SELF-EFFICACY OF MEDICAL STUDENTS: AUTISM-RELATED KNOWLEDGE, COMFORT LEVEL, EDUCATION, AND EXPERIENCE

By

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The purpose of this study was to explore the scope and nature of medical students' curriculum and educational practices related to autism spectrum disorder before graduating medical school. Quantitative methods were used to gain insight into autism knowledge, comfort levels, and self-efficacy of medical students currently enrolled at East Carolina University. Thirty-three students responded, showing higher than expected mean scores on the autism knowledge section of the survey. The study found that the third-year medical students had a higher knowledge mean (16.83) than other years. The medical students' comfort level was higher when treating patients with Autism only (52.7%) when compared to treating patients with Autism with co-morbidities (35.6%). Medical students reported being uncomfortable (75.7%) when asked for guidance about school support (e.g., Section 504, individual education plans, and student accommodations). The study sample size was small. Future research could recruit participants from more than one medical school to increase the sample size. No gap in knowledge was found; however, comfort levels were lower than expected.

SELF-EFFICACY OF MEDICAL STUDENTS: AUTISM-RELATED KNOWLEDGE, COMFORT LEVEL, EDUCATION, AND EXPERIENCE

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CHAPTER 1 : INTRODUCTION

The need for well-educated doctors will continue to rise in the coming years, as the benefits of early diagnosis and intervention have become undeniable. Multiple disabilities (i.e., developmental disabilities and attention deficit disorder) are rising (https://cdc.gov). Therefore, our medical providers need to be knowledgeable of many disorders and disabilities and communicate with their patients regarding these disorders and disabilities. For example, autism spectrum disorder (ASD) is a neurodevelopmental disorder currently being diagnosed at a higher rate (Dunlap, 2019; Zerbo et al., 2015). Individuals with Autism are more likely to interact with multiple health care professionals than their typically developing peers (Wachob & Pesci, 2016). Medical students who gain a deeper insight into these disorders and disabilities will be important when diagnosing and communicating with patients. These individuals will often have comorbidities of attention deficit disorder, which presents in different ways depending on the individual (Leitner, 2014). Having a firmer understanding of Autism and ways to communicate can improve care for those individuals while also providing the appropriate support for the families. One of the difficulties of diagnosing Autism andpossible comorbidities is that these patients present differently than their typically developing peers; due to the role environment plays in their behavior (Bultas, 2012).

Future medical providers and other healthcare workers need to better understand the basics of Autism. Medical providers are less likely to understand the screening and assessment tools used to diagnose Autism due to the lack of education on the topic (Baltas et al., 2015; Long-Bellil et al., 2011; Zerbo et al., 2015). Getting an early base knowledge can build a student's confidence in the field. Therefore medical students in universities across the United States should receive additional education on ASD to make them more knowledgeable and

comfortable diagnosing autism spectrum disorder. When entering medical school, students have already earned a bachelor's degree and taken pre-med classes (https://students-residents.aamc.org, 2019). They also may have had experiences with individuals with disabilities. Therefore, we can better understand medical students' comfort level and self-efficacy by understanding their prior knowledge and examining the medical school curriculum. Self-efficacy plays a role in how medical students will perform and learn while in school (Artino, 2012; Bandura, 1977). Comfort levels and self-efficacy show how confident a person is in what they are learning and what they know (Bandura, 1977). The purpose of this study is to explore the scope and nature of medical students' curriculum and educational practices related to autism spectrum disorder prior to graduating from medical school. This study will look at the student's base knowledge of ASD, personal comfort in interacting with patients with ASD, and the various educational practices used to teach the screening materials. This study uses a quantitative approach to examine the medical education curriculum at a North Carolina Medical University.

Research Questions

1. How does prior knowledge and experience and the medical school training prepare future doctors to have a base knowledge of autism spectrum disorder?
2. How does medical school training prepare future doctors to interact and communicate with patients who have ASD?
3. What is the relationship between autism knowledge and a medical student choosing pediatrics or family medicine? –
    a. How does autism knowledge correlate to demographics, gender category, or intended specialty choice?

CHAPTER 2: LITERATURE REVIEW

While research on understanding autism has increased over the last decade, studies on health providers' base knowledge of this neurodisorder are harder to find (Havercamp et al., 2016). Studies included in this review have focused on the disorder and its definition within the medical community (e.g., Crais et al., 2014; Dunlap, 2019; Venkat et al., 2012). Previous studies have examined the pediatric doctor's office and the barriers for patients with autism and their families (e.g., environment, doctor's knowledge, limited knowledge of community resources) (Baltas et al., 2016; Barton et al., 2012; Dunlap, 2019). Many of those barriers could be eliminated with more education on the screening tools used for identification, earlier detection of Autism, how to interact with patients and their families, and community services. Medical schools and universities increase knowledge of ASDA and other prevalent disorders, by increasing the training on ASD and other developmental disabilities provided to medical students which will increase their comfort level and self-efficacy, medical students increase their comfort of care through their own self-efficacy.

This systematic review of the literature focuses on Autism, autism education, and medical education of health professionals regarding developmental disabilities. Currently, there is little to no research that explores autism spectrum disorder (ASD) in medical education. Therefore, this section will provide a literature review related to aspects of ASD, physician's knowledge after medical school, and the care of patients with ASD. Databases including Ovid, ProQuest, PsychInfo, MEDLINE, and EBSCO were searched (2010 to 2020) using the East Carolina University's One Search; also, the reference sections of each article were hand-searched using the following keywords: Autism, autism education, pre-med education, medical school education, pediatric setting.

Defining Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a developmental disorder that affects children of all races (cdc.gov, 2020). This disorder presents differently in every child, making it difficult to diagnose early. The American Pediatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5) updated the definition of Autism in 2013 to include individuals who have 1) Persistent deficits in social communication and social interaction and 2) restricted, repetitive patterns of behavioral interests and activities. All previous subcategories are included under Autism Spectrum Disorders which includes Asperger's disorder, autistic disorder, and pervasive developmental disorder (MacKenzie et al., 2013; Venkat et al., 2012) placing the subcategories under the diagnosis of ASD (Hyman, 2013, June 4). The National Institute of Neurological Disorders and Stroke has classified ASD as a "group of complex neurodevelopment disorders" with repetitive patterns of behavior (Autism Spectrum Disorder Fact Sheet, 2021). This disorder is still being researched to find out how it manifests in infants at or before birth. Over the last 50 years, the prevalence of Autism has increased as much as 15 times, and it occurs in 0.2% of the world population, affecting males four times more than it affects females (Igić et al., 2017). Children diagnosed with ASD have atypical behaviors such as not making eye contact, not looking at or listening to people, failing to follow conversations, repeated behaviors, and having an unusual tone of voice (i.e., singsong or flat and robot-like) (Biyani et al., 2015; Venkat et al., 2012). These atypical behaviors make it hard to treat children with ASD in a medical setting. They may present differently than typically developing children when it comes to pain or illness. This behavior can also cause the care of children with ASD to be delayed due to an overstimulating environment and agitated behaviors (MacKenzie et al., 2013). Research has shown that children with ASD present more frequently to medical providers

than typically developing children because of concurrent medical and psychological health needs, an increased rate of accidents and self-injurious behaviors (Bultas, 2012; Wood et al., 2013).Many children who are diagnosed with ASD are older and most likely in school at the time of diagnosis (Bultas et al., 2013). There has been a dramatic increase in ASD diagnosis in the United States in the last decade (cdc.gov, 2020).

Recent research shows that 1 in 54 children in the United States of America will be diagnosed with ASD (nimh.nih.gov, n.d.). ASD is a neurodevelopmental disorder that affects all races, and there have been no significant differences in ASD prevalence among the races (nimh.nih.gov, n.d.). Boys have a higher rate of diagnosis of ASD at 1 in 34, and girls are at 1 in 145 in the United States (nimh.nih.gov, n.d.). While the cause of ASD is still being researched, most studies suggest that genes interacting with influences from the environment can lead to ASD (nimh.nih.gov, n.d.). Early interventions and testing help us to understand more about this disorder. However, many pediatric doctors and nurses have little background knowledge about ASD. Some primary care providers (PCP) do not feel they have adequate training or confidence to diagnose and medically treat children with ASD (Bultas et al., 2016; Mazurek et al., 2017). As PCPs are the first to encounter the child, they have more opportunities to test and screen them for ASD (Dunlap, 2019).

Autism can be detected in children as young as 18 months old, with 1 in 54 children in the United States diagnosed with Autism (https//cdc.gov); our pediatric doctors are the most important individuals that need to be up to date on their knowledge and understanding of autism spectrum disorder. Unfortunately, many primary care providers feel unprepared, uncomfortable, and overwhelmed by the complex needs of patients with ASD (Havercamp et al., 2016).

Providing continuing education for those pediatricians will help the children have an opportunity to get the early interventions that they need.

Pediatric Doctor's Office

Pediatric doctors are often the first health care providers (HCP) that children with ASD see for medical care (Chebuhar et al., 2013). HCPs, in general, have reported a lack in their confidence and training in appropriate communication skills and strategies when interacting with ASD (Bultas et al., 2016; Mazurek et al., 2017). Bultas et al. (2016) found a few of the challenges that pediatric doctors face in their ability to care for children with ASD. Those are limited on office personnel and resources, the limited time allotted for appointments, and tight appointment schedules. Some of these challenges also lead to a delay in identifying children who have ASD; the main challenge seen by many HCPs are the sensitivity and specificity of screening tools (Crais et al., 2014). While many different screening tools are available to HCPs, the Modified Checklist for Autism in Toddlers (M-CHAT) was the only screening tool mentioned in the Crais et al. (2014) study. When asked about the M-CHAT, many of the HCP participants spoke to the length of the screening tool, the complicated scoring; they also felt that some of the questions were confusing (Crais et al., 2014). These delays in identification result in poor long-term outcomes and increased medical costs over their lifetime (Mazurek et al., 2017). Children identified as Autistic require treatment from multiple HCPs, like speech pathologists, occupational specialists, and their primary doctors, depending on how complexthe complexity of their diagnosis leads to higher health costs and interference with their daily life (Mazurek et al., 2017). These HCPs tend to spend more time with children with ASD than any other children, including those who present with chronic illnesses (Bultas et al., 2016).

The pediatric doctor's office is a new and sometimes overwhelming environment with bright lights and loud noises, often having many children running around that can cause overstimulation for the children with ASD (Chebuhar et al., 2013; Bultas et al., 2016). This causes increased anxiety in both the child and the parent or caregiver. In addition, increased anxiety may be exhibited because of their unfamiliarity with the office routine (Bultas et al., 2016). Similar to the hospital setting, the environmental triggers of bright lights and loud noises will lead to increased anxiety, which leads to poor compliance (Bultas et al., 2016). In a pediatric doctor's office, moving the patient to a treatment room to complete their check-in paperwork and checking their vitals along with height and weight helps lessen stimulation to the patient and stress for the parent. In addition, this treatment room can be tailored to become more sensory-friendly.

As PCPs spend more time with children who have ASD, these providers must have a good base knowledge of the disorder (Bultas et al., 2016). Many pediatric offices face office-based challenges when caring for children with ASD. Some of the challenges they face are the limited time for appointments, limited office personnel, limited resources, and a tight appointment schedule (Bultas et al., 2016). In addition to these challenges, children with ASD present with atypical behaviors as compared to their typically developing peers. These atypical behaviors lead to more challenges when treating children with ASD.

Early Detection of ASD

One of the most critical issues for families with young children is the health and wellbeing of the child. With the increasing prevalence of ASD throughout the United States, many parents want to have all the information about the medical care of their children. With ASD, early detection is key to better medical care in the future. Several pediatric doctors feel that

the surveillance of a child alone is sufficient compared to the screening tools for ASD due to the question of the effectiveness of the screening tools themselves (Crais et al., 2014). The recommended age that children are screened for ASD is at their 18- and 24-month checkups (Barton et al., 2012; Crais et al., 2014; Dunlap, 2019; Will et al., 2013). Children who are screened at 18 months may show few to no signs; this is the case with about 20-40% of children; however, those children may regress after and start to show symptoms of ASD at 24 months old (Barton et al., 2012). Numerous children who are flagged as positive at 18 months may not be further diagnosed at the second screening; this is called a false positive. While they may not present as autistic at 24 months, they may have other developmental disabilities (Barton et al., 2012). Many PCPs worry that the false positive in the early months could cause parents unnecessary stress, while most parents would choose this transient stress of a positive screening versus the missed opportunity of identification and early interventions (Barton et al., 2012; Dunlap, 2019).

Screening Tools

There are multiple screening tools for ASD available for the PCPs to use when determining the warning signs of Autism in their younger patients. Some are more well-known than others; these tools include both the parents' and PCPs' observations of the child. The Ages and Stages Questionnaire (ASQ), Communication and Symbolic Behavior Scale (CSBS), Modified Checklist for Autism in Toddlers (M-CHAT), and Screening Tools for Autism in Toddlers and Children (STAT) (https://www.cdc.gov, February 11, 2020) are the screening tools used by most pediatricians. Each of these tools have checklists or interview questions that either the parents or PCP fill out. The two screening tools found mostly in research are the M-CHAT and STAT (ESTAT). At the same time, the ASQ is used in the general checkup and observation

of all children to assess their development of communication, gross motor, fine motor, problem-solving, and personal adaptive skills (https://www.cdc.gov, February 11, 2020).

The M-CHAT was initially adapted for use in the United States by Robins, Fein, Barton, and Green (2001); they kept the original nine parent report items, adding fourteen new parent report items related to early social communication and joint attention while eliminating the home visitor observation section (Barton et al., 2012). This tool contains 23 items for the parents to answer in a checklist format identifying signs of ASD in children aged 16-30 months (Barton et al., 2012; Robins et al., 2001). This assessment tool does not rely on the pediatrician and is filled out only by the parents (Robins et al., 2001). Parents can complete an online version of the assessment before arriving at their pediatrician's office, instead of the paper version they would have to fill out during their child's appointment (Robins et al., 2009). While this tool initially showed high accuracy levels in identifying children with ASD, there was also a high false-positive rate that prompted the addition of a follow-up interview for additional clarification (Barton et al., 2012). The M-CHAT has been tested and researched over the years; studies include different ethnic groups to determine any cultural differences. Barton et al. (2012) found in various studies, they examined that culture did play a part in three items. Still, a follow-up eliminated the differences between the minority and non-minority groups. The researchers found that language and culture may have influenced the manner in which some ethnic groups answered the questions (Barton et al., 2012). Barton et al. (2012) also found that certain ethnic groups, Hispanic/Latino and African American, were tested at an older age than their Asian and White counterparts by almost four months.

The Early Screening Tool for Autism in Toddlers (ESTAT) is a level one screener used with 14-15-month-old toddlers; this test contains a 5-10-minute questionnaire for the parents and

clinical observation (Barton et al., 2012). Barton et al. (2012) found a study that shows ESTAT to have a higher false-positive rate, with most of those children identified as having other developmental disabilities. In addition, this screening tool is shown to require considerable professional time, making it impractical as a level one screen (Barton et al., 2012). The STAT was developed to screen children ages 24-36 months, and it was adapted by community service providers who interacted with children in the intervention setting; this screening focused on critical social and communicative behaviors, including imitation, play, requesting, and directing attention (https://vkc.mc.vanderbilt.edu, 2020).

Other screening tools are being developed and used by practicing pediatricians, autism specialists, and psychologists. The Center for Disease Control (February 11, 2020) recommends that screening tools that include parent input be used as the parent is a reliable source on their children's behavior. Screenings include the M-CHAT, as mentioned above, STAT (ESTAT), ASQ, and Child Development Inventories (https://cdc.gov, February 11, 2020). Other diagnostic tools that HCPs can use are the Childhood Autism Rating Scale (CARS) and Autism Diagnostic Observation Scale (ADOS) (https://cdc.gov, February 11, 2020). The CDC (February 11, 2020) also recommends that future research be conducted on ASD screening tools to help further understand the tools as there is not enough evidence about the benefits and harms of using them.

Medical School Education

Many different medical professionals interact with and treat patients with ASD; therefore their knowledge of how to communicate and treat those patients is important to their health and well-being. Research has found that the health care system and medical providers will need to become more educated on the needs of those individuals with ASD (McGonigle et al., 2014). One study by Wachob and Pesci (2016) researched the emergency medical technicians (EMT)

and paramedics' knowledge and comfort of care regarding their ASD patients. The researchers found that the youngest and least experienced (> 1 year of service) had a higher level of knowledge and comfort score when compared to their older and more experienced coworkers (Wachob & Pesci, 2016). They surmised that this result was due to a generational difference in the participants. The older generations were raised in the 1970s, 1980s, and some in the 1990s, when ASD was not as well-known as today with the younger generation (Wachob & Pesci, 2016). EMTs are often the first medical personnel on the scene and may need to respond differently to those with ASD. Individuals with ASD react differently to various stimuli and medical examinations; it is critical that EMS personnel recognize the signs and alter their treatment (Wachob & Pesci, 2016). The same can be said for the emergency department or acute care settings. The healthcare system and the medical providers of all types, need to become educated on the needs of individuals with ASD (McGonigle et al., 2014).

When personal comfort is discussed in terms of the medical provider, it is more about the confidence in interacting with ASD patients (Wachob & Pesci, 2016). This comfort level will lead to more self-confidence in the medical care of their patients. As a result, there has been an increasing demand for more education and training on recognizing and assisting children and adults with ASD (Wachob & Pesci, 2016). McGonigle et al. (2014) completed a study that explored ASD educational material for those in acute care, emergency department, and EMTs training. The researchers found no didactic or practical training curricula for those emergency department nurses or other emergency department personnel on ASD characteristics (McGonigle et al., 2014). McGonigle et al. (2014) surveyed emergency medical services and emergency department personnel to find the top three categories to focus on in their educational material; those three areas found were first a need to impart knowledge about ASD (communication and

social interactions) and its' epidemiology, second a need to dispel the 'myths' about individuals with ASD, and third education on the medical need of individuals with ASD.

Self-Efficacy and Activity Theory

Research on medical students' knowledge and comfort level with autism spectrum disorder and caring for patients with ASD highlights a need for more education in this area (Long-Bellil et al., 2011). Many providers must learn more about Autism on the job than they do in the classroom, as medical schools do not have enough time to teach every new disorder. A student's self-efficacy plays a prominent role in how they learn in school. Bandura (1977) believed that a person's self-efficacy belief lies at the core of human functioning. The belief about one's capability to handle their education and classes is fundamental in university classes.

Vygotsky's cultural-historical activity theory focuses on the thought process and a framework of studying it (Portnov-Neeman & Barak, 2013). Self-efficacy is a personal belief in one's capability to organize and execute courses of action required to attain designated types of performances (Artino, 2012; Bandura, 1977). The activity theory looks at a human's higher mental functioning as products of a mediated activity (Portnov-Neeman & Barak, 2013). Mediational tools such as language mnemonic devices, direct thinking processes, and material tools help support students' learning and cognition (Portnov-Neeman & Barak, 2013). Artino (2012) found positive links between students' academic efficacy and their achievement. Students who have higher levels of self-efficacy in various academic classes choose tasks that help their development of knowledge, skills, and abilities in those areas (Artino, 2012). Starting at the university level for future medical providers, the instructors need to implement instruction that not only fosters knowledge and skill attainment but also, promotes the development of the

necessary accompanying confidence (Artino, 2012). The educators should also focus on providing students with authentic mastery experiences (Artino, 2012).

Conclusion

It is essential for all medical professionals to have a base knowledge of ASD in order for them to treat and interact with patients confidently. While there is no set educational program that is used for medical students, nurses, and EMTs, further research should be conducted to explore the benefits of this education. In addition, as the prevalence of ASD is on the rise (https://cdc.gov, 2020), there will be more young patients being diagnosed with this developmental disorder and treated by our future medical professionals. Therefore, including educational material on ASD in the curriculum is important to the future medical care of our children.

CHAPTER 3: METHODS

This study aimed to explore education about ASD in the medical curriculum for MD students from the Brody School of Medicine at East Carolina University. Presently, there is little to no published research on the education of medical students related to ASD. This study invited medical students to complete a questionnaire to share information about the content of classes that teach about developmental disabilities, specifically ASD, as well as how this content is taught to medical students; it also explored the classes offered to medical students as electives and whether they are taught any strategies on how to interact and communicate with patients with ASD or developmental disabilities. This study aimed to understand medical students' education, preparation, and personal comfort level concerning ASD by asking medical students about their training. In addition, the study focused on the student's current knowledge of ASD, based on the year of medical school in which they are currently in and their comfort level of how to interact with patients with ASD and their families.

Participants

Participants are currently enrolled at East Carolina University's Brody School of Medicine for the 2020-2021 school year and the Fall 2021 semester. Participation in this survey was voluntary. The study sample size is 33 (N = 33), excluding one participant who chose not to consent to the survey, while four others did not complete over 36% of the survey. Participants included 21 females (58%) and 15 (42%) males. In the category of race, the participants were 62% white non-Hispanic, 23% African American, 10% Asian, and 6 % of other ethnic origins. Of the 33 participants, 14% are first-year medical students, 33% are second-year medical students, 19% are third-year medical students, and 33% are fourth-year medical students (Table 1). Most participants (N = 33) were second- or fourth-year medical students (n=12, 36.4%; *n*=11,

33.3%) (Table 1). Participants indicated either pediatrics or were undecided on medical concentration (*n*=9, 27.3%; *n*=5, 15%).

Table 1

Student Demographics

	N	**Percentage**
Gender		
Male	15	42%
Female	21	58%
Race		
White (Non-Hispanic)	24	62%
Black (Non-Hispanic)	9	23%
Asian	4	10%
Multi-racial	1	3%
Native American or Alaskan Native	1	3%
Year in Medical School		
First Year	5	15%
Second Year	10	30%
Third Year	6	18%
Fourth Year	12	36%
Medical Concentration		
Family Medicine	3	8%
Pediatrics	9	25%
Surgical	5	14%
Emergency Medicine	3	8%
Internal Medicine	4	11%
Other[a]	12	33.3%
Future Employment		
Private Practice	12	33%
Hospital setting	8	22%
Public Health	2	5.6%
Academic Medicine	10	27.8%
Other	4	11%

[a] other includes Obstetrics and Gynecology, Psychiatry, Radiology, and undecided

Procedures

Data were collected from the medical school at East Carolina University in Greenville, North Carolina, in the summer and fall of 2021. Medical students were sent the Elks Autism Knowledge and Comfort Level survey (Appendix B) via email. The email addresses of current medical students were collected through the administrative assistant at Brody School of Medicine. Surveys were also sent via student newsletter through the University program associate in the student affairs office at Brody School of Medicine. The investigator invited 285 medical students to complete an electronic research questionnaire using Qualtrics, an online survey platform, via email (Appendix A). Following approval from the IRB, data collection was completed during June, July, August, and September 2021. Of the 285 emails sent out, 37 responses were collected, a 13% return rate. Not all responses were complete, which gave the researcher an 11.5% final return rate. The methodological approach implemented in this study was a quantitative questionnaire of medical students in their first, second, third, or fourth year of medical school. This method allowed the researcher to explore themes throughout the data from each group and compare each group

Instruments

Demographics

Each survey included basic demographic information questions (e.g., race and sex) along with university-related questions of current medical year, desired medical concentration (pediatrics, surgical, emergency medicine, etc.), desired future medical employment (e.g., private practice, hospital, public health), and prior knowledge of Autism (Appendix B).

Knowledge

The questionnaire contains a 20-item base ASD knowledge (characteristics, age at onset, treatments, community resources, etc.), multiple-choice and true-false questions (Shah, 2001; Crane et al., 2019), and five-item educational practices of the medical school (e.g., electives offered, choice of classes, types of class-lecture, lab, simulation) survey given to professors via email (Appendix D). The true/false scale showed moderate internal consistency (Cronbach's $\alpha = 0.64$) (Crane et al., 2019). The multiple-choice questions will be scored either correct or incorrect, (correct = 1, incorrect = 0).

Comfort

There are eleven questions about their current comfort level in treating and supporting their future patients with Autism (Appendix C). Each question uses a four-point Likert scale ranging from one to four, where one equals low comfort, and four equals high comfort (O'Neil et al., 2017). The survey is modified using questions from Shah (2001), Crane et al. (2019), and O'Neil et al. (2017) studies that focused on ASD and ADHD knowledge of pediatricians, nurses, and EMTs.

Data Analysis

Data were collected, and all responses were assigned/coded an identifying number and sorted by medical class rank (year 1, year 2, year 3, and year 4). The researcher used SPSS version 28 to analyze the descriptive quantitative data comparing medical class years to each other using one-way ANOVA tests for the knowledge section of the survey and descriptive statistics to compare the comfort levels by medical year and question. The researcher looked for the degree of basic knowledge each medical student has based on the year in medical school. Using SPSS, the study compared the data from the knowledge and comfort survey to compare

data of available educational courses to determine the relationship between the level of knowledge and level of comfort in those who chose either pediatrics or family medicine as their medical tract. Due to hospital restrictions during the spring of 2020 through the present day; medical students have not been able to interact with various types of patients, limiting their knowledge and experiences.

CHAPTER 4: RESULTS

Descriptive statistics on student demographics and students' comfort level (Table 2) were achieved using SPSS. In addition, multiple ANOVAs were conducted with data on participant knowledge of ASD (Table 2). The survey covered demographics, knowledge of Autism, and comfort levels of the medical students covering behavior, treating, and communicating with patients and families, and supporting families with school and community supports. The results are described in three sections: participants, knowledge, and comfort.

Participants Prior Knowledge

Many survey participants had previously worked with an individual with ASD (*n*=19, 54%). Participants were also asked about prior ASD experiences (Table 2) and classes that taught ASD and other disabilities (Table 3). Medical students reported taking at least one class with ASD as a topic (Table 4), with 48.8% taking one class, 42.4% taking two to three classes, and 9% taking three or more classes. The researcher also surveyed medical professors to investigate the type of classes through Qualtrics. Five professors who taught either the family medicine, pediatrics, or behavioral sciences department were sent the educational procedures survey (Appendix D). One response was received from the professor who teaches behavioral science courses. According to the professor, students receive two to four classes with ASD as a special subject within course content. Students also receive instructional experiences such as labs, simulations, standardized patients, case studies, and lectures. The professor responded that medical students have a pre-selected schedule for their four years in medical school. First and second-year students take their foundational sciences and introductory courses. Third-year are focused on core clinical instruction, including eight weeks of pediatrics and six weeks of psychiatry, with one month of clinical electives. Fourth-year students have some requirements

(e.g., an Intensive Care Unit (ICU) month ranging in departments within the clinical setting, with only two clinical months guaranteed in rehabilitation and emergency medicine along with a three-week transition to residency course that is at least partially directed at their chosen specialty. Students are not taught about community resources while in medical school.

Table 2

Classes Taken That Include Autism

		Yes		No		Total	
		N	%	N	%	N	%
Year in medical school	First Year	5	15.6%	0	0.0%	5	14.3%
	Second Year	8	25.0%	3	100.0%	11	31.4%
	Third Year	7	21.9%	0	0.0%	7	20.0%
	Fourth Year	12	37.5%	0	0.0%	12	34.3%
Total		32	100.0%	3	100.0%	35	100.0%

Table 3

Classes Taken That Include Other Disabilities or Cognitive Development

		Yes		No		Total	
		N	%	N	%	N	%
Year in medical school	First Year	4	13.3%	1	20.0%	5	14.3%
	Second Year	8	26.7%	3	60.0%	11	31.4%
	Third Year	7	23.3%	0	0.0%	7	20%
	Fourth Year	11	36.7%	1	20.0%	12	34.3%
Total		30	100%	5	100.0%	35	100.0%

Table 4

How Many Classes Included Autism As A Topic?

			Number of Class			
			1	2-3	more than 3	Total
Year in medical school	First Year	N	2	3	0	5
		%	12.5%	21.4%	0.0%	15.2%
	Second Year	N	8	1	0	9
		%	50.0%	7.1%	0.0%	27.3%
	Third Year	N	3	4	0	7
		%	18.8%	28.6%	0.0%	21.2%
	Fourth Year	N	3	6	3	12
		%	18.8%	42.9%	100.0%	36.4%
Total		N	16	14	3	33
		%	100.0%	100.0%	100.0%	100.0%

Knowledge

The second section of the survey, totaling twenty questions, queried participants' knowledge of Autism, including questions such as the age of diagnosis, symptoms for diagnostic criteria, and the main cause of Autism. No participant answered all questions correctly; four of the participants missed only two questions (*n*=4; 12.1%). Of those participants, two are ,second-year, and two are third-year medical students. These responses demonstrate the participants' lack of knowledge on the main cause of Autism which research has found to be genetic factors (*n*=9, 29%) (Shah, 2011), while most participants knew the age at which symptoms first appear (*n*=19, 61.3%; age 0-3 years old). Most of the medical students correctly answered questions about the top three symptoms (*n*=32, 31%, Impaired social understanding; *n*=26, 26%, Language abnormalities; *n*=33, 32%, Restricted and repetitive behavior patterns) and the three common behavioral problems seen in patients with ASD (*n*=34, 33%, Dislike of change; *n*=33, 32%, Poor eye contact; 25, 25%, Repetitive speech). Comparing the means showed third-year medical students had a higher average of correct answers (*M*=16.83, *SD*=1.47, *SE*=.60) on the knowledge section (Table 4). The fourth-year medical students had the next highest average (*M*= 14.08, *SD*=1.78, *SE*=0.51) followed by second-year (*M*=13.91, *SD*=2.89, *SE*=0.86), and first-year medical students (*M*=13.60, *SD*=2.88, *SE*=1.29). There was no statistical significance based on the mean or between groups ([$F(3,30) = 2.66$, $p = .066$]).

Table 5

One-Way ANOVA-Autism Knowledge Test Results

	Test of Homogeneity of Variances				ANOVA	
Medical year	Mean	Std. Dev	Levene's Statistic	Sig	F	Sig
First Years	13.60	2.881	1.211	.323	2.66	.066
Second Year	13.91	2.844				
Third Year	16.83	1.472				
Fourth Year	14.44	1.782				

Comfort

Medical students were asked to rate their comfort level using a four-point Likert scale, from low comfort to high comfort. Low and somewhat low comfort responses were coded as uncomfortable, somewhat high and high comfort were coded as comfortable. The study found that year three and four medical students are comfortable treating patients with only ASD from birth to 18 years old (Table 6) while treating patients with ASD and another comorbidity rated as uncomfortable (56.7-73.3%) (Tables 7-10). Conversely, medical students in years one and two rated as uncomfortable in treating patients with only ASD and ASD with other comorbidities.

Table 6

Current Level Of Comfort With Providing Care To Patients With Autism Only

		Frequency	Percent
Valid	1 Low Comfort	5	13.5
	2 Somewhat Low	12	32.4
	3 Somewhat High	7	18.9
	4 High Comfort	12	32.4
	Total	36	97.3
Missing	System	1	2.7
Total		37	100.0

Table 7

Current Level Of Comfort With Providing Care To Patients With Autism And Oppositional Defiant Disorder (ODD)

		Frequency	Percent
Valid	1 Low Comfort	8	21.6
	2 Somewhat Low	17	45.9
	3 Somewhat High	6	16.2
	4 High Comfort	2	5.4
	Total	33	89.2
Missing	System	4	10.8
Total		37	100.0

Table 8

Current Level Of Comfort With Providing Care To Patients With Autism And Attention Deficit Hyperactivity Disorder (ADHD)

		Frequency	Percent
Valid	1 Low Comfort	7	18.9
	2 Somewhat Low	11	29.7
	3 Somewhat High	10	27.0
	4 High Comfort	5	13.5
	Total	33	89.2
Missing	System	4	10.8
Total		37	100.0

Table 9

Current Level Of Comfort With Providing Care To Patients With Autism And Anxiety

		Frequency	Percent
Valid	1 Low Comfort	7	18.9
	2 Somewhat Low	12	32.4
	3 Somewhat High	10	27.0
	4 High Comfort	4	10.8
	Total	33	89.2
Missing	System	4	10.8
Total		37	100.0

Table 10

Current Level Of Comfort With Providing Care To Patients With Autism And Depression

		Frequency	Percent
Valid	1 Low Comfort	8	24.2
	2 Somewhat Low	11	33.3
	3 Somewhat High	11	33.3
	4 High Comfort	3	9
	Total	33	89.2
Missing	System	4	10.8
Total		37	100.0

Communication was rated as comfortable for all medical school years. Supporting the families with behavior issues, school support, and behavior therapies was rated as uncomfortable for most medical students. When asked about challenging behaviors and their comfort level in supporting families, the second and fourth years were the most uncomfortable (*n*= 8, 80%; *n*=9, 75%), followed by the third-year medical students (*n*= 4, 67%), and the first year medical students (*n*=2, 40%). There were three first-year students (60%) who felt comfortable helping families with challenging behavior. When asked about helping families with school and the IEP or Section 504 process, two-thirds of the medical students rated the level of comfort as uncomfortable (*n*=25, 76%), with the highest percentage being the fourth-year students (92%) followed by the third-year medical students (*n*=8, 80%). The third-year students were split on comfort level (Table 10).

Summary of Results

Table 11

Level Of Comfort In Providing Guidance About Schools Supports (504, Individual Education Plan/IEP Etc.)

			Low Comfort	Somewhat low	Somewhat High	High Comfort	Total
Year in medical school	First Year	N	1	2	1	1	5
		%	20.0%	40.0%	20.0%	20.0%	100.0 %
	Second Year	N	5	3	2	0	10
		%	50.0%	30.0%	20.0%	0.0%	100.0 %
	Third Year	N	2	1	2	1	6
		%	33.3%	16.7%	33.3%	16.7%	100.0 %
	Fourth Year	N	3	8	0	1	12
		%	25.0%	66.7%	0.0%	8.3%	100.0 %
Total		N	11	14	5	3	33
		%	33.3%	42.4%	15.2%	9.1%	100.0 %

This study aimed to understand medical students' education, preparation, and personal comfort level with respect to ASD by asking medical students about their training. The study found that Autism as a subject is being taught to medical students. This prior knowledge is found to help the participants with the knowledge portion of the survey, with the third-year medical

students having the highest mean score. The comfort levels of the medical students when focusing on communication showed them to be uncomfortable with supporting families with challenging behaviors. The study also found that providing support to patients and families regarding school support plans for the patients with ASD had very low comfort, with 76% of medical students reporting.

CHAPTER 5: DISCUSSION

Classes such as neurology and behavioral sciences are a few courses students can take to learn about ASD and other developmental disorders. These classes were a few of the ones stated in the survey by the participants when asked if the medical student took at least one class with Autism as a subject (Table 2). The added knowledge on autism students gain throughout medical school helps their comfort level in interacting with patients with ASD. This basic knowledge shows that ASD is being covered in medical education and their undergraduate classes, as reported by participants (Table 2 & 3). Providing more classes at the undergraduate level and in medical schools helps prepare future doctors to gain a deeper understanding of Autism and the co-morbidities that can accompany it.

The first question in this study sought to determine how prior knowledge and experience with ASD prepare future medical doctors to have a base knowledge of Autism. Based on the results, five first-year students had taken classes that included Autism as a topic or main subject. It progressed for each medical year as was expected (Table 2). The results of the knowledge section yielded an interesting finding that the researcher did not expect. Third-year medical students scored more correct answers than the fourth-year students, similar to the results found in the study conducted by Wachob and Pesci (2016). The third-year students are heavily focused on finishing their knowledge training and currently have that knowledge at their fingers before they venture into their clinical residency. Therefore, it may be that their understanding of ASD is still in their minds at the time of this survey. Fourth-year students have been out in the field and could second guess what they know since they are no longer in the classroom and less likely to have those notes on hand. Therefore, their practical knowledge may be less than the third years at this point. It was expected that first- and second-year medical students had a lower mean score

on the knowledge section due to a less extensive medical education. Fourth-year medical students were expected to have a higher mean score than the other medical year cohorts. There could be a reason due to the pandemic, which halted in-person learning, or a gap in education for another reason.

The results show a comfortable response to communicating with patients with ASD and other comorbidities but an uncomfortable response to treating means there could be a gap in medical student preparation. The rating of comfort on treating patients with ASD could be connected to the medical students' ability to provide that treatment. Treatment would fall into the scope of their training and practice, allowing them to have ,knowledge, and statistics to support them. The most common disabilities (e.g., ASD, and ADHD) have more research, information, and treatment plans available. The comorbidities that fall more on the mental disability side of the diagnose (e.g., ODD, anxiety, and depression) were rated lower on the comfort level means the medical students may feel less comfortable treating patients with these conditions. The lower rating could be because there is no medical treatment plan solely in the doctor's care. Like ODD, most treatment plans for mental disabilities require multiple professionals to support the patient and family long term (Havercamp et al., 2016). Communicating with patients and their families may not come easy to this newer generation of future doctors (Havercamp et al., 2016). COVID has limited their clinical experiences creating another barrier in their education. Allowing for workshops or small sections of a course that focuses on communication (Shah, 2011) would enable the students to build their comfort level throughout the medical training.

Individuals must have the conviction that they can effectively accomplish the required behavior(s) under usual and, more crucially, demanding situations in addition to having the necessary knowledge and abilities to perform a task (Artino, 2012). The study set out to assess

the importance of medical school training and how it prepared future doctors to communicate and interact with patients who have ASD. Students in medical school at East Carolina University have pre-selected schedules upon entering their first year. Artino (2012) found that people obtain information to evaluate efficacy beliefs from four primary sources, according to self-efficacy theory: (a) enactive mastery experiences (actual performances); (b) observation of others (vicarious experiences); (c) verbal and nonverbal forms of persuasion; and (d) 'physiological and affective states from which people partly judge their capableness, strength, and vulnerability to dysfunction. As the students are taught using multiple teaching techniques like standardized patients, case studies, and simulations help medical students with practical hands-on experience. However, the medical schools still teach in the traditional lecture, lab-style, and students go into the hospital setting for clinical experience in their fourth year. We can surmise that clinical experiences would be like enactive mastery experiences, a standardized patient or case study could fit observation of others, and lecture would be similar to verbal and nonverbal forms of persuasion. According to research, enactive mastery experiences are the most influential source of efficacy information among these four types because they provide the most direct, real evidence that an individual can acquire the personal resources needed to achieve (Artino, 2012).

The participants did answer that they had classes that taught Autism and the knowledge levels were higher than expected. The gap is possibly in the hands-on part of their education. According to one of the medical student instructors, due to COVID-19 some courses that may have an outside observation assignment or clinical experience have been altered, not allowing medical students to gain that hands-on experience (D. Eldridge, personal communication, October 4, 2021). Participants responded as uncomfortable when supporting the family with challenging behavior, behavioral therapy, and supporting them through school. Those who were

most uncomfortable with supporting patients and families with school, such as 504s and Individual Education Plans (IEP), are in their third and fourth years of medical school. Those with lower comfort levels could be from the lack of clinical experience pre-COVID and during COVID, exposing gaps in education that may or may not have been there pre-COVID. Also, it could be their first time dealing with the school system forms, guidelines, and providing support to the families; they may not be sure where to go for added information on the IEPs or the 504 processes. The study was not design to explore if this information is covered in their courses. It would be interesting to further explore this potential gap in medical education. This shows that more education is needed from a special education standpoint to support patients and their families at all levels of the medical profession. As with general education teachers, medical providers will need the basic knowledge of available school resources or who parents should contact for further assistance if they pursue becoming pediatricians or family doctors. Adding workshops or additions to a course in their third year could allow students to become educated on the types of educational assistance their patients could access and at what age. Also, allowing medical students to take a special education course through an education program could gain a broader understanding.

One did not complete the survey of the nine participants who desire to become pediatricians. The other eight cover all four years of the medical school experience. It was interesting to see how each participant rated their comfort levels. While those in their third or fourth year were more comfortable with treating and communicating with patients, some had a lack of comfort with treating patients who had ASD with oppositional defiant disorder (ODD)—leading the researcher to question if ODD, its etiology and treatment, is taught to medical students. ADHD was a comorbidity that medical students were comfortable treating and

communicating with patients. The low response numbers, high female population, and large population who are white limited the study in correlating autism knowledge to either category.

LIMITATIONS

This study had a small sample group. Due to the small sample size, there were not enough participants choosing to become pediatricians or family medicine doctors. The majority of participants were female, which could have skewed the results. The majority of the sample was white, non-Hispanic. Only one medical school was used in this study leading to a smaller pool of participants to collect from. The survey was conducted during summer sessions when most medical students were not active in class, so they might not have been checking school emails and missed the survey. COVID fatigue could also play a role in the low response rate.

FUTURE RESEARCH

If this study were to be redone, the researcher would include other medical schools in North Carolina and surrounding states. Opening the participant pool to a wider range of medical students. Nursing students could also be included in future studies as they also interact with patients and families with ASD. Adding nurses could allow the researcher to study the difference in medical educations provided to students who will work together in the future. This addition could help shape a program or medical course to help fill gaps in comfort found in this study

Additionally, adding those in a physician's assistance educational program would expand the study. Many medical professions interact with a patient with ASD, so acquiring a wider lens of medical education allows us to close any gaps found. Adding interviews from students regarding comfort levels could add a more profound understanding of the level chosen. Finally, interviewing medical professors in the pediatric, family medicine, and behavioral sciences

departments will allow future researchers more background information into individual courses and the departments.

CONCLUSION

Medical students have a short amount of time and a linear path they travel through medical school. While this study did not find a gap in knowledge as the researcher expected, medical students' comfort levels surprised them. Medical school is taxing on the individual as they need to gain more significant amounts of basic medical knowledge before entering into their final four years of medical school. This study showed that medical school teaches knowledge, but execution of that knowledge may not be taught in the four years that participants are in medical school. The addition of standardized patients and simulations could also help in the long run with comfort levels.

REFERENCES

A Snapshot of Autism Spectrum Disorder in North Carolina. (2020, April 8). Retrieved from https://www.cdc.gov/ncbddd/autism/addm-community-report/north-carolina.html

Admission Requirements. (2019, April 12). https://students-residents.aamc.org/applying-medical-school/applying-medical-school-process/medical-school-admission-requirements/admission-requirements/.

Artino, A. R. (2012). Academic self-efficacy: from educational theory to instructional practice. *Perspectives on Medical Education, 1*(2), 76–85. https://doi.org/10.1007/s40037-012-0012-5

Autism Spectrum Disorder (ASD). (n.d.). Retrieved from https://www.nimh.nih.gov/health/statistics/autism-spectrum-disorder-asd.shtml

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. https://doi.org/10.1037/0033-295x.84.2.191

Barton, M. L., Dumont-Mathieu, T., & Fein, D. (2012). Screening young children for autism spectrum disorders in primary practice. *Journal of Autism and Developmental Disorders, 42*(6), 1165-1174. doi:10.1007/s10803-011-1343-5

Biyani, S., Morgan, P. S., Hotchkiss, K., Cecchini, M., & Derkay, C. S. (2015). Autism spectrum disorder 101: A primer for pediatric otolaryngologists. *International Journal of Pediatric Otorhinolaryngology, 79*(6), 798-802. doi:10.1016/j.ijporl.2015.04.006

Bultas, M. W. (2012). The health care experiences of the preschool child with Autism. *Journal of Pediatric Nursing 27*(5), 460–470 doi://doi.org/10.1016/j.pedn.2011.05.005

Bultas, M. W., McMillin, S. E., & Zand, D. H. (2016). Reducing barriers to care in the office-based health care setting for children with Autism. *Journal of Pediatric Health Care 30*(1), 5-14. doi://doi.org/10.1016/j.pedhc.2015.08.007

Chebuhar, A., McCarthy, A. M., Bosch, J., & Baker, S. (2013). Using picture schedules in medical settings for patients with an autism spectrum disorder. *Journal of Pediatric Nursing, 28*(2), 125-134. doi://doi.org/10.1016/j.pedn.2012.05.004

Crais, E. R., McComish, C. S., Humphreys, B. P., Watson, L. R., Baranek, G. T., Reznick, J. S., Christan, R. B., Earls, M. (2014). Pediatric healthcare professionals' views on autism spectrum disorder screening at 12–18 Months. *Journal of Autism and Developmental Disorders, 44*(9), 2311-2328. doi:10.1007/s10803-014-2101-2

Crane, L., Davidson, I., Prosser, R., & Pellicano, E. (2019). Understanding psychiatrists' knowledge, attitudes and experiences in identifying and supporting their patients on the autism spectrum: Online survey. *BJPsych Open, 5*(3) doi:10.1192/bjo.2019.12

Dunlap, J. J. (2019). Autism spectrum disorder screening and early action. *The Journal for Nurse Practitioners, 15*(7), 496-501. doi:http://dx.doi.org/10.1016/j.nurpra.2019.04.001

Havercamp, S. M., Ratliff-Schaub, K., Macho, P. N., Johnson, C. N., Bush, K. L., & Souders, H. T. (2016). Preparing tomorrow's doctors to care for patients with autism spectrum disorder. *Intellectual and Developmental Disabilities, 54*(3), 202-216,230,232. doi:http://dx.doi.org/10.1352/1934-9556-54.3.202

Hyman, S. L. (2013, June 4). *New DSM-5 includes changes to autism criteria*. American Academy of Pediatrics. https://www.aappublications.org/content/early/2013/06/04/aapnews.20130604-1.

Igić, M., Kostadinović, L., Tričković-Janjić, O., Stojković, B., & Obradović, R. (2017). Dental health care for children with autism spectrum disorders. *Acta Stomatologica Naissi, 33*(76), 1786-1792. doi:10.5937/asn1776786I

Leitner, Y. (2014). The Co-Occurrence of Autism and Attention Deficit Hyperactivity Disorder in Children â€“ What Do We Know? *Frontiers in Human Neuroscience, 8*. https://doi.org/10.3389/fnhum.2014.00268

Long-Bellil, L. M., Robey, K. L., Graham, C. L., Minihan, P. M., Smeltzer, S. C., Kahn, P., & Alliance for Disability in Health Care Education. (2011). Teaching medical students about disability: The use of standardized patients. *Academic Medicine, 86*(9), 1163-1170. doi:10.1097/ACM.0b013e318226b5dc

MacKenzie, J. G., Abraham, G., & Goebel, S. M. (2013). Management of pediatric patients with autistic spectrum disorders in the emergency department. *Clinical Pediatric Emergency Medicine, 14*(1), 56-59. doi://doi.org/10.1016/j.cpem.2013.01.010

Mazurek, M. O., Brown, R., Curran, A., & Sohl, K. (2017). ECHO Autism: A new model for training primary care providers in best-practice care for children with Autism. *Clinical Pediatrics, 56*(3), 247-256. doi:10.1177/0009922816648288

McGonigle, J. J., Migyanka, J. M., Glor-Scheib, S. J., Cramer, R., Fratangeli, J. J., Hegde, G. G., Shang, J., & Venkat, A. (2014). Development and evaluation of educational materials for pre-hospital and emergency department personnel on the care of patients with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 44*(5), 1252+. https://link.gale.com/apps/doc/A373257294/HRCA?u=ncliveecu&sid=HRCA&xid=9e236079

O'Neil, M., Tutko, H. D., Daviss, W. B., Olson, A., Porter, J., Ryer, J., & House, S. (2017). Attention Deficit Hyperactivity Disorder (ADHD): Survey Report. nhpip.org.

Portnov-Neeman, Y., & Barak, M. (2013). Exploring Students' Perceptions about Learning in School: An Activity Theory Based Study. *Journal of Education and Learning, 2*(3). https://doi.org/10.5539/jel.v2n3p9

Screening and Diagnosis of Autism Spectrum Disorder for Healthcare Providers. (2020, February 11). Retrieved June 29, 2020, from https://www.cdc.gov/ncbddd/autism/hcp-screening.html

Screening Tool for Autism in Toddlers and Young Children (STAT™). (2020). Retrieved June 30, 2020, from https://vkc.mc.vanderbilt.edu/vkc/triad/stat/

Shah, K. (2001). What do medical students know about Autism? *Autism, 5*(2), 127-133. doi:10.1177/1362361301005002003

Robins, D., Fein, D., & Barton, M. (2009) *M_CHAT.ORG: Welcome To M-CHAT.ORG: FREE, INSTANT, ONLINE M-CHAT scoring: Lineagen M-Chat*. M-CHAT Revised with Follow-Up. https://m-chat.org/.

Robins, D. L., Fein, D., Barton, M. L., & Green, J. A. (2001). The modified checklist for Autism in toddlers: An initial study investigating the early detection of Autism and pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 31*(2), 131-144. doi:10.1023/A:1010738829569

Venkat, A., Jauch, E., Russell, W. S., Crist, C. R., & Farrell, R. (2012). Care of the patient with an autism spectrum disorder by the general physician. *Postgraduate Medical Journal, 88*(1042), 472-481. doi:10.1136/postgradmedj-2011-130727

Wachob, D., & Pesci, L. J. (2017). Brief report: Knowledge and confidence of emergency medical service personnel involving treatment of an individual with autism spectrum

disorder. *Journal of Autism and Developmental Disorders, 47*(3), 887-891. doi:10.1007/s10803-016-2957-4

Will, D., Barnfather, J., & Lesley, M. (2013). Self-perceived autism competency of primary care nurse practitioners. *The Journal for Nurse Practitioners, 9*(6), 350-355. doi:10.1016/j.nurpra.2013.02.016

Wood, E. B., Halverson, A., Harrison, G., & Rosenkranz, A. (2019). Creating a sensory-friendly pediatric emergency department. *Journal of Emergency Nursing*, *45*(4), 415-424. doi://doi.org/10.1016/j.jen.2018.12.002

Zerbo, O., Massolo, M. L., Qian, Y., & Croen, L. A. (2015). A Study of Physician Knowledge and Experience with Autism in Adults in a Large Integrated Healthcare System. *Journal of Autism and Developmental Disorders*, *45*(12), 4002–4014. https://doi.org/10.1007/s10803-015-2579-2

APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building · Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** ·
Fax **252-744-2284** · **rede.ecu.edu/umcirb/**

Notification of Exempt Certification

From:	Social/Behavioral IRB
To:	Kyndall Elks
CC:	Sheresa Blanchard
Date:	4/1/2021
Re:	UMCIRB 21-000160 SELF-EFFICACY OF MEDICAL STUDENTS: AUTISM-RELATED KNOWLEDGE, COMFORT LEVEL, EDUCATION, AND EXPERIENCE

I am pleased to inform you that your research submission has been certified as exempt on 4/1/2021. This study is eligible for Exempt Certification under category # 2c.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

Document	Description
Autism Education Survey.docx(0.01)	Surveys and Questionnaires
Elks Autism Education Survey-Educational Practices.docx(0.01)	Surveys and Questionnaires
In person script(0.01)	Recruitment Documents/Scripts
Kyndall Thesis Proposal_03-15-2021.docx(0.01)	Study Protocol or Grant Application
Survey Consent Email(0.01)	Recruitment Documents/Scripts
Survey-Research-Consent-Letter-Template for Expedited Research 3-24-20.doc(0.01)	Consent Forms

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
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Notification of Amendment Approval

From: Social/Behavioral IRB
To: Kyndall Elks
CC: Sheresa Blanchard
Date: 5/17/2021
Re: Amel_UMCIRB 21-000160
UMCIRB 21-000160
SELF-EFFICACY OF MEDICAL STUDENTS: AUTISM-RELATED KNOWLEDGE, COMFORT LEVEL, EDUCATION, AND EXPERIENCE

Your Amendment has been reviewed and approved using expedited review on 5/17/2021. It was the determination of the UMCIRB Chairperson (or designee) that this revision does not impact the overall risk/benefit ratio of the study and is appropriate for the population and procedures proposed.

Please note that any further changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must adhere to all reporting requirements for this study.

If applicable, approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
Autism Education Survey.docx(0.02)	Surveys and Questionnaires

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: ELKS AUTISM KNOWLEDGE AND COMFORT LEVEL SURVEY

Demographic survey

1. Sex
    a. Male
    b. Female
    c. Prefer not to answer
    d. Other _____
2. Race (choose all that apply)
    a. White, non-Hispanic
    b. Black, non-Hispanic
    c. Hispanic
    d. Asian
    e. mixed
    f. other ethic race
    g. prefer not to answer
3. Year in medical school
    a. First year
    b. Second year
    c. Third year
    d. Fourth year
4. Desired medical concentration, or current concentration track
    a. Family medicine
    b. Pediatrics
    c. Surgical
    d. Emergency medicine
    e. Internal Medicine
    f. Psychologist
    g. Other:_____
5. Future employment goal
    a. Private practice
    b. Hospital
    c. Public health
    d. Academic Medicine
    e. Research

Prior Knowledge of Autism

6. Have you taken a class that included Autism as a topic? If YES, answer number 6a & 6b.
    a. Yes
    b. No

        6a. How many classes?

            a. 1
            b. 2-3
            c. More than 3

        6b. What was the name of the class(es)?

            a. _____

7. Have you taken a class that taught other disabilities or cognitive development as a topic? If YES, answer 7a & 7b.
    a. Yes
    b. No

        7a. How many classes?

            a. 1
            b. 2-3
            c. More than 3

        7b. What was the name of the class(es)?

            a. _____

8. Are you related to anyone with Autism? If YES, answer number 8a
    a. Yes
    b. No

        8a. How are **You** related to the person with Autism?

    a. Sibling
    b. Parent of the child
    c. Aunt/uncle
    d. Cousin
    e. Other _____

9. Have you worked with a person with Autism? (paid, internship, volunteer, etc.)
    a. Yes
    b. No

Autism Knowledge Survey (Correct answers are in bold)

1. Which of these symptoms make up the three principal diagnostic criteria for Autism? (pick 3)
    a. **Impaired social understanding**
    b. **Language abnormalities**
    c. Impulsive behavior
    d. Lack of self-control
    e. **Restricted and repetitive behavior patterns**
2. What other behavioral problems are specifically associated with Autism? (pick 3)
    a. Poor concentration
    b. **Dislike of change**
    c. **Poor eye contact**
    d. Lack of common sense
    e. **Repetitive speech**
3. At about what age are the first symptoms of Autism usually apparent? (pick 1)
    a. **0-3 years old**
    b. 3-5 years old
    c. 5-10 years old
    d. 10 years old and up
4. Which of these treatments or interventions is **MOST** likely to be effective for most children with Autism?
    a. Music therapy
    b. **Behavior therapy**
    c. Psychoanalysis
    d. Medication
    e. Pet therapy
5. What is the main cause of Autism?
    a. Brain damage before birth
    b. Brain damage after birth
    c. **Genetic factors**
    d. No known cause yet
6. What happens to most people with Autism as they grow older?
    a. Die early
    b. Need institutionalized care for the rest of their lives
    c. Live independently but remain isolated
    d. **Need continued support in employment and accommodation**
    e. Get married and have children of their own
7. As adults, what are people with Autism probably more likely than the rest of the population to develop?
    a. Schizophrenia
    b. Alzheimer's disease
    c. **Depression**
    d. Narcotic disorders

    e. Paranoid ideas
8. How is ASD diagnosed:
    a. Biological (blood test)
    b. Genetics (karyotype)
    c. **Clinical (observation of absence or presence of certain behaviors)**
    d. I don't know
9. Males are diagnosed at a higher rate than females.
    a. **True**
    b. False
    c. I don't know
10. An autism diagnosis cannot be made before a child is 3 years of age
    a. True
    b. **False**
    c. I don't know
11. A child failing to respond to their name when called can be an early sign of Autism
    a. **True**
    b. False
    c. I don't know
12. A lock of eye contact is necessary for a person to receive a diagnosis of Autism
    a. True
    b. **False**
    c. I don't know
13. Research has shown that the measles, mumps, rubella vaccine is not a direct cause of Autism
    a. **True**
    b. False
    c. I don't know
14. Autism cannot be diagnosed in adulthood
    a. True
    b. **False**
    c. I don't know
15. Younger siblings of children with Autism have a higher probability of being diagnosed with Autism.
    a. **True**
    b. False
    c. I don't know
16. Most children with Autism eventually outgrow Autism.
    a. True
    b. **False**
    c. I don't know
17. Most people with Autism also have intellectual disabilities.
    a. True
    b. **False**

c. I don’t know

18. More than half of people diagnosed with Autism do not talk.
    a. True
    b. **False**
    c. I don’t know
19. Children with Autism can show unusual reactions to certain smells and sounds.
    a. **True**
    b. False
    c. I don’t know
20. The behaviors in Autism can only be managed with medication.
    a. True
    b. **False**
    c. I don’t know

APPENDIX C: MEDICAL STUDENT COMFORT LEVEL SURVEY

Autism Comfort Survey

Rate your level of comfort in treating patients of different ages who have Autism only.

	Level of Comfort with providing care			
	Low Comfort	**Somewhat Low**	**Somewhat High**	**High Comfort**
1. Children 5 years and younger	1	2	3	4
2. Children 6-12 years old	1	2	3	4
3. Children 13 years and older	1	2	3	4

Rate your level of comfort in providing support to families of patients with Autism.

	Level of Comfort with providing care			
	Low Comfort	**Somewhat Low**	**Somewhat High**	**High Comfort**
4. Answering questions about behavior therapy approaches	1	2	3	4
5. Helping parents manage challenging behaviors	1	2	3	4
6. Giving guidance about schools supports (504, Individual Education Plan/IEP etc.)	1	2	3	4

Rate your current level of comfort with providing care to patients with Autism and those with Autism and another co-morbidity.

	Level of Comfort with providing care			
	Low Comfort	**Somewhat Low**	**Somewhat High**	**High Comfort**
7. Patients with Autism only	1	2	3	4
8. Patients with Autism and Oppositional defiant disorder (ODD)	1	2	3	4
9. Patients with Autism and Attention Deficit Hyperactivity Disorder (ADHD)	1	2	3	4
10. Patients with Autism and anxiety	1	2	3	4
11. Patients with Autism and depression	1	2	3	4

Rate your current level of comfort in communicating with patients with Autism and those with Autism and another co-morbidity.

	Level of Comfort with providing care			
	Low Comfort	**Somewhat Low**	**Somewhat High**	**High Comfort**
1. Patients with Autism only	1	2	3	4
2. Patients with Autism and Oppositional defiant disorder (ODD)	1	2	3	4
3. Patients with Autism and Attention Deficit Hyperactivity Disorder (ADHD)	1	2	3	4
4. Patients with Autism and anxiety	1	2	3	4
5. Patients with Autism and depression	1	2	3	4

APPENDIX D: EDUCATIONAL PRACTICES SURVEY

(Professor's survey)

Please answer each question to the best of your knowledge.

1. What types of class experiences are offered to medical students (click all that apply)?
    a. Lecture
    b. Simulation
    c. Case Studies
    d. Standardized patient
    e. labs
    f. Other: _____
2. Can medical students pick their electives?
    a. Yes, they have full control over all classes
    b. No, their schedules are pre-selected
    c. They can pick from a few optional elective classes; their core classes are set.
    d. I do not know
3. They are taught about disabilities:
    a. In only one class
    b. In two to four classes
    c. Not taught at all
    d. Taught in all classes
    e. I do not know
4. Are students taught about Autism?
    a. Autism is covered with other disabilities
    b. Autism is a special subject
    c. No, it is not covered
5. Are students taught about community resources and how to find them?
    a. Yes
    b. No
    c. I do not know