

THE EFFECTS OF YOGA ON A MALE CHILD WITH AUTISM SPECTRUM DISORDER

by

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The purpose of the present study was to utilize yoga as a Complementary Alternative Medicine (CAM) to decrease disruptive behavior and increase communication a male child, aged 10 years (developmental level 1-2 years) diagnosed with autism spectrum disorder. Due to the lack of empirical literature, an A-B single subject design was used for the current study. The current study took place in a rural North Carolina elementary school, within a self-contained classroom designed for children with a diagnosis of autism. Results indicated that there was a decrease in disruptive behaviors after yoga was introduced in the intervention phase and an increase in communication skills during phase B. Behaviors decreased from 10 disruptive behaviors during Phase A, and 2 disruptive behaviors during Phase B. Communication skills increased from 0 uses during Phase A, to 11 uses during Phase B. The research participant independently used the communication board 9 times. Consistent with previous literature, the current study illustrates the benefits of yoga on children with autism. Results indicated that participation in yoga yielded a decrease in disruptive behaviors and an increase in communication.

THE EFFECTS OF YOGA ON A MALE CHILD WITH AUTISM SPECTRUM DISORDER

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CHAPTER 1: INTRODUCTION

There are more than 3.5 million individuals in US who are diagnosed with autism spectrum disorder (ASD or autism). ASD is the fastest growing developmental condition in our country (Centers for Disease Control and Prevention, 2016). Autism is currently prevalent in 1 in 68 children, and boys are 4 times more likely to be diagnosed with ASD (Centers for Disease Control and Prevention, 2016). Children with autism have deficits in communication, social skills, and behaviors. Disruptive behaviors are another type of behavior that can be seen in individuals diagnosed with autism. Disruptive behaviors occur in more than half of children with autism (Gadow, DeVincent, Pomeroy, & Azizian, 2004; Lecavalier, 2006). Common disruptive behaviors displayed in children with autism are tantrums, aggression, noncompliance, self-injury, property destruction, recklessness, and hyperactivity (Bearss, Lecavalier, Minshawi, Johnson, Smith, Handen... Scahill, 2013). Aggression is displayed in about half of children diagnosed with autism, and can include any form of behavior that is harmful to the individual or peers (Kanne & Mazurek, 2011; Matson & Adams, 2014; Mazurek, Kanne, & Wodka, 2013). Disruptive behaviors, such as aggression, can be linked back to the core symptoms in autism (Matson & Wilkins, 2009). ASD can present mild to severe impairment to the functioning of an individual. Although the cause of autism is unclear, and there is no known cure. However, there have been effective forms of treatment that have emerged.

There are two commonly used forms of treatment children with autism can receive, conventional or alternative. A conventional form of treatment would refer to a treatment that is widely accepted and used by most healthcare professionals, such as behavior therapy, Applied Behavior Analysis (ABA), speech therapy, occupational therapy, and physical therapy (National Cancer Institute, 2015). For individuals with autism, conventional treatments such as speech

therapy and occupational therapy (OT) are two forms of interventions commonly used (National Cancer Institute, 2015). Speech therapy can help children with autism learn how to use conversational speech, learn the rules of conversation, and/or work with children that are non-verbal (American Occupational Therapy Association, 2016; Case-Smith & Arbesman, 2008). Occupational therapy helps children with autism engage in play, self-care, educational activities, independence and employment (American Speech-Language-Hearing Association., 2016; Welch & Polatajko, 2016). An alternative form of treatment, also referred to as complementary and alternative medicine (CAM), is any therapeutic approach that is formed outside of conventional treatments (National Center for Complementary and Integrative Health, 2016). CAMs are divided into two forms: biologically based CAMs and non-biologically based CAMs. Non-biologically based CAMs focus on dietary changes that can help reduce the symptoms of autism. Non-biologically based CAM treatments, such as music therapy, sensory-integration therapy, and massage therapy, focus on exposing children with autism to different sensory stimulation that help to improve sensory regulation and reduce some of the core characteristics of autism.

Yoga has also been linked to ASD as a form of treatment to reduce some of the core symptoms of autism. In general, yoga has been known to reduce stress, relax the mind, increase body awareness, center attention, and sharpen concentration (American Osteopathic Association, 2016). Further, yoga has been effective at increasing non-verbal communication, expressive emotions, focus, and improve behaviors (Koenig, Buckley-Reen, & Garg, 2012; Radhakrishna, 2010; Rosenblatt et al., 2011; Scroggins et al., 2016). It is estimated that between 25% and 40% children with autism are non-verbal (National Autism Association, 2016; Rose, Trembath, Keen, & Paynter, 2016; Thunberg, Ahlsén, & Annika, 2011; Wan et al., 2011) and about half of children with autism display aggression during childhood (Kanne & Mazurek, 2011; Matson &

Adams, 2014; Mazurek, Kanne, & Wodka, 2013). Disruptive behaviors displayed by individuals with autism that can consist of hitting, kicking, biting, pulling hair, and throwing objects (Fitzpatrick, Srivorakiat, Wink, Pedapati, & Erickson, 2016; Hodgetts, Nicholas, & Zwaigenbaum, 2013; Matson & Adams, 2014). Disruptive behaviors are defined as behaviors that cause a disruption, such as crying, inappropriate vocalizations (yelling), slapping, hitting, grabbing, hand flapping, and task avoidance (Conroy, Asmus, Boyd, Ladwig, & Sellers, 2007; Mohammadzaheri, Koegel, Rezaei, & Bakhshi, 2015). While disruptive behaviors are not necessarily aggressive behaviors, aggression is one form that does occur in children with autism. Yoga may have the potential to improve non-verbal communication and disruptive in children with autism spectrum disorder by improving focus, decreasing aggressive behaviors, and increasing non-verbal communication skills.

CHAPTER 2: THEORETICAL PERSPECTIVE

This research project was guided basic tenets of operant conditioning, a behavior learning theory founded by B.F. Skinner. Operant conditioning was based on Thorndike's law of effect (McLeod, 2015; Neukrug, Brace-Thompson, Maurer, & Harman, 2015). The law of effect was the understanding that "what comes after a connection acts upon it to alter its strength" (Thorndike, 1927, pg. 212). The law of effect is a hypothesis that was created to explain to facts of learning in animals, and was extended into a fundamental law to explain the power of wants, interests, purposes, and desires (Thorndike, 1927). Skinner expanded the law of effect by introducing reinforcement, and calling it operant conditioning (McLeod, 2015; Neukrug et al., 2015).

Operant conditioning is a way to train behavior, by placing an organism into a controlled environment and reinforcing a desired behavior (Skinner, 1961). Reinforcement is use of a consequence to reinforce the occurrence of a desired behavior. Skinner studied the theory of operant conditioning using animals. Skinner utilized operant conditioning on pigeons, monkeys, and rats. Skinner has been able to manipulate animal behavior, and make them exhibit complexities and subtleties of behaviors through the use of operant conditioning (Skinner, 1961). Skinner taught pigeons to peck the brighter of two spots through operant conditioning and positive reinforcement (Skinner, 1961). One of Skinner's most famous studies used operant conditioning on rats (McLeod, 2015; Neukrug et al., 2015). Rats were placed in a "Skinner" box with one lever. The rats would wander around the box until accidentally pressing the lever. The lever would release a pellet of food (consequence), and as a response to the consequence the rats learned to press the lever when entering the box (McLeod, 2015; Neukrug et al., 2015). After receiving food, the number of times the rats would press the lever would increase (McLeod,

2015; Neukrug et al., 2015). The type of consequence stated in this scenario is reinforcement. The rat was rewarded for pressing the lever, and therefore, continued to engage in said behavior.

Skinner identified three consequences to manipulate behavior: neutral operants, reinforcers, and punishers. A neutral operant is an environmental response that neither increases nor decreases a behavior. Reinforcement increases the likelihood that a behavior will occur again, and punishment decreases the likelihood of a behavior occurring again (McLeod, 2015; Neukrug et al., 2015). There are two types of reinforcement, and two types of punishment that can be used to manipulate behavior. Reinforcement can be positive or negative. Positive reinforcement is the use of a reward to increase the likelihood that a behavior will occur again. Negative reinforcement is the removal of something aversive to increase the likelihood that a behavior will occur again (Neukrug et al., 2015). Similarly, punishment can be positive or negative as well. Positive punishment is adding something aversive to decrease the likelihood that a behavior will occur again. Negative punishment is the removal of a reward to decrease the likelihood that a behavior will occur again (Neukrug et al., 2015).

Operant conditioning is the active choice to engage in a behavior. In the present study, a child with autism will have to choose to engage in a behavior to receive positive reinforcement. The researcher's goal is to decrease disruptive behavior through the use of yoga, and give the research participant the opportunity to communicate desires with a communication choice board. When the research participant actively chooses to engage in yoga, rather than a disruptive behavior, the participant will be reinforced with the ability to communicate his/her desires with a communication choice board. It is hypothesized that the reinforcement of communication will be desired, which will decrease disruptive behaviors and replace said behaviors with the use of yoga, and secondarily improve communication skills.

CHAPTER 3: REVIEW OF LITERATURE

The severity and impairments that are present in an individual with autism spectrum disorder make each individual unique. The use of a treatment that meets the uniqueness of each individual is essential to improve the functioning of said individual. In understanding the diagnosis of autism and existing treatment options, it is worthwhile to examine the effect yoga can have on communication and disruptive behaviors.

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) and autism are two terms that are used interchangeably to describe a neurodevelopmental disorder characterized by difficulties in social interaction, verbal and nonverbal communication, and repetitive behaviors (American Psychiatric Association & DSM-5 Task Force, 2013; Autism Speaks, 2016b; Centers for Disease Control and Prevention, 2016). Autism is diagnosed on a spectrum because each person with autism is unique due to the varying degree and severity of symptoms (American Psychiatric Association & DSM-5 Task Force, 2013; Autism Speaks, 2016b; Centers for Disease Control and Prevention, 2016). The DSM-V is a manual used by professionals in the mental health field to diagnose mental disorders based on a set of diagnostic criteria developed by the American Psychiatric Association. The DSM-V is used by mental health professionals to diagnosis individuals with autism based on communication skills, behavior, and symptom persistency (Table 1: Criteria A and B). Symptoms have to be present during the early developmental period of a child's life (Table 1: Criteria C). Individuals with autism display symptoms that impair the way an individual functions (Table 1: Criteria D). The DSM-V rules out other possible disabilities when diagnosing an individual with autism, such as intellectual disability and global developmental delay (Table 1: Criteria E)(American Psychiatric Association & DSM-5 Task Force, 2013). The

severity of the symptoms is based on social communication impairments (Criterion A) and restricted, repetitive patterns of behavior (Criterion B). Severity can be labeled on a scale from 1 to 3, with Level 1 requiring support, Level 2 requiring substantial support, and Level 3 requiring very substantial support (Table 2) (American Psychiatric Association & DSM-5 Task Force, 2013).

Autism and communication (Criteria A). One criteria for diagnosing autism is a deficit in communication. Communication skills can range from being verbal and having a difficult time conversing with peers, to being non-verbal and only being able to make unusual sounds, as illustrated in Table 1 and Table 2. Children with less severe autism may have a difficult time processing nonliteral language and pragmatic language (Whyte & Nelson, 2015). Nonliteral language means metaphors, figurative language, sarcasm, and indirect requests. Pragmatic language is social language skills, meaning appropriate social interactions. Pragmatics involve using language for different purposes, changing language according to the conversation, and following the rules for conversing with others (American Speech-Language-Hearing Association, 2016). However, it is estimated that between 25% and 40% of children with autism are non-verbal (National Autism Association, 2016; Rose, Trembath, Keen, & Paynter, 2016; Thunberg, Ahlsén, & Annika, 2011; Wan et al., 2011). Children with autism struggle with pragmatic and nonliteral language, and initiating conversation and friendship with peers. A child with autism who is non-verbal would struggle to communicate their own personal needs as well as the previously mentioned struggles.

Autism and repetitive behaviors (Criteria B). In the DSM-V children with autism are required to currently display or have a history of at least two types of restricted, repetitive patterns of behavior, interests, or activities (American Psychiatric Association & DSM-5 Task

Force, 2013). As described in Table 1, behaviors can manifest through repetitive actions, resistance to change, abnormally fixated interests, and sensory aspects. Individuals with lower functioning skills tend to display an increased level of repetitive sensory and motor behaviors, while females display fewer amounts of repetitive behaviors when compared to males (Richler, Bishop, Kleinke, & Lord, 2007; Szatmari et al., 2006; Szatmari et al., 2012). Typical behaviors seen in autism are repetitive and/or restricted, oftentimes due to an inability to cope with change (American Psychiatric Association & DSM-5 Task Force, 2013). The inability to cope with change can in turn lead to disruptive behaviors.

Disruptive behaviors and autism. Disruptive behaviors are another type of behaviors that can be seen in individuals diagnosed with autism. Disruptive behaviors occur in more than half of children with autism (Gadow, DeVincent, Pomeroy, & Azizian, 2004; Lecavalier, 2006). Disruptive behaviors are defined as behaviors that cause a disruption, such as crying, inappropriate vocalizations (yelling), slapping, hitting, grabbing, hand flapping, and task avoidance (Conroy, Asmus, Boyd, Ladwig, & Sellers, 2007; Mohammadzaheri, Koegel, Rezaei, & Bakhshi, 2015). Common disruptive behaviors displayed in children with autism are tantrums, aggression, noncompliance, self-injury, property destruction, recklessness, and hyperactivity (Bearss et al., 2013). Due to impairments in areas such as communication and behaviors, disruptive behaviors can impair the way children with autism function in the home and in the community. Disruptive behaviors may occur as a part of, or as a result from, the symptoms of autism (Criteria A & B)(Table 1). For instance, hyperactivity, tantrums, and noncompliance could be a result of the diagnosis criteria that is stated in Criteria B (Table 1)(American Psychiatric Association & DSM-5 Task Force, 2013).

Table 1

DSM-V Autism Criteria

Letter	Criteria	Manifested
Criteria A	Persistent deficits in social communication and social interaction across multiple contexts.	Deficits in social-emotional reciprocity; deficits in nonverbal communication behaviors used for social interaction; deficits in developing, maintain, and understanding relationships.
Criteria B	Restricted repetitive patterns of behavior, interests, or activities.	An individual has to display at least two of the following manifestations: <ul style="list-style-type: none"> • Stereotyped or repetitive motor movements, use of objects, or speech. • Insistence on sameness, inflexible adherences to routines, or ritualized patterns of verbal or nonverbal behavior. • Highly restricted, fixated interests that are abnormal in intensity or focus. • Hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment.
Criteria C	Symptoms must be present in the early developmental period.	
Criteria D	Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.	
Criteria E	Symptoms are not better explained by intellectual disability or global developmental delay	

(American Psychiatric Association & DSM-5 Task Force, 2013)

Table 2

Severity Levels For Autism Spectrum Disorder

Severity Level	Social Communication	Restricted, Repetitive Behaviors
Level 3 “Requiring very substantial support”	Severe deficits in verbal and nonverbal communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches.	Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning in all spheres. Great distress/difficulty changing focus or action.
Level 2 “Requiring substantial support”	Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and who has markedly odd nonverbal communication.	Inflexibility of behavior, difficulty coping with change, or other restricted/repetitive behaviors appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.
Level 1 “Requiring support”	Without supports in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful response to social overtures of others. May appear to have decreased interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose to-and-fro conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful.	Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of organization and planning hamper independence.

Deficits in communication and social skills can result in aggression, and is one form of disruptive behavior that is commonly seen in children with autism.

Repetitive behaviors, disruptive behaviors, and aggression are different but can be overlapped in the diagnosis of autism as well. Children with autism may display repetitive behavior, such as always playing with the same toy. Children with autism can display a disruptive behavior, such as yelling out or hand flapping. Children with autism may display aggression, such as hitting, kicking, or throwing objects, towards peers or self as well. Each of these concepts can demonstrate three different forms of behaviors. However, repetitive behaviors, disruptive behaviors, and aggression can overlap into the same behavior. Children with autism can display aggression as a form of a disruptive behavior, and as a repetitive behavior. For instance, a child with autism may hit his/her self frequently throughout the day. This particular behavior is repetitive, it is aggressive, and it is disruptive. Therefore, although repetitive behaviors, disruptive behaviors, and aggression are three different terms, these terms can overlap in certain situations.

Aggression. Aggression is a type of disruptive behavior, and is a common problem in about half of children with autism, with males' aggression being more severe (Kanne & Mazurek, 2011; Matson & Adams, 2014; Mazurek, Kanne, & Wodka, 2013). Hitting; kicking; biting; throwing objects; and pulling hair, glasses, or other personal effects of others are the most common forms of aggression seen in studies pertaining to children with autism (Fitzpatrick, Srivorakiat, Wink, Pedapati, & Erickson, 2016; Hodgetts, Nicholas, & Zwaigenbaum, 2013; Matson & Adams, 2014). While there are multiple factors that may lead to aggression, two of these factors include the lack of communication and social problems, both related to Table 1 (Matson & Wilkins, 2009).

Autism prevalence and epidemiology. According to the Centers of Disease Control and Prevention (Centers for Disease Control and Prevention, 2016), about 1 in 68 children are diagnosed with autism. Boys are 4.5 times more likely to have autism than girls (boys: 1 in 42; girls: 1 in 189)(Centers for Disease Control and Prevention, 2016). Research indicates many possible causes for autism. Genetic factors play an important role in possible causations for autism, as well as environmental factors (Landrigan, 2010; Sutcliffe, 2008). Gene mutations, gene deletions, copy number variants (CNVs) and other genetic abnormalities are all possible genetic factors that may influence the development of autism (Grafodatskaya, 2010; Sutcliffe, 2008). Possible environmental factors include toxic exposure, such as lead and mercury; exposure to pesticides; viral infection; thyroid hormones; and oxytocins (Holzman, 2014; Landrigan, 2010; Matsuzaki, Iwata, Manabe, & Mori, 2012; Yasa, 2014). Although the causation of autism is highly studied, research has not uncovered the exact cause of autism. In addition, there is no known cure for autism. However, there are many treatments for autism that assist in helping children with autism thrive to their fullest potential.

Treatment

There are two commonly used forms of treatment children with autism can receive, conventional or alternative. A conventional form of treatment would refer to a treatment that is widely accepted and used by most healthcare professionals, such as behavior therapy, Applied Behavior Analysis (ABA), speech therapy, occupational therapy, and physical therapy (National Cancer Institute, 2015). Alternative forms of treatment also referred to as complementary and alternative medicine (CAM), which are forms of therapeutic approaches that are formed outside of conventional treatments (National Center for Complementary and Integrative Health, 2016). However, complementary and alternative are different forms of treatment. Complementary is or

can be used in combination with a conventional therapeutic approach. Whereas, an alternative is uncommon and used in place of a conventional therapeutic approach (National Center for Complementary and Integrative Health, 2016).

Conventional forms of treatment. Every child with autism is different, and the way two children with autism receive and respond to treatment may be different too. Some forms of conventional treatment that are used for children with autism are behavioral treatments, Applied Behavior Analysis (ABA), pharmacological treatments, speech therapy, occupational therapy (OT), and physical therapy (PT). Speech therapy is used for children with autism to help focus on the communication deficits. Speech therapy can help children with autism learn how to use conversational speech, learn the rules of conversation, and/or work with children that are non-verbal (American Speech-Language-Hearing Association, 2016; Autism Speaks, 2016c). OT concentrates on the cognitive, physical and motor skills of a child with autism. OT tends to aid children with autism to use appropriate play with peers, gain self-care skills, and learn independence (American Occupational Therapy Association, 2016; Autism Speaks, 2016c; Case-Smith & Arbesman, 2008). PT is used in children with autism to help meet children with autism's sensory motor needs (Atun-Einy et al., 2013; Mieres, Kirby, Armstrong, Murphy, & Grossman, 2012). Children with autism may need to work on balance, coordination, and muscle tone which can affect sitting, walking, running, and jumping (Atun-Einy et al., 2013; Autism Speaks, 2016c; Mieres et al., 2012). Each form of treatment is used to help reduce and improve the different symptoms of autism that may impair a child with autism.

Alternative forms of treatment. There are two types of complementary and alternative medicine (CAM) treatments, biologically based CAM and non-biologically based CAM. Some common biologically based CAM treatments are dietary interventions, and natural products, such

as vitamins and minerals, omega-3 fatty acids, herbs, probiotics, and fish oil (Autism Speaks, 2016a; Brondino, Fusar-Poli, Rocchetti, Provenzani, Barale, & Politi, 2015; National Center for Complementary and Integrative Health, 2016). Some common non-biologically based CAM treatments include mind and body practices such as yoga, massage therapy, music therapy, auditory integration training, sensory integration therapy, meditation, deep breathing, acupuncture, movement therapies and chiropractic and osteopathic manipulation (Brondino et al., 2015; National Center for Complementary and Integrative Health, 2016). Research indicates that between 30 and 95 percent of children with autism have engaged in complementary or alternative medical treatment (Autism Speaks, 2016a; Brondino et al., 2015; Hanson et al., 2007). Perrin et al. (2012) examined the use of CAM in a large sample of children with autism, and found that 28% (896 out of 3173) reported using CAM, 17% (548) reported using dietary interventions, and 20% (643) reported using other CAMs (Perrin et al., 2012). The following are a few biologically and non-biologically based CAM treatments examined in a summary article written by Brondino et al. (2015).

Biologically based CAM treatments.

Dietary interventions. The gluten and/or casein free (GFCF) diet is one dietary intervention that has empirical data to support it. It is theorized that this could be due to an allergy or a leaky gut (Lau, Green, Taylor, Hellberg, Ajamian, Tan..., 2013; Levy & Hyman, 2008; Lundin & Dwyer, 2014). Lundin and Dwyer (2014) state the following, “a theory that increased intestinal permeability, or a “leaky gut,” allows peptides to pass through the wall of the intestine into the general circulation. According to the “Opioid Excess Theory,” the peptides then cross the blood-brain barrier and cause disruptions in neurodevelopment (p. 196-206).” However, research is limited in supporting this treatment. In 2006, Elder, Kreider, Schaefer, and

deLaosa conducted a preliminary, double blind clinical trial on 15 children, aged 2 to 16 with autism. Children were placed on the GFCF diet for 12 weeks. Results indicated that there were no significant differences in children, although several parents reported an improvement in their child (Elder et al., 2006). Recently, Hyman et al. (2016) conducted a similar study to obtain information on the effectiveness of the GFCF diet. Researchers placed 14 children, aged 3 to 5, on a GFCF diet for 4 to 6 weeks. There were no significant differences in physiologic functioning, behavior problems, or autism symptoms (Hyman et al., 2016). Whiteley et al. (2010) conducted a 24-month study on children with autism using the GFCF diet, and results indicated a significant improvement with the diet; however, the study did not use a placebo. GFCF may work for some children with autism, but strong empirical research is lacking to support the use of GFCF as a treatment for autism (Elder, Kreider, Schaefer, & deLaosa, 2015).

Omega-3 and vitamins. Research on omega 3 and autism is muddled. Research oftentimes has small sample sizes, and indicates no significance in children with autism once omega 3 is given to subjects. There have been improvements by increasing omega-3 in children with autism's diet but not on a significant level (Bent, Bertoglio, Ashwood, Bostrom, & Hendren, 2011; Bent et al., 2014; Meiri, Bichovsky, & Belmaker, 2009). Omega-3 has been linked to reducing hyperactivity in children with autism as well (Bent et al., 2014; Bent et al., 2011). Vitamins are used as a CAM due to the frequent observation that children with autism have deficiencies in vitamins and micronutrients. Research indicates that children with autism obtain less than recommended amounts of vitamin D, calcium, potassium, pantothenic acid, and choline (Stewart et al., 2015). Vitamin D is essential to children with autism because it is important for brain development (Cannell, 2008). Vitamin D may decrease core autism

symptoms and help reduce the risk of autism in infants (Shaun et al., 2015; Stubbs, Henley & Green, 2016).

Non-biologically based CAM treatments. Many of the non-biologically based CAM treatments focus on Criteria A (communication and social skills) and Criteria B (behaviors) of the DSM-V autism diagnosis criteria. Multiple non-biologically based CAM treatments focus on sensory hypo- hypersensitivity that can be present in children with autism. Children that exhibit impairments in sensory information processing may be overwhelmed by lights, sounds, smells, tastes, or textures (Wigham, Rodgers, South, McConachie, & Freston, 2015). Treatments such as music therapy, sensory-integration therapy, and massage therapy focus on exposing children with autism to different sensory stimulations to help improve and reduce some of the core symptoms of autism.

Music therapies. In the DSM-V, deficits in social interaction and communication play a key role in the diagnosis criteria of autism (American Psychiatric Association & DSM-5 Task Force, 2013). Research indicates that music therapy may be beneficial for children with autism by helping improve social interaction, verbal and non-verbal communication skills, initiating behavior, and social-emotional reciprocity (Geretsegger, Elefant, Mossler & Gold, 2014; Silverman, 2008). In a recent study, LaGasse (2014) examined the effects music therapy group intervention had on eye gaze, joint attention, and communication in 17 children, aged 6 to 9 with autism. Children were divided randomly into a music therapy group or a non-music social skills group, and participated in ten 50-minute group sessions over a 5-week period. Results indicated that the group with music therapy showed improvement in social responsiveness and joint attention. There were no significant differences in initiation of communication, response to communication, or social withdraw/behaviors after treatment (LaGasse, 2014). However,

Gattino, Riesgo, Longo, Leite, and Faccini (2011) reported a significant improvement in nonverbal communication in children with autism, after receiving relational music therapy (improvisation). Research is still conflicted on the effectiveness of music therapy with children with autism. Some research indicates that it may be beneficial (Geretsegger, Elefant, Mossler & Gold, 2014; Schwartzberg & Silverman, 2013), and then there is research that indicates there was no significant difference in children with autism that receive music therapy compared to those that do not receive music therapy (Lim & Draper, 2011).

Sensory integration therapy. In the DSM-V, sensory hypo- hypersensitivity is part of the criteria for a diagnosis of autism (American Psychiatric Association & DSM-5 Task Force, 2013). In three studies using sensory integration on children with autism, significant improvements were noted in the results. Fazlioğlu and Baran (2008) conducted a study on 30 children with autism, aged 7 to 11. Children that received sensory integration therapy showed a significant improvement when compared to the control group (Fazlioğlu & Baran, 2008). Likewise, Pfeiffer, Koenig, Kinnealey, Sheppard, and Henderson (2011) and Thompson (2011) conducted studies that demonstrated a significant improvement in children with autism that received sensory integration therapy. However, in a current systematic review on sensory integration therapy, researchers noted that the current evidence-base literature does not support the use of sensory integration therapy in the education and treatment of children with autism (Lang et al., 2012). Researchers reviewed 25 studies, the results of three studies were positive, eight studies had mixed results, and 14 studies reported no benefits from sensory integration therapy (Lang et al., 2012).

Massage therapy. As previously stated, sensory hypo- hypersensitivity is part of the criteria for a diagnosis of autism (American Psychiatric Association & DSM-5 Task Force,

2013). The use of massage therapy in autism is hypothesized to help treat sensory impairment through touch (Grandin, 1992). Research suggests that the use of massage therapy has resulted in improvement for children with autism. Researchers conducted a study on 46 children with autism, less than 6 years old. Massage therapy was used with children directly 20 times over 5 months, and parents gave children a massage daily as well. Silva, Schallock, Ayres, Bunse, and Budden (2009) reported that children receiving massage therapy displayed a significant improvement in social and language skills and reduction in autistic behavior compared with wait-list control participants. Piravej, Tangtrongchitr, Chandarasiri, Paothong, and Sukprasong (2009) studied children with autism and the results indicated that improvements were seen in anxiety, conduct problem, hyperactivity, inattention-passivity, hyperactivity index, and sleeping behavior after receiving massage therapy.

Yoga as a CAM Therapy

Classroom-based yoga may be beneficial for stress management, improving student behavior, and as a form of intervention for children with autism, intellectual disability, learning disability, and emotional disturbance (Butzer et al., 2015); Serwacki and Cook-Cottone, 2012). In a survey, there were 36 programs identified that offered yoga in more than 940 schools in the United States (Butzer, Ebert, Telles, & Khalsa, 2015). There are differences in the programs; however, the majority of the programs teach the following four basic elements of yoga: physical postures, breathing exercises, relaxation techniques, and mindfulness and meditation practices (Butzer et al., 2015).

Kenny (2002) stated, As Autism Spectrum Disorders are becoming more commonly diagnosed, it is crucial that specialists working with this population develop therapeutic interventions that address the whole child, including social and language deficits, sensory

integration difficulties, physical problems associated with poor motor coordination and body awareness, and general self-esteem and overall well-being. (p. 78)

Yoga is a movement therapy that may have potential benefits to address the whole child (Table 3). Table 3 displays the results of previous research that pertained to children with autism, and yoga. The results in Table 3, indicate that children receiving yoga showed improvements in focus, non-verbal communication, receptive skills, and expressive emotions (Radhakrishna, 2010; Scroggins et al., 2016). Table 3 results also displayed improvements in behaviors and helping children with autism self-regulate stress (Koenig, Buckley-Reen, & Garg, 2012; Rosenblatt et al., 2011; Scroggins et al., 2016).

Yoga has been successfully implemented as a therapy for children with Attention Deficit Hyperactivity Disorder (ADHD), Learning Disabilities, Pervasive Developmental Delay, Sensory Integration Dysfunction, and Dyspraxia. Yoga has had consistent and significant results with children with autism as well (Kenny, 2002). Yoga may increase imitation, cognitive skills and social communication behaviors in children with ASD. Children showed increased skills in focus, non-verbal communication, receptive skills, and expressive emotions (Radhakrishna, 2010; Scroggins et al., 2016). Yoga has been effective at improving behaviors and helping children with autism self-regulate stress (Koenig, Buckley-Reen, & Garg, 2012; Rosenblatt et al., 2011; Scroggins et al., 2016). Although the effectiveness of yoga on children with autism is underdeveloped, the foundation is growing. Research indicates yoga has a positive impact on children with autism. Methodological limitations and the limited amount of research prevent yoga from being a strong, evidence-based practice.

Single-Subject Design

Single-subject design (also known as single case experiments or single subject research)

Table 3

Yoga in Children with Autism

Author	Duration	Sample Size	Type of intervention	Frequency	Outcome measure	Findings
Radhakrishna, S., 2010	10 months	$n = 6$ (M: 5; F: 1), Age: 8-14 years	Yoga	5 weekly sessions	Questionnaire, Interviews	Improvement in imitation skills and play patterns
Rosenblatt et al., 2011	8 weeks	$n = 24$ (M: 22; F: 2) Age: 3-18 years	Yoga (in addition to dance and music)	45 min for 8 sessions	BASC, ABC, ABC irritability scale	Improvement, but no change in ABC
Koenig, Buckley-Reen, & Garg., 2012	16 weeks	$n = 46$ (M: 37; F: 9), Age: 5-12 years	Yoga $n = 25$	15-20 min/day	ABC, Vineland	Improvement with moderate effect size in the experimental group
Scroggins, Litchke, & Liu., 2016	4 weeks	$n = 1$ (Male, Age 7)	Multi-sensory Yoga	45 min for 8 sessions, twice a week	TRIAD, STBC, YPRS	Improvements in disruptive behavior, focus, and pose performance.

ABC, Aberrant Behavioral Checklist; BASC-2, Behavioral Assessment System for Children, Second Edition; STBC, Sparks Target Behavior Checklist; TRIAD, Treatment and Research Institute for Autism Social Skills Assessment; YPRS, Yoga Pose Rating Scale.

is popular in the fields of special education and counseling. Single-subject design is used when a researcher is trying to determine if an intervention or treatment changes an individual's or small group of individuals' behavior (Fraenkel & Wallen, 2006). The design is made up of a visual comparison of two or more conditions, one condition being the baseline phase and other conditions consisting of the intervention phase of a study (Byiers, Reichle, & Symons, 2012). The baseline phase illustrates a visual for the benchmark data to which the research participant's behavior will be compared within a study. Researchers document any changes over an extended period of time and use line graphs to show the effects of a particular intervention or treatment (Fraenkel & Wallen, 2006). Visuals are used to show any changes that are displayed in one or more of the following areas: level, trend, and variability. Level refers to the research participant's average rate of performance throughout a study (Byiers, Reichle, & Symons, 2012). Trend is the rate of increase or decrease, and variability is the degree in which the behavior fluctuates (Horner, Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, 2005).

In a single-subject design, researchers have control over the experimental conditions and can identify and/or eliminate extraneous variables in the experiment. A single-subject design allows for researchers to identify functional relationships between an independent and a dependent variable, and have capability to examine intra- and inter- subject validity (Satake, Jagaroo, & Maxwell, 2008). Single-subject design is often times used to view the effectiveness of an intervention on children with autism. In a study, researchers used a single-subject design to view the effectiveness of floor-time play for children with autism (Dionne & Martini, 2011). Similarly, single subject designs have been efficient at examining the effectiveness of Applied Behavior Analysis, horseback riding, and therapy cushions as forms of intervention for children with autism (Holm et al., 2014; Umeda & Deitz, 2011; Virués-Ortega, 2010).

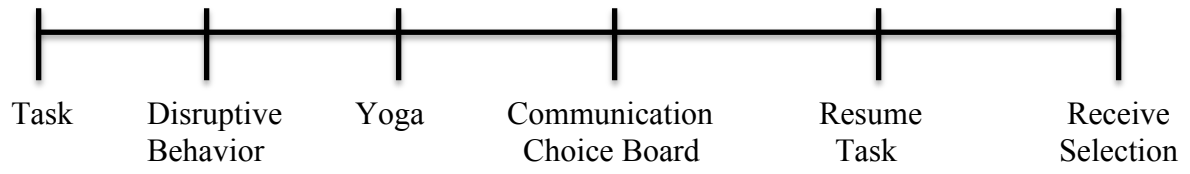
There are multiple types of single subject design: pre-experimental (AB) design, withdrawal (ABA or ABAB) design, the multiple-baseline/multiple-probe design, the changing-criterion design, the multiple-treatment design, and the alternating treatments and adapted alternating treatments designs (Byiers, Reichle, & Symons, 2012). A pre-experimental (AB) design is made up of two phases, baseline phase and intervention phase. Because this design only consists of one intervention phase, it is used to make a correlation between two variables rather than causation between two variables (Byiers, Reichle, & Symons, 2012). With the AB design it is more difficult to control for extraneous variables because the intervention phase is only introduced once. On the other hand, the AB design allows researchers to take that initial step in data collection and start building the foundation for a new research topic. Research on how yoga affects the behavior and communication skills of children with autism is limited. Therefore, an AB design will be used to build the foundation on the relationship between yoga, behavior, and communication.

The Present Study

As reviewed up to this point, there was limited empirical evidence on the effect yoga has on children with autism. Based on the literature, yoga may have a positive impact on communication and disruptive behavior (Koenig, Buckley-Reen, & Garg, 2012; Radhakrishna, 2010; Rosenblatt et al., 2011; Scroggins et al., 2016). The purpose of the present study is to utilize yoga as a CAM to decrease disruptive behavior and increase communication. The researcher, the classroom teacher/myself, defines disruptive behavior as any behavior that negatively affects the classroom environment. Behavior can include, but are not limited to, hitting, kicking, biting, and throwing objects. The research participant will engage in yoga once in the morning, and then throughout the day when a disruptive behavior occurs. The researcher

seeks for yoga activities to help decrease the amount of disruptive behaviors that occur due to poor communication, and increase the use of a communication tool. This can be done through the linear reaction of incorporating yoga and a communication choice board into the research participant's daily schedule, as illustrated in Figure 1. More specifically if a disruptive behavior occurs after a task has been presented to the research participant, then the research participant will be guided through a yoga activity, given the option of communication, resume the previous task, and then receive the item selected from the communication board. Thus decreasing disruptive behaviors, through yoga and communication. The following research question guided the present study: How does yoga as a CAM influence behavior and communication skills?

Figure 1. The Researcher's Purpose of the Present Study.



CHAPTER 4: METHODOLOGY

Sample

The Institutional Review Board at East Carolina University approved this study on February 15, 2017, and the Institutional Review Board at East Carolina University approved an amendment of this study on April 10, 2017. This study was based on a fifth grade student at rural North Carolina elementary school, who had been diagnosed with severe autism. The student is a male and was recruited by the researcher on March 7, 2017. A purposeful sampling technique was implemented for recruitment since a research participant with severe autism symptoms was desired for participation in the study due to previous research. Previous study results indicated that children participating in yoga activities showed an increase in non-verbal skills, and behaviors (Koenig, Buckley-Reen, & Garg, 2012; Rosenblatt et al., 2011; Scroggins et al., 2016).

Communication and behavior are two areas that are used to diagnose autism, and severity levels are assessed in diagnostic criteria as well (American Psychiatric Association & DSM-5 Task Force, 2013). The researcher wanted to observe a research participant that displayed severe non-verbal communication and behavior symptoms. The researcher sought to observe if yoga would be effective on a research participant with severe autism because any amount of improvement could greatly impact the quality of life of that child. Although all students in a class were a part of the yoga intervention, data were only collected on one student. The research participant was identified for the present study due to the severity of communication and behavior symptoms. The research participant was the only student in the classroom selected that was non-verbal, and had frequent disruptive behaviors when compared to classroom peers. The

criteria to participate in the present study required an elementary student to have a diagnosis of autism spectrum disorder.

In the present study, the researcher observed the research participant's disruptive behavior, and operationally defined disruptive behavior as any behavior that negatively affects the classroom environment. Behaviors can include, but are not limited to, hitting, yelling, kicking, biting, and throwing objects. The DSM-V states that an individual with autism has deficits in communication and social skills. These deficits can be manifested in social-emotional reciprocity, non-verbal communication behaviors, and developing, maintaining, and understanding relationships (American Psychiatric Association & DSM-5 Task Force, 2013). The present study focused on an individual's communication skills, and defines communication skills as the ability to which an individual can use words, sounds, signs, or behaviors to express or exchange information, ideas, thoughts, feelings, etc. to someone else (Merriam-Webster, Incorporated, 2015). The present study used a single-subject design to view the effectiveness of the intervention. The data collection period started on March 8, 2017, and ended on April 26, 2017 for a total of 6 weeks or 30 school days of intervention.

Measure

Data for the present study were collected through observation in the classroom setting and preexisting psychological evaluations, provided to the research team through access to research participant's current Individualized Education Program (IEP). The research participant's social, emotional, and cognitive developmental age was obtained from recent psychological testing that was administered by the school psychologist throughout the month of January 2017. Observational data were collected on behavior and communication March 8, 2017 to April 26, 2017.

A behavior log was kept during baseline and intervention phases to monitor the student's disruptive behavior for six weeks. The instructional assistant logged data on behaviors and communication of the research participant, and was trained to log data by the researcher. The researcher demonstrated how to log behavior and communication and gave the instructional assistant examples to follow. Immediately following disruptive behavior, the classroom instructional assistant documented information on disruptive behaviors through a behavior log for the research participant. The behavior log consisted of the antecedent (what happened before the behavior), the behavior, and the consequence (what happened after the behavior). Observational data were collected on communication using a communication log. The researcher and the instructional assistant documented how frequently the research participant used a communication device ("I want..." board), what the research participant wanted, and whether the research participant independently used the board or had to be prompted to communicate through the board. The communication log was used to collect data on the date, time, prompt, and item selected. The researcher wanted to document how frequently the research participant used the communication device, the times that it was used, whether a prompt was needed for the research participant to use the board, and what the research participant wanted to communicate.

Research Design

The present study used an A-B single subject design with yoga being used during the intervention period. Phase A was the baseline portion of the study, and no intervention was given at this time. Phase B was the intervention phase. The intervention that was used was yoga. Phase A lasted two weeks or 10 school days, and Phase B lasted four weeks or 20 school days. Data were collected at the beginning of Phase A using the research participant's current

IEP, behavior log, and communication log. Data were collected throughout the study on behavior and communication through observation logs. At the end of Phase B, all observational data were analyzed.

Procedures

Permission to conduct this research was granted by the Institutional Review Board (IRB) at East Carolina University (Appendix A). Once receiving IRB approval, an amendment had to be made due to the timeline of the intervention phase being interrupted by the research participant's spring break. Permission to amend the present study was obtained from the Institutional Review Board (Appendix B). After receiving IRB approval, the research participant was selected to be a part of the study, based on the criteria created by the researcher, and parent consent was obtained (Appendix C). The researcher (also known as the teacher of the classroom) shared the research participant's schedule (Appendix D) and purpose of the study with the parents, the instructional assistants, and the principal of the elementary school that was selected. After receiving parental consent, baseline data was collected.

Baseline phase. Baseline data included results of psychological evaluation on the research participant's social, emotional, and cognitive developmental age. Results of the psychological evaluation were obtained from the research participant's IEP file. The demographic survey was completed using information from the research participant's IEP file (Appendix E). The psychological evaluation that was conducted by the school psychologist was completed on April 21, 2017. The instructional assistant collected a data log containing information on research participant's behavior and communication. The behavior log used was an ABC behavior chart and it obtained information on what occurred before the behavior, what the behavior was, and what occurred after the behavior (Appendix F). The communication log

collected information on whether or not the research participant initiated or was prompted to use the communication choice board, how frequently the research participant used the communication choice board throughout the study, and what the research participant indicated he wanted through use of the communication choice board (Appendix G). The researcher created the communication choice board, and obtained choices of items in the classroom the research participant may desire (Appendix H). During baseline the researcher did not prompt the research participant to use the board. However, the board was on the research participant's desk to use if the research participant desired to do so.

Once baseline data were collected, the research participant began doing the yoga activities on a daily basis for the remainder of the data collection period. The researcher learned each yoga pose used for the present study through a certified yoga instructor during baseline. The researcher taught the instructional assistant each pose during the baseline period and poses were practiced each day at 3:30 p.m. until the intervention phase began. The researcher demonstrated each pose for the instructional assistant, and corrected the form of the instructional assistant before the certified yoga instructor observed. Before the intervention phase began, a certified yoga instructor observed the researcher and instructional assistant completing yoga poses, and corrected any mistakes that were made during the observation at the end of baseline week to prepare for the intervention phase.

Intervention phase. Yoga was completed in the morning at 8:00 am. At this time in the academic day, students have finished breakfast but have not begun any academic work. The classroom instructional assistant led classroom students through yoga poses, while the researcher guided the research participant through the yoga pose one-on-one. The yoga sessions with the research participant were videotaped once a week, on Wednesday. Wednesday was selected

because it was the first day yoga was introduced, and the last day yoga was done for the intervention period. After recording was completed, it was transferred to ePirate and deleted from the device used to record. The yoga session consisted of a combination of breathing exercises and yoga poses, once a day, for approximately five minutes per session. The poses consisted of five yoga poses: sitting pose, cat pose, downward dog, tree pose, and corpse pose. During each pose, the research participant and classroom students held each pose for three to five breaths (Table 4). These poses can help improve research participant's focus and attention, sensory information processing, communication, self-regulation, motor control, and help connect with the body and breath (Betts & Betts, 2006; Scroggins et al., 2016; Your Little Professor, n.d.). Throughout the school day, the research participant received one session of yoga at eight o'clock in the morning, and had the opportunity to receive multiple unplanned sessions of yoga based on his disruptive behavior. If a disruptive behavior occurred during the academic day, the research participant was directed to the carpet and the researcher guided the research participant to complete the yoga poses for five minutes. The research participant was then prompted by the researcher to use the communication choice board after the completion of the yoga poses. Immediately following disruptive behavior, the classroom instructional assistant collected information on disruptive behaviors through a behavior log for the research participant. The behavior log consisted of the antecedent (what happened before the behavior), the behavior, and the consequence (what happened after the behavior). Immediately following the research participant's use of a communication chart, the classroom instructional assistant collected data on: (a) the number of times the research participant communicated through his/her communication chart; (b) whether or not the research participant initiated communication or was

Table 4

Yoga Poses, Instruction

Pose	Instruction
Sitting Pose	<ul style="list-style-type: none"> • Sit at the front of the mat and cross your legs. Have the palms face up, with the back of the wrist resting on the knees/thigh area. • Close your eyes and take a deep breath (count to three slowly in your head) through your nose. • Hold your breath and release it slowly through your nose. • Do this five times; focus on your breath, while emptying your mind.
Cat Pose	<ul style="list-style-type: none"> • In the center of the mat, have students get on their hands and knees. • Take a deep breath in and round your back towards the sky, while trying to make your tailbone and head touch the ground. • Hold this pose for three breaths, and then move onto the next pose
Downward Dog	<ul style="list-style-type: none"> • Tuck your toes, and press your hands into the mat and lift your hips into the air • Reach your heels to the mat. The heels do not have to touch the mat. • There should be a straight line from the hips to the shoulders • Hold here for 3-5 breaths • If this is uncomfortable, you can support the child's torso until strength is gained
Tree Pose	<ul style="list-style-type: none"> • Stand and take a deep breath in • Keeping yourself as straight as possible, bend the right leg, and place the heel of your right foot on your left ankle, with the right toes on the ground (this is to help keep balance) • Slowly raise your arms over your head, and gaze forward focusing on an object or spot on the wall that is not moving. If raising your arms is not an option, leave your arms at your side, or bring your hands to touch in front of your chest. • Hold this pose for three breaths before switching to the left leg.
Corpse Pose	<ul style="list-style-type: none"> • Lay flat on your back, with your arms away from your sides. • Alternate between relaxing and tensing the body for three times each. • Lay with a relaxed body for five breaths.

(Betts & Betts, 2006; Scroggins et al., 2016; Your Little Professor, n.d.).

prompted to communicate; (c) and what the research participant communicated. At the end of the data collection period, the researcher and the research team analyzed all observational data.

Data Analysis

The present study used a visual analysis of the single subject design as the primary method of data analysis. Many single subject researchers traditionally use visual analysis. This method involves the interpretation of the level (i.e., phase), trend (i.e., rate of increase or decrease), and variability (i.e., degree of behavior fluctuation) of behavior being measured during both baseline and intervention conditions (Horner, Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, 2005). In addition to visually analyzing the single subject data, the researcher also collected data on behavior and communication through observation logs, the research participant's developmental age was obtained through a demographic survey obtained from the research participant's IEP, and results from recent psychological testing that was conducted by the school psychologist. The study results will demonstrate a success with the intervention if the research participant displays any increase in communication skills, and decrease in disruptive behavior. Any positive growth due to yoga would be considered a success due to the positive impact any amount of progress would have on research participant's overall well-being.

CHAPTER 5: RESULTS

Demographics

The researcher used a demographic survey in this study to obtain information from the research participant's IEP, and indicated that the research participant selected for this study was an 11-year-old, male, in the fifth grade. Based on parent report and the research participant's IEP file, both indicated that the research participant had a developmental age ranging from 1-2 years old. The research participant was diagnosed with autism that required very substantial support for social communication and restricted, repetitive behaviors. Research participant received speech services for communication delays, and was served in the self-contained classroom for children with autism. A summary of demographic results are reported in Table 5, presented below.

Phase A (Baseline)

Phase A was the baseline phase and there was no intervention done during this time period. During Phase A, the researcher and instructional assistants in the self-contained classroom for children with autism collected data on the research participant's disruptive behavior, and his use of the communication choice board that was present on the research participant's desk. The baseline data that were collected through an ABC (antecedent-behavior-consequence) behavior chart indicated that the research participant engaged in disruptive behaviors 10 times over a two-week period of time. Duration of disruptive behavior ranged between one to two minutes, and occurred between one to three times a day during Phase A. Four of the disruptive behaviors observed occurred between 8:45 and 9:45 a.m. Four of the disruptive behaviors occurred between 12:55 and 2:50 p.m. The other two disruptive behaviors that were observed occurred at alternate times. Overall, the disruptive behaviors that were

Table 5

Demographic Survey Results

Gender	Age	Developmental Age	Grade	Social Communication Severity	Restricted, Repetitive Behaviors Severity	School Services	School Setting
Male	10	1-2 years old	Fifth	Level 3: Requiring very substantial support	Level 3: Requiring very substantial support	Speech	Self-contained

observed during Phase A included screaming, hand hitting, running, and stomping feet (Table 6). No prompts were given to use the communication choice board during the baseline phase. During Phase A, the research participant did not use the communication choice board at all to communicate with staff members.

Phase B (Intervention)

Phase B was the intervention phase, and started on March 22, 2017. Yoga was completed during the intervention phase as a form of alternative therapy for the research participant. The research participant engaged in a disruptive behavior two times during Phase B (Table 7). Both behaviors occurred at 9:25 a.m., and lasted between 1 to 2 minutes. The student screamed, and hit his hand during the behavior. Immediately following the behavior, the researcher led the research participant to the carpet to complete yoga sequence. Once yoga was completed the research participant was verbally prompted to use his communication choice board. During Phase B, a decrease in disruptive behavior and an increase in the use of the communication choice board was observed. Figure 2 illustrates the frequency of disruptive behaviors and use of the communication choice board. During Phase B, week 2, the research participant used the communication choice board without prompting from instructional staff for the first time.

Disruptive Behaviors

Overall, there was a decrease in disruptive behaviors from Phase A to Phase B. The research participant had 10 disruptive behaviors during Phase A, and 2 disruptive behaviors during Phase B. Observations and visual analysis indicate a decrease in disruptive behaviors throughout the present study (Figure 3). The purpose of the present study was to decrease the frequency of disruptive behaviors, and results indicate that there was an observed decrease between Phase A and Phase B.

Table 6

Phase A A-B-C Chart

Date	Time	Duration	Situation	Antecedent	Behavior	Consequence
3/2/17	9:00 a.m.	2 minutes	Carpet, Exercise, 6 students, 3 adults	Teacher told students it was time to exercise.	Student screamed, and hit his hand.	Teacher moved close to students, and ignored behavior. Student began to participate in exercise.
3/3/17	2:50 pm	2 minutes	Playground, 3 students, 3 adults	Teacher assistant told student to “follow her” and walked towards the car rider’s section.	Student screamed.	Teacher assistant held hand, and said, “we are walking to car.”
3/7/17	1:58 pm	2 minutes	Classroom, 3 students, 4 adults	Student was asked to sit in chair by teacher.	Student screamed.	Teacher said “try again,” pulled out students chair, and said “sit.”
3/8/17	9:39 am	1 minute	Hallway, 6 students, 3 adults, tornado drill	Student was asked to sit on knees.	Student screamed.	Teacher said, “copy me.”
3/8/17	9:43 am	1 minute	Hallway, tornado drill, 3 adults, 6 students	Student was on knees, head covered.	Student screamed.	Teacher said, “it’s okay.”
3/8/17	9:45 am	2 minutes	Hallway, tornado drill, 6 students, 3 adults	Student was on knees, head covered.	Student screamed, got up, and ran toward staff member.	Teacher assistant directed student toward classroom.
3/13/17	12:55 pm	1 minute	Classroom, 1 student, 1 teacher,	Student was putting numbers in	Student screamed and hit	Student was allowed to take a break.

			IEP Goals	order.	hand.	
3/13/17	1:10 pm	2 minutes	Classroom, 2 students, 3 adults	Student was working on language program.	Student started crying, then got out of chair screaming and hitting hand.	Student worked on puzzles on iPad. Student was asked if he wanted to play with the sand.
3/15/17	1:30 pm	2 minutes	Reading centers, 4 students, 4 adults	Student was told to switch tables.	Student screamed and stomped to table.	Teacher assistant rubbed back, and presented student with task.
3/16/17	8:45 am	2 minutes	Reading groups, 6 students, 3 adults	Teacher asked student to touch the letter that he heard.	Student screamed, and hit his hand.	Teacher promoted student to answer, and continued to the next letter.

Table 7

Phase B A-B-C Chart

Date	Time	Duration	Situation	Antecedent	Behavior	Consequence
3/23/17	9:25 am	1 min	Math group, 2 students, 1 teacher	Teacher asked student to write his name on the board.	Student screamed, and hit his hand 3 times.	Yoga
3/30/17	9:25 a.m.	2 min	Math group, 2 students, 1 teacher	Teacher asked student to fill in the blank to indicate the missing number.	Student screamed, and hit his hand two times.	Yoga

Figure 2. Frequency of Disruptive Behaviors and Communication Choice Board.

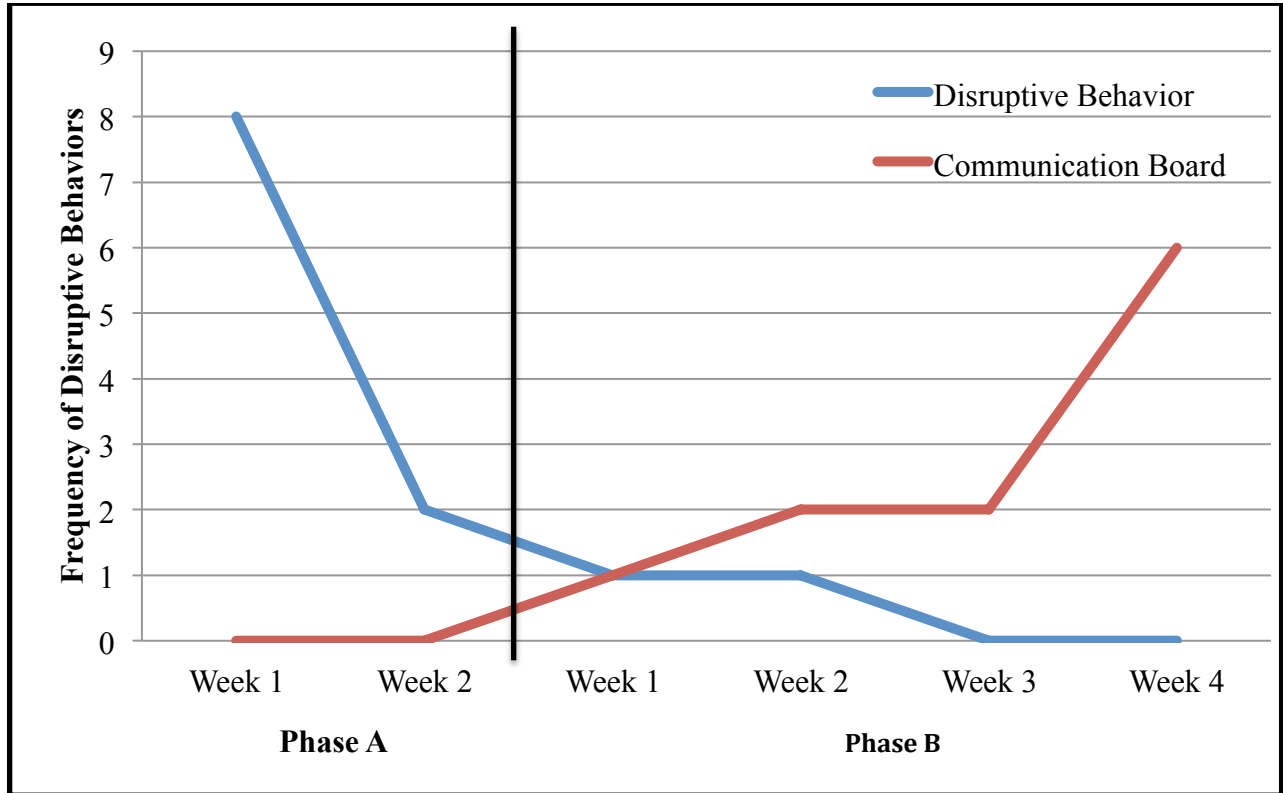
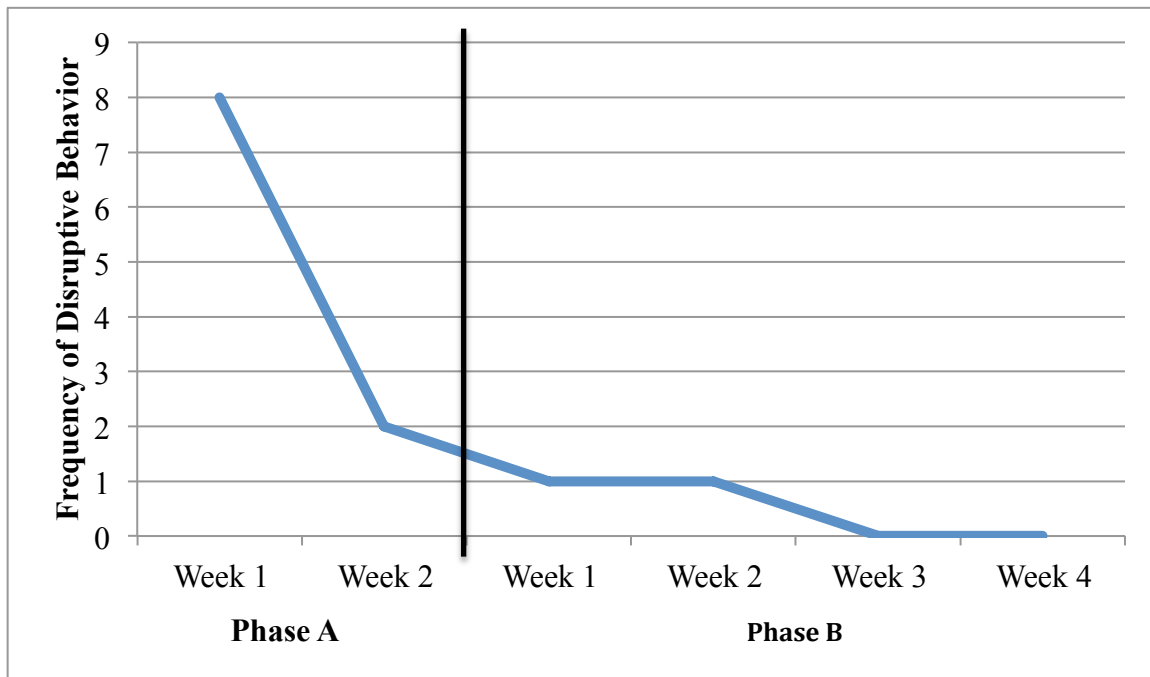


Figure 3 Frequency of Disruptive Behavior.



Communication

During Phase A, the research participant did not use his communication choice board. During Phase B, the research participant used his communication choice board 11 times (Table 8). The research participant independently used his communication choice board 9 out of 11 times during Phase B. Observations and visual analysis indicate a positive increase in use of communication choice board (Figure 4). The purpose of the present study was to increase the use of the research participant's communication choice board, and results indicate that there was an observed increase between Phase A and Phase B.

Summary of Results

The purpose of the present study was to view the effect that yoga had on disruptive behaviors and communication skills. The results demonstrated a success with the intervention

because the research participant displayed an increase in communication skills, and a decrease in disruptive behavior. The positive growth observed is a success due to the positive impact any amount of progress has on the research participant's overall well-being. Overall, there was a change in behavior and communication skills during the present study. As noted in Figure 1, there was a decrease in disruptive behaviors, and an increase in communication skills during the intervention period. Therefore, it is possible that yoga had a positive impact on the research participant, and the present study was successful at using yoga as an alternative therapy to decrease disruptive behaviors and increase communication skills. Since this was a preliminary study, more research is needed.

Table 8

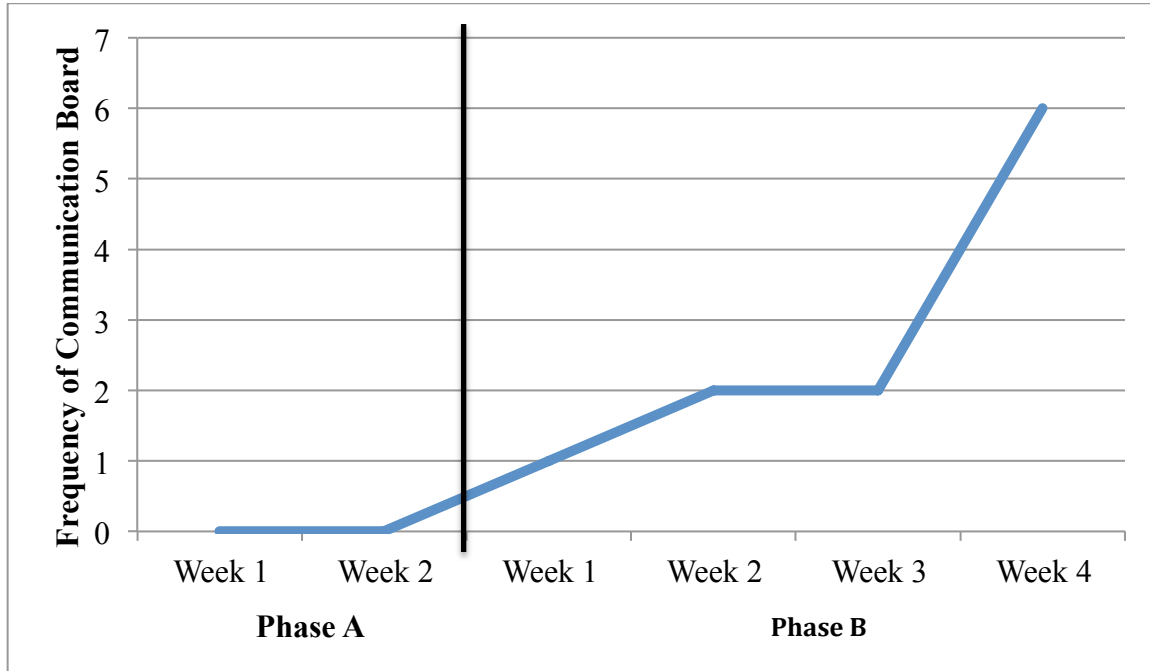
Use of Communication Choice Board

Date	Time	Prompt	Item Picked
3/23/17	9:30 a.m.	Verbal	iPad
3/30/17	9:30 a.m.	Verbal	iPad
4/5/17	10:40 a.m.	Independent	Tickles
4/11/17	8:30 a.m.	Independent	iPad
4/11/17	10:55 a.m.	Independent	Tickles
4/13/17	10:49 a.m.	Independent	Tickles
4/13/17	1:46 p.m.	Independent	iPad
4/24/17	10:45 a.m.	Independent	Tickles
4/24/17	10:55 a.m.	Independent	Tickles
4/24/17	11:05 a.m.	Independent	Tickles
4/24/17	2:25 p.m.	Independent	Tickles

**IPad is defined as an apple device that contains educational applications used in the classroom setting.*

**Tickles are defined as using touch on arms, head, and neck to promote laughter from the research participant.*

Figure 4. Frequency of Communication Choice Board.



CHAPTER 6: DISCUSSION

The findings of the current study were based on one completed demographic survey, 12 disruptive behaviors, and seven uses of the communication choice board. The results bring new data to an area that has limited research. Research indicated that classroom-based yoga may be beneficial for stress management, improving student behavior, and as a form of intervention for children with autism, intellectual disability, learning disability, and emotional disturbance (Butzer et al., 2015a; Serwacki and Cook-Cottone, 2012). The findings of the current study indicate that yoga may have had a positive impact on the research participant. During the intervention phase, where yoga was implemented in the classroom, disruptive behaviors decreased, and communication skills increased. The results of Radhakrishna (2010) and Scroggins et al., (2016) research, indicated that children showed increased skills in focus, non-verbal communication, receptive skills, and expressive emotions. Likewise, the current study results indicated an increase in communication skills. The research participant did not use his communication choice board during the baseline phase. The communication choice board was present during baseline, but the research participant never chose to use it independently. During the intervention phase, there was an observed increase in the amount of times the research participant used the communication choice board. The research participant used the communication choice board zero time during baseline, and during intervention the research participant used the board once during week 1 and six times during week 4.

Previous research indicated that yoga had been effective at improving behaviors and helping children with autism self-regulate stress (Koenig, Buckley-Reen, & Garg, 2012; Rosenblatt et al., 2011; Scroggins et al., 2016). Similarly, the results of the current study indicate a decrease in disruptive behaviors. The research participant engaged in ten disruptive

behaviors during the baseline phase. Once yoga was introduced to the research participant, there were only two disruptive behaviors observed one during week 1 and one at the beginning of week 2. After the occurrence of the disruptive behaviors during the intervention phase, the research participant was directed to the carpet area of the classroom, and guided through the yoga activities. Once yoga sequence was completed, the research participant was verbally prompted to use his communication choice board to express his wants. Although the effectiveness of yoga on children with autism is not extensively studied, the current study aids in building the foundation for the use of yoga as a CAM. Research indicates yoga has a positive impact on children with autism, and may improve disruptive behaviors and communication skills (Koenig, Buckley-Reen, & Garg, 2012; Radhakrishna, 2010; Rosenblatt et al., 2011; Scroggins et al., 2016). This study combined both behaviors and communication. This study extended previous research by demonstrating a positive impact on behavior (decreasing disruptive behavior) and communication (increasing use of communication choice board). The present study selected a research participant who was non-verbal with no way of verbally communicating with peers. This study successfully implemented a new communication device that the research participant independently used. Previous attempts at a communication device (DinoVox) for the research participant resulted in disruptive behaviors, and refusal to use device. The researcher selected an “I want” board for the research participant to use for the present study, and by the end of the intervention phase the research participant was choosing to independently use the new communication device. This study included all students in the classroom, but only collected data on the research participant. Two other students in the classroom responded well to the yoga, and enjoyed participating in yoga each morning with the class.

The results of the study revealed an improvement in decreasing disruptive behaviors and increasing communication skills. The researcher observed a decrease in disruptive behaviors and an increase in communication after classroom-based yoga was implemented as a form of alternative therapy for children with autism. During the intervention phase, the research participant required two prompts during week 1 and one at the beginning of week 2. The research participant continued to independently use his communication choice board during weeks 2, 3, and 4.

The researcher attributes the success of communication to positive reinforcement. The theoretical perspective used for the present study was a behavior learning theory called operant conditioning. Operant conditioning is the active choice to engage in a behavior. In the present study, the research participant was choosing to engage in disruptive behavior (Skinner, 1961). However, the researcher wanted the research participant to choose to engage in a non-disruptive behavior to receive positive reinforcement. The researcher's goal was to decrease disruptive behavior through the use of yoga, and then give the research participant the opportunity to communicate desires with a communication choice board. The researcher believed that the research participant would actively choose to engage in yoga, rather than a disruptive behavior, and be reinforced with the ability to communicate his desires with a communication choice board. However, after engaging in two disruptive behaviors during the intervention phase, the research participant was guided through the yoga poses, and prompted to use the communication choice board. A potential limitation could have been the research participant engaging in a disruptive behavior. However, after week 2, the research participant no longer engaged in disruptive behaviors. Therefore, yoga was no longer used after a disruptive behavior. The research participant received yoga in the morning, and throughout the day independently used

the communication choice board to express his wants and desires. The researcher believes that the yoga paired with the positive reinforcement of being able to communicate, increased the use of the communication choice board, and decreased the amount of disruptive behaviors.

In the DSM-V, deficits in social interaction, communication, and sensory hypo-hypersensitivity is a part of the diagnosis criteria of autism (American Psychiatric Association & DSM-5 Task Force, 2013). Children with autism seek treatment to reduce the severity of symptoms of autism. The present study was successful at improving two symptoms of autism, communication and disruptive behaviors. Therefore, the findings of the current study indicate that yoga may have had a positive impact on the research participant, and the present study was successful at using yoga as an alternative therapy to decrease disruptive behaviors and increase communication skills. During the intervention phase, the research participant no longer engaged in disruptive behaviors and independently chose to use the communication choice board. The results demonstrated in the present study were not only huge progress for the research participant, but also progress in the field of research for children with autism. The pairing of operant conditioning, autism, disruptive behavior, and communication need to continue to be explored and expanded on. The positive results indicate the need to continue to grow this field of research to help not only children with autism, but also potentially children with or without disabilities.

Limitations and Future Research

This study embarked on new areas of research and there was limited research on the research topic. The present study utilized a small sample that met the participation criteria and created the foundation study using a single subject design. The present study demonstrated success, and indicated there may be a relationship between yoga, disruptive behaviors, and

communication. Future research needs to continue to discover the effectiveness of yoga as an intervention for children with or without disabilities. In future studies, researchers may want to use a larger sample, and broader diagnostic criteria in hopes to strengthen the use of yoga as an evidence based practice.

The current study used a single subject AB design. An AB design consists of one baseline phase, and one intervention phase. Due to the design used in the current study, only correlations could be made between two variables. If multiple intervention phases were used in the study, then results could have demonstrated causations between two variables (Byiers, Reichle, & Symons, 2012). With the AB design it is more difficult to control for extraneous variables because the intervention phase is only introduced once. However, the AB design allows researchers to take that initial step in data collection and start building the foundation for a new research topic. Once the foundation of yoga as an alternative therapy for children with autism has been built, various research designs could be used to reduce limitations and strengthen the study. This study was a foundation study, and further research is needed to continue to build on what this study has found. This study opens new doors and opportunities for children with autism, and future research needs to strengthen the foundation by exploring this topic with various research designs.

The communication choice board used in the present study was new to the research participant, and was not introduced to the research participant before the intervention phase. The new communication choice board could be a potential limitation to the present study due to the effect the new communication choice board could have on the results. Future research may want to introduce the communication choice board before the intervention phase began. Another limitation related to the communication choice board, is the prompts that were given to the

research participant during the intervention phase. Prompts to use the communication choice board were only given to the research participant during the intervention phase. The communication results in the present study may have been different if prompts were given during the baseline phase, as well as the intervention phase.

Positive reinforcement could be a potential limitation that future researchers may want to account for in future studies. The research participant may have been reinforced from experiencing the selection on the communication choice board. The positive reinforcement from the communication choice board may have affected the relationship of yoga and autism. In the future, using the communication choice board during baseline and intervention phase may reduce the likelihood that this limitation will occur.

Lastly, the duration of study was in the typical range for intervention, but could be a limitation. The current study took place over a 6-week period. Previous research that used yoga as an intervention for children with autism varied in research duration from 4 weeks, 8 weeks, 16 weeks, and 10 months. Although the current study was not as short as one of the previous studies, results could be strengthened from a longer baseline and intervention period. In the future, it may be beneficial to collect data for a whole school year. Researchers could use the first two nine-weeks to collect baseline, and then introduce the intervention for the remainder of the year. Future researchers could also implement a multiple intervention and baseline phases to strengthen the results of the study. To expand upon this limitation, during the baseline phase there were 8 disruptive behaviors during Week 1 and only 2 disruptive behaviors during Week 2. Therefore, a trend could not be established. The baseline period should have been extended as the results. The duration of the baseline phase is a limitation, and needs to be addressed in future research.

Based on the limitations described, it is important to keep in mind that the results of the current study are correlations based on observational data. A more rigorous study of the effect of yoga on children with autism should be conducted to generalize this research further. Future researchers could potentially use special education classrooms, as well as regular education classroom. A larger, random sample should be used with various types of research designs to strengthen results, and show significant causations. This study observed great results, and a positive difference was observed in the research participant once yoga was implemented on a daily basis. Future studies need to take this foundation study and broaden it so we, as researchers, can help children with autism manage their symptoms with an intervention that meets all of their needs. Larger sample sizes, various research designs, and longer intervention periods can help strengthen the research on yoga as an intervention. Our goal for the future should be to make yoga an evidence-based practice for children with autism because it may have a positive impact on the life of children with autism.

Conclusions and Implications

The current study was able to provide support, consistent with previous literature, illustrating the potential benefit of yoga on children with autism. The study begins to fill a gap in the current literature, by building the foundation on the benefits of yoga as an alternative therapy to decrease disruptive behaviors and increase communication skills. This study demonstrated a positive change in the research participant. Over a 6-week period of time, disruptive behaviors decreased from 8 to 0, and the use of the communication choice board increased from 0 to 6. These results create a great foundation to a research topic that has very little literature to support yoga as an intervention. The current study and previous research provide further insight to the benefits of yoga in the classroom setting. Teachers of all children

should consider using yoga in the classroom to view the effects that it may have on students.

This study observed an improvement in disruptive behaviors and communication in children with autism, but with further research it could be proven that yoga may be beneficial for children with or without disabilities.

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APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB
To: [Lindsey Floyd](#)
CC: [Sandra Triebenbacher](#)
Date: 2/15/2017
Re: [UMCIRB 16-001916](#)
The Effects of Yoga on a Male Child with Autism Spectrum Disorder

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 2/15/2017 to 2/14/2018. The research study is eligible for review under expedited category #6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

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 submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

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:

Name	Description
Demographic Survey	Surveys and Questionnaires
Parent Consent Form	Consent Forms
The Effects of Yoga on a Male Child with Autism Spectrum Disorder	Study Protocol or Grant Application

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

APPENDIX B: INSTITUTIONAL REVIEW BOARD AMENDMENT APPROVAL

Notification of Amendment Approval

From: Social/Behavioral IRB
To: [Lindsey Floyd](#)
CC: [Sandra Triebenbacher](#)
Date: 4/10/2017
Re: [Ame1_UMCIRB 16-001916](#)
[UMCIRB 16-001916](#)
The Effects of Yoga on a Male Child with Autism Spectrum Disorder

Your Amendment has been reviewed and approved using expedited review for the period of 4/10/2017 to 2/14/2018. 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. A continuing or final review must be submitted to the UMCIRB prior to the date of study expiration. The investigator must adhere to all reporting requirements for this study.

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
Updated Version 2(0.01)	Study Protocol or Grant Application
Updated Version 2 Parent Consent(0.01)	Consent Forms

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

APPENDIX C: PARENT CONSENT FORM

East Carolina University



Parental Permission to Allow Your Child to Take Part in Research

Information to consider before allowing your child to take part in research that has no more than minimal risk.

Title of Research Study: The Effect Yoga has on Disruptive Behavior and Communication Skills in a Male Children with Autism Spectrum Syndrome

Principal Investigator: Lindsey Lee

Institution, Department: East Carolina University, Department of Human Development and Family Science

Address: 969 Woodland Church Rd., Albertson, NC 28508

Telephone #: 252-560-5836

Study Coordinator: Sandra Lookabaugh; Sheresa Blanchard

Telephone #: 252-328-4276; 252-737-2075

Please **PRINT** clearly

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research. If you choose for your child to take part in this research, a copy of the first page of this document will be included in your child's Individualized Education Program (IEP).

Why is my child being invited to take part in this research?

The purpose of this research is to view the effect yoga has on disruptive behaviors and communication skills. Disruptive behaviors are any behaviors that negatively affect the classroom environment. Behavior can include, but is not limited to, hitting, yelling, kicking, biting, and throwing objects. Your child is being invited to take part in this research because your child is a student at Wallace Elementary School with severe autism. The decision for your child to take part in this research will also depend upon whether your child wants to participate. By doing this research, we hope to learn how yoga as a form of alternative therapy influences behavior and communication skills

If you and your child agree for him/her to volunteer for this research, your child will be the only participant in the study. All students in the classroom will participate in yoga activities, but data will only be collected on your child.

Are there reasons my child should not take part in this research?

I understand I should not agree for my child to take part in this study if he/she is unable or uncomfortable to complete yoga activities.

What other choices do I have if my child does not take part in this research?

Your child can choose not to participate.

Where is the research going to take place and how long will it last?

The research will be conducted at Wallace Elementary School in the Exceptional Children classroom for children with autism. You will need to come to Wallace Elementary School, room 14, every day school day for six weeks during the study. The total amount of time your child will be asked to volunteer for this study is 30 days over the next six weeks. There will not be space available for you to wait for your child during the research due to research occurring during the school day.

What will my child be asked to do?

Your child will be asked to do the following:

- Participant will be assessed at the beginning, during, and the end of the study.
 - Throughout the study data will be collected on the research participant's behavior and communication through a log. Anytime a disruptive behavior occurs, the instructional assistant will document what occurred before the behavior, what the behavior looked like, and what occurred after the behavior. The instructional assistant will document when the research participant uses his communication chart throughout the study. Immediately following the research participant's use of a communication chart, the classroom instructional assistant will collect data on the number of times the participant communicates through his communication chart, whether or not the research participant initiated communication or was prompted to communicate, and what the research participant communicated.
- Parents will be asked to complete a demographic survey to obtain further information on research participant.
- For 30 days, the child will be asked to complete five yoga poses (sitting pose, cat pose, downward dog, tree pose, and compose pose), each morning at 8:00 a.m. If child engages in disruptive behaviors throughout the day, the child will be asked to calm using deep breaths and then engage in yoga poses again.
- A video will be taken of participant and researcher engaging in yoga activity. The research team will be the only individuals that have access to video. The video will be used to strengthen the reliability of the intervention.

What might I experience if I take part in the research?

We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in everyday life. We don't know if your child will benefit from taking part in this study. There may not be any personal benefit to your child but the information gained by doing this research may help others in the future.

Other people who have taken part in this type of research have experienced reduced stress, an increase in non-verbal communication, an increase in expressive emotions, improved focus, and improved behaviors. By participating in this research study, your child may also experience these benefits.

Will my child be paid for taking part in this research?

We will not be able to pay you or your child for the time you volunteer while being in this study.

Will it cost me anything for my child to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

ECU and the people and organizations listed below may know that your child took part in this research and may see information about your child that is normally kept private. With your permission, these people may use your child's private information to do this research:

- The University & Medical Center Institutional Review Board (UMCIRB) and its staff have responsibility for overseeing your child's welfare during this research and may need to see research records that identify your child.
- The University's staff that is on the committee for the present study may see personal information regarding your child. The committee consists of four professors at East Carolina University.

How will you keep the information you collect about my child secure? How long will you keep it?

Rivers West 127 for three years in a locked file cabinet, and all electronic files are in a password-protected file and de-identified.

What if my child decides he/she doesn't want to continue in this research?

Your child can stop at any time after it has already started. There will be no consequences if he/she stops and he/she will not be criticized. Your child will not lose any benefits that he/she would normally receive.

Who should I contact if I have questions?

The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 252-560-5836 (Monday through Friday from 3:00 to 5:00 p.m.).

If you have questions about your child's rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971.

APPENDIX D – PARTICIPANT’S DAILY SCHEDULE

7:30-8:00 → Arrive, unpack, and eat breakfast

8:00-8:15 → Prep and complete yoga activity

8:15-9:00 → Reading Groups

9:00-9:15 → Activity

9:15-9:50 → Writer’s Workshop

9:50-10:30 → Specials

10:30-11:00 → Snack – Possible Yoga Time

11:00-11:30 → Math Groups

11:30-12:00 → Lunch

12:00-12:30 → Quiet Time

12:30-1:00 → Math Groups

1:00-1:15 → Activity – Possible Yoga Time

1:15-1:30 → Social Skills

1:30-1:45 → Social Studies/Science

1:45-2:00 → Technology/Sensory Break

2:00-2:45 → Recess

2:45-3:00 → Pack Up/Go Home

APPENDIX E – DEMOGRAPHIC SURVEY

1. Name of Person Completing Survey: _____
2. Today's Date: _____
3. Child's gender: ___ Male ___ Female
4. Child's age: ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11
5. Child's developmental age: ___ <1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7
6. Child's grade level: ___ Kindergarten ___ 1st ___ 2nd ___ 3rd ___ 4th ___ 5th
7. What are the severity levels of the research participant's diagnosis for social communication?
 - a. Level 1: Requiring Support _____
 - b. Level 2: Requiring Substantial Support _____
 - c. Level 3: Requiring Very Substantial Support _____
8. What are the severity levels of the research participant's diagnosis for restricted, repetitive behaviors?
 - a. Level 1: Requiring Support _____
 - b. Level 2: Requiring Substantial Support _____
 - c. Level 3: Requiring Very Substantial Support _____
9. What services does the research participant receive in the school setting?
 - a. Speech _____
 - b. Occupational Therapy _____
 - c. Physical Therapy _____
 - d. Hearing Services _____

APPENDIX F – ABC BEHAVIOR CHART

Time; Date; Duration of Incident	Situation: Environmental surroundings (places, activities people)	Antecedent: What occurred immediately before the behavior was exhibited?	Behavior: List observed behaviors during the incident	Consequence: What occurred immediately after the behavior was exhibited?

APPENDIX G – COMMUNICATION LOG

Date	Time	Prompt	Item Picked

Types of Prompt:

- I = Independent
- V = Verbal
- G = Gesture
- P = Physical

APPENDIX H – COMMUNICATION CHOICE BOARD

“I want...” Communication choice board Options

1. Hungry – Lunch Box Picture
2. Water
3. Trampoline
4. iPad
5. Bathroom
6. Puzzles
7. Work – School work
8. Kinetic Sand
9. Tickle
10. Not on the board
11. Finished
12. Bubbles
13. Cars
14. Dinosaur