering, 2005).

Although school psychologists are likely to be trained in assessment and identification of psychological disorders, the variation in the range, presentation, and severity of ASD symptomology may pose challenges to practitioners who lack training in assessment of ASD or the use of EBA tools (Williams et al., 2009). It is recommended that practitioners who evaluate children for ASD have extensive experience working with and assessing children with ASD on a regular basis (Lord et al., 2012) to increase confidence in diagnostic accuracy. However, there is variability across school systems in terms of who conducts ASD evaluations and in rules, interpretation, and implementation of eligibility criteria regarding identification of children with ASD (Noland & Gabriels, 2004; Stahmer & Mandell, 2007). Implementing EBA is one way to protect against the variability resulting from these structural, systemic differences.

School psychologists clearly play an important role in the identification of ASD (Esler & Ruble, 2015), as well as intervention planning and consultation (Ruble, Dalrymple, & McGrew, 2012). Although it is important to acknowledge that decisions about special education eligibility, which is the primary focus of school-based evaluations, are ultimately a team-based decision (U.S. Department of Education, 2004), a role of a school psychologist within that team is to serve as a qualified assessor and to contribute their expertise on psychological and developmental disorders. Identifying gaps in school psychologists' knowledge, training, and experiences regarding ASD will help guide future preservice training, inform current practices, and identify areas of professional development.

This study aimed to better understand variables predicting the use of EBA practices for ASD. Specifically, we conducted a national survey of school psychologists and examined the influences of demographic characteristics and ASD knowledge as well as training and experiences on the use of EBA. To understand influences

Table 1. Participant demographics based on report of use of evidence-based autism spectrum disorder assessment.

Demographics	EBA (n = 93)		Non-EBA (n = 309)		Total (n = 402)	
	n	%	n	%	n	%
Gender						
Female	80	86.2	253	81.8	333	82.8
Male	11	11.8	51	16.5	62	15.4
Employment setting						
School district	84	90.4	293	94.8	377	93.8
Cooperative	9	9.7	16	5.2	25	6.2
Degree						
M.S./M.A.	21	22.5	106	34.3	127	31.6
Ed.S./Psy.S.	50	53.8	142	45.9	192	47.8
Ph.D./Ed.D./Psy.D.	21	22.6	55	17.8	76	18.9
Geographic region						
Northeast	15	16.1	80	25.9	95	23.6
Midwest	21	22.6	96	31.1	117	29.1
South	39	41.9	104	33.7	143	35.6
West	18	19.4	29	9.4	47	11.7
Community size						
Rural	7	7.52	44	14.2	51	12.7
Small town	21	22.6	81	26.2	102	25.4
Large town	20	21.5	71	22.9	91	22.6
Small city	27	29.0	53	17.2	80	19.9
Large city	18	19.4	55	17.8	73	18.2
Ages served (years)						
0–2	18	19.4	33	10.7	51	12.7
3–5	77	82.7	204	66.0	281	69.9
6–12	82	88.2	267	86.4	349	86.8
13–17	63	67.7	207	66.9	270	67.2
18–21	36	38.9	128	41.4	164	40.8

Note. EBA = evidence-based assessment.

on the use of EBA practices, participants were categorized into one of two groups: those who reported using EBA and those who did not. EBA for ASD was defined in this study as the use of a comprehensive assessment battery that included four types of assessment measures: (a) diagnostic, (b) intelligence, (c) adaptive functioning, and (d) social-emotional/behavioral functioning. We also investigated how the use of EBA practices influenced the type of ASD-specific and intelligence assessment measures used. Last, we examined differences in reported training needs.

Method

Participants

A total of 402 participants from 43 states participated in the study (Table 1). However, across the total sample, compared with geographic region standards from the U.S. Census Bureau (2010), school psychologists from the West were underrepresented: 11.7% of the sample was from the West compared with 23% of the U.S. population. Proportions of respondents from the South (32%), Midwest (22%), and Northeast (18%) were comparable to the U.S. population; however, a relatively large proportion of the study sample reported working in Kentucky (14.7%), where the primary authors were located.

Recruitment

Participants were recruited from two sources: (a) NASP and (b) state-affiliated school psychology organizations. Paper-based surveys were mailed to a randomly selected sample of 1,000 NASP members. State organization members received an electronic version of the survey. Of the NASP surveys, 57 were returned as undeliverable and 238 were returned completed for a 27% response rate; 17 were ineligible for data analysis as a result of employment in settings other than schools. The response rate is considered adequate and is higher than response rates in studies that applied a similar methodology (Cochrane & Laux, 2007; Powers, Hagans, & Busse, 2008).

The president or research chair for the 50 state-affiliated school psychology organizations was contacted via email to obtain consent to sample their membership. Responses from representatives from 31 states were not received, and emails from 7 states were returned as undeliverable. Thus, representatives from 12 states forwarded information to their membership about the survey. A total of 193 members completed the survey; 29 members were ineligible as a result of employment in settings other than school systems (Table 1). Response rate of this portion of the sample was not determined as membership size of the state organizations was unknown.

Measure

The Autism Survey for School Psychologists was developed with input from school psychologists experienced in ASD. Identical questions and scales were included in both the paper-based and electronic-based formats. The electronic survey was formatted and delivered using Survey Monkey web-based software. The final survey was composed of 14 demographic questions, followed by five topical areas: (a) services provided to students with autism, (b), autism experience and training, (c) autism knowledge, (d) autism training needs, and (e) autism eligibility and diagnosis. Demographic questions included psychologist's age, gender, highest degree earned, number of hours worked per week, age of children served, and years of experience working as a school psychologist, and school demographics included geographic area, school size, and community size. The first four topical areas are the focus of the present study. The topical area of autism eligibility and diagnosis was not included in the analyses for this study as the questions focused on applications of special education eligibility beyond the scope of assessment-related practices. A copy of the survey can be obtained from the first author.

For the services provided to students with autism items, respondents endorsed the different types of assessments they administer to students with ASD. The experiences and training items were based on 11 Likert-scale statements rated on a scale ranging from 1 (*not at all true*) to 5 (*very true*) and included current experience working with children with ASD and past training received to work with children with ASD. Example items are as follows: "I learned to conduct assessments for identifying autism in my graduate program" and "Information on the child's restricted and/or repetitive behaviors and interests are reflected and synthesized in my

psychological assessment reports." Also, participants had the option to rate the items as "do not know." The internal consistency of these items was $\alpha = .827$.

The autism knowledge items were based on 10 Likert-scale statements rated on a scale ranging from 1 (*not at all true*) to 5 (*very true*) that assessed factual knowledge of ASD. Example items include the following: "Autism is listed as an eligibility category in IDEIA," and "Autism is an emotional/behavioral disorder." The internal consistency of the items was $\alpha = .540$. Given that the scale was developed to measure a set of items representing different areas of knowledge, as opposed to a singular domain, a low internal consistency was anticipated.

The training needs component of the survey was a series of 13 statements that participants rated dichotomously as *yes* or *no*. Examples items include the following: "I need additional training in identifying children with autism," and "conducting social skills assessments." The internal consistency of these items was $\alpha = .847$.

Data from the electronic-based survey were imported into Microsoft Excel from Survey Monkey, provided a participant code, cleaned, and then entered into an IBM SPSS Statistics 23 database for analysis. Data from the paper-based format were entered directly into the IBM SPSS Statistics 23 database. Summative scores for the autism knowledge, autism experience and training, and training needs subscales were created. Descriptive analyses of the data (e.g., means, standard deviations, histograms, and boxplots) as well as testing for assumptions were performed. Available case analysis was imputed to manage missing data.

To understand predictors of use of EBA, several analyses were performed. First, bivariate correlations were performed to identify significant relations between use of EBA and responses to items from the autism knowledge and autism experience and training scales. Chi-square tests were also performed to examine the relation between school psychologist use of EBA and six demographic variables (e.g., gender, employment setting, highest degree obtained, geographic region, community size, age served) along with use of *DSM* criteria to guide special education eligibility determinations. Significant variables identified from these analyses were then entered into a binary stepwise forward logistic regression to develop a model for predicting inclusion within the EBA and to provide information on the relative strength of individual predictors. Chi-square test of independence was also used to examine administration practices of particular ASD-specific measures as well as use of different intelligence assessment batteries. Last, *t* test analysis was used to determine differences in reported training needs and reported use of EBA practices.

Results

Of the 402 total respondents, 93 (23%) met criteria for inclusion in the EBA group (Table 1). Bivariate correlations (Table 2) identified a significant positive correlation between autism experience and training and EBA ($r = .273$, $p = .001$). The percentage of school psychologists who engaged in EBA was greater for those who had lived in Southern and Western regions of the United States ($\chi^2[3] = 12.1$,

Table 2. Relation between autism knowledge, autism experience and training, and training needs with the evidence-based autism assessment grouping.

Measure	EBA r
Autism knowledge	.094
Autism experience	.273**
Training needs	.028

Note. EBA = evidence-based assessment.
*$p < .05.$ **$p <.01.$

Table 3. Use of *diagnostic and statistical manual of mental disorders* criteria to guide special education eligibility determination based on inclusion with evidence-based autism spectrum disorder assessment grouping.

	EBA ($n = 93$)		Non-EBA ($n = 309$)			
Autism-specific assessment	n	%	n	%	c^2	p
Autism	36	38.7	80	25.9	7.22	.027*
Asperger's Syndrome	34	36.5	79	25.5	6.66	.036*
Pervasive developmental disorder-not otherwise specified	28	30.1	70	22.6	3.53	.172

Note. EBA = evidence-based assessment.
*$p < .05.$ **$p <.01.$

$p = .007$), served children between 3–5 years of age ($\chi^2 [1] = 9.56, p = .002$), and served children younger than 3 years of age ($\chi^2[1] = 4.86, p = .028$). No other significant differences in demographic variables were found between groups, including years of experience as a school psychologist. The use of *DSM* criteria to guide special education eligibility was also explored between groups (Table 3). The percentage of school psychologists who engaged in EBA were also more likely to endorse use of *DSM* criteria consistent for autistic disorder ($\chi^2[2] = 7.22, p = .027$) and Asperger's syndrome ($\chi^2 (2) = 6.64, p = .036$) as part of special education eligibility determination, but with no differences in application of *DSM* criteria for pervasive developmental disorder-not otherwise specified ($\chi^2[2] = 3.53, p = .172$).

On the basis of the aforementioned analyses, the autism experience and training summative score (Table 4), geographic region, and age of children served (between ages 3 and 5 years and younger than age 3 years), and use of DSM criteria for autistic disorder and Asperger's syndrome were entered into the regression analysis. Results

Table 4. Means and standard deviations of the autism knowledge and autism experience and training, and autism training needs summative scores by use of evidence-based autism spectrum disorder assessment.

	EBA ($n = 93$)		Non-EBA ($n = 309$)			
	M	SD	M	SD	t	p
Autism knowledge	43.2	3.84	42.1	4.84	2.08	.039
Autism experience	61.8	6.20	55.9	9.92	5.33	.000
Training needs	5.80	3.68	5.56	3.57	.−541	.589

Note. The maximum score for the autism knowledge summative score is 55, the maximum autism experience summative score is 70, and the maximum training needs summative score is 13. EBA = evidence-based assessment.

Table 5. Stepwise forward logistic regression to predict inclusion in the evidence-based autism spectrum disorder assessment group.

Variable	Odds ratio	β	Wald test	df	p
Model 1	76.3				
Autism experience		.102	26.9	1	.000
Model 2	78.0				
Autism experience		.106	26.7	1	.000
Geographic region			12.1		
Northeast		−1.04	5.65	1	.017
Midwest		−1.23	8.64	1	.003
Model 3	77.2				
Autism experience		.106	25.8	1	.000
Geographic region			12.2		
Southern		−1.12	6.43	1	.011
Western		1.36	10.1	1	.001
Ages served					
3—5 years		.106	25.8	2	.000

from the logistic regression (Table 5) indicated three of the five variables accounted for significant variance and were contained within the final model, Model 3 ($\chi^2 = 16.6, p = .035$): (a) Autism experience and training summative score, (b) geographic region (e.g., school psychologists from the Southern and Western regions were more likely to use EBA), and (c) experience with children between 3 and 5 years of age. The results from Model 1 indicate that school psychologists with higher levels of ASD experience and training were more likely to engage in evidence-based ASD assessment, Wald's $\chi^2(1) = 25.8, p < .001, B = .106, SE = .021$, 95% CI [1.07–1.16]. Nagelkerke's $r^2 = .138$ for this model indicated a small relation between the prediction and grouping variable and correctly predicted 76.3% of cases. Model 2 added geographic region, and Model 3 contained the autism experience and training score, geographic region, and experience working with children in the 3–5 age groups. Nagelkerke's r^2 of .184 and .208, respectively, indicated a moderate relation between prediction and grouping with these additional variables, with a prediction success of 78.0% for Model 2 and 77.2% for Model 3.

Analysis of the use of particular ASD specific measures and EBA indicated a large effect size for more frequent and comprehensive use of ASD-specific measures ($\chi^2 = 239.3, p < .001, r = .77$; Table 6). Of the EBA group, 100% reported using at least

Table 6. Use of autism-specific assessments based on inclusion with evidence-based autism spectrum disorder assessment grouping.

Autism-specific assessment	EBA ($n = 93$)		Non-EBA ($n = 309$)		c^2	p
	n	%	n	%		
GARS	75	80.6	160	51.7	24.5	.001**
CARS	65	69.9	141	45.6	16.8	.001**
ADOS	49	52.6	30	9.70	83.6	.001**
ADI-R	24	25.8	9	2.91	49.7	.001**
SCQ	18	19.3	11	3.55	26.7	.001**

Note. ADI-R = Autism Diagnostic Interview-Revised; ADOS = Autism Diagnostic Observation Schedule; CARS = Childhood Autism Rating Scales; EBA = evidence-based assessment; GARS = Gilliam Autism Rating Scales; SCQ = Social Communication Questionnaire.
*$p < .05$. **$p < .01$.

Table 7. Use of intelligence assessments reported from the evidence-based autism assessment grouping.

Intelligence assessment	EBA ($n = 93$)		Non-EBA ($n = 309$)		c^2	p
	n	%	n	%		
WISC-IV	59	63.4	177	57.2	1.11	.290
UNIT	38	40.9	73	23.6	10.6	.001*
SB-5	32	34.4	56	18.1	11.1	.001*
KABC-2	31	33.3	57	18.4	9.26	.002*
WJ-III	26	27.9	51	16.5	6.05	.014*
DAS-II	25	26.9	53	17.2	4.33	.038*
WAIS-IV	10	10.7	38	12.3	.162	.687
Bayley-III	14	15.0	18	5.85	8.31	.004*
MSEL	3	3.22	3	1	2.47	.116

Note. Bayley-III = Bayley Scales of Infant and Toddler Development, Third Edition; DAS-II = Differential Ability Scales, Second Edition; KABC-2 = Kaufman Assessment Battery for Children, Second Edition; MSEL = Mullen Scales of Early Learning; SB-5 = Stanford-Binet Intelligence Scales, Fifth Edition; UNIT = Universal Nonverbal Intelligence Test; WAIS-IV = Wechsler Adult Intelligence Scale, Fourth Edition; WISC-IV = Wechsler Intelligence Scale for Children, Fourth Edition; WJ-III = Woodcock–Johnson Tests of Cognitive Abilities, Third Edition.
*$p < .05$.

one ASD-specific measure compared with only 51% of the non-EBA group. The EBA group also endorsed administration of the ADOS at a higher rate than did the non-EBA group ($\chi^2 = 80.9, p < .001, r = .45$). Of the EBA group, 52% reported using the ADOS compared with only 9% of the non-EBA group. Both groups reported using the GARS-2 and CARS-2 most frequently.

Use of different intelligence assessment batteries was also explored. In the non-EBA group, 71.5% participants endorsed using intelligence assessments with students with ASD, compared with 100% of the participants in EBA group, who by definition included intelligence testing in their evaluation batteries ($\chi^2 = 33.9, p < .001, r = .29$). The majority of the respondents across both groups most frequently endorsed administration of the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV; Table 7). Administration of separate nonverbal intelligence assessments, such as the Universal Nonverbal Intelligence Test (UNIT), was also associated with EBA, ($\chi^2 = 10.6, p = .002, r = .16$).

A t test analysis was performed to explore potential differences in reported training needs by EBA group. The analysis did not reveal significant differences in the summative Training Needs score for the EBA group and the non-EBA group; $t(365) = -.541, p = .589$.

Discussion

With its continuing rise in prevalence, ASD is no longer considered a low incidence disability, and the need for school psychologists who are well informed, trained, and skilled in screening and diagnostic assessment of ASD is unquestionable. The present study extends the previous literature by identifying factors in knowledge, training, and experience that distinguish school psychologists who use EBA practices from those who do not. Of the 402 school psychologists surveyed, a surprisingly low number (less than 25%) engaged in EBA as defined in our study. In other

words, the majority of school psychologists in the sample reported that they did not conduct comprehensive assessment of ASD that included examination of all areas of development along with ASD-specific instruments. Even among school psychologists who are implementing EBA, the majority relied on ASD checklists that provide limited information and, in the case of the GARS-2, have weak psychometric properties (Norris & Lecavalier, 2010).

Regarding comprehensive assessment of ASD, the EBA group was more likely to include a standardized measure of intelligence than the non-EBA group. This may be related to the higher reported levels of experience and training in ASD in the EBA group. Understanding the cognitive level of an individual is important to a diagnosis of ASD, as the level of social impairment needs to be discrepant from overall level of development (APA, 2013). It is interesting that years of experience as a school psychologist was not a predictor of using EBA; however, we did not explore whether experience may have been related to use of intellectual measures in general. A possibility is that school psychologists with more experience or comfort in school-based assessment are more likely to use standardized assessment measures in any assessment, not just those specific to ASD.

Unfortunately, even among psychologists using EBA, the most widely used intellectual measures were ones that have known limitations for use with the ASD population. Best practice recommendations for assessment of intellectual abilities in ASD emphasize the need to select instruments that require less social engagement and verbal mediation (National Research Council, 2001). Although the Wechsler series is commonly used to evaluate intellectual abilities in ASD, concerns exist that its nonverbal subtests involve a level of verbal instruction and responding that may lead to underestimation of skills (Barbeau, Soulières, Dawson, Zeffiro, & Mottron, 2013). The UNIT, which was another commonly endorsed intellectual measure in the EBA group, requires no verbal directions and no verbal responses on the part of the student and may address the limitations of measures with verbal demands for children with impaired verbal skills. However, administration of the UNIT relies on the use of gestures. As impairment in using and understanding gestures is part of the diagnostic criteria for ASD, this mode of administration may not be appropriate for students with ASD (Fives & Flanagan, 2002). It is clear that more research is needed on the validity of intellectual measures for children with ASD as well as more awareness on the limitations of selected measures.

Analysis of the predictors of EBA use identified three significant variables: experience with children age 3–5 years of age, geographic location, and experience with and training in ASD. Experience and training in ASD was the strongest predictor of EBA practices. It is surprising that knowledge of ASD was not a significant predictor in the final model. In other words, possessing a high level of knowledge of ASD did not differentiate school psychologists who provided EBA from those who did not. This finding suggests that hands-on experience may be more important than content knowledge. However, an important limitation of this finding is that our survey questions regarding ASD knowledge focused on basic diagnostic criteria and

symptoms, and it may be that those using EBA have a more complex and intricate understanding of ASD than was captured in our items.

We also found a relation between EBA and working with children 5 years of age and younger, particularly those 3–5 years of age. Working with younger children is likely a proxy for experience with ASD assessment, as ASD concerns tend to be identified in early childhood, and more efforts of training are focused on this age group (Wiggins et al., 2006). Furthermore, once initial ASD eligibility is established, subsequent reevaluations may not involve a comprehensive assessment of ASD eligibility if the need for special education services remains clear. However, there are many reasons a comprehensive ASD evaluation may be appropriate across grades K–12, and there is a need for additional training in the assessment of older students with ASD given the limited reporting of EBA practices with this population. Initial evaluations for ASD eligibility may arise for school-age students, given that some children do not show significant signs of the social impairments involved with ASD until social expectations exceed their abilities (APA, 2013). With regard to reevaluations, detailed updated testing may be especially appropriate for children with ASD as a result of the uneven patterns of development that tend to accompany this disorder (APA, 2013). There is evidence to suggest that developmental profiles change with age, with discrepancies in verbal and nonverbal reasoning skills decreasing over time as children gain language skills (Joseph, Tager-Flusberg, & Lord, 2002) and reductions in certain repetitive behaviors occurring as age and nonverbal intelligence increase (Bishop, Richler, & Lord, 2006). Reevaluations may uncover new areas of strength and weakness as the student progresses through school.

Geographic location was a weaker but significant predictor of EBA. School psychologists from the South and West were more likely to report using EBA. This finding was somewhat surprising, as per-pupil spending tends to be lower in these regions (U.S. Census Bureau, 2015), and evidence suggests that education spending may be related to better-trained educational staff and the availability of more specialists in ASD (Mandell & Palmer, 2005). Furthermore, cities in the South and West were underrepresented in a national survey of best places to live for ASD. Of the 10 best cities, none were from the South, and only one (Los Angeles) was from the western region (Autism Speaks, 2011). Last, a previous study of diagnostic practices within community settings (which included but were not limited to school teams) found diagnostic stability of ASD to be lowest in the West and South (Daniels et al., 2011).

However, there can be high variability even within states regarding the availability of ASD resources and training, and further research is needed to understand the relation between geographic region and availability of training or professional practices around EBA. Each state establishes their own ASD eligibility criteria for special education services, although the criteria must meet or exceed the criteria outlined by the federal regulations (U.S Department of Education, 2004). Furthermore, although IDEIA indicates that all children with disabilities have access to free and appropriate public education, states can create their own educational eligibility

assessment policies as long as they meet the minimum requirements set by the federal government. As a result, these eligibility criteria, policies, and procedures vary across states, and states are not reciprocal with each other (Mandell & Palmer, 2005; Stahmer & Mandell, 2007). MacFarlane and Kanaya (2009), for example, analyzed ASD eligibility criteria across states and found that 17 states plus Washington, D.C., used the exact wording in the federal regulations. The remaining 33 states, however, used a variety of different criteria including the following: (a) the use of the *DSM-IV-TR* (APA, 2000), (b) mentioning ASD not only autism, and (c) requiring medical diagnoses. Application of eligibility criteria within a given state can also be varied. For example, a recent survey of early childhood practitioners in Colorado found large disparities in the state across school districts in the procedures, tools, and practices used to identify young children with ASD (Barton et al., 2016). This variation across programs and districts within and across states and the lack of state reciprocity can result in missed, inaccurate, or delayed identification. Missed or inaccurate identification might lead to the provision of ineffective services or services provided at the wrong intensity, which will significantly affect a child's developmental trajectory and academic outcomes.

Although some school districts also have the option of accepting a diagnosis from another service provider outside of the school system, school psychologists are typically the professionals who identify children with ASD in educational settings as noted at the state policy level for special education eligibility purposes (Broder-Fingert et al., 2013; Pettygrove et al., 2013; Wiggins et al., 2006; Yeargin-Allsopp et al., 2003). However, a recent evaluation of publications related to autism in school psychology journals found a lack of publications related to the development and psychometric properties of assessments for students with ASD (McKenney, Dorencz, Bristol, & Hall, 2015). This suggests school psychologists may have little guidance regarding which tools demonstrate the strongest psychometric properties for identifying ASD. This seems particularly concerning given the significant variation in ASD educational eligibility identification requirements and procedures across states (Barton et al., 2016; Mandell & Palmer, 2005; Stahmer & Mandell, 2007). These findings also suggest the need for more research on educational state policies and practices that leverage and support the use of EBA.

Limitations

Our study is subject to the inherent limitations of survey methodology. First, although the sampling method used in the current is common in survey research, it limited the available pool of potential participants as email address lists and physical addresses for NASP members may be unreliable (Lefever, Dal, & Matthíasdóttir, 2007). Second, participants who self-selected could introduce sampling bias, particularly as noted with the overrepresentation of respondents from the South. Moreover, the degree to which association members of NASP or their state-affiliated school psychology characterize the field of school psychology as whole remains uncertain (Lewis, Truscott, & Volker, 2008), and self-selection could introduce

differences as a result of invested interest in the survey topic (Schwarz, 1999). Although our response rate was comparable to response rates in studies using similar methods, especially in light of the findings related to geographic area, our survey results may also not be representative of the full population of school psychologists within and across regions. For example, the West was underrepresented within our sample, which may in turn be related to state- and regional level factors (e.g., prevalence rates of ASD, number of practicing school psychologists, state and district special education policies regarding eligibility determination). Third, the use of Likert scales as part of the survey design is a measurement issue that may have limited the range of response options given the low granularity of the scales to solicit more definitive responses from the participants (Smithson, 2006). Similarly, the survey did not include questions regarding the use of developmental interviews or informal behavioral observations as part of EBA as the focus of the research was on the use of assessment measures as opposed to the assessment process. Given the access that school psychologists have to observing students in a natural, classroom context, it is plausible that school psychologists may find obtaining informal as opposed to formal assessment information more useful in the process of determining ASD eligibility for special education services.

Conclusion and future directions

The increase in the number of children receiving special education services under the classification of ASD combined with the urgency for identifying children as young as possible call for effective strategies to adequately prepare school psychologists to use EBA. Overall, the results of the study identify specific gaps between best and current ASD assessment practices and suggest directions for improvement in current ASD assessment procedures and training programs. Providing opportunities for professional development may essentially, allow for the growth of knowledge and skills and subsequently, lead to earlier diagnosis and better intervention (Brock et al., 2006).

Employers of school psychologists may wish to provide professional development opportunities regarding ASD specific training to broaden the experiences and exposure of their employees, and thus, increase school psychologist skills. Perhaps employers may wish to mandate several hours of professional development in regards to knowledge of ASD assessment and identification. With specific training and exposure to cases, school psychologists may feel better equipped, in terms of skills and experience, to diagnose or identify a child as having ASD when faced with such a case. Recent research has found that the use of technology such as webcams and videos have been found to be successful in training psychologists regarding psychotherapy techniques (Manring, Greenberg, Gregory, & Gallinger, 2011). Using the same approach, in terms of ASD assessment, may allow for the substitution of real-life experiences through videos. Alternatively, employers may wish to have school psychologists "rotate" as an apprentice with a local school district ASD team for a period of time. The use of an ASD diagnostic or identification team may

be an efficient way to approach ASD training and autism diagnosis/identification concerns. An ASD diagnostic or identification team will only require a small group of school psychologists to be trained so extensively. Many researchers agree that a team approach should be used in the diagnosis of ASD (McClure, MacKay, Mamdani, & McCaughney, 2010; Noland & Gabriels, 2004). Although it may not be practical to train all school psychologists to be part of such teams, previous research has found the development and trainings of such teams to be successful by directly teaching over an intensive multiday format (McClure et al., 2010). Access to an ASD diagnostic identification team may allow school psychologists to provide diagnoses or identifications of children who have ASD more effectively and at an earlier age. Targeted education and professional development that includes applied activities should result in evaluations that lead to earlier provision of intervention, and potentially more favorable developmental and learning outcomes. for students with ASD.

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