Examining Pre-Service Teacher Candidates' Sources and Levels of Knowledge about Autism Spectrum Disorders

William H. Blackwell Ph.D
Sam Houston State University, whb004@shsu.edu

Mary E. Sheppard
St. Joseph's University, msheppar@sju.edu

Donna Lehr
Boston University

Shuoxi Huang
Boston University

Abstract

This study was designed to identify what pre-service teacher candidates knew about autism spectrum disorder (ASD) and how they had acquired that knowledge in order to design more effective preparation courses. Teacher candidates (N=87) from three teacher preparation programs completed questionnaires during, or prior to, their first special education course. The findings indicate a relationship between sources of knowledge about ASD and actual levels of knowledge. Based on the findings, the authors argue that there is a need for coursework that focuses on effective intervention strategies and utilizes direct opportunities for teacher candidates to work with students with ASD.

Keywords: Autism Spectrum Disorder, Inclusion, Teacher Preparation

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Introduction

There is a growing need for teachers to enter the profession with an established set of knowledge and skills to address the academic and social needs of students with autism spectrum disorder (ASD) (Busby, Ingram, Bowron, Oliver, & Lyon, 2012). The Center for Disease Control and Prevention (2015) reported that the rate of diagnosis of autism spectrum disorder (ASD) is 1 in 68 children, and the U.S. Department of Education (2015) reported that 39.0% of children, diagnosed with ASD, spend 80% or more of their school day in the general education setting and an additional 19.8% spend between 40 and 79% in the general education setting. The rate of ASD diagnosis, coupled with the high percentage of students spending much of their school day in general education settings, means that almost all teachers will teach students with ASD during their careers.

The increased rates of diagnosis and inclusion of children with ASD in both the classroom and community also mean that many pre-service teacher candidates will enter their undergraduate programs with a level of exposure and perceived knowledge regarding students with ASD. The accuracy of their knowledge and their commitment to existing attitudes and belief sets can have a substantial impact of their ability and willingness to provide inclusive learning opportunities to students with ASD (Baglieri & Shapiro, 2012). Many teacher candidates now enter preparation programs either knowing or having had some interactions with a person with ASD. In addition, they have likely been exposed to content related to ASD through the popular media. While direct,

personal experiences with individuals with ASD may lead to more inclusive and unbiased knowledge and attitudes, the portrayal of individuals with ASD through film, television, popular literature, news outlets, and other forms of mass media can often contain stereotypes and inaccuracies that exert a negative influence on the way people understand and interact with individuals with ASD (Baglieri & Shapiro, 2012; Greenwell, 2004; Haller, 2010). This potential mix of accurate and inaccurate knowledge presents a challenge for those responsible for preparing the next generation of teachers. Although many teacher candidates have had some exposure to ASD, this exposure may not necessarily translate into accurate knowledge grounded in established research about effective teaching practices for students with ASD.

Current research on teacher preparation programs and ASD

Much of the research that has been conducted on teachers' perceptions of students with ASD has focused on the preparedness of teachers to include children with ASD in the general education classroom. In a study that investigated the correlation between teachers' knowledge about ASD and attitudes toward inclusion, the authors found that teachers who knew more about ASD had more positive attitudes toward the inclusion of children with ASD in general education settings (Segall & Campbell, 2012). In addition, Segall and Campbell found that practitioners had many misconceptions about the etiology of, and best practices for, teaching children with ASD (2012). Similarly, several studies have found that general education pre-service teachers (Jung, Cho, & Ambrosetti, 2011) and teachers in the field (Busby et al., 2012) often report feeling unprepared to meet the needs of the students with ASD in their classrooms and that "there are considerable perceived barriers to inclusion of children with autism" (Busby et al.,

2012, p. 32). The authors of these studies recommended additional coursework in preparation programs to ensure that all teachers received accurate information regarding children with ASD correct any preconceived errors in thinking (Busby et al., 2012; Jung et al., 2011; Segall & Campbell, 2012). Busby et al. (2012) recommended that teacher preparation courses include information about ASD to ensure that all teachers are aware of the most common characteristics, how the characteristics may manifest in the classroom, and acquire knowledge of effective strategies for helping students with ASD succeed in school.

Several studies have found that when explicitly asked about their training to teach students with ASD, teachers reported that teacher preparation programs were inadequate in addressing this content area. In a study of evidence-based practice used by teachers who work with children with ASD, Morrier, Hess, & Heflin (2011) found that fewer than 15% of the participants reported receiving instruction in evidence-based practices in their teacher preparation coursework at colleges or universities. The sentiment was echoed by teachers, in a study conducted by Able et al. (2015), who reported a specific need for teacher preparation programs to address the specific characteristics of students with ASD and expose trainees to related, effective teaching strategies.

Most teacher preparation programs, as per state licensure requirements, require teacher candidates to complete at least one course about people with disabilities. These are typically survey courses that address the disability categories identified in the Individuals with Disabilities Education Act of 2004 (of which ASD is one) and offer brief descriptions of the historical treatment of people with disabilities and current educational laws and practice (Klehm, 2014; Turner, 2003). To address the needs of all teachers to

learn about teaching children with ASD, some researchers have discussed enhancing the

introductory courses with the inclusion of literature with characters with ASD (Beecher &

Darah, 2011). Other studies have demonstrated the positive effects of a course designed

to teach specific evidence-based teaching strategies for children with ASD to both

teachers in the field (master's degree candidates) (Lerman, Vondran, Addison, & Kuhn,

2004), and preservice teachers (Leblanc, Richardson, & Burns, 2009). The presence of

these recommendations has yet to result in a mandated instructional modality that

specifically enhances teachers' effectiveness in addressing the needs of students with

ASD in the general classroom.

Rationale and significance of the current study

The research on teacher preparation in the area of ASD indicates that pre-service

teachers (Jung, Cho, & Ambrosetti, 2011) and teachers in the field (Busby et al., 2012)

often feel unprepared to teach students with ASD. The research also shows that courses

designed to specifically address teaching students with ASD are effective in preparing

master's level (Lerman, Vondran, Addison, & Kuhn, 2004) and undergraduate students

(Leblanc, Richardson, & Burns, 2009) to utilize evidenced based teaching practices for

students with ASD. At this time, there is a dearth of empirical study that examines

students' degree of knowledge about ASD and related, evidence based teaching strategies

at the time of admission to teacher preparation programs.

This current study is firmly rooted in the learning theories of Vygotsky (1978),

which purports that students entering the learning environment have an established

understanding (through social and cultural exposure and experiences) of certain

phenomena upon which instruction should be designed. As people with ASD have

increasingly been included in schools and communities, the publically available

information about ASD, through different forms of media, has also increased.

Researchers acknowledge the changing social and cultural shift over the past few decades

with regard to individuals with ASD and this study seeks to identify how the media and

other social relationships (family/ friends) influence knowledge. Identifying the

knowledge that pre-service teachers have prior to formal instruction is key to

understanding the accuracy and the depth of knowledge acquired informally. This

information can then be used to plan effective instruction.

      The principal investigators on this project are all involved in pre-service teacher

preparation at three differently structured and sized universities: a large private research

university in the northeastern United States, a mid-sized public research university in the

mid-Atlantic, and a small private liberal arts college in the Midwest. Despite differences

in program structures, university environments, student populations, geographic location,

and state licensure requirements, the principal investigators were all encountering many

of the previously identified challenges and barriers to preparing teacher candidates for

working with students with ASD. The researchers felt it was important to understand the

knowledge levels and sources of knowledge of pre-service teacher candidates who are

enrolling in their first introductory special education class. This approach was designed

to further examine the concerns about teacher knowledge and the influence of sources of

knowledge that had been identified in previous studies (Baglieri & Shapiro, 2012; Busby

et al., 2012; Haller, 2010; Jung, Cho, & Ambrosetti, 2011; Segall & Campbell, 2012). It

was also hoped that the instrument used to assess the knowledge of pre-service teachers

could be utilized in a wider number of teacher preparation programs that are striving to

improve their candidates' knowledge and abilities regarding the education of students with ASD.

The research questions used to guide the study were: (a) What are the sources of knowledge about ASD utilized by beginning teacher candidates? (b) What is the overall level of knowledge about ASD among beginning teacher candidates? (c) Are there differences in the levels of knowledge about ASD based on the sources of knowledge utilized by beginning teacher candidates?

Method

Participants

A purposive sample was deemed most appropriate for gathering data that could be used to answer the research questions (Shadish, Cook, & Campbell, 2002). Participants were undergraduate students from three universities, who were enrolled in either their first introductory course in special education (two programs) or before they had taken the introductory course (one program). Institutional review board (IRB) approval was received from each of the institutions. The sample included 87 participants, 43 of which (49.4%) were enrolled in a large private research university in the northeastern United States, 34 (39.1%) in a mid-size public research university in the mid-Atlantic, and 10 (11.5%) in a small private liberal arts university in the Midwest. All students who were enrolled in the courses were invited to participate only those who reported education as a major or minor (*N*=87) were included in the analysis. The participants reported their majors as: a general education discipline (e.g., middle school mathematics teacher education program) (n = 63; 72.4%), special education (n = 5; 5.7%), and combined special education/general education program (n = 9; 10.3%). There were 10 participants

(11.5 %) who reported a minor in teacher education. Twenty participants (23.0%) were

freshman; 37 (42.5%) were sophomores; and 30 (34.5 %) were juniors. There were 65

female participants (74.7%) and 22 male participants (25.3%). Regarding categories of

race/ethnicity, 63 participants (72.4%) identified as White, 13 (14.9%) as Asian or Pacific

Islander, three (3.4%) as Hispanic/Latino, two (2.3%) as African American, one (1.0%)

as Native American, four (4.6%) as "Other", and one (1.1%) chose not to respond.

Instrument

Beginning Teacher Candidate Autism Spectrum Disorder Knowledge Survey. The

survey was developed for this project to gather information in three domains: a)

participant characteristics, b) sources of knowledge about autism, and c) levels of

knowledge about autism. The *participant characteristics* section asked for information

on academic major/minor, class year (freshman, sophomore, etc.), gender, race/ethnicity,

and age. In the *sources of knowledge about autism* section, five types of sources of

knowledge were provided for participants to choose from: mass media (e.g., TV shows,

movies, magazines), autism awareness activities (e.g., autism awareness month

programming), personal experiences (e.g., personally knowing someone with autism),

personal communication (e.g., talking with a relative who works as a teacher for students

with autism), and courses/workshops offered in the community, workplace, or other

settings. Participants were allowed to choose all domains that applied, and then respond

to additional questions designed to obtain more information about each domain. As an

example, participants who reported that mass media was a knowledge source were then

asked to indicate the specific sources of media that informed their knowledge (e.g.,

movies, social media).

The questions included in the *levels of knowledge about autism* section were based on previous studies that examined the knowledge levels for individuals working in the education, psychology, and healthcare fields. The autism awareness survey developed by Stone (1987), updated by Heiderken et al. (2005), and most recently modified by Tipton & Blacher (2014) served as the primary basis for this section. The questions utilized by Tipton & Blacher (2014) were kept since their survey reflected an update to the changes to the diagnostic criteria resulting from the DSM-V revisions (American Psychiatric Association, 2013). Additional questions were added to reflect the ever-growing knowledge base on autism spectrum disorders (U.S. Department of Health and Human Services, 2015). The additional questions were developed by the research team, all of whom had professional experience working with students with autism spectrum disorders and were knowledgeable of the existing research literature. This last section consisted of 46 true/false statements designed to assess participants' knowledge about ASD in six sub-categories: basic characteristics of ASD (12 items; $\alpha = .750$), early signs of ASD (10 items; $\alpha = .825$), ASD prevalence rates (four items; $\alpha = .646$), causes of autism (six items; $\alpha = .738$), diagnosis (five items; $\alpha = .778$), and prognosis and intervention (nine items; $\alpha = .779$). The uneven number of questions in each sub-category resulted from the pilot testing of the instrument. During the pilot phase, questions were added and removed in order to increase the Cronbach's alpha for each section. Based on the results reported in the current study, the section on ASD prevalence rates ($\alpha = .646$) needs further modification before replicating the study with new participants (Vogt, 2006). In addition to the 46 items included in these six sub-categories, participants were asked a multiple choice question on the current estimated

prevalence rates of ASD and a self-evaluation question on their estimated knowledge

level about ASD.   The questions for this section are presented in Table 1.

Table 1. True/False survey items for the *levels of knowledge about autism* section (T = True, F = False). *Denotes items taken from Tipton & Blacher (2014).

Basic Characteristics (α = .750)
1. Autism is an emotional disorder.* (F)
2. Autism is a developmental disorder.* (T)
3. Autism generally begins before the age of 3. (T)
4. Some children with autism seem to develop normally until around 18 to 24 months of age and then lose the skills they once had. (T)
5. The characteristics of autism can range from very mild to very severe. (T)
6. All individuals with autism have significant disability and are unable to live independently. (F)
7. All individuals with autism are nonverbal, that is, they do not speak. (F)
8. All individuals with autism display poor eye contact.* (F)
9. Individuals with autism are incapable of having interpersonal relationships. (F)
10. All individuals with autism have below average intelligence. (F)
11. Individuals with autism are often more capable than standardized tests demonstrate.* (T)
12. Some individuals with autism have exceptional abilities in areas such as visual skills, music, and math. (T)

Early Signs (α = .825)
1. Reduced sharing of interests, emotions, or affect with other people or failure to initiate or respond to social interactions is a sign that a child might have autism. (T)
2. Absence of pointing, waving goodbye, or using other gestures to communicate is a sign that a child might have autism. (T)
3. Absence of interest in peers/parents is a sign that a child might have autism. (T)
4. Having difficulties adjusting behavior to suit various social contexts is a sign that a child might have autism. (T)
5. Absence of imaginative play or difficulty imitating others is a sign that a child might have autism. (T)
6. Repeating the same actions or movements over and over again, such as flapping hands, rocking his/her body, or spinning in circles, is a sign that a child might have autism. (T)
7. Responding to a question by repeating it, rather than answering it, is a sign that a child might have autism. (T)
8. Having difficulty adapting to changes in schedule or environment (e.g., having a tantrum if the furniture is rearranged) is a sign of autism. (T)
9. Having obsessive, unusual interest in one object or one specific part of an object is a sign that a child might have autism. (T)
10. Underreacting or overreacting to sensory stimuli (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures) is a sign that a child might have autism. (T)

Prevalence (α = .646)
1. The number of individuals diagnosed with autism is increasing. (T)
2. According to the Centers for Disease Control and Prevention, the prevalence of children estimated to be affected by autism is 100 to 1. (F)
3. Autism is diagnosed more frequently in males than in females.* (T)
4. Autism occurs equally in all racial, ethnic, and socioeconomic groups. (T)

Causes (α = .738)
1. The cause of autism is unknown. (T)
2. There is a single gene for autism. (F)
3. A child is more likely to have autism if he/she has a sibling with autism. (T)
4. Autism is caused by parents who are indifferent to the emotional needs of their children. (F)
5. Vaccines can cause autism.* (F)
6. The brain of a person with autism looks dramatically different from the brain of a neurotypical person. (F)

Diagnosis (α = .778)
1. Autism can be diagnosed at 18 months in some individuals.* (T)
2. Autism can be diagnosed by brain scan. (F)
3. Autism can be diagnosed by urine test. (F)
4. Autism can be diagnosed by blood test. (F)
5. Autism can be diagnosed by behavior and development assessments, including interviewing parents and observing the behaviors of the child. (T)

Prognosis and Intervention (α = .779)
1. There is a cure for autism.* (F)
2. Some children with autism can grow up to live independently.* (T)
3. Appropriate special education services can improve the development and learning of children with autism.* (T)
4. There is one intervention that works for all individuals with autism.* (F)
5. Secretin therapy is a safe and effective treatment for autism that has been supported by good scientific evidence. (F)
6. Stem cell therapy is a safe and effective treatment for autism that has been supported by good scientific evidence. (F)
7. Chelation therapy is a safe and effective treatment for autism that has been supported by good scientific evidence. (F)
8. Applied behavior analysis is a safe and effective treatment for autism that has been supported by good scientific evidence. (T)

9. Special diet is a safe and effective treatment for autism that has been supported by good scientific evidence.* (F)

Procedures

   The procedures were reviewed and approved by the IRBs at each of the three participating campuses. The survey was designed using Qualtrics and was administered to all undergraduate students enrolled in the introductory special education course at two of the three participating universities during the fall 2014 semester. At the third university, the survey was administered in an introductory teaching course and a question was added to the survey to ensure that the teacher candidates included in the sample had not yet taken the introductory special education course. A principal investigator was designated for each university, who was responsible for administering the survey. During the second week of the semester, the principal investigator attended the designated class session and provided each student with an internet-connected tablet or laptop to complete the survey. The principal investigator provided a brief overview of the project and then read the informed consent, as required by the IRB for one of the participating universities. Students who agreed to participate in the study then completed the survey in an online format through Qualtrics. In order to ensure anonymity, students, who did not participate in the study, were instructed to use their devices/laptops for browsing the internet during that same time period. Across the three university sites, four students did not participate in the study. Once the surveys were completed, the data were downloaded from Qualtrics into a database file prepared for use in IBM SPSS Statistics.

Findings

Sources of knowledge about autism spectrum disorder

Participants were asked to identify the sources of knowledge about ASD that have informed their understandings. Table 2 presents the sources of knowledge about ASD reported by the beginning teacher candidates.

Table 2. Participants' sources of knowledge about autism spectrum disorder. ($n = 87$)

Source of knowledge*	n	%
Mass media (e.g., TV shows, movies, magazines, and newspapers)	57	65.5
Autism awareness activities (e.g., autism awareness month, autism walks, telethons, and school/class presentations)	33	37.9
Personal communication (e.g., talking with a friend/family member who knows about autism)	58	66.7
Personal experiences (e.g., personally knowing someone with autism)	44	50.6
Coursework/workshops	20	23.0
Other Sources	1	1.1
No knowledge sources (e.g., do not know anything about autism)	3	3.4

*Participants were allowed to select multiple sources. Thus, totals may exceed 87 participants and percentages may exceed 100%.

The two most frequently identified sources of knowledge about ASD were personal communication and mass media. Fifty-eight participants (66.7%) indicated that personal communication (e.g., talking with a friend/family member who knows about autism) was a knowledge source; 57 participants (65.5%) identified mass media as a knowledge source. An examination of the sub-categories in this domain indicated that 46 participants (52.9%) reported obtaining knowledge about ASD from TV shows, 31 (35.6%) from movies, 29 (33.3%) from social media, 28 (32.2%) from internet content, 24 (27.6%) from books, 17 (19.5%) from newspapers, and 18 (20.7%) from magazines.

The other knowledge source that was identified by over half of the participants was personal experience (e.g., personally knowing someone with ASD). The 44

participants (50.6%) who selected this domain had the option of responding to questions

about the nature of these personal experiences, reporting knowing at least one individual

with ASD. Among these respondents, 23 (26.4%) described themselves as friends of

individuals with ASD, 13 participants (14.9%) were relatives of individuals with ASD,

14 (14.9%) had worked in service provider roles with individuals with ASD, and eight

(9.2%) were classmates or work colleagues of individuals with ASD. There were 17

participants (19.5%) who reported knowing at least one individual with ASD "very well"

and 24 (27.6%) reported knowing at least one individual with ASD "somewhat well."

Autism awareness activities were identified by 33 participants (37.9%) and

coursework/workshops were identified by 20 participants (23.0%). Across the five types

of knowledge sources, 63 participants (72.4%) reported deriving their knowledge from

multiple sources and 21 (24.1%) derived knowledge from only one source. There were

three participants (3.4%) who reported having no previous knowledge of ASD; therefore,

they did not identify a knowledge source.

Level of knowledge about autism spectrum disorder

Table 3 presents the results of the identification of students' level of knowledge

based upon their score on the survey section. The mean score of participants was 24.4

points ($sd = 8.96$) out of a total of 46 possible points, which indicated correct responses

to 53.0% of the questions. The scores ranged from 0-39. Participants scored highest on

the *basic characteristics* section, with a mean score of 8.48 out of 12 possible points

(70.7% correct). The other two sub-categories in which participants answered half of the

questions correctly or better were *early signs* (58.1% correct) and *diagnosis* (49.4%

correct). Participants answered less than half of the questions correctly in the sub-

categories of *intervention* (41.6% correct), *prevalence* (42.0% correct), and *causes*

(37.3% correct).

Table 3. Participants' level of knowledge about autism spectrum disorder by survey subcategory. (*n* = 87).

Sub-category	Chronbach's α	# of questions	Possible Range	Actual Range	Mean score	SD	Percentage of correct responses
Basic characteristics	.750	12	0-12	0-12	8.48	2.51	70.1%
Early Signs	.825	10	0-10	0-10	5.81	2.98	58.1%
Prevalence	.646	4	0-4	0-4	1.68	1.16	42.0%
Causes	.738	6	0-6	0-6	2.24	1.41	37.3%
Diagnosis	.778	5	0-5	0-6	2.47	1.55	49.4%
Intervention	.779	9	0-9	0-9	3.74	2.05	41.6%
Total Score		**46**	**0-46**	**0-39**	**24.44**	**8.96**	**53.0%**

Responses to each question in the six sub-categories were examined to determine

which areas participants had the most correct and incorrect responses. Overall,

participants scored the highest in the sub-category that addressed *basic characteristics*

and lowest in the *causes* sub-category. Some of the lowest scores for individual

questions were in the sub-category *prognosis and intervention*. For example, there were

3.4% (n = 3) of participants who correctly responded that "secretin therapy" is not a safe

and proven treatment for autism; 5.7% (n = 5) knew that "chelation therapy" is not a safe

and proven treatment, and 18.4% (n = 16) knew that a "special diet" is not a safe and

proven treatment for autism. Most students 73.2% (n = 63) responded 'do not know' to

questions about specific interventions.

Descriptive and correlational analyses were conducted for the self-evaluation question that asked participants to rate their knowledge of ASD. Of the 87 total participants, 69 participants (79.3%) indicated that they knew "quite a bit" about ASD; 14 participants (16.1%) indicated that they knew "a little bit" about ASD; three participants (3.4%) reported they knew "nothing" about ASD; and one participant (1.1%) indicated that she/he knew "a great deal" about ASD. The correlation analysis results indicated a positive correlation between the level of knowledge reported in the self-evaluation question and the level of knowledge demonstrated through the responses to the 46 questions of knowledge of ASD ($r^2 = 0.42$, $p < 0.01$).

Analysis of variance (ANOVA) was utilized to determine if there were significant differences in the total scores between the subjects from different universities, gender and year in school. There were no significant differences between the total scores of participants based upon university [$F_{(29, 57)} = 1.358$, p=.160], school year [$F_{(29, 57)} = .719$, p=.109], or gender [$F_{(29, 57)} = .187$, p=.530]. Due to the sample size difference, ANOVA was not used to determine differences between majors.

Differences in knowledge based on sources

Independent samples t-tests were conducted in order to examine differences in the levels of knowledge about ASD based on the sources of information utilized by beginning teacher candidates. The Bronferroni correction was utilized to reduce the chance of a Type 1 error. Table 4 presents the results of the independent samples *t*-tests.

Table 4. Differences in participants' levels of knowledge about autism spectrum disorder based on the sources of knowledge. ($n = 87$)

Source of knowledge	Source utilized?					
	Yes		No			
	M	SD	M	SD	d	t (85)
Mass media						
Basic characteristics	8.65	1.98	8.17	3.32	.176	0.48
Early signs	6.07	2.94	5.33	3.04	.247	1.01
Prevalence	1.54	1.00	1.93	1.41	.319	1.50
Causes	2.19	1.37	2.33	1.52	.097	0.44
Diagnosis	2.40	1.53	2.60	1.59	.128	0.57
Intervention	3.75	1.81	3.70	2.49	.023	0.11
Total score	*24.61*	*7.85*	*24.01*	*10.90*	*.063*	*0.30*
Autism awareness activities						
Basic characteristics	9.39	1.69	7.93	2.77	.636	2.73**
Early signs	6.58	2.60	5.35	3.12	.428	1.90
Prevalence	2.03	1.05	1.46	1.19	.508	2.26*
Causes	2.55	1.12	2.05	1.55	.370	1.61
Diagnosis	3.00	1.39	2.15	1.56	.575	2.57**
Intervention	4.30	1.67	3.39	2.20	.466	2.04*
Total score	*27.85*	*6.40*	*22.33*	*9.68*	*.673*	*2.91**
Personal communication						
Basic characteristics	9.09	1.98	7.28	3.03	.707	3.35**
Early signs	6.31	2.72	4.83	3.27	.492	2.23*
Prevalence	1.74	1.19	1.55	1.12	.164	0.72
Causes	2.31	1.42	2.10	1.42	.148	0.65
Diagnosis	2.55	1.50	2.31	1.65	.152	0.68
Intervention	3.81	1.85	3.59	2.44	.101	0.47
Total score	*25.81*	*7.67*	*21.66*	*10.72*	*.445*	*2.08**
Personal experience						
Basic characteristics	9.57	1.35	7.37	2.93	.964	4.52***
Early signs	6.41	2.55	5.21	3.28	.408	1.91
Prevalence	1.89	1.17	1.47	1.14	.364	1.70
Causes	2.52	1.30	1.95	1.48	.409	1.91
Diagnosis	2.95	1.36	1.95	1.48	.704	3.28**
Intervention	4.09	1.68	3.37	2.34	.353	1.65
Total score	*27.43*	*6.42*	*21.35*	*10.15*	*.716*	*3.35**
Coursework/workshops						
Basic characteristics	9.20	1.61	8.26	2.70	.423	1.48
Early signs	6.65	2.23	5.57	3.14	.397	1.43
Prevalence	1.55	0.89	1.72	1.24	.158	0.57
Causes	2.25	1.02	2.24	1.52	.008	0.03
Diagnosis	2.70	1.42	2.40	1.59	.199	0.79

Intervention	3.75	1.83	3.73	2.13	.010	0.04
Total score	*26.10*	*5.72*	*23.93*	*9.70*	*.273*	*0.95*

*p < .05. ** p < .01. ***p < .001

Statistically significant differences were found between the levels of knowledge about

ASD and the sources of knowledge utilized by participants within several domains.

Participants who indicated that *personal experience* was a knowledge source had

significantly higher scores as compared to those participants who did not indicate this as

a knowledge source on the total score ($p < 0.01$) and the sub-categories of *basic

characteristics* ($p < 0.001$) and *diagnosis* ($p < 0.01$). Participants who indicated that

autism awareness activities were a knowledge source had significantly higher scores as

compared to those participants who did not report this as a source in the total score ($p <

0.01$) and the knowledge sub-categories of *basic characteristics* ($p < 0.01$), *diagnosis* ($p <

0.01$), *prevalence* ($p < 0.05$), and *intervention* ($p < 0.05$). Similar results were found in

the domain of *personal communication*. Participants who identified personal

communication as a knowledge source had significantly higher scores than those who did

not in the total score ($p < 0.05$) and the sub-categories of *basic characteristics* ($p < 0.01$)

and *early signs* ($p < 0.05$). No statistically significant differences were found in the

knowledge source domains of *mass media* or *coursework/workshops*.

Discussion

The findings of this study demonstrate that many students entering teacher

preparation programs possess some understanding of ASD. Many are able to identify the

basic characteristics of ASD and some of the early signs. However, teacher candidates

knew the least about the causes of ASD and effective interventions for teaching children

with ASD. This finding, when examined in the context of the literature that reports that

many teachers in the field feel unprepared to teach children with ASD (Busby et al., 2012; Jung, Cho, & Ambrosetti, 2011), is important to consider when designing coursework to prepare teachers for inclusive classrooms, that will, with all likelihood, include children with ASD.

The findings show that almost all (96.9%) of the teacher candidates who participated reported that they had at least some understanding of ASD at the beginning of their teacher training with a wide array of sources of that understanding. There were statistically significant differences in the levels of knowledge between students who reported having more direct and personal experiences with ASD – either through autism awareness activities, personal communication, or personal relationships – than those who had not. In particular, personal experiences and autism awareness activities seemed to have the most impact on the differences in knowledge levels. This finding is an indication that teacher preparation programs could improve the knowledge levels and preparedness of their teacher candidates by including learning opportunities that are directly involved with individuals with ASD and their families. The finding is supported by previous research on the positive effects of field-based courses on strategies for supporting children with ASD (Leblanc, Richardson, & Burns, 2009; Lerman, Vondran, Addison, & Kuhn, 2004).

Students in the second largest group, those who learned about ASD from mass media, scored no better than students who identified other sources of knowledge. Those students who reported that they learned about ASD from mass media cited TV as the most frequent source. Hence, the concern raised in previous studies that the limited view of ASD being presented in the media (Baglieri & Shapiro, 2012; Greenwell, 2004; Haller,

2010), and the potential for misinformation being available on-line and via social media (Betsch & Sachse, 2012) would negatively affect knowledge about ASD, is not supported by the findings of this study.

Although teacher candidates are coming into preparation programs having heard of ASD, and many knowing the basic characteristics, what they lack is knowledge of the early signs of ASD, effective treatments, and prevalence. Previous studies have found that general education teachers who have more information about ASD, view the inclusion of children with ASD more positively (Busby et al., 2012; Segall & Campbell, 2012). In addition, research has shown that when children with disabilities are taught by teachers who have positive views about the academic potential of children with disabilities, their academic performance is stronger than of children whose teachers have low expectations (Klehm, 2014). Some teacher candidate students, especially those pursuing a special education certification, will receive information in evidence based teaching practices in courses during their preparation programs. However, many general or secondary subject specific teacher candidates will have only one required course in children with disabilities. The findings from this study, and those of research conducted with teachers in the field, support the recommendation that, in order to ensure that teacher candidates expect student progress through their own efforts as teachers in inclusive classrooms, teacher preparation programs either (a) require a course for all future teachers that addresses evidence based teaching practices for children with ASD, or (b) embed information about evidence based practices for students with ASD in pedagogical courses across the curriculum. In both instances, more direct forms of learning such as direct

opportunities for working with students with ASD can lead to improved knowledge and preparedness for educating students with ASD in inclusive classrooms.

Limitations

There are several limitations to this study. Although the participants in this study attended three different schools, most of the participants were white women. In addition, two of the universities were located within the same large geographic boundary (northeastern United States and the mid-Atlantic), which limited the geographic diversity of the sample. The survey section on *sources of knowledge about ASD* has several limitations associated with it. Participants may not accurately remember where they derived information on ASD. Their responses may be impacted by personal factors such as their relationship to individuals with ASD (e.g., a close family member) or their interest in the topic. Participants may also have unknowingly gathered information about ASD that impacts their current knowledge levels. For example, it is possible that a participant may have been influenced by media portrayals of ASD without realizing that this has happened. Finally, it is difficult to measure the influence of overlapping sources of knowledge, which might result from a combination of a close relationship with an individual with ASD and subsequent coursework. Regarding the survey section on *levels of knowledge of ASD*, the sub-category of *ASD prevalence rates* had a low Cronbach alpha ($\alpha = .646$). While the questions in this section were modified during pilot stages, additional modification is needed before replication of this study.

<div align="center">

Conclusion

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In order to prepare teachers for today's classroom, teacher educators need to design courses that address the information that teacher candidates will need in their

professional practice. Several studies have highlighted the need for teachers to have a

better understanding of ASD in order to serve these students. The findings from this

study show that many teacher candidates, especially those who enter preparation

programs having known someone with ASD, or having some personal communication

about people with ASD, have a general understanding of the common characteristics of

people with ASD. Our recommendations would be that coursework only briefly address

the basic characteristics of people with ASD and focus more deeply on the early signs of

ASD and effective teaching strategies to support students with ASD. We assert that

courses focused on intervention and teaching strategies that involved direct opportunities

for working with students with ASD would best prepare teacher candidates for the

inclusive classrooms of today.

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