

THE EFFECT OF YOGA ON THE TOTAL NUMBER OF OFF-TASK BEHAVIORS  
FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

By

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## ABSTRACT

### THE EFFECT OF YOGA ON THE TOTAL NUMBER OF OFF-TASK BEHAVIORS FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

Ashley Jovick

**BACKGROUND:** Autism spectrum disorder (ASD) is a complex developmental disability. Signs will usually appear during early childhood and affect a person's ability to communicate and interact with others. ASD is defined by a certain set of behaviors and is a 'spectrum condition' that affects individuals differently and to varying degrees. Two major behaviors associated with ASD are poor motor skills and sensory activities.

**PURPOSE:** The purpose of this investigation is to examine the effectiveness of yoga on reducing off-task behaviors in children with Autism Spectrum Disorder.

**METHODS:** Off-task behavior data will be taken in Baseline and Intervention Phases. Video analysis was used to track the off-task behaviors. The primary researcher and research assistant recorded the off-task behavior data at the end of each day. Analysis of the data will determine whether or not there is a beneficial correlation between yoga and off-task behavior of children with ASD.

**RESULTS:** Future researchers should continue to research the effects of Yoga on the off-task behaviors of children with ASD.

## TABLE OF CONTENTS

ABSTRACT .....	ii
LIST OF TABLES .....	iv
LIST OF FIGURES .....	v
INTRODUCTION .....	1
METHODS .....	9
RESULTS .....	17
DISCUSSION .....	31
CONCLUSION.....	34
REFERENCES .....	36

## LIST OF TABLES

Table 1. <i>Yoga for Kids poses, time in pose, and description of movement</i> .....	10
Table 2. <i>Time Sampling Recording Form</i> .....	11
Table 3. <i>Social Validity Questionnaire</i> .....	16

## LIST OF FIGURES

<i>Figure 1.</i> Participant 1: Total # of Physical Aggression Acts .....	19
<i>Figure 2.</i> Participant 1: Total # of Non-Compliance Acts.....	19
<i>Figure 3.</i> Participant 1: Total # of Verbal Outburst Acts .....	20
<i>Figure 4.</i> Participant 2: Total # of Non-Compliance Acts.....	22
<i>Figure 5.</i> Participant 2: Total # of Verbal Outburst Acts .....	22
<i>Figure 6.</i> Participant 2: Total # of Elopement Acts.....	23
<i>Figure 7.</i> Participant 3: Total # of Non-Compliance Acts.....	25
<i>Figure 8.</i> Participant 3: Total # of Verbal Outburst Acts .....	25
<i>Figure 9.</i> Participant 3: Total # of Non-Compliance Acts.....	27
<i>Figure 10.</i> Participant 3: Total # of Verbal Outburst Acts .....	28
<i>Figure 11.</i> Participant 3: Total # of Elopement Acts.....	28

## CHAPTER I

### INTRODUCTION

Reports on individuals who engage in regular exercise have demonstrated positive health benefits in both cardiovascular and cognitive functioning (Mental Health Foundation, 2017). In 2017, the Centers for Disease Control and Prevention reported that 56.7 million (i.e., 18.7%) people living within the United States have been diagnosed with some type of disability. Individuals living with disabilities, including children with Autism Spectrum Disorder (ASD), are often excluded from participating in regular exercise and therefore do not receive the same benefits of exercise as their typically developing peers (Arnell, Jerllnder,& Lundqvist, 2017). Yoga as an alternative form of exercise has benefits such as reducing stress and even increases brain activity (Arnell, et al, 2017). Yoga can be a simple alternative exercise for children with ASD, because it can be done almost anywhere and, in any way (Arnell, et al, 2017). With benefits from exercise reported, the primary researcher decided to investigate the impact of yoga for students with ASD as a way to increase on-task-time behavior.

#### Autism Spectrum Disorder

A diagnosis of ASD includes a neurodevelopmental disorder that has an innate biological basis and unknown etiology (Diagnostic and Statistical Manual of Mental Disorders -5, 2013). A child with ASD will have persistent deficits in social

communication and social interaction across multiple contexts, which are manifested by deficits in social-emotional reciprocity, nonverbal communicative behaviors used for social interaction, and deficits in developing, maintaining, and understanding relationships (DSM-5, 2013). ASD is defined by a certain set of behaviors and is a ‘spectrum condition’ that affects individuals differently and to varying degrees (i.e., Level 1, 2, 3). There is no known biological marker for ASD, but it is believed to be caused by multiple factors that could potentially include a genetic component (DSM-5, 2013). Caminha (2012) reported that 60 to 80% of children diagnosed with ASD will have sensory integration deficits, such as heightened arousal or emotional dysregulation.

### Yoga

Yoga has demonstrated as an intervention for a variety of social, emotional, behavioral and academic difficulties (Nardo & Reynolds, 2002). Yoga incorporates physical postures, breath control, mental concentration, and deep relaxation to positively affect mental health states (Zipkin, 1985). Yoga has also been reported to promote self-control, attention and concentration, self-efficacy, body awareness, and stress reduction (Nardo & Reynolds, 2002). Additionally, yoga has been suggested as a therapeutic intervention for children with psychomotor deficits (Hopkins & Hopkins, 1979). Yoga as a treatment has been successful in reducing inattention and impulsive and oppositional behavior (Bray, Kehle, Peck & Theodore, 2005).

## Off-Task Behavior

Off-task behaviors are defined as behaviors where the student completely disengages from the learning environment and task to engage in an unrelated behavior (Baker, 2007). These behaviors can cause children to lose valuable time in the classroom and cause distractions for classmates and stress for teachers (Burke, Oats, Ringle, Fichtner, & DelGaudio, 2011). Off-task behavior can also affect a child's academic performance (Mahar, 2011). Off-task behaviors often include externalizing behaviors (e.g., aggression, hyperactivity, refusal to comply with teacher expectations) which can be precursors of additional behavioral and mental health risks for children as they age, such as anxiety and depression (Barkley, 2007; Brinkmeyer & Eyberg, 2003; Janosz, Le Blanc, Boulerice, & Tremblay, 2000; Mental Health America, 2009; Reef, Diamantopoulou, Van Meurs, Verhulst, & van der Ende, 2011; Webster-Stratton & Ried, 2003).

## LITERATURE REVIEW

### Benefits of Yoga

Yoga has demonstrated promising results as an intervention for a variety of social, emotional, behavioral and academic difficulties (Nardo & Reynolds, 2002). Although previous experimental research on yoga's effectiveness specifically for children with



ASD is somewhat limited, few studies have been conducted. In a study conducted by Buckley-Reen, Garg, & Koenig (2012), they implemented an occupational therapy intervention that included yoga postures, breathing, and relaxation exercises for elementary school students with ASD and challenging and maladaptive behavior. Students who participated in the yoga intervention showed improved behavior compared with teachers' ratings of students who engaged in their daily morning routines.

Today, yoga is recognized as a mind-body medicine that integrates an individual's physical, mental, and spiritual components to ameliorate several aspects of health (Atkinson & Permuth-Levine, 2009). Yoga improves physical and psychological conditions, as well as stress and anxiety (Atkinson & Permuth-Levine, 2009). Yoga is also a relaxation technique that can decrease breathing rate, heart rate and blood pressure which may lead to the individual being more able to focus on a task (Atkinson & Permuth-Levine, 2009). These physical changes activate the parasympathetic nervous system, triggering relaxation. The continued practice of yoga brings increased parasympathetic drive, calming of stress responses, hormonal release and brain activity (Atkinson & Permuth-Levine, 2009).

Among the various physical activities for young children, yoga is considered to be a perfect exercise system, as it promotes physical health benefits, psychological well-being kinesthetic awareness (an overall sense of their body position), and an awareness of how their body is moving (Choi, Gilbert, Kim, & Wee, 2016). Due to the focus on mind and body integration, yoga can increase basic motor, cognitive, and communication skills in children with developmental disabilities (including those with ASD and sensory

integration issues). Accordingly, yoga has helped children with special needs reduce their stress and anxiety, improve their immune systems, and coordinate their breathing processes. Yoga has potential to help students experiencing stress to improve their academic achievement and mental well-being (Choi, et al, 2016).

### Benefits of Exercise

Exercise on a regular basis can help you stay healthy and live longer as it aids cardiovascular development, bone density, and metabolism (Ohuruogu, 2016). Exercise has also demonstrated the ability to lower stress and how our bodies and minds deal with what's going on in our daily lives (Ohuruogu, 2016). It is recommended that children accumulate at least 60 minutes of physical activity (Longmuir, Colley, Wherley & Tremblay, 2014). There is growing evidence that too much sedentary time causes negative health risks, separate and distinct from a failure to meet these physical activity guidelines (Colley, Longmuir, et al, 2014). Specifically, screen based sedentary time can contribute to anti-social behavior (aggression or behavioral disorders) (Colley, et al, 2014). To make informed decisions, parents, caregivers and physical activity leaders must be informed of the relative benefits of exercise and the risks of sedentary behavior (Colley, et al, 2014). A physically active lifestyle is associated with many positive outcomes related to growth and development (Fisher, 2009). Children who engage in regular physical activity or exercise training have a healthier body composition and bone development is also positively influenced (Fisher, 2009). It has also been accepted that acute exercise benefits cognitive performance (Faulkner, Grigg, Lambrick, & Stoner,

2016). For children it has been suggested that cognitive performance is at its best when engaging in moderate intensity exercise, instead of low or vigorous exercise (Faulkner, et al, 2016).

The number of children with disabilities is growing and the benefits of exercise for those affected with ASD have been researched. With research stating this information, students who live with ASD benefit from incorporating yoga into their daily school schedules.

### Off-task Behaviors

For the purpose of this investigation, off-task is defined as a behavior where a student completely disengages from the learning environment and task to engage in an unrelated behavior (Baker, 2007). In a study that focuses on children with ASD and ADHD, the research describes off-task behaviors as when the child does not follow teacher directions, but engages in distractible behaviors, inappropriate use of materials or displays other problem behavior (Schafer et al, 2013). While little research has focused on on-task time behavior directly in accordance with physical activity, we know that exercise and/or physical activity has demonstrated positive results for self-esteem, depression, self-concept, emotional, behavioral and social well-being (Donaldson and Ronan, 2006).

## Purpose

The purpose of this investigation is to examine the effectiveness of yoga on reducing off-task behaviors in children with Autism Spectrum Disorder.

## Key Terms

*Autism Spectrum Disorder* – characterized by ongoing social problems that include difficulty communicating and interacting with others and repetitive behaviors as well as limited interests or activities (National Institute on Mental Health)

*Physical Activity* – any bodily movement produced by skeletal muscles that require energy expenditure (World Health Organization, 2019)

*Off Task Behavior* – where a student completely disengages from the learning environment and task to engage in an unrelated behavior (Schafer et al, 2013)

*Emotional Dysregulation* – the automatic or intentional modification of a person's emotional state that promotes adaptive or goal-directed behavior (individuals with ASD may fail to employ adaptive emotional regulation strategies and instead react impulsively to emotional stimuli with tantrums, aggression, or self-injury; (Mazefsky et al., 2013)

*Physical Aggression*- Purposely attempting to cause harm to someone or something through hitting, kicking, biting, pinching, pulling hair, etc.

*Verbal Outburst* - Yelling, screaming, knocking over items, destroying or damaging items or property, other physical or verbal incidents that significantly impact others ability to access their environment.

*Non-compliance* - Refusing to follow directions, refusals to move, refusals to make a choice, falling to the ground and refusing to move; only charted if lasting more than 1 minute.

*Elopement* - Leaving the designated supervised area without permission.

## CHAPTER II

### METHODS

#### Participants

Participants for this investigation were between 13 to 16 years of age, had a previous diagnosis of ASD and a secondary diagnosis of Intellectual Disability (ID), attended a school designed to provide services for children with disabilities, including those with ASD in Northern California. Participants were selected based on age proximity (i.e., 3 years) disability (i.e., ASD), and similar ratio of off-task behaviors demonstrated within the academic setting as reported by the classroom teacher, school principle, and paraeducators.

#### Instruments

##### “Yoga for Kids!” (Storyhive, 2017)

The yoga video (Yoga for Kids!, Storyhive, 2017) will be used in this investigation. Storyhive has support from the National Screen Institution (2014) and has brought hundreds of films to life online and around the world. The video was selected based on the total time of the video (i.e., 25 mins), number of yoga poses (13) and the simplicity of the movements. Based on the above information the primary researcher believes that *Storyhive* yoga is an appropriate instrument for this investigation. See

Figure 1 below for a complete listing of the yoga poses with a description of the required movement.

Table 1. *Yoga for Kids poses, time in pose, and description of movement*

Yoga Pose	Total Time	Description of Movement
Cow Pose	1-minute 15 seconds	On hands and knees, stretching back, breathing in pushing belly button to the floor. Then breathing out, arching the back, moving the head down.
Child's pose	15 seconds	Sitting on your heels, resting your head on the floor and your hands by your heels.
Downward Facing Dog	15 seconds	Hands and feet on the floor with the bottom up in the air.
Upward Facing Dog	15 seconds	Palms and feet still on the floor but pushing the stomach towards the floor
Mountain Pose	1-minute 50 seconds	Standing tall, hands to sides with palms facing out and focus on breathing.
Rocket Ship	30 seconds	Palms touching, interlace fingers, stretching arms over the head, jumping up in the air spreading the legs apart.
Tree Pose	1-minute 30 seconds	Lifting one foot where heel is touching one ankle, or bring foot to opposite calf, lifting arms either to center, above your head or out to the side.
Cobra	40 seconds	Laying down on your stomach, palms to the floor, lifting your chest as far as you can, and bringing your chest back to the floor.
Butterfly	50 seconds	Sitting, feet together, bouncing legs up and down, then crossing legs, stretching the back by bringing one arm back with the other arm on the knee.
Bridge Pose	1 minute	Laying on the back, bending the knees, palms are flat on the floor, lifting the gluteus up, and back down while breathing in and out.
Rock N' Roll	15 seconds	Bringing knees into chest, rock and roll your back front to back and side to side.

Time Sampling Recording Form

The time sampling recording form will tally target behaviors, number of requested breaks, as well as a notes section for the primary researcher or research assistant need to add. The 30-minute academic session is broken down into increments of five minutes to determine when off-task behaviors are most present. Total number of behaviors will be totaled at the end of each session and tracked on the data form. See Figure 2 for an illustration of the time sampling form used in this study.

Table 2. *Time Sampling Recording Form*

	<b># Off Task Behaviors Exhibited (refer to text)</b>	<b>Bx Exhibited (refer to text)</b>	<b>Notes (refer to text)</b>
<b>10:00</b>			
<b>10:05</b>			
<b>10:10</b>			
<b>10:15</b>			
<b>10:20</b>			
<b>10:25</b>			
<b>10:30</b>			
	<b>Total # of behaviors:</b>	<b>Total time off-task:</b>	



## Assessment

Participants were assessed based on their ability to remain on-task and engaged in the learning exercise for each day. Off-task behaviors will be recorded by the primary researcher and research assistants when a student disengages from the learning environment and engages in another activity or behavior. For each time an off-task behavior is demonstrated the primary researcher and research assistants will tally each time the child is off-task.

To ensure observer drift did not take place, interobserver agreement was calculated at the completion of each treatment session throughout the investigation (Kazdin, 2010). Calculating interobserver agreement requires at least two observers recording the same behavior using the same scoring system (Richards et al., 2014). For this investigation, the primary researcher and each research assistant recorded each participant's behavior during Baseline Phase 1, Intervention Phase 1, Baseline Phase 2, and Intervention Phase 2.

## Setting

This investigation took place at a school in Northern California during the Fall semester of 2018. The classroom is located in a suite, inside of a business complex building. There are six desks up against the walls and a big open space in the middle of the classroom. The door to the classroom has a window on it, but it is covered by a solid

cloth. The primary researcher will also place a sign on the door to make students, teachers, and administrators aware that an investigation is taking place.

### Target Behavior

The purpose of this investigation is to examine the effectiveness of yoga on reducing off-task behaviors in children with Autism Spectrum Disorder. These behaviors are labeled ‘problem’ behaviors, due to the nature of how they affect the child’s learning environment. By implementing the yoga program, the primary researcher is investigating the impact of a structured yoga program on the frequency of off-task behaviors in the classroom for children with ASD. Each participant will exhibit behaviors that the primary researcher deems ‘off-task’ and those behaviors will be recorded. These off-task behaviors look different for each participant. For example, one participant has a tendency of standing up during class and wondering. Other participants demonstrate defiance and engage in unrelated activities. The primary researcher identified the most prominent off-task behaviors for each participant and recorded those behaviors within the investigation.

### Research Design

This investigation will investigate the impact of a structured yoga class on the total number of off-task behaviors demonstrated by each participant in the academic setting. A withdrawal design (i.e., A-B-A-B) with two Baseline Phases and two Intervention Phases will be implemented to determine the impact of yoga on off-task behaviors for children with ASD.

### Baseline Phase 1

Within Baseline Phase 1 the primary researcher will observe and record each off-task behavior demonstrated for each participant over the span of 30 minutes. To ensure interobserver agreement the research assistant will be observing and recording all off-task behaviors at the same time. at the completion of each treatment day the primary researcher will collect the Off-task frequency sheets from the research assistant and record the data on a password protected excel file.

### Intervention Phase 1

During Intervention Phase 1, all participants will take part in the structured yoga program for a total of 30 minutes. Participants will be verbally told to follow the video instructor and do their best to complete each movement. Each participant will be provided with a yoga mat and water. The research assistant will also have a yoga mat to model the moves for the students. The primary researcher will be observing, as well as collecting data of on-task time behavior during academic time. Immediately following the yoga session, the academic session will start.

### Baseline Phase 2

Within Baseline Phase 2 the primary researcher will observe and record each off-task behavior demonstrated for each participant over the span of 30 minutes. To ensure interobserver agreement the research assistant will be observing and recording all off-task behaviors at the same time. at the completion of each treatment day the primary researcher will collect the Off-task frequency sheets from the research assistant and record the data on a password protected excel file.

### Intervention Phase 2

During Intervention Phase 2, all participants will take part in the structured yoga program for a total of 30 minutes. Participants will be verbally told to follow the video instructor and do their best to complete each movement. Each participant will be provided with a yoga mat and water. The research assistant will also have a yoga mat to model the moves for the students. The primary researcher will be observing, as well as collecting data of on-task time behavior during academic time. Immediately following the yoga session, the academic session will start.

### Data Analysis

A withdrawal design with two Baseline Phases and two Intervention Phases was used to determine the impact of yoga on the number of off-task behaviors demonstrated by each participant during the academic session by video recording. This design allows for visual analysis of the number or percentage of off-task behaviors demonstrated for each treatment session within this investigation.

### Descriptive Statistics

For this investigation the mean percentage of performance for of off-task behaviors demonstrated within each phase of this investigation will be reported. *Mean* percentage of performance will be calculated by adding up the total percentage of off-task behaviors performed during each phase, and then dividing by the total number of times the intervention was implemented and then multiplying by 100.

### Social Validity

On-site Behaviorists and Staff both completed a social validity questionnaire.

The three-item scale assessed what the research assistants and behaviorists believed that the yoga program was a positive experience for the participants, if the yoga program could be a part of the participants' daily routine and if they thought there were any other benefits, they observed from the yoga program for the participants.

Table 3. *Social Validity Questionnaire*

<b>Research Assistant / On Site Behaviorists /Paraprofessional Staff</b>	<b>Yes</b>	<b>No</b>	<b>Notes</b>
<b>1. Do you believe this yoga program was a positive experience for the participants?</b>			
<b>2. Do you believe this yoga program could be a part of the daily routine for these participants?</b>			
<b>3. Were there any other benefits that you observed from this yoga program for the participants?</b>			

## RESULTS

### Individual Results

#### Participant 1

Participant 1 is a 17-year-old male who was diagnosed with ASD (Level 2) at two years of age. Participant 1 uses limited expressive language, demonstrates high levels of echolalia and requires writing and/or AAC devices for effective and substantial communication. Participant 1 receives 12 to 16 hours of physical activity per week and has done some yoga at home and at school in the past, but it is not a part of his daily exercise routine.

Baseline Phase 1. Participant 1 exhibited behaviors of Physical Aggression (PA) and Verbal Outburst (VO). In Baseline Phase 1 Participant 1 exhibited an average of 6 acts of PA and 1 act of VO per each 30-minute work period. Participant 1 was off-task for an average of 20 minutes (67%) per each 30-minute work period in Baseline Phase 1. Verbal and gestural prompting were used to assist Participant 1 remain on task.

Intervention Phase 1. Participant 1 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 1 transitioned into his 30-minute work period. Following the Yoga session, Participant 1 exhibited 1 act of PA and 2 acts of VO on average per each 30-minute work period. Participant 1 was off-task for an average of 22:30 minutes (75%) per each 30-

minute work period in Intervention Phase 1. Verbal and gestural prompting were used to assist Participant 1 to remain on-task.

Baseline Phase 2. Participant 1 exhibited behaviors of PA, Non-Compliance (NC) and VO. In Baseline Phase 2, Participant 1 exhibited less than <1 acts of PA, 1 act of NC and 1 act of VO on average per each 30-minute work period. Participant 1 was off-task for an average of 15 minutes (50%) per each 30-minute work period in Baseline Phase 2. Verbal and gestural prompting were used to assist Participant 1 to remain on task.

Intervention Phase 2. Participant 1 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 1 transitioned into his 30-minute work period. In Intervention Phase 2, Participant 1 had an average of less than <1 acts of PA, 1 act of NC, and 1 act of VO on average per each 30-minute work period. Participant 1 was off-task for an average of 14:30 minutes (48%) per each 30-minute work period. Verbal and gestural prompting

were used to remind or assist Participant 1 to remain on-task.

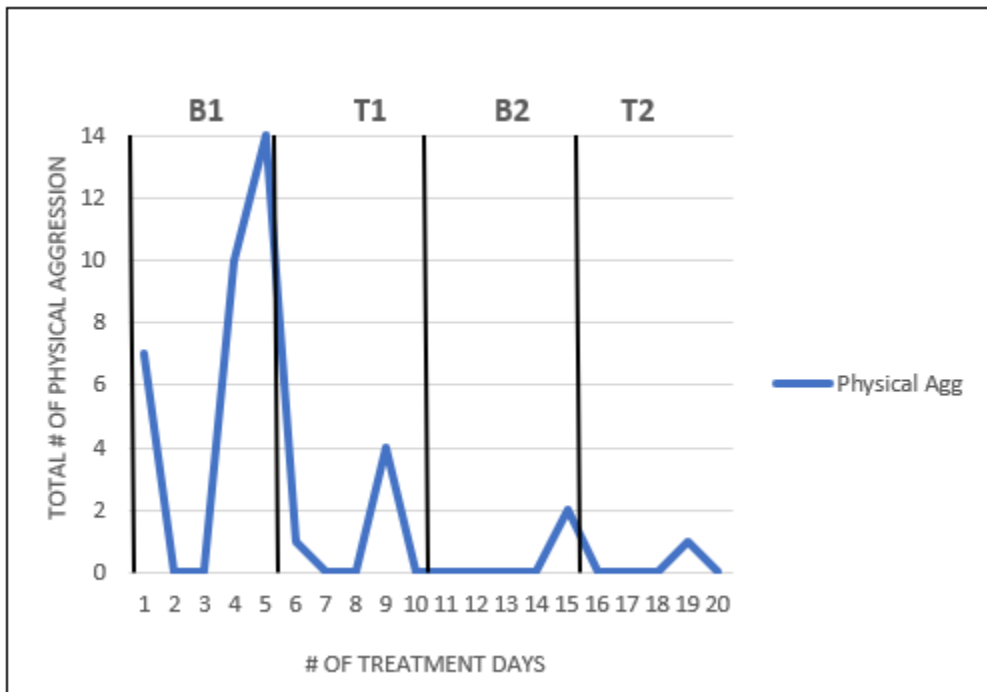


Figure 1. Participant 1: Total # of Physical Aggression Acts

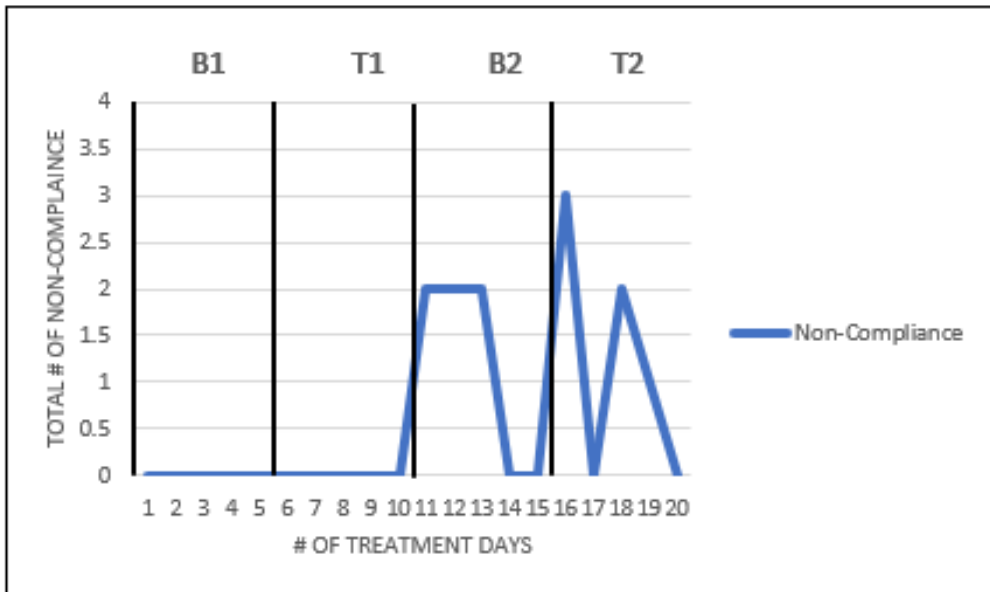
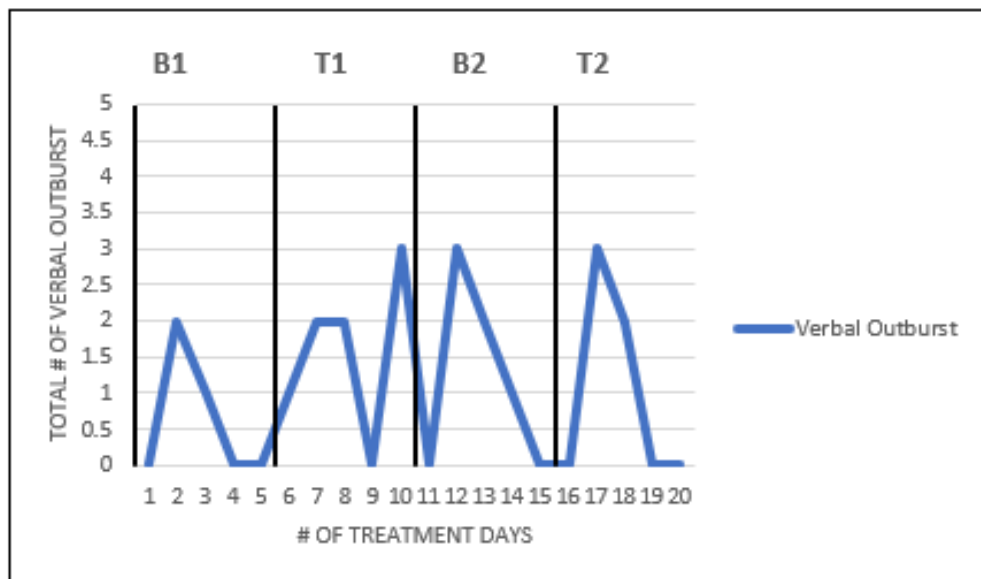


Figure 2. Participant 1: Total # of Non-Compliance Acts





*Figure 3.* Participant 1: Total # of Verbal Outburst Acts

### Participant 2

Participant 2 is a 16-year-old male who was diagnosed with ASD (Level 3) at 3 years of age. Participant 2 uses limited expressive language and communicates with the use of picture icons. Participant 2 has a good understanding of receptive language, but at times needs gestures, modeling and physical prompting to help him start and finish a task. Participant 2 engages in walking while at school and at home with his family for 10 to 12 hours a week as reported by his parents and has previously engaged in yoga sessions at school prior to this study.

Baseline Phase 1. Participant 2 exhibited behaviors of NC, VO and Elopement (E). In Baseline Phase 1, Participant 1 exhibited an average of 3 acts of NC, 1 act of VO and 1 act of E per each 30-minute work period. Participant 2 was off-task for an average

of 23:30 minutes (75%) per each 30-minute work period in Baseline Phase 1. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Intervention Phase 1. Participant 2 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 1 transitioned into his 30-minute work period. After the Yoga session, Participant 1 exhibited an average of 2 acts of NC per each 30-minute work period. Participant 1 was off-task for an average of 22 minutes (73%) per each 30-minute work period in Intervention Phase 1. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Baseline Phase 2. Participant 2 exhibited behaviors of NC. In Baseline Phase 2, Participant 1 exhibited 2 acts of NC for each 30-minute work period. Participant 2 was off-task for an average of 19 minutes (63%) per each 30-minute work period. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Intervention Phase 2. Participant 2 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 1 transitioned into his 30-minute work period. After the Yoga session, Participant 2 exhibited behaviors of NC. In Intervention Phase 2, Participant 2 exhibited 6 acts of NC per each 30-minute work period. Participant 2 was off-task for 23:30 minutes (78%) per each 30-minute work period. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

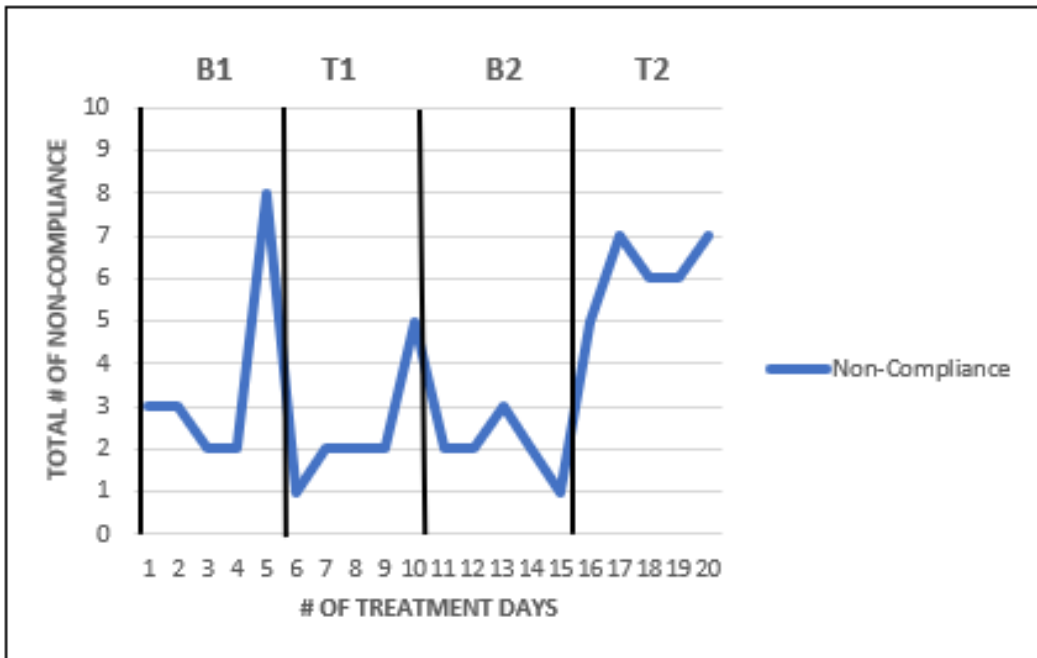


Figure 4. Participant 2: Total # of Non-Compliance Acts

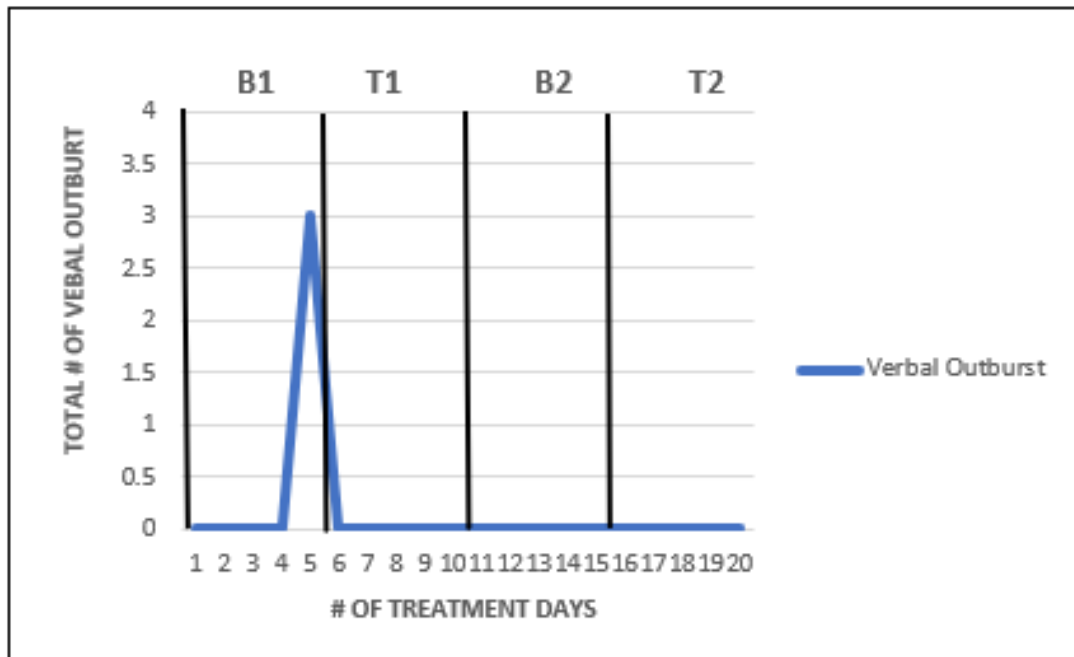


Figure 5. Participant 2: Total # of Verbal Outburst Acts

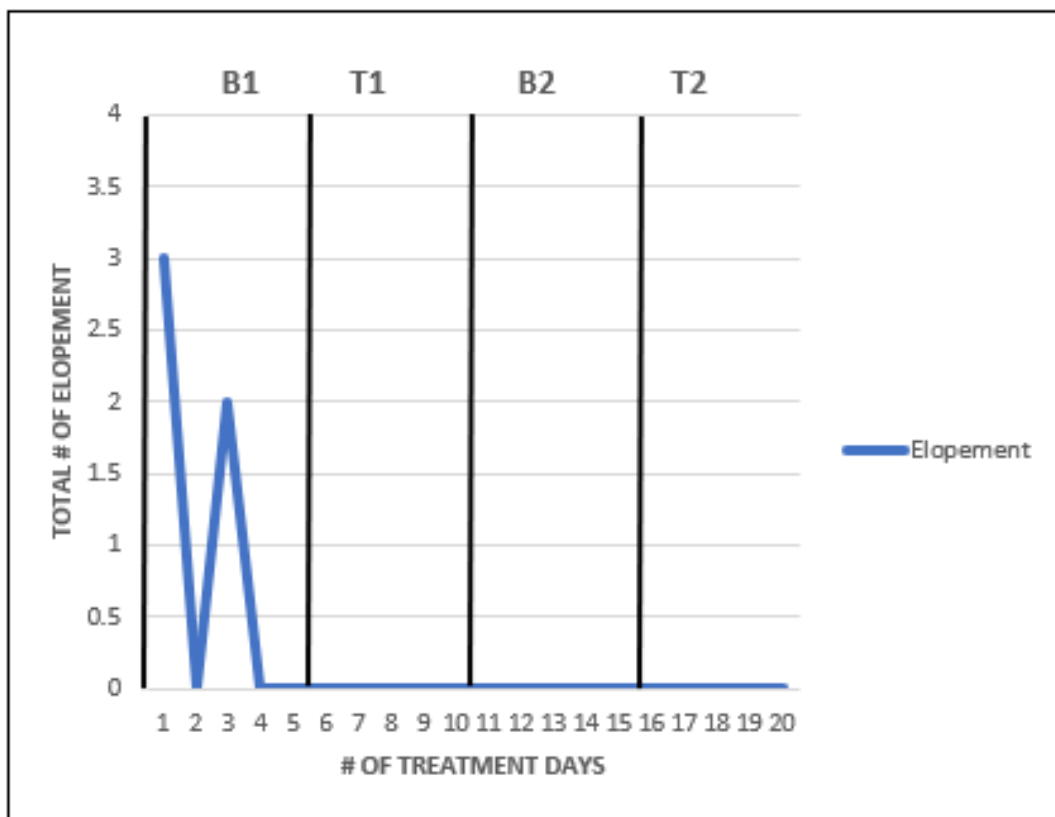


Figure 6. Participant 2: Total # of Elopement Acts

### Participant 3

Participant 3 is a 13-year-old male who was diagnosed with ASD (Level3). Participant 2 uses limited expressive language and communicates with the use of Alternative Augmentative Communication (AAC) devices / other materials to communicate. Participant 3 has a good understanding of receptive language. Participant 3 engages in walking while at school for up to 10 hours a week. Participant 2 has had no past experience in Yoga.

Baseline Phase 1. Participant 3 exhibited behaviors of NC and VO. In Baseline Phase 1, Participant 3 exhibited 8 acts of NC and 3 acts of VO per each 30-minute work

period. Participant 3 was off-task for an average of 20 minutes (67%) per each 30-minute work period in Baseline Phase 1. Verbal and gestural prompting were used to assist Participant 3 to remain on task.

Intervention Phase 1. Participant 3 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 3 transitioned into his 30-minute work period. After the Yoga session, Participant 3 exhibited behaviors of NC and VO. Participant 3 exhibited an average of 6 acts of NC and 6 acts of VO on average per each 30-minute work period. Participant 3 was off-task for an average of 21 minutes (70%) per each 30-minute work period in Intervention Phase 1. Verbal and gestural prompting were used to assist Participant 3 to remain on task.

Baseline Phase 2. Participant 3 exhibited behaviors of NC and VO. In Baseline Phase 2, Participant 3 exhibited 5 acts of NC and 3 acts of VO on average per each 30-minute work period. Participant 3 was off-task for an average of 13 minutes (43%) per each 30-minute work period in Baseline Phase 2. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Intervention Phase 2. Participant 3 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 3 transitioned into his 30-minute work period. After the Yoga session, Participant 3 exhibited an average of 4 acts of NC and 3 acts of VO on average per each 30-minute work period. Participant 3 was off-task for an average of 15 minutes (50%) on

average per each 30-minute work period. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

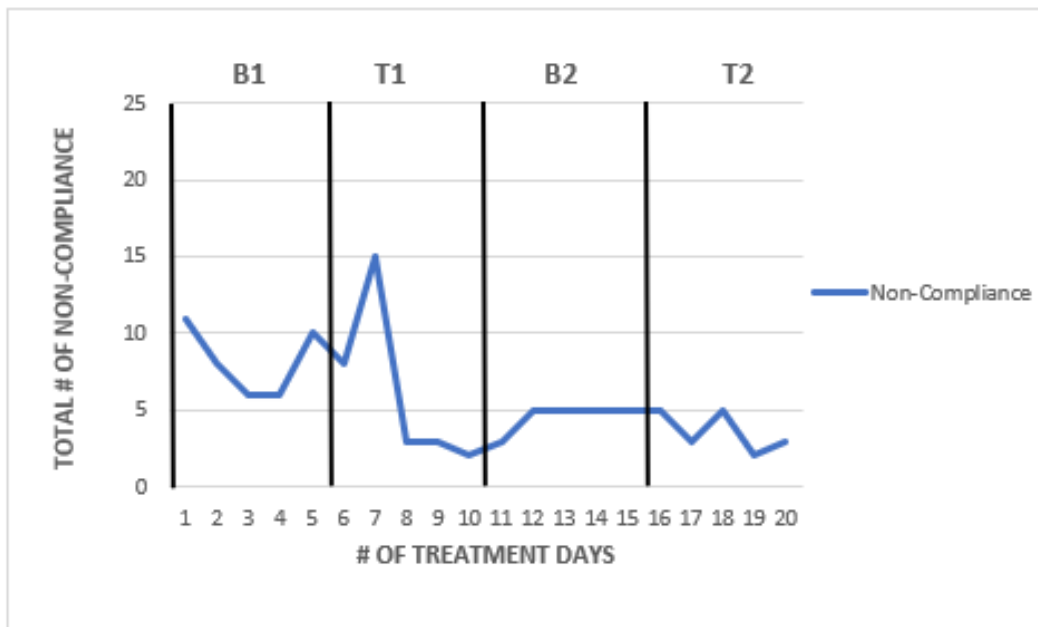


Figure 7. Participant 3: Total # of Non-Compliance Acts

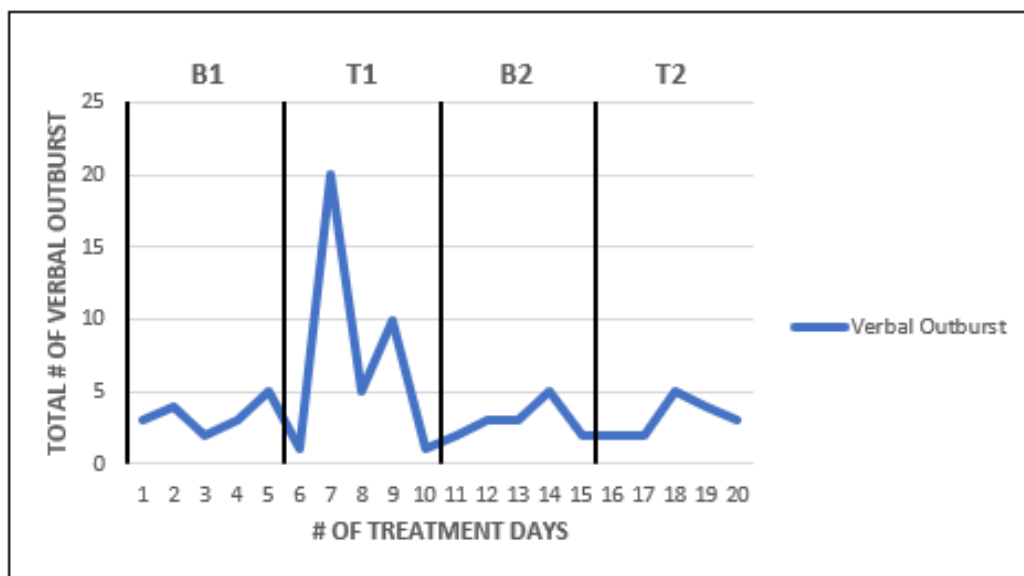


Figure 8. Participant 3: Total # of Verbal Outburst Acts

### Participant 4

Participant 4 is a 17-year-old male who was diagnosed with ASD (Level 2) at 16 months of age. Participant 2 uses limited expressive language and communicated with the use of AAC devices (iPad) and typing to communicate. Participant 2 has great receptive language. Participant 2 engages in walks while at school and participates in recreational sports at home as reported by his parents. This participant has no prior experience with Yoga.

Baseline Phase 1. Participant 4 exhibited behaviors of NC, VO and E. In Baseline Phase 1, Participant 4 exhibited an average of 4 acts of NC, 1 act of VO and 1 act of E per each 30-minute work period. Participant 4 was off-task for an average of 22 minutes (73%) per each 30-minute work period in Baseline Phase 1. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Intervention Phase 1. Participant 4 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 3 transitioned into his 30-minute work period. After the Yoga session, Participant 1 exhibited an average of 3 acts of NC, 2 acts of VO and 2 acts of E on average per each 30-minute work period. Participant 4 was off-task for an average of 18 minutes (60%) per each 30-minute work period in Intervention Phase 1. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Baseline Phase 2. Participant 4 exhibited behaviors of NC, VO and E. In Baseline Phase 2, Participant 1 exhibited 3 acts of NC, 2 acts of VO and <1 acts of E per each 30-minute work period. Participant 4 was off-task for an average of 18 minutes (60%) per

each 30-minute work period in Baseline Phase 2. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

Intervention Phase 2. Participant 4 participated in Yoga for five consecutive treatment days for a total of 30 minutes per day. At the conclusion of each yoga session Participant 3 transitioned into his 30-minute work period. In Intervention Phase 2, Participant 4 exhibited an average of 3 acts of NC, 1 act of VO and 1 act of E on average per each 30-minute work period. Participant 4 was off-task for an average of 14 minutes (47%) on average per each 30-minute work period. Verbal and gestural prompting were used to assist Participant 2 to remain on task.

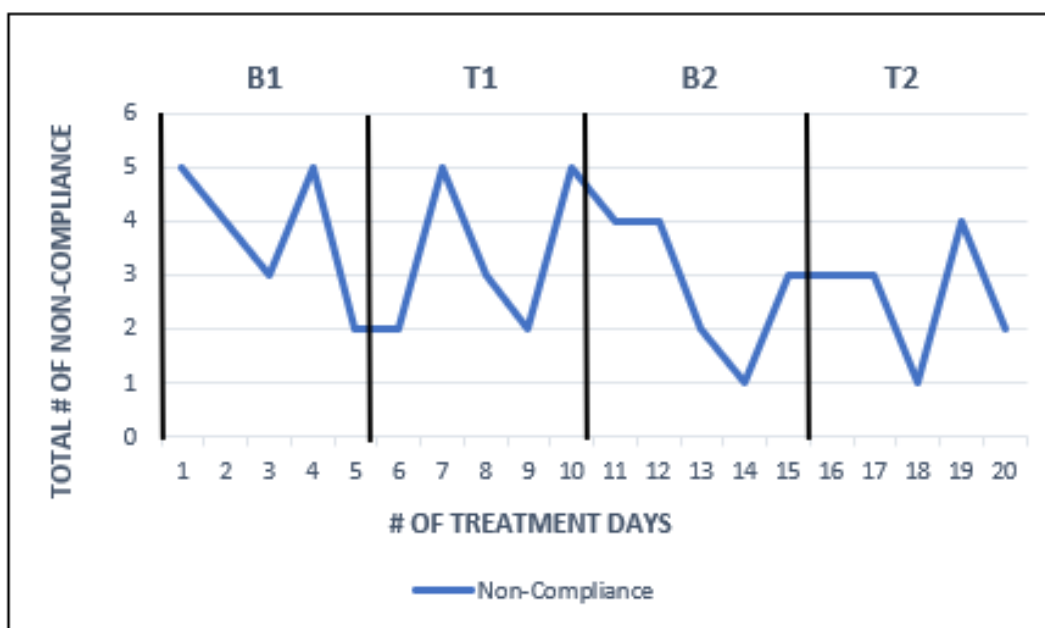


Figure 9. Participant 3: Total # of Non-Compliance Acts



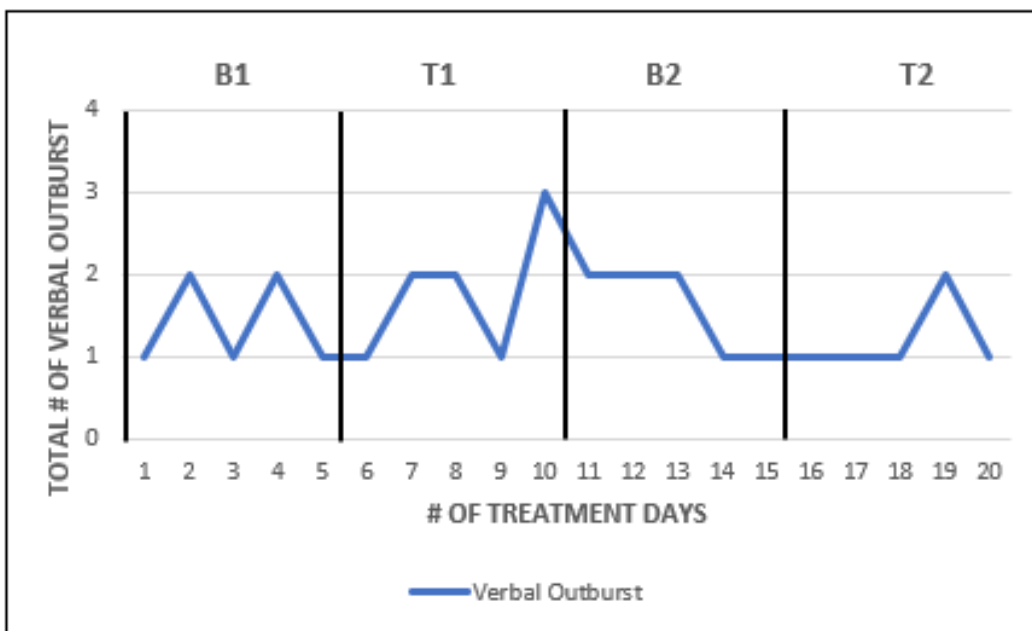


Figure 10. Participant 3: Total # of Verbal Outburst Acts

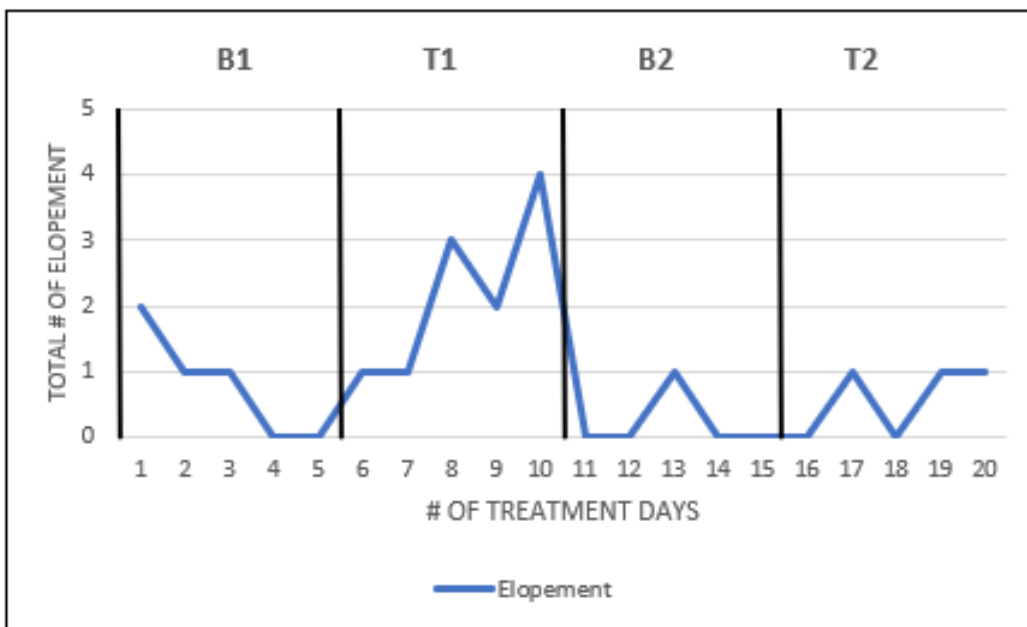


Figure 11. Participant 3: Total # of Elopement Acts

Table 4. *Percentage of Off-Task Time for all Participants*

<u>Participant</u>	<u>Baseline Phase</u> <u>1</u>	<u>Intervention</u> <u>Phase 1</u>	<u>Baseline Phase</u> <u>2</u>	<u>Intervention</u> <u>Phase 2</u>
1	67%	75%	50%	48%
2	75%	73%	63%	78%
3	67%	70%	43%	50%
4	73%	60%	60%	47%

#### Social Validity

At the conclusion of Intervention Phase 2 for each participant, all research assistants and administration completed a survey focused on the overall quality of the program, sustainability, and insight on any benefits that were observed. The answers ranged from yes to no, as well as a section for additional comments. The results from the survey demonstrated that both the research assistants and administration agreed that the yoga program was a positive experience and was a beneficial addition to their daily schedules. Additionally, the research assistants mentioned that despite the need to provide physical prompting for each of the participants throughout the yoga program, they believed that with time the students would learn how to independently participate. They also believed that the yoga program was beneficial for the participants and should be continued with daily schedules for each participant.

### Fidelity of Intervention

This intervention was delivered as intended and has a high degree of fidelity as exhibited by the primary researcher and research assistants. A procedure sheet was created to ensure all steps were taken and implemented in the same way at the same times. The Yoga program took place each day within the two intervention phases at 9:45 am and concluded at 10:15am. During the Yoga program, verbal, gesturing, and partial physical promptings were used to help keep participants on-task. Additionally, each treatment day of the yoga program was recorded and reviewed independently by both the primary researcher and the research assistant to determine the number of the off-task behaviors and total time on-task for each participant. Finally, all participants followed the same academic schedule throughout the whole study. These academic sessions were recorded for data collection.

## DISCUSSION

The purpose of this investigation was to examine the effectiveness of yoga on reducing off-task behaviors in children with ASD. The primary researcher hypothesized that the participants total number of off-task behaviors would decrease within each of the intervention phases. Results from this study were mixed as participants responded differently to the yoga intervention.

The primary research on the effectiveness of yoga reducing off-task behaviors for children with ASD supports the idea that Yoga is a beneficial intervention for children with ASD and other populations. Yoga is ideally a lifetime practice, is noncompetitive and provides an environment where taking risks and self-confidence can increase (Nagarathna, Nagendra & Radhakrishna, 2010). A study done on Integrated Approach Yoga Therapy took place over the course of two years and results demonstrated yoga having a positive impact on levels of sitting tolerance and the number of off-task behaviors (Nagarathna, Nagendra & Radhakrishna, 2010). Another study was done to analyze the effect of yoga on psycho-motor abilities among intellectually disabled children and results of the study showed improvements in motor skills such as reaction time, eye hand coordination, static balance, and agility after 3 months of yoga training (Gharote, Pise & Pradhan 2018). In a qualitative examination of yoga for middle school adolescents, the students mentioned positive effects of yoga on relaxation, stress-mood, social interaction, self-regulation of behavior, sleep and academic performance (Butzer, Conboy, Frame, Khalsa, LoRusso, Riley & Windsor 2017). A study that involved

Integrated Movement Therapy (structure and continuity, social interaction, language simulation, self-calming, physical stimulation, and direct self-esteem building) found that involving all of these factors had especially consistent and remarkable results for children diagnosed with ASD (Kenny 2002). Furthermore, research has investigated the use of complementary alternative medicine therapies (i.e, yoga) and based on reviews has concluded that it is safe to prescribe a gentle exercise program, such as yoga, as adjuvant therapy for those who suffer from chronic pain syndromes (Achilefu, Joshi, McCarthy & Meier 2017).

Specifically, to those with ASD, a study was done where they compared students who received a daily 16-week manualized yoga intervention to students who simply engaged in their normal morning routine. They found that the yoga intervention group showed a reduction in behaviors that were identified as maladaptive behaviors by teachers, including irritability, lethargy, social withdrawal, hyperactivity and noncompliance. This study also found that although there are many benefits to yoga interventions, the one main issue of these yoga-based programs that is often overlooked is the lack of intensity and duration of the intervention (Buckley-Reen, Garg & Koenig 2012). The current study concludes that continuous practice for at least a year could gradually and significantly improve the symptoms of ASD (Bhardwaj & Deorari, 2014).



## CONCLUSION

At the conclusion of this study the primary researcher believes that yoga may be an effective intervention for children with ASD. Due to a number of limitations, such as the duration of each intervention phase (i.e., 2 weeks), total number of participants (i.e., how many participants), setting, and the researchers experience running a yoga program results may not be indicative of the overall strength of the intervention. Future researchers should increase the duration of the intervention, increase the number of participants, use a different research design (i.e., A-B-A-B-A-B), possibly do some correlational research (i.e., did the participant get enough sleep the night before the yoga intervention?), change the subject of the study from children with ASD to adults with ASD, use a trained yoga therapist in addition to the primary researcher, etc.

It should be noted that throughout this study each participant received the number of treatment days for all four phases. Based on direct observation throughout this study the primary researcher observed each participant benefit from the yoga intervention. Primary benefits included physical benefits, relaxation, emotional benefits, decreases in off-task behaviors, increase in participation time during the yoga session itself, sensory regulation and social interaction.





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