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The Impact of an Autonomy-Supportive Yoga Intervention on the Self-Determination and Anxiety of Individuals with Intellectual and Developmental Disabilities: A Multi-Method Approach

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THE IMPACT OF AN AUTONOMY-SUPPORTIVE YOGA INTERVENTION ON
THE SELF-DETERMINATION AND ANXIETY OF INDIVIDUALS WITH
INTELLECTUAL AND DEVELOPMENTAL DISABILITIES:
A MULTI-METHOD APPROACH

A Thesis
Presented to
the Graduate School of
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In Partial Fulfillment
of the Requirements for the Degree
Master of Science
Parks, Recreation, and Tourism Management

by
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Accepted by:
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ABSTRACT

Individuals with intellectual and developmental disabilities are at greater risk for low self-determination and increased symptoms of anxiety. Research supports the use of autonomy-supportive interventions to promote positive health outcomes with this population. The aim of this study was to examine the impact of a six-week autonomy-supportive yoga intervention on the self-determination and anxiety of adults with intellectual and developmental disabilities. This study used a multi-method design: eight subjects participated in pre- and post- semi-structured, qualitative interviews and a quantitative assessment of anxiety. Directed content analysis identified support for four themes related to the impact of yoga participation: autonomy, relatedness, competence, and anxiety. Quantitative findings related to change in anxiety trended toward significance. The findings indicated that participating in an autonomy-supportive yoga intervention may be associated with increased self-determination and decreased symptoms of anxiety in adults with intellectual and developmental disabilities.

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CHAPTER ONE

Introduction

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines intellectual and developmental disability (IDD) as, “a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains” (American Psychiatric Association, 2013, p.33). Individuals with IDD have an increased risk of experiencing negative health outcomes, many of which are typically lifelong, in all domains of health and wellbeing, particularly in physical, mental, and social health (Boat & Wu, 2015). They tend to experience lower levels of independence and fewer social relationships than the general population (Boat & Wu, 2015). In addition, these individuals are more likely to be diagnosed with congenital heart disease, depression, and obesity (Boat & Wu, 2015).

Individuals with IDD are also at an increased risk of experiencing anxiety. Anxiety can negatively impact an individual’s overall quality of life and ability to participate in activities of daily living (Carraro & Gobbi, 2012). While the literature suggests the importance of studying the self-determination and anxiety of individuals with IDD, there has been limited research on either in relation to this population (Wehmeyer, 2005).

People with IDD also have an increased risk of experiencing low self-determination, which can lead to a poor quality of life (Carraro & Gobbi, 2012; Reid, Smiley, & Cooper, 2011; Roizen & Patterson, 2003). Self-determination can be defined as, “acting as the primary causal agent in one’s life and making choices... regarding

one's quality of life free from undue external influence" (Wehmeyer, 1996, p.18). Self-determination is considered a strong predictor of positive health outcomes, particularly among individuals with IDD (Carraro & Gobbi, 2012; Emond Pelletier & Joussemet, 2017; Nota, Ferrari, Soresi, & Wehmeyer, 2007; Reid, Smiley, & Cooper, 2011).

In the general population, research supports the use of physical activity to improve self-determination and symptoms of anxiety (Bartlo & Klein, 2011; Carraro & Gobbi, 2012; Janssen et al., 2010; Netz, Wu, Becker, & Tenenbaum, 2005; Robertson et al., 2000; Wilski, Nadolska, Dowling, McConkey, & Hassan, 2012). Studies have shown that physical activity can improve self-determination and symptoms of anxiety for individuals with IDD (Gill et al., 2013; Martinsen, 2008; Teixeira, Carraça, Markland, Silva, & Ryan, 2012).

A form of physical activity that is effective in improving psychological health outcomes is yoga (Lin, Hu, Chang, Lin, & Tsauo, 2011; Woodyard, 2011). Yoga is a type of complementary and integrative health (CIH) that connects an individual's physical, mental, and spiritual health through breathing techniques, physical postures, and meditation (Lin et al., 2011; Woodyard, 2011). There are many forms of yoga, including but not limited to Hatha yoga, Iyengar yoga, and Ashtanga yoga, with each focusing on varying physical and mental practices (Ross & Thomas, 2010). In recent years, yoga has gained more popularity in Western culture with more than 20 million people in the United States reporting practicing yoga in 2012 (Cramer, Lauche, Langhorst, & Dobos, 2016). In a study comparing the health benefits of exercise and yoga, yoga was identified as an equally effective, or even superior intervention to improve health outcomes for

individuals with health conditions (Ross & Thomas, 2010). Research has also shown that yoga can improve self-determination and symptoms of anxiety in the general population (Li & Goldsmith, 2012; Woodyard, 2011). However, this has not been studied with individuals with IDD.

Specific Aim

The aim of this study is to determine the impact of an six-week yoga intervention on the self-determination and anxiety of adults with IDD.

Definition of Terms

ASD: Autism Spectrum Disorder is a developmental disability that typically involves deficits in communication, behavior, and socialization (Charman, 2008; Lord, Cook, & Leventhal, 2000; Manning-Courtney et al., 2013).

CIH: Complementary and integrative health, the practice of conventional and non-mainstream medicine (NCCIH, 2017).

DS: Down Syndrome, also known as Trisomy 21, is an intellectual disability caused by a third chromosome that involves delays in learning, expressive language, and short-term memory (Chapman & Hesketh, 2000; Roizen & Patterson, 2003)

IDD: Intellectual and developmental disability, or a neurodevelopmental disability “characterized by significant limitation both in intellectual function and in adaptive behavior...” (AAIDD, p.1).

FXS: Fragile X Syndrome is a neurodevelopmental disability caused by a mutation of the FMR1 gene located on the X chromosome and can involve cognitive deficits, poor short

and/or long-term memory, and autism-like symptoms, including poor eye contact and repetitive behaviors (Garber, Visootak, & Warner, 2008; Hartley et al., 2011).

PI: Primary Investigator, the individual conducting this study

PS: Program Supervisor, the director of the SPRP

SDT: Self-Determination Theory

SPRP: Special Population Recreation Program, a recreation, leisure, and sports program created to meet the needs of adults with IDD in the southeast United States.

Anxiety: “The experience of excessive worry in a number of life domains which appears difficult to control... typically accompanied by agitation, feelings of tension and the activation of the automatic nervous system and can have detrimental effects on the skills, performance and daily living functions,” (Carraro & Gobbi, 2012, p.1).

Self-Determination: “Acting as the primary causal agent in one’s life and making choices and decisions regarding one’s quality of life free from undue external influence or interference” (Wehmeyer, 1996, p.18).

CHAPTER TWO

Literature Review

Individuals with IDD are at a greater risk of experiencing low self-determination and increased symptoms of anxiety. It is important to identify effective interventions for improving these psychological health outcomes (Carraro & Gobbi, 2012; Reid et al., 2011; Roizen & Patterson, 2003). This literature review will include information on 1) individuals with IDD, 2) self-determination and Self-Determination Theory, 3) anxiety, 4) physical activity, and 5) yoga.

Intellectual and Developmental Disabilities

According to the American Association of Intellectual and Developmental Disabilities (AAIDD), IDD is a neurodevelopmental disability “characterized by significant limitation both in intellectual function and in adaptive behavior...” (AAIDD, p.1), thus it is imperative to fully explore potential interventions that promote independence and enhance quality of life. A developmental disability is an umbrella term that includes intellectual disability. The term *neurodevelopmental disability* encompasses numerous diagnoses, including but not limited to IDD, communication disorders, attention-deficit/hyperactivity disorder, specific learning disorder, and motor disorders.

According to the AAIDD (2013), to be diagnosed with IDD specifically, an individual must meet the following criteria:

1. “Deficit in intellectual functions, such as reasoning, problem-solving, academic learning, abstract thinking, judgment, and practical understanding confirmed by

- both clinical assessment and individualized, standardized intelligence testing” (p.12).
2. “Deficits in adaptive functioning that result in failure to meet developmental standards and sociocultural standards for personal independence and social responsibility” (p.14).
 3. “Onset of these deficits occurs during the developmental period” (p.16).

In the DSM-5, IDD is categorized by severity as mild, moderate, severe, or profound (AAIDD, 2013). Some common diagnoses associated with IDD include Down syndrome (DS), fragile X syndrome (FXS), and autism spectrum disorder (ASD).

Down syndrome. DS also known as Trisomy 21, is the leading cause of birth defects, occurring in 1 of every 732 infants in the United States (Presson et al., 2013; Sherman, Allen, Bean, & Freeman, 2007). The cause of DS is known to be a third chromosome 21 (Roizen & Patterson, 2003). Individuals are often identified as having distinct facial characteristics, which include slanting eyes, small chin, round face, flattened nose, and “low” ears, meaning the top of the ears fall below the eye line (Cornejo, Pedrini, Machado-Lima, & Nunes, 2017). In the first two years of life, infants with DS typically show delays in learning and continue to show deficits in expressive language and short-term memory as they age (Chapman & Hesketh, 2000). Individuals with DS typically experience increased anxiety and depression throughout the lifespan (Chapman & Hesketh, 2000). They are also at a greater risk for certain comorbidities, such as vision and hearing deficits, and congenital heart disease (Roizen & Patterson, 2003). Risk factors for DS may include the use of oral contraceptives and fertility drugs,

smoking while pregnant, and low socio-economic status, but the only statistically significant risk factor is increased maternal age at the time of birth (Sherman et al., 2007). In general, women are having children later in life, possibly contributing to the recent increase in the prevalence of DS (Sherman et al., 2007).

Fragile X Syndrome. FXS is the most common IDD and predictor of ASD, affecting 1 in every 3,600 individuals (Berry-Kravis, Knox, & Hervey, 2011; Hartley et al., 2011). In fact, researchers predict that 25% to 44% of individuals with FXS also have symptoms of ASD (Hartley et al., 2011). It is a neurodevelopmental disability caused by a mutation of the Fragile X Mental Retardation 1 (FMR1) gene located on the X chromosome and is most common in males (Garber et al., 2008; Hartley et al., 2011). FXS is highly and uniquely genetic, with the mutation typically being passed from male carriers to their unaffected daughters, who then pass it to their sons, who are affected by the disorder (Garber et al.). Characteristics of FXS are first apparent through mild motor and language delays (Garber et al.). Some individuals with FXS display autism-like symptoms, such as poor eye contact and repetitive behaviors (Garber et al.). These individuals may also have cognitive deficits, including low IQ, poor short and/or long-term memory, and difficulty in academic learning (Garber et al.). Males tend to be much more affected by FXS than females, who typically exhibit emotional deficits and learning disabilities, rather than limited cognitive functioning. Both males and females often experience numerous comorbidities in addition to FXS, such as ASD, anxiety, depression, obesity, and mood disorders (Garber et al., 2008; McLennan, Polussa, & Hagerman, 2011). Symptoms of FXS are typically treated pharmaceutically with

selective serotonin-reuptake inhibitors, stimulants, and atypical antipsychotics (McLennan et al., 2011), but there is no cure. The level of independence achieved in adult life varies significantly. On average, adult males with FXS experience low to moderate levels of independence in activities of daily living (ADLs), friendships, and leisure activities, while adult females tend to have moderate to very high levels of independence in the same areas (Hartley et al., 2011). However, individuals who have both FXS and ASD experience a significantly lower level of independence overall (Hartley et al.).

Autism Spectrum Disorder. ASD is one of the most common neurodevelopmental disabilities (Tyler, Schramm, Karafa, Tang, & Jain, 2011). Current research estimates that ASD affects 1 out of every 68 individuals, or 1.5% of the population, most of whom are male, as they are four and a half times more likely to be diagnosed with ASD than females (Charman, 2008; Manning-Courtney et al., 2013). Aside from its strong genetic nature, little is known about ASD, including causation and life expectancy. As the name suggests, the severity of ASD falls on a spectrum. Symptoms include social and communication deficits, repetitive behaviors, and sensory abnormalities, which typically become evident in the first three years of life (Charman, 2008; Lord et al., 2000; Manning-Courtney et al., 2013). Children with ASD may not use words to communicate, respond well to their name, maintain eye contact, engage in pretend play, seek out others, or point to objects of interest (Lord et al., 2000; Manning-Courtney et al., 2013). However, this disorder is unique to each individual, which contributes to the difficulty in diagnosing and treating it. Currently, there is no medical

marker to confirm the presence of ASD, making diagnosis dependent on patient history, behavioral observations, and assessments by a multidisciplinary team (Manning-Courtney et al., 2013). It can be diagnosed as a comorbidity with other IDD, such as DS and FXS (Charman, 2008). In fact, more than 50% of males who have FXS are also diagnosed with a form of ASD (Berry-Kravis et al., 2011; McLennan et al., 2011). ASD includes a number of disorders categorized by the severity of their symptoms on a spectrum (Brennan, Barton, Chen, Green, & Fein, 2015), some of which include Asperger's syndrome and autistic disorder. Asperger's syndrome is considered a mild form of ASD, as individuals with this disorder have poor social skills, but have an IQ over 70 and functional communication skills (Charman, 2008). Individuals with autistic disorder experience more severe symptoms, including communication and socialization deficits, repetitive behaviors, and restricted interests (Davis et al., 2011). While each form of IDD comes with its own unique symptoms, there are several common outcomes that are prevalent across all diagnoses, including poor self-determination and anxiety (Carraro & Gobbi, 2012).

Self-Determination and Self-Determination Theory

In regards to IDD, self-determination is the “determination of one’s own fate or course of action without compulsion” (Wehmeyer, 2005, p. 114). Self-determination is considered a strong predictor of positive health outcomes (Emond Pelletier & Joussemet, 2017). Research suggests the importance of promoting self-determination in the design and implementation of support services for adults with IDD (Emond Pelletier & Joussemet, 2017).

However, there has been limited research on self-determination related to this population. Of the research that has been conducted, most have been focused on individuals with learning disabilities rather than IDD (Shogren & Broussard, 2011; Wehmeyer, 2005). While some studies indicate a relationship between IQ level and self-determination, others claim that environmental and social factors are most important in promoting self-determined behavior (Emond Pelletier & Joussemet, 2017; Mumbardó-Adam et al., 2017). One study conducted interviews with individuals with IDD to determine the value they place on self-determination (Shogren & Broussard, 2011). The researchers found three common themes: 1) having the choice and control to make their own decisions, 2) being able to set and achieve personal goals, and 3) being advocates for themselves and others with disabilities (Shogren & Broussard, 2011).

Further research, particularly related to individuals with IDD, has been encouraged as students within this population have reported consistently low levels of self-determination (Mumbardó-Adam et al., 2017). Continued investigation could increase the understanding the potential benefits of self-determination within this population (Shogren & Broussard, 2011). Self-determination is broadened through the lens of Self-Determination Theory (SDT).

SDT is an evidenced-based macrotheory of human motivation, personality development, and psychological needs (Deci & Ryan, 2008; Ryan & Deci, 2017). The basic premise of this theory is that an individual's self-determination and quality of motivation lies in the fulfillment of the following needs: autonomy, competence, and relatedness (E. L. Deci & Ryan, 2008). Autonomy is the feeling of having a sense of

control and choice, while competence refers to feeling effective in achieving desired outcomes, and relatedness is the feeling of being connected to others (Frielink, Schuengel, & Embregts, 2018). According to SDT, the deprivation or fulfillment of these needs can have clear and significant consequences on an individual's psychological health and wellbeing (Deci & Ryan, 2008; Ryan & Deci, 2017).

For years, SDT has been utilized as the theoretical framework of numerous studies related to health, wellbeing, and exercise (E. L. Deci & Ryan, 2008). In a systematic review, researchers examined the relationship between SDT-based constructs and physical activity behavioral outcomes (Teixeira et al., 2012). The review focused on multiple components of SDT, particularly motivation and its relationship with autonomy, competence, and relatedness. This relationship draws attention to the idea of needs support, or what kind of support an individual requires to fulfill their needs for autonomy, competence, and relatedness. Sixty-six studies were included in the final review, 10 of which were experimental, 11 prospective, 42 cross-sectional, and three mixed methods designs. The included studies measured the relationships between the fulfillment of the basic psychological needs and exercise, self-regulation and exercise, and predictive need support and exercise. Multiple studies found autonomy to be a strong predictor of exercise. In the studies examining the relationship between need satisfaction and exercise, more than half found a positive association between perceived competence and physical activity. Several studies were included in the review that involved an SDT-based intervention and specifically aimed to increase personal autonomy through exercise. These interventions included 4-30 week exercise programs taught in an “autonomy-

supportive style,” which is discussed in further detail below (Teixeira et al., 2012, p. 22). Of the SDT-based intervention studies, the treatment groups showed statistically significant improvements related to perceived autonomy, motivation, and the satisfaction of needs for autonomy, competence, and relatedness. Overall, this systematic review found a strong relationship between predictive physical activity outcomes and SDT-based constructs (Teixeira et al., 2012).

Autonomy Support

Autonomy, an integral component of SDT, can be described as the feeling that one can “engage in an activity or cease an activity for reasons that come from within oneself and are freely chosen” (Fortier, Sweet, O’Sullivan, & Williams, 2007, p. 743). According to SDT, an individual who feels autonomous and competent is more likely to achieve desired health outcomes (Fortier et al., 2007). To promote autonomy and competence, practitioners are encouraged to implement interventions in an autonomy-supportive style, which consists of Researchers encourage the continued examination of autonomy-supportive facilitation, especially in studies that involve implementing an intervention over multiple sessions (Fortier et al., 2007). Executing an intervention in an autonomy-supportive environment is expected to increase autonomy and perceived competence, which is likely to facilitate behavioral change, and reduce symptoms of anxiety (Fortier et al., 2007).

Anxiety

Anxiety, a commonly reported condition among individuals with IDD, can negatively impact an individual’s quality of life and ability to participate in activities of

daily living (ADLs; Carraro & Gobbi, 2012; Reid et al., 2011). Anxiety is a natural response to stress, but becomes harmful when the level of anxiety is inappropriately high or persists after the threat has been removed. The condition is characterized by excessive worry and agitation that is difficult to control (Carraro & Gobbi, 2012). It can also cause physiological responses, such as increased heart rate and shortness of breath, which can inhibit physical functioning, particularly for individuals with IDD (Carraro & Gobbi, 2012).

Anxiety is the most frequently diagnosed pediatric psychiatric disorder among the generalized population, and the prevalence of anxiety is expected to be higher among individuals with IDD (Carraro & Gobbi, 2012; Davis et al., 2011; Pruijssers, Van Meijel, Maaskant, Nijssen, & Van Achterberg, 2014). Studies have shown that 31.4% of individuals with IDD experience anxiety (Reid et al., 2011). This could be related to a number of factors, including genetic predispositions, cognitive deficits, and poor coping skills (Prujssers et al., 2014). Up to 75% of individuals with FXS who have the full FMR1 mutation have comorbid psychiatric disorders, including anxiety and depression (Hartley et al., 2011). These diagnoses also affect 41% to 81% of people with autistic disorder, who are likely to be more affected by the symptoms of anxiety compared with the general population (Davis et al., 2011). While anxiety has a significant effect on children with IDD, little is known about the progression of anxiety across the lifespan of this population. Research suggests that individuals with IDD face increased anxiety, supporting the need for early intervention to reduce the effect of these symptoms (Davis et al., 2011). There are numerous interventions that aim to reduce symptoms of anxiety.

A particularly effective intervention is physical activity (Marks, Sisirak, Heller, & Wagner, 2010).

Physical Activity

The benefits of physical activity for the general population have been well-documented. With moderate to vigorous physical activity, an individual may experience reduced blood pressure and cholesterol, improved symptoms of depression and anxiety, and an increase in overall wellbeing (Janssen et al., 2010; Netz et al., 2005). Physical activity naturally promotes autonomy, and in turn self-determination, by allowing an individual to choose to participate in physical activity for pleasure, health, quality of life, and/or goal attainment (Fortier et al., 2007; Williams et al., 2002).

A systematic review explored the benefits of physical activity and psychological health (Netz et al., 2005). The review included 36 studies, of which 22 had both treatment and control groups, and 14 had treatment-only groups. The review showed a significant change in overall wellbeing in older adults, with treatment groups showing “three times as much pretest-posttest change as did control groups” (Netz et al., 2005, p. 280), which suggests that there is a strong, positive relationship between physical activity participation and psychological wellbeing.

Individuals with IDD are more likely to have lower levels of physical activity and poor nutrition, putting them at an elevated risk for obesity and cardiovascular disease, the most common cause of death among adults with IDD (Marks et al., 2010). They are also more likely to have poor social skills, which can have long-term effects on an individual’s overall well-being (Alexander et al., 2016).

Research supports the use of physical activity in improving self-determination and symptoms of anxiety (Bartlo & Klein, 2011; Bize, Johnson, & Plotnikoff, 2007; Carraro & Gobbi, 2012; Marks et al., 2010; Wilski et al., 2012). One form of physical activity that is gaining popularity in Western culture for its effectiveness in improving physical and psychological health is yoga (Van Puymbroeck, Payne, & Hsieh, 2007; Woodyard, 2011).

Yoga

Yoga is a 5,000-year-old form of mind-body medicine that connects an individual's physical, mental, and spiritual health through conscious breathing, body movements, and meditation (Lin et al., 2011; Woodyard, 2011). There are four guiding principles of yoga (Woodyard, 2011). First, the dimensions of the human body are interrelated in that the health of one dimension affects the health of the others. Second, each person's practice should be individualized according to his or her specific needs and goals. Third, healing comes from within, creating a greater sense of empowerment. Lastly, healing is dependent on the state of the individual's mind (Woodyard, 2011).

The practice of yoga is considered to have "eight limbs," which consists of ethical principles for living a life of meaning and purpose (Woodyard, 2011, p. 50). Individual yoga disciplines are developed from these eight limbs. Hatha yoga is the most frequently used discipline in the Western world. It is a physically-oriented yoga style that focuses on breathing techniques, stretching, and meditation to balance the body's energy (Cramer et al., 2016; Lin et al., 2011; Woodyard, 2011). This specific form of yoga can lead to increased muscular strength, flexibility, and cardiovascular health, while also

reducing symptoms of anxiety, stress, and depression (Cramer et al., 2016; Katzman et al., 2012; Kirkwood, Rampes, Tuffrey, Richardson, & Pilkington, 2005; Schmid, Miller, Van Puymbroeck, & DeBaun-Sprague, 2014; Van Puymbroeck, Schmid, Shinew, & Hsieh, 2011; Woodyard, 2011).

There has only been one study that specifically focuses on the impact of yoga on adults with IDD (Hawkins, Weber, Stegall, & Ryan, 2012). However, this study measured physical fitness outcomes rather than psychological health outcomes, suggesting a need for further research on the impact of yoga on self-determination and anxiety among individuals with IDD.

Yoga and self-determination. After reviewing the literature, it is clear that there is a need for research on the relationship between yoga and self-determination for individuals with IDD. One cohort study was identified that measured the effect of yoga on the flexibility, quality of life, and autonomy, a key component of self-determination, of older adults. (Deci & Ryan, 2008; Gonçalves, Vale, Barata, Varejão, & Dantas, 2011). According to the researchers, functional autonomy is related to perception, physical and mental health, and independence in daily activities (Gonçalves et al., 2011). Subjects included 83 women over 60 years old who were enrolled in the Elderly Health Program. The intervention consisted of two 60-minute Hatha yoga classes per week for 14 weeks. The classes included respiratory exercises, stretching and balance exercises, and meditation. The results of the study showed statistically significant improvements in flexibility and autonomy (Gonçalves et al., 2011).

Self-determination, along with anxiety, is considered a strong predictor of positive health outcomes, including reducing symptoms of anxiety (Carraro & Gobbi, 2012; Emond Pelletier & Joussemet, 2017; Nota et al., 2007; Reid et al., 2011). Given the lack of research regarding the impact of yoga on self-determination, it is important to explore the relationship between yoga and anxiety, as well.

Yoga and anxiety. There is a growing body of knowledge supporting the use of yoga as a therapeutic intervention to reduce symptoms of anxiety (Kirkwood et al., 2005; Lin et al., 2011). In 2005, a systematic review was conducted to determine the effectiveness of yoga in treating anxiety (Kirkwood et al.). The review included eight controlled trials (six randomized and two non-randomized) that involved yoga interventions for individuals who were described as “suffering from anxiety” (Kirkwood et al., 2005, p. 885). All studies included in the review found that yoga was strongly associated with increased psychological health outcomes, particularly anxiety ($p=.009$). While the strongest study concluded that yoga was an effective treatment of anxiety, most of the study designs discussed in the review were not of high quality, according to the researchers (Kirkwood et al., 2005).

A meta-analysis examined the effects of yoga on psychological health, quality of life, and physical health of people with cancer (Lin et al., 2011). Ten randomized controlled trials that measured the effects of yoga on psychological health on individuals with cancer were included in the final analysis. The studies used a variety of yoga styles for the interventions, including Restorative yoga, Hatha yoga, and Tibetan Style yoga. The interventions ranged from six to 24 weeks, most of which were held in a group

setting. The psychological outcomes measured in the studies included anxiety, depression, distress, and stress. Of the studies included, eight measured for changes in anxiety and all of them found a statistically significant improvement in symptoms to anxiety in response to the yoga intervention (Lin et al., 2011).

While there is extensive research on the use of yoga in reducing symptoms of anxiety in the general population (Kirkwood et al., 2005; Lin et al., 2011), no studies were identified that measured anxiety among individuals with IDD. Anxiety can have a negative effect on an individual's sense of autonomy and competence, further indicating the need for research on the impact of yoga on individuals with IDD (Carraro & Gobbi, 2012; E. L. Deci & Ryan, 2008; Nota et al., 2007).

Conclusion

Individuals with IDD are more likely to experience poor self-determination and increased symptoms of anxiety than the general population (Carraro & Gobbi, 2012; Schalock et al., 2002). Research suggests that participating in physical activity can improve these outcomes for individuals with IDD (Gill et al., 2013; Martinsen, 2008; Teixeira et al., 2012). Yoga, a form of physical activity, is a CIH intervention that may be effective in improving symptoms of self-determination and anxiety for this population (Javnbakht, Hejazi Kenari, & Ghasemi, 2009; Kirkwood et al., 2005; Moadel et al., 2007; Sareen, Kumari, Gajebasia, & Gajebasia, 2007). While the benefits of practicing yoga, particularly as a therapeutic intervention, are well-documented, there is currently no research related to the impact of yoga on the self-determination and anxiety of individuals with IDD.

CHAPTER THREE

Methods

This chapter will outline the following information: 1) study design, 2) procedure, 3) selection of subjects, 3) data collection, 5) intervention, 6) data analysis, and 7) limitations.

Design

This single-arm, QUAL+quan multi-method study (Morse, 2003) was primarily qualitative as the focus was to understand the influence an autonomy-supported yoga intervention had on self-determination and anxiety for adults with IDD. A single quantitative assessment was used to further examine the impact of yoga on anxiety and reduce the risk of fatigue among participants during pre- and post-testing, which is a commonly reported challenge when studying individuals with IDD. Interviews were conducted before and after the intervention.

A multi-method approach was selected for several reasons. There are limited quantitative measures that have been validated for this population and even fewer developed for them specifically (Esbensen, Rojahn, Aman, & Ruedrich, 2003). Additionally, the use of qualitative methods was expected to provide a more detailed explanation of the impact of the intervention being studied than a quantitative approach alone. Specifically, a multi-method design offers a more complete understanding of the impact of yoga on self-determination and anxiety of adults with IDD.

Procedure

The principal investigator (PI) initially contacted the program supervisor (PS) to discuss participant recruitment, setting, and dates of the intervention. The PI also developed an interest letter, describing the nature of the study, and gathered all necessary documentation, including consent forms, assent forms, and authorization for use of photographic/image/video/ voice recording. Following Institutional Review Board (IRB) approval, the PI met with the PS to give her necessary documentation, who then gave them to the Legal Authorized Representative (LAR) of each potential participant. The consent and authorization forms were completed by the LAR as the IRB requires consent from the LAR if the subject has a form of IDD. Potential participants with IDD completed assent forms with research assistants, indicating their agreement to participate in the study. The participants and LARs were instructed to return the completed documents within one week. The PS then collected and returned the documents to the PI. The PI scheduled a meeting with the PS in order to receive, review, and ensure that the documentation was complete. The PI stored all hardcopy documents in a locked filing cabinet.

Recruitment of Subjects

Participants were recruited from a recreation, leisure, and sports program for adults with IDD in the southeastern United States. Following Institutional Review Board (IRB) approval, each potential participant's legal authorized representative (LAR) was asked to complete a screening packet, which included the consent form, authorization for

use of image/video/voice recordings, a demographics questionnaire, and several screening tools (described below).

In order to participate in the study, individuals had to meet the following criterion: 1) be a participant of the recreation, leisure, and sports program; 2) be 18 years or older; 3) have a form of IDD; and 4) have consent from their LAR to participate. Individuals who met these criteria were asked to provide assent to a trained research assistant before the first yoga session began, indicating their agreement to participate in the study.

Individuals were excluded from the study if it was determined that it was not appropriate for them to engage in physical activity based on Physical Activity Readiness Questionnaire (PAR-Q) (Shephard, 1988). Potential participants were required to obtain additional approval from their physician if the LAR indicated a concern regarding participation in physical activity based on the PAR-Q. Potential participants were also excluded from the study if they were not able to follow verbal cues based on the Child (with Special Needs) Description of Adaptive Skills/Level of Supports screening questionnaire (Level of Support) (Dyches, 2000). This instrument asked the LAR to indicate what level of support each participant needed with specific adaptive skills, some of which included communication, self-care, and social skills. In accordance with the literature, participants who required "pervasive" support in more than half of the specified adaptive skill areas, indicated by a score of 3.54 or higher, were excluded from the study (Dyches, 2000).

Data Collection

Qualitative Data Collection. Open-ended, semi-structured qualitative interviews were conducted with participants to understand individual experiences and give each participant an opportunity to express their opinions related to the intervention and measured outcomes. The interviews were completed one week prior to and one to two weeks following the intervention to identify any change in self-determination and anxiety following the intervention. The interviews were conducted on the same day as the quantitative assessment in a private, one-one-one setting at the recreation program's facility. Participant interviews were audio- and video-record to not only increase comprehension during transcription, but to also identify any physical communication, such as pointing or performing a pose. The questions were developed by the PI and trained research assistants, based on SDT and standardized instruments that measure self-determination and anxiety (Deci & Ryan, 2008; Mindham & Espie, 2003; Sheldon & Deci, 1996; World Health Organization, 1996). While the post-test interview included questions about the participants' feelings about the intervention, the majority of the questions were the same for pre- and post-testing, some of which included:

1. Tell me about a time that you felt worried.
2. Tell me about a time that you chose to do something by yourself.
3. Tell me how you feel about the people in your life.

Comprehension is a commonly reported limitation in studies related to individuals with IDD (Esbensen et al., 2003). Communication cards were used to assist verbal and non-verbal participants in understanding the question and providing an appropriate response. When a participant had difficulty answering a question, the PI used the

communication cards to give the participants examples of appropriate answers. The PI initially developed and utilized communication cards to assist participants with comprehension during the interviews at pre- and post-test. Each question had a corresponding communication card with appropriate responses. The communication cards included pictures with words or short phrases. For example, an image of a hand giving a thumbs up was labeled with the word “good.”

Quantitative Data Collection. The Glasgow Anxiety Scale for people with an Intellectual Disability (GAS-ID) (Mindham & Espie, 2003) was selected to measure anxiety before and after participation in yoga. The GAS-ID is a self-report instrument that consists of 27 items with a 3-point Likert-type scale, where 0 = *never*, 1 = *sometimes*, and 2 = *always*. Potential scores range from 0 to 70, and higher scores indicate more anxiety. Research supports the high test-retest reliability ($r = 0.95$) and internal consistency ($\alpha = 0.96$) of this instrument (Mindham & Espie, 2003). The instrument was individually administered to each participant by a trained research assistant in an interview-style one week before the first yoga session began and one to two weeks after the intervention concluded.

Intervention

The six-week Hatha yoga intervention included one-hour sessions, held twice a week in a large room at the recreation center. The intervention was designed and implemented by a yoga therapist, two certified yoga instructors, and several trained research assistants who had recently conducted another study with many of the same participants. The instructors received autonomy support training before the yoga

intervention began. The training included understanding the meaning of autonomy support and how to create an autonomy-supportive environment.

Implementing an intervention in an autonomy-supportive style involved acknowledging and supporting participant initiatives and feelings (Fortier et al., 2007; Williams et al., 2002). According to the literature, it is also important to offer opportunities for independent decision-making, while providing a clear rationale for each option presented (Fortier et al., 2007; Silva et al., 2008). To encourage the participants to make their own choices, each session included a segment called Yogi's Choice, during which the participants were asked to choose one of two poses to perform independently. Each participant was given a picture that demonstrated the proper form of each pose and asked to perform the pose of their choosing.

In addition to Yogi's Choice, participants were encouraged to decide whether they were comfortable with receiving hands-on assistance. Participants were given a card stating that they wanted hands-on assistance during the session on one side, while the other side indicated that they did not want to receive hands-on assistance. At the beginning of each session, the yoga instructor explained how to use the card and asked the participants to place it at the top of their yoga mat. Hands-on assistance was only provided to the participants that indicated they were comfortable with it at the beginning of each session.

The curriculum for the six-week intervention (Table 1) was developed by the yoga therapist and two certified yoga instructors. The curriculum was designed to improve self-determination (autonomy, competence, and relatedness) and reduce anxiety.

The sequences became progressively more challenging throughout the six-week period. Each session was taught by one of the certified yoga instructors, who led the entire group with verbal instructions and visual demonstrations. A trained research assistant supported the instructor and demonstrated modifications. An additional research assistant provided verbal support and instruction and hands-on assistance to those who indicated that they were comfortable with it. The yoga therapist provided chair yoga for individuals who preferred to use a chair or were unable to perform the postures from a mat. Props and modifications were also provided to ensure safe and successful performance of the poses. Each session included a guided meditation (*dhyana*) at the beginning of class, reviewing the weekly intention, repetition of a mantra, breathwork (*pranayama*) and postures (*asanas*), and a final relaxation (*savasana*). Intentions were developed by the research team to further promote self-determination.

Six intentions were used over the course of the intervention, with a new intention being presented each week. The intentions were set as the theme of class and repeated as a mantra throughout class. The intentions were based on the *yamas* (philosophy) and *niyamas* (behaviors) of yoga (Adele & Jennings, 2009) and the constructs of self-determination (autonomy, competence, relatedness). The instructors frequently reminded the participants of the intention throughout each session. A complete list of the intentions can be found in Table 1.

Data Analysis

Qualitative Analysis. All qualitative data were stored on a password-protected hard drive. Qualitative data included video recordings, audio recordings, and transcribed

texts of all recorded interviews. The pre- and post-testing interviews were analyzed after the intervention concluded (Creswell & Plano Clark, 2011). Prior to analysis, each participant was assigned a pseudonym to protect their privacy.

Directive content analysis was used to analyze the qualitative data, in which each interview was transcribed and read before being hand-coded for themes. This approach examined the data for specific words and uses quotes to support the findings. The PI utilized a deductive approach during analysis, in which each transcript was reviewed and participant responses were categorized into autonomy, competence, relatedness, and anxiety.

Following analysis by the PI, the second author analyzed the transcripts using a deductive approach to establish validity. The PI and the second author reviewed the analysis together to determine levels of agreement. This content analysis was guided by the specific aim of the study, which is to determine the impact of yoga on adults with IDD related to self-determination and anxiety.

Quantitative Analysis. Demographics and quantitative data were analyzed using SPSS version 25. Frequency and descriptive statistics were used to analyze participant demographics. A Shapiro-Wilk test was used to assess normality of the data. The data distribution was considered non-normal. Therefore, a Wilcoxon Signed Rank Test was used to identify any change in the mean ranks between pre- and post-testing assessments. Due to the small sample size, percent change was also calculated to further assess change in anxiety. The following formula was used to determine percent change: $(\text{Time 2} - \text{Time 1}) / \text{Time 1} * 100$.

Fidelity. To assess fidelity, each session was digitally recorded on an iPad and analyzed by the PI to ensure that it was taught in an autonomy-supportive manner. Fidelity was assessed utilizing a checklist developed by the PI which evaluated the presence of the following items in each session: Yogi's Choice; review the cards indicating preference for hands-on assistance; set the intention for the session; provide information about poses; acknowledge and appreciate participant comments and requests; allow participants to refuse to perform a pose; allow participants to perform a requested pose; encourage participants to make their own decisions; and give participants an opportunity to recall the benefits of poses. The recordings revealed 100% fidelity throughout the intervention.

Limitations

There is limited research related to adults with IDD and even fewer studies measuring the effect of yoga on individuals within this population. To our knowledge, this is the only study to measure the impact of yoga on self-determination and anxiety of adults with IDD. This study has contributed new findings to the literature related to IDD and identified several opportunities for further research. However, this study is limited by the small sample size, and therefore, the findings are not generalizable to all adults with IDD. The use of open-ended interviews also presents limitations particularly related to comprehension. Participant responses may have been misunderstood by the researchers and the participants may have had difficulty comprehending interview questions and instrument items. It is also important to acknowledge the bias of the PI as an individual with a personal yoga practice, which could have introduced research bias into the study.

To reduce the effect of bias, the PI engaged in reflexive journaling before analyzing the data. However, it is likely that bias still influenced the analysis of the study. Furthermore, the study is limited by the influence of the researchers. The PI, research assistants, and yoga instructors had an established rapport with many of the participants due to a previous study related to yoga, which may have influenced participant responses and increased social desirability. Additionally, the findings of this study could have been limited by participants' previous experience with yoga.

CHAPTER FOUR

Article

Manuscript

The Impact of an Autonomy-Supportive Yoga Intervention on the Self-Determination and Anxiety of Individuals with Intellectual and Developmental Disabilities

Abstract

Background. The aim of this study was to examine the impact of a six-week autonomy-supportive yoga intervention on the self-determination and anxiety of adults with intellectual and developmental disabilities. Research supports the use of autonomy-supportive interventions to increase positive health outcomes with this population.

Method. This study used a multi-method design. Eight subjects participated in a pre- and post- semi-structured, qualitative interviews and a quantitative assessment of anxiety.

Results. Directed content analysis identified support for four themes related to the impact of yoga: autonomy, relatedness, competence, and anxiety. Quantitative findings related to change in anxiety trended toward significance. *Conclusions.* The findings indicate that participating in an autonomy-supportive yoga intervention may be associated with increased self-determination (autonomy, competence, and relatedness) and decreased symptoms of anxiety in adults with intellectual and developmental disabilities.

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Keywords: *recreational therapy, yoga, autonomy support, intellectual and developmental disability, anxiety, self-determination, autonomy, competence, relatedness*

Introduction

Self-determination is defined as the “determination of one’s own fate or course of action without compulsion” (Wehmeyer, 2005, p. 114). Individuals with intellectual and developmental disabilities (IDD) are at an increased risk of experiencing low self-determination and anxiety (Reid, Smiley, & Cooper, 2011; Roizen & Patterson, 2003). In general, self-determined individuals are more likely to achieve positive health, indicating the importance of promoting self-determination through the design and implementation of interventions for adults with IDD (Emond Pelletier & Joussemet, 2017). An intervention focused on developing self-determination can be guided by Self-Determination Theory (SDT).

SDT is an evidenced-based macro-theory of human motivation, personality development, and psychological needs (Deci & Ryan, 2008; Ryan & Deci, 2017). The theory suggests that an individual’s self-determination is based on the fulfillment of the following needs: autonomy, competence, and relatedness (E. L. Deci & Ryan, 2008). Autonomy is the feeling of having a sense of control and choice, while competence refers to feeling effective in achieving desired outcomes, and relatedness is the feeling of being connected to others (Frielink et al., 2018). According to SDT, deprivation or fulfillment of these needs can have clear and significant consequences on an individual’s psychological health and wellbeing (Deci & Ryan, 2008; Ryan & Deci, 2017). SDT further suggests that an individual who feels autonomous is more likely to achieve desired health outcomes (Fortier et al., 2007).

To promote autonomy, competence, and relatedness, practitioners are encouraged to implement interventions in an autonomy-supportive style, which involves offering choices with clear rationale for each option, minimizing pressure and controls, avoiding external incentives, supporting the participant's initiatives, and acknowledging the participant's feelings (Fortier et al., 2007; Silva et al., 2008). While there is limited research on the effect of autonomy support among adults with IDD, Frielink and colleagues (2018) found that implementing an intervention in an autonomy-supportive style was associated with increased autonomy, competence, and relatedness and increased psychological health outcomes (Frielink et al., 2018). The literature emphasizes the importance of creating an autonomy-supportive environment, particularly for individuals with IDD, who often have less choice and control over their lives than people without IDD. An autonomy-supportive environment can fulfill the needs of autonomy, competence, and relatedness (Fortier et al., 2007; Frielink et al., 2018). Executing an intervention in an autonomy-supportive style is also expected to facilitate behavioral change and reduce symptoms of anxiety (Fortier et al., 2007; Margalit & Shulman, 1986).

Anxiety is a common comorbidity of IDD and is characterized by excessive worry and agitation that is difficult to control (Carraro & Gobbi, 2012). Physiological responses may be associated with anxiety and might include increased heart rate and shortness of breath, which can inhibit physical functioning, particularly for individuals with IDD (Carraro & Gobbi, 2012). There are numerous interventions that aim to reduce symptoms of anxiety. A particularly effective intervention is physical activity (Marks et al., 2010).

The benefits of physical activity for the general population have been well-documented, but may be especially important for individuals with IDD (Wilski et al., 2012). These individuals are less likely to engage in physical activity, putting them at an elevated risk for obesity and cardiovascular disease (Marks et al., 2010). One form of physical activity that is gaining popularity in Western culture is yoga (Van Puymbroeck, Payne, & Hsieh, 2007; Woodyard, 2011).

Yoga is a form of complementary and integrative health that connects an individual's physical, mental, and spiritual health through conscious breathing, body movements, and meditation (Lin et al., 2011; Woodyard, 2011). Hatha is the most commonly practiced yoga style in the Western world. It is a physically-oriented style that focuses on breathing techniques, stretching, and meditation to balance the body's energy (Cramer et al., 2016; Lin et al., 2011; Woodyard, 2011). This specific form of yoga can lead to increased muscular strength, flexibility, and cardiovascular health, while also reducing symptoms of anxiety, stress, and depression (Cramer et al., 2016; Katzman et al., 2012; Kirkwood et al., 2005; Schmid et al., 2014; Van Puymbroeck et al., 2011; Woodyard, 2011).

Research has shown that yoga can improve self-determination and anxiety in the general population (Li & Goldsmith, 2012; Woodyard, 2011). However, there has been limited research related to the effect of yoga on individuals with IDD. One study that specifically focused on the influence of yoga on individuals with IDD measured the impact of yoga on physical functioning. The study included two participants and claimed that participation in a yoga class positively influenced exercise behavior and perceived

exertion levels when compared to non-structured exercise sessions (Hawkins et al., 2012). While there is a growing body of research supporting the therapeutic use of yoga, further research is needed to understand its impact on the psychological health outcomes of adults with IDD. Therefore, the aim of this study was to examine the impact of a six-week autonomy-supportive yoga intervention on the self-determination and anxiety of adults with IDD.

Methods

This single-arm, multi-method study (Morse, 2003) was primarily qualitative as the focus was to understand the influence an autonomy-supported yoga intervention had on self-determination and anxiety for adults with IDD. A single quantitative assessment was used to further examine the impact of yoga on anxiety and reduce the risk of fatigue among participants during pre- and post-testing, which is a commonly reported challenge when studying individuals with IDD. Interviews were conducted before and after the intervention.

A multi-method approach was selected for several reasons. There are limited quantitative measures that have been validated for this population and even fewer developed for them specifically (Esbensen et al., 2003). Additionally, the use of qualitative methods was expected to provide a more detailed explanation of the impact of the intervention being studied than a quantitative approach alone. Specifically, a multi-method design offers a more complete understanding of the impact of yoga on self-determination and anxiety of adults with IDD.

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Participants were recruited from a recreation, leisure, and sports program for adults with IDD in the southeastern United States. Following Institutional Review Board (IRB) approval, each potential participant's legal authorized representative (LAR) was asked to complete a screening packet, which included the consent form, authorization for use of image/video/voice recordings, a demographics questionnaire, and several screening tools (described below).

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adaptive skill areas, indicated by a score of 3.54 or higher, were excluded from the study (Dyches, 2000).

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Qualitative Data Collection. Open-ended, semi-structured qualitative interviews were conducted with participants to understand individual experiences and give each participant an opportunity to express their opinions related to the intervention and measured outcomes. The interviews were completed one week prior to and one to two weeks following the intervention to identify any change in self-determination and anxiety following the intervention. The interviews were conducted on the same day as the quantitative assessment in a private, one-one-one setting at the recreation program's facility. Participant interviews were audio- and video-recorded to not only increase comprehension during transcription, but to also identify any physical communication, such as pointing or performing a pose. The questions were developed by the PI and trained research assistants, based on SDT and standardized instruments that measure self-determination and anxiety (Deci & Ryan, 2008; Mindham & Espie, 2003; Sheldon & Deci, 1996; World Health Organization, 1996). While the post-test interview included questions about the participants' feelings about the intervention, the majority of the questions were the same for pre- and post-testing, some of which included:

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Quantitative Data Collection. The Glasgow Anxiety Scale for people with an Intellectual Disability (GAS-ID) (Mindham & Espie, 2003) was selected to measure anxiety before and after participation in yoga. The GAS-ID is a self-report instrument that consists of 27 items with a 3-point Likert-type scale, where 0 = *never*, 1 = *sometimes*, and 2 = *always*. Potential scores range from 0 to 70, and higher scores indicate more anxiety. Research supports the high test-retest reliability ($r = 0.95$) and internal consistency ($\alpha = 0.96$) of this instrument (Mindham & Espie, 2003). The instrument was individually administered to each participant by a trained research assistant in an interview-style one week before the first yoga session began and one to two weeks after the intervention concluded.

Intervention

The six-week Hatha yoga intervention included one-hour sessions, held twice a week in a large room at the recreation center. The intervention was designed and implemented by a yoga therapist, two certified yoga instructors, and several trained research assistants who had recently conducted another study with many of the same participants. The instructors received autonomy support training before the yoga intervention began. The training included understanding the meaning of autonomy support and how to create an autonomy-supportive environment.

Implementing an intervention in an autonomy-supportive style involved acknowledging and supporting participant initiatives and feelings (Fortier et al., 2007; Williams et al., 2002). According to the literature, it is also important to offer opportunities for independent decision-making, while providing a clear rationale for each option presented (Fortier et al., 2007; Silva et al., 2008). To encourage the participants to make their own choices, each session included a segment called Yogi's Choice, during which the participants were asked to choose one of two poses to perform independently. Each participant was given a picture that demonstrated the proper form of each pose and asked to perform the pose of their choosing.

In addition to Yogi's Choice, participants were encouraged to decide whether they were comfortable with receiving hands-on assistance. Participants were given a card stating that they wanted hands-on assistance during the session on one side, while the other side indicated that they did not want to receive hands-on assistance. At the beginning of each session, the yoga instructor explained how to use the card and asked

the participants to place it at the top of their yoga mat. Hands-on assistance was only provided to the participants that indicated they were comfortable with it at the beginning of each session.

The curriculum for the six-week intervention (Table 1) was developed by the yoga therapist and two certified yoga instructors. The curriculum was designed to improve self-determination (autonomy, competence, and relatedness) and reduce anxiety. The sequences became progressively more challenging throughout the six-week period. Each session was taught by one of the certified yoga instructors, who led the entire group with verbal instructions and visual demonstrations. A trained research assistant supported the instructor and demonstrated modifications. An additional research assistant provided verbal support and instruction and hands-on assistance to those who indicated that they were comfortable with it. The yoga therapist provided chair yoga for individuals who preferred to use a chair or were unable to perform the postures from a mat. Props and modifications were also provided to ensure safe and successful performance of the poses. Each session included a guided meditation (*dhyana*) at the beginning of class, setting the weekly intention, repetition of a mantra, breathwork (*pranayama*) and postures (*asanas*), and a final relaxation (*savasana*). Intentions were developed by the research team to further promote self-determination.

Six intentions were used over the course of the intervention, with a new intention being presented each week. The intentions were set as the theme of class and repeated as a mantra throughout class. The intentions were based on the *yamas* (philosophy) and *niyamas* (behaviors) of yoga (Adele & Jennings, 2009) and the constructs of self-

Table 1.						
<i>Yoga Curriculum</i>						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Intention	I am strong	I can do anything	I am kind	I am thankful	I am happy	I am loved
Cloud Rest Guided Meditation	x	x	x	x	x	x
Windshield Wiper	x	x	x	x	x	x
Hamstring Stretch	x	x	x	x	x	x
Rocking and Rolling			x	x	x	x
Cat/Cow	x	x	x	x	x	x
Child's Pose	x	x	x	x	x	x
Mountain Pose	x	x	x	x	x	x
Lotus Pose	x	x	x	x	x	x
Half Moon	x	x	x	x	x	x
Forward Fold	x	x	x	x	x	x
Cactus Arms	x	x	x	x	x	x
Runner's Lunge	x	x	x	x	x	x
Table Top	x	x	x	x	x	x
Warrior I	x	x	x	x	x	x
Warrior II	x	x	x	x	x	x
Pyramid Pose	x	x				
Reverse Warrior			x	x	x	x
Extended Side Angle			x	x	x	x
Shooting Star	x	x	x	x	x	x
Chair Pose	x	x	x	x	x	x
Puppy					x	x
Dolphin					x	x
Downward-Facing Dog					x	x
Plank on the Wall					x	x
Boat Pose	x	x	x	x	x	x
Bridge Pose			x	x	x	x
Staff Pose	x	x	x	x	x	x
Knees to Chest			x	x	x	x
Butterfly			x	x	x	x
Legs Up the Wall	x	x				
Supine Twist	x	x	x	x	x	x
Final Relaxation (Savasana)	x	x	x	x	x	x

determination (autonomy, competence, relatedness). The instructors frequently reminded the participants of the intention throughout each session. A complete list of the intentions can be found in Table 1.

Data Analysis

Qualitative Analysis. All qualitative data were stored on a password-protected hard drive. Qualitative data included video recordings, audio recordings, and transcribed texts of all recorded interviews. The pre- and post-testing interviews were analyzed after the intervention concluded (Creswell & Plano Clark, 2011). Prior to analysis, each participant was assigned a pseudonym to protect their privacy.

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Quantitative Analysis. Demographics and quantitative data were analyzed using SPSS version 25. Frequency and descriptive statistics were used to analyze participant

demographics. A Shapiro-Wilk test was used to assess normality of the data. The data distribution was considered non-normal. Therefore, a Wilcoxon Signed Rank Test was used to identify any change in the mean ranks between pre- and post-testing assessments. Due to the small sample size, percent change was also calculated to further assess change in anxiety. The following formula was used to determine percent change: $(\text{Time 2} - \text{Time 1} / \text{Time 1}) * 100$.

Fidelity. To assess fidelity, each session was digitally recorded on an iPad and analyzed by the PI to ensure that it was taught in an autonomy-supportive manner. Fidelity was assessed utilizing a checklist developed by the PI which evaluated the presence of the following items in each session: Yogi's Choice; review the cards indicating preference for hands-on assistance; set the intention for the session; provide information about poses; acknowledge and appreciate participant comments and requests; allow participants to refuse to perform a pose; allow participants to perform a requested pose; encourage participants to make their own decisions; and give participants an opportunity to recall the benefits of poses. The recordings revealed 100% fidelity throughout the intervention.

Results

Ten participants completed the pre-testing interview and assessment, with eight participants completing both the pre- and post-testing interviews and assessments. Two of the ten participants were unable to complete post-testing interviews and assessment due to illness. Additionally, the interviews and assessments of two participants were excluded from analysis due to issues with comprehension as these participants were unable to

provide appropriate verbal responses or non-verbal responses with communication cards. Therefore, the final analysis included eight (four male, four female) participants at pre-testing and six (two male, four female) participants at post-testing.

Table 2.		
<i>Participant Demographics</i>		
Variable	Mean	SD
Age	35.25	±13.4
	Frequency	%
Sex		
Male	4	50%
Female	4	50%
Race		
White	6	75%
Black	2	25%
Marital status		
Single	8	100%
Education		
Grades 7-10	1	12.5%
High School Graduate	4	50%
Special Education Certificate	2	25%
Not Specified	1	12.5%
Exercise Participation	8	100%
Health		
Excellent	5	62.5%
Good	3	37.5%

Demographic data were collected for each participant (see Table 2). The average age of the sample was 35.25 years, and the majority of the participants were White. A variety of health conditions were reported, including diabetes, fragile X syndrome, IP36 Deletion, asthma, scoliosis, and involuntary muscle spasms. All participants (100%) were single and reported engaging in physical activity; 50% had graduated from high school,

22.5% had received a special education certificate, and 12.5% completed some high school education (grades 7-12).

Data were analyzed using a deductive approach, with data supporting the influence of yoga on improving self-determination (autonomy, competence, and relatedness) and reducing anxiety.

Autonomy. The qualitative findings demonstrated an association between autonomy and yoga. During post-testing interviews, many participants said Yogi's Choice, a component specifically included to promote autonomy, was their favorite part of the intervention. For example, Jenny said, "*One of my favorite things about [is] the yogi's choice and then I like the dog thing [downward facing dog].*" Another participant said, "*I loved the Yogi's Choice.*"

Additionally, a clear association emerged between autonomy and relatedness. More specifically, aspects of the program that seemed to promote or reflect autonomy seemed to lead to feelings of relatedness. Early in the intervention, one participant, Michelle, yelled, "*shoop*" while performing shooting star, to which the other participants laughed in response. Michelle encouraged the other participants to do the same if they were performing the same pose. This phrase was repeated while performing shooting star throughout the course of the intervention and was mentioned by a number of participants during post-testing interviews. During her post-testing interview, Michelle performed shooting star while making the sound, saying, "*I like the 'shoop!' We made it up together.*" It seemed that the acceptance of her autonomous behavior by her peers created a sense of connectedness and belonging for her and the rest of the group.

The same participant also demonstrated autonomy by introducing storytelling to the yoga practice. When participants were asked to perform boat pose, and then row while in the pose, Michelle asked the instructors if the group could “pretend” that they were being chased by something (i.e. ghosts, snakes, alligators). In accordance with an autonomy-supportive teaching style, Michelle’s request was acknowledged by the instructors and offered as an option to the rest of the group, to which the group responded positively. Storytelling became an important part of this pose and continued for the duration of the intervention. This behavior demonstrated autonomy in several ways. Not only did Michelle take initiative and request to include storytelling into the practice, but other participants began offering their own ideas for what might be chasing them while “rowing their boat.” A theme of relatedness also emerged in response to this autonomous behavior. It became something that involved everyone in the class, creating a sense of belonging and connectedness. Together, participants would yell “row!” with each stroke. The group always responded to suggestions for what might be chasing them with positivity and encouragement. During post-testing interviews, two participants mentioned this aspect of the intervention. Michelle said, *“I like it, we did the ghosts and we pretended like we getting [sic] away from snakes and crocodiles and ghosts,”* and David said, *“It was fun. Yeah, I like doing that stuff Michelle does.”*

Relatedness. The data demonstrated an association between yoga and relatedness. More specifically, the interaction with the yoga instructors, research assistants, and other participants were clearly identified as factors that promoted feelings of relatedness. During pre-testing interviews, many participants reported seeing the yoga instructors

again was what they were most excited for regarding the yoga intervention. For example, Sally said, *“I’m so excited. I can’t wait to see Ellen [yoga therapist].”* When asked what she was most excited for in the yoga group, Nina said, *“Y’all coming up here to do it with us [sic].”* After the intervention concluded, several participants reported interacting with the yoga team and other participants as their favorite part of the yoga group. Michelle said, *“I get to be with Ellen [yoga therapist],”* and Sally said, *“My favorite is [sic] sitting in the chair and me and Michelle do it together.”* These comments indicate that the importance of the yoga instructors and research assistants in creating a sense of connectedness and belonging among the participants.

Competence. The data also indicated a relationship between yoga and feelings of competence. Many participants mentioned increased upper- and lower-body muscular strength and weight loss. During pre-testing interviews, several participants mentioned improving muscular strength and weight loss when asked what they wanted to gain from the intervention. Several participants mentioned having achieved these outcomes during their post-testing interview. Michelle proudly showed off her biceps, saying, *“I feel much stronger. Look at my muscles [sic].”* Several participants specifically mentioned feeling increased strength in their lower-body. Sally said that her legs feel stronger, while David specifically mentioned that yoga *“gets [his] legs in shape.”* When asked what changes they have noticed since starting yoga, two participants mentioned weight loss. Ben said, *“I lose this,”* while pointing to his stomach and Jenny said, *“I feel like I’m losing weight.”*

The data also suggested that participating in the intervention could have led to increased feelings of competence in practicing yoga. Several participants described their favorite poses during post-testing interviews, some of which included warrior, tree, downward-facing dog, and side angle, indicating increased competence in practicing yoga. For example, Ben said, *“My favorite things in yoga is [sic] uhm do the uhm exercise like uh do warrior one to warrior two. Yeah, the side angle. And the tree...”* Additionally, participant responses indicated that participating in yoga could lead to competence in other activities. For example, David indicated that participating in yoga improved his athletic performance in the Special Olympics, specifically stating, *“It helped me with bowling at the Spring Games. When I bowled, it helped.”*

Anxiety. Qualitative and quantitative analysis indicated that yoga may influence feelings and symptoms of anxiety. Participants were asked to describe what they do to make themselves feel better when they are worried. In response to this question, Ben said that he likes to do yoga, by himself or with the group, explaining that participating in yoga makes him feel better. More specifically, he mentioned that the yoga instructors made him feel better. Jenny further indicated that yoga may reduce symptoms of anxiety, stating *“I feel good when I do poses. It just make me not think about other stuff, like in the past.”* Pre- and post-testing interviews also demonstrated an association between yoga and other psychological health outcomes that could be related to anxiety. Participants specifically mentioned that yoga led to improved mood and increased feelings of happiness. During post-testing interviews, participants were asked to identify

any changes they have noticed since participating in the yoga group. In response to this question, Ben said, *“I feel a lot happier,”* and Jenny said, *“I’m just in a better mood.”*

Several participants indicated that the 5-minute meditation and final relaxation increased feelings of relaxation, which could be associated with reduced symptoms of anxiety. David said, *“I like the, the laying down part [meditation and final relaxation]. Oh my gosh. It’s so sweet. Relaxing, too. Yeah, I like it. Yeah, makes you feel better all the time.”* Ben said, *“The cloud [meditation] and the tree. It makes me feel more relaxed.”*

Further indicating a possible association between yoga and anxiety, the quantitative findings demonstrated a trend toward significance ($Z=-1.802$, $p=.072$) and 16% decline in symptoms of anxiety on the GAS-ID. The mean at pre-test was 23.3 and post-test was 19.6. Two participants’ changes were clinically significant, scoring higher than 13 during pre-test and below 13 during post-test.

Discussion

The qualitative findings suggest that the yoga intervention had an impact on self-determination, as the participants responses demonstrated increased feelings of autonomy, competence, and relatedness. The current literature indicates the importance of choice and sense of control for individuals with IDD, which was evident in participant responses of this study (Shogren & Broussard, 2011). Choice was intentionally included in the design and implementation of this intervention through a segment called Yogi’s Choice, which was specifically included to promote autonomy and give the participants an opportunity to choose and independently perform one of two poses during the yoga

practice. Several participants specifically mentioned that they “loved” Yogi’s Choice, supporting the claim that choice and control is an important aspect of self-determination for adults with IDD.

Relatedness is often overlooked in the literature, with more research supporting the constructs of autonomy and competence (Edmunds et al., 2008; Fortier et al., 2007). However, one study found that implementing an intervention in an autonomy-supportive environment was associated with increased feelings of relatedness, as well as autonomy and competence (Frielink et al., 2018). The findings of this study support these claims and contribute new findings regarding relatedness. Participant responses clearly demonstrated the importance of staff and peers in developing a sense of connectedness and belonging. During pre- and post-testing interviews, many participants mentioned staff and other yoga participants when describing what they were most looking forward to and what they most enjoyed about yoga. With this population, the interaction between the participants and the staff seemed to be especially important for increasing feelings of relatedness. However, the qualitative findings also indicated a potential relationship between autonomy and relatedness. Autonomous behaviors that were demonstrated during the intervention seemed to lead to feelings of relatedness among the participants. This finding aligns with the current literature that suggests a correlation between autonomy and relatedness, which can lead to positive health outcomes (Hodgins, Koestner, & Duncan, 1996; Ryan & Powelson, 1991; Turner, Irwin, Tschann, & Millstein, 1993). However, none of the identified studies focused on individuals with

IDD, warranting further research examining the association between these constructs and their combined influence on adults with IDD.

Competence was also well-supported by the qualitative data and aligns with the current literature that suggests that implementing an intervention in an autonomy-supportive style is associated with increased autonomy and competence (Fortier et al., 2007; Frielink et al., 2018; Teixeira et al., 2012). SDT defines competence as feeling effective in achieving desired outcomes (Frielink et al., 2018). During pre-testing interviews, several participants mentioned improving muscular strength and weight loss when asked what they wanted to gain from the intervention. Some of these participants reported increased strength or weight loss in their post-testing interview, indicating that they achieved their desired outcome, increasing their feelings of competence. Participant responses further suggested that participating in an autonomy-supportive yoga intervention promoted increased feelings of competence in practicing yoga, as well as other activities. One participant specifically mentioned that he thought participating in yoga helped him perform better during the Special Olympics. These findings support the current literature that suggests that there is positive association between perceived competence and physical activity (Teixeira et al., 2012).

According to SDT, self-determined individuals are more likely to achieve positive health outcomes (E. L. Deci & Ryan, 2008). This study also measured the impact of yoga on the anxiety of adults with IDD. The qualitative findings suggest that yoga may promote increased self-determination of adults with IDD, which may have been associated with decreased symptoms of anxiety.

Participant responses align with the current literature that supports the use of yoga as a therapeutic intervention to reduce symptoms of anxiety (Kirkwood et al., 2005; Lin et al., 2011). Previous studies have demonstrated that yoga is associated with a statistically significant reduction in symptoms of anxiety, among other psychological health outcomes (Lin et al., 2011). While there is a growing body of knowledge supporting the use of yoga as a therapeutic intervention to reduce symptoms of anxiety in the general population. This study is the first to examine the impact of yoga on the anxiety of adults with IDD (Kirkwood et al., 2005; Lin et al., 2011). Specifically, the findings suggest that yoga may reduce symptoms of anxiety for adults with IDD. During interviews, several participants indicated that yoga reduced their feelings of anxiety. Two participants specifically mentioned that the yoga staff and participants make them feel better when they are worried, suggesting the importance of the staff in reducing symptoms of anxiety for this population. Several participants specifically mentioned that the meditation and final relaxation were particularly relaxing, which may suggest that these specific components of yoga can improve symptoms of anxiety. While the quantitative results were not statistically significant, two participants' changes were clinically significant, scoring higher than 13 during pre-test and below 13 during post-test, warranting further exploration into the influence of yoga on symptoms of anxiety.

Many participants also reported improved mood and increased happiness in response to yoga, which support the findings of previous studies that have identified an association between yoga participation and increased mood and decreased symptoms of anxiety in the general population (Streeter et al., 2010; Woolery, Myers, Sternlieb, &

Zeltzer, 2004). However, there is a need for further research specifically related to the impact of yoga on the anxiety and mood of adults with IDD.

Participant responses also indicated other potential factors that could influence symptoms of anxiety for adults with IDD. In accordance with autonomy support, the staff responded to participant feelings with acknowledgement and support (Edmunds et al., 2008; Fortier et al., 2007; Frielink et al., 2018). During sessions, if participants were demonstrating symptoms of anxiety, the other participants often provided words of comfort and encouragement. For example, one participant frequently demonstrated self-stimulating behaviors during final relaxation. When this behavior occurred, the participant was prompted to use slow, deep breathing and perform the gyan mudra, which involves touching the thumb and pointer finger of both hands. When prompted, the participant immediately stopped engaging in self-stimulating behavior. These findings support the current literature that states that implementing an intervention in an autonomy-supportive style can increase psychological health outcomes (E. L. Deci & Ryan, 2008; Edmunds et al., 2008; Fortier et al., 2007; Frielink et al., 2018). However, further research is needed to understand the impact of autonomy-supportive interventions on symptoms of anxiety.

Limitations

There is limited research related to adults with IDD and even fewer studies measuring the effect of yoga on individuals within this population. To our knowledge, this is the only study to measure the impact of yoga on self-determination and anxiety of adults with IDD. This study has contributed new findings to the literature related to IDD

and identified several opportunities for further research. However, this study is limited by the small sample size, and therefore, the findings are not generalizable to all adults with IDD.

The use of open-ended interviews also presents limitations particularly related to comprehension. Participant responses may have been misunderstood by the researchers and the participants may have had difficulty comprehending interview questions and instrument items. Future studies should consider including LARs in qualitative interviews, as they may be able to report any changes they have noticed in response to the yoga intervention.

It is also important to acknowledge the bias of the PI as an individual with a personal yoga practice, which could have introduced research bias into the study. To reduce the effect of bias, the PI engaged in reflexive journaling before analyzing the data. Furthermore, the study is limited by the influence of the researchers. The PI, research assistants, and yoga instructors had an established rapport with many of the participants due to a previous study related to yoga, which may have influenced participant responses and increased social desirability. Additionally, the findings of this study could have been limited by participants' previous experience with yoga. Future studies should examine the impact of yoga on adults with IDD who have no prior yoga experience.

Implications for Practice

One of the major implications of this study is that an autonomy-supported yoga intervention might be an effective treatment for improving self-determination and reducing symptoms of anxiety of adults with IDD. While the findings of this study cannot

be generalized to all adults with IDD, the findings of this study are encouraging and warrant further exploration into the benefits of yoga for this population. Teaching yoga in this style may have increased self-determination, and by extension, reduced symptoms of anxiety among participants. While this teaching style emphasizes the importance of choice, it is important to provide limited choices to avoid overwhelming the participants. The purpose of providing choice is to give the participants a sense of control, which might be lost if they are overwhelmed by options.

Individuals who have taught yoga therapeutically will find that teaching yoga to individuals with IDD is different from teaching the general population. The yoga sessions in this intervention were often loud and chaotic. Participants often yelled words of encouragement to their friends across the room. Some participants frequently engaged in stereotypic behavior, verbal and non-verbal, which could be disruptive. Unlike many typical yoga classes, these sessions were highly interactive. The participants frequently responded to the instructors and research assistants with comments, questions, and laughter throughout the session. Finally, many participants wanted to hug the instructors and research assistants before, during, and after the session, with which some practitioners may not be comfortable. Each practitioner should set boundaries for what is and is not acceptable during the intervention based on his or her comfort level. It is important for practitioners to be mindful of and prepared for the uniqueness of teaching yoga to adults with IDD.

Recommendations for Future Research

This study has identified several opportunities for future research. While the findings of this study were encouraging, a causal relationship between yoga and self-determination and anxiety cannot be determined without a larger sample size and control group. Further research is needed to determine the impact of autonomy support on self-determination and anxiety for this population.

Initially, the intervention was expected to continue for eight weeks, but was only held for six weeks due to scheduling conflicts. If the intervention had been implemented for more than six weeks, the participants may have demonstrated a statistically significant decrease in anxiety. Future research is needed to determine the dose yoga to reduce anxiety for adults with IDD. Additionally, several participants reported increased feelings of happiness and improved mood in response to the yoga intervention. Future studies should examine the impact of yoga on these and other psychological health outcomes, in addition to anxiety, for adults with IDD.

The screeners used in this study were not sensitive enough to determine cognitive ability to respond to verbal cues. Even though all of the participants passed the screeners, two interviews had to be excluded, indicating the need for a more sensitive screener in future studies. Additionally, LARs completed the screeners for each participant and could have underestimated the level of support participants need in adaptive skill areas. Future studies should consider using self-report screeners to decrease social desirability.

Finally, due to the existing rapport between the participants and research team, social desirability may have influenced participant responses during pre- and post-testing

interviews and assessments. In future studies, pre- and post-testing should be completed by researchers who have no prior experience with the participants to reduce the effect of social desirability.

Even though this study was guided by SDT, it did not examine intrinsic motivation, which is another aspect of the theory (Deci & Ryan, 1985). Including intrinsic motivation in the study would not have been feasible due to the existing rapport between the participants and staff. Additionally, the yoga intervention was added as a schedule activity for the recreation, leisure, and sports program, which would have made it even more difficult to gauge participant motivation.

While it is impossible to know if changes in self-determination and anxiety were in response to the yoga intervention itself or the autonomy-supportive environment in which it was implemented, some of the outcomes seemed related to specific aspects of the intervention over others. More specifically, it seemed that competence may have been especially influenced by participation in yoga, while autonomy and relatedness were more affected by the autonomy-supportive teaching style and the staff. Future research should explore the influence of the specific aspects of the program on each of these outcomes.

Conclusion

The aim of this study was to examine the impact of a six-week autonomy-supportive yoga intervention on the self-determination and anxiety of adults with IDD. The findings from this study were encouraging. The results indicated that yoga may lead to improved self-determination, through the fulfillment of the needs of autonomy,

competence, and relatedness, which may have led to reduced symptoms of anxiety. Additionally, the findings indicate the benefits of implementing an intervention in an autonomy-supportive style to increase the impact of the intervention. While this study provides important foundational information, further research is needed to understand the impact of autonomy-supportive yoga on the self-determination and anxiety of adults with IDD.

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CHAPTER FIVE

Conclusion

The aim of this study was to examine the impact of a six-week autonomy-supportive yoga intervention on the self-determination and anxiety of adults with IDD. This study was guided by Self-Determination Theory, which suggests that self-determination is determined by the fulfillment of the following needs: autonomy, competence, and relatedness. Autonomy is the feeling of having a sense of control and choice, while competence refers to feeling effective in achieving desired outcomes, and relatedness is the feeling of being connected to others (Frielink et al., 2018). The theory further claims that the deprivation or fulfillment of these needs can have significant consequences on an individual's psychological health and wellbeing, such as anxiety (Deci & Ryan, 2008; Ryan & Deci, 2017). In order to promote the fulfillment of these needs, practitioners are encouraged to implement interventions in an autonomy-supportive style (Frielink et al., 2018). While research supports the use of autonomy-supportive interventions to increase positive health outcomes in the general population, there has been limited research specifically related to this population.

Individuals with IDD are at an increased risk of experiencing low self-determination and symptoms of anxiety (Reid, Smiley, & Cooper, 2011; Roizen & Patterson, 2003). Research has shown that yoga can improve these outcomes in the general population, but further research is needed to examine the impact of yoga on the self-determination and anxiety of individuals with IDD (Li & Goldsmith, 2012; Woodyard, 2011).

Summary of Major Findings

The findings of this study indicate that participating in an autonomy-supportive yoga intervention can promote self-determination and reduce symptoms of anxiety in adults with intellectual and developmental disabilities.

Self-Determination. Overall, participant responses indicated increased feelings of autonomy, competence, and relatedness in response to the yoga intervention. Each of these constructs were specifically targeted by implementing the intervention in an autonomy-supportive style. Participants clearly indicated the importance of choice and control, with many describing Yogi's Choice as one of their favorite aspects of the intervention. Participants also demonstrated the feelings of relatedness, indicating the importance of staff and peers in developing a sense of connectedness and belonging during the intervention. This study also identified a potential relationship between autonomy and relatedness. Throughout the intervention, components that were intentionally included to promote autonomy, also seemed to lead to feelings of relatedness among the participants, warranting further research examining the association between these constructs. Participant responses further demonstrated increased competence. Several participants reported having achieved increased muscular strength and weight loss, which they had indicated as a desired outcome during pre-testing interviews. Additionally, some participant responses demonstrated increased competence in practicing yoga, as well as other activities, including the Special Olympics.

Anxiety. The qualitative findings suggest that autonomy-supportive yoga can lead to reduced symptoms of anxiety for adults with IDD. Participant responses demonstrated

the importance of the yoga staff and participants in reducing symptoms of anxiety.

Additionally, the meditation and final relaxation seemed to promote relaxation, indicating that these specific aspects of yoga may be effective in improving symptoms of anxiety.

The quantitative findings also support the use of yoga to reduce symptoms of anxiety for adults with IDD. The results demonstrated a trend toward significance regarding reduction in symptoms of anxiety.

Challenges

While the body of research related to individuals with IDD is growing, it is still generally limited. The lack of research can be partly explained by the challenges associated with studying this population. Studying this population has known challenges, especially related to comprehension during data collection. A screener was used to measure the level of support needed in a variety of adaptive skill areas with the intention of identifying potential participants who could not appropriately respond to verbal cues. Participants who required pervasive support in more than half of the adaptive skill areas were considered inappropriate for this study. However, it was clear that this stipulation was not sensitive enough for this study. All of the potential participants passed the screener, even though two of the participants were not able to provide appropriate verbal response even with the use of communication cards. The screener might have been more effective if individuals who required pervasive support in any adaptive skill area was excluded.

There was clearly an issue with comprehension with most of the participants. Several participants specifically told me that they did not understand the question they

were being asked. The open-ended nature of the questions could have contributed to this issue. When it was clear that participants did not understand, the interview question or assessment item were re-phrased and simplified in the moment, which occasionally meant that the questions became close-ended or positively or negatively skewed. Interestingly, the participants seemed to be able to answer close-ended questions more easily than open-ended questions. The close-ended questions were more clear and less abstract, which could have made them easier to comprehend.

Communication cards were developed to assist non-verbal participants during pre- and post-testing. However, none of the participants who met inclusion criteria were non-verbal. The communication cards were still useful during pre- and post-testing to assist in clarifying the questions.

Ten pre-testing interviews and assessments and eight post-testing interviews and assessments were completed. The pre- and post-interviews for two participants were excluded. Following pre-testing, it was clear that some of the interviews and assessments would need to be excluded, but post-testing interviews and assessments were completed before making that decision. The LAR of one participant did not provide authorization for video- and audio-recording during interviews, which presented a number of challenges related to gathering accurate data. An additional researcher took notes during the interview, but analysis would still have been challenging without an audio-recording. This participant seemed to have difficulty comprehending the interview questions and instrument items. He was able to give a verbal response to all of the questions, although the responses were not always appropriate. For example, he answered a number of

questions with “hot dog.” He also changed his answer a number of times based on our reaction to his first response, indicating that social desirability could have influenced his interviews. There was no way for me to know which answers were truly representative of his feelings and which were given because he thought that was the answer we wanted. For these reasons, I decided to exclude his interviews from analysis.

Another participant clearly had difficulty comprehending the interview questions and instrument items. During both his pre- and post-interview, this participant would repeat the question being asked. Even after rephrasing the question a number of times, he was not able to provide an appropriate response. The communication cards were also used to assist with comprehension, but it seemed that he thought he was being asked to read the words on the communication cards. Instead of using the communication card to answer the question, he would point to one of the images and describe it or read the word below it. For example, he would point at a picture of a sad face, mimic someone crying, and say, “sad,” and then point to the picture of a happy face and say, “happy.” During post-testing, the participant seemed to become visibly frustrated during the interview. I seemed that he was frustrated because he thought he was doing what he was being asked to do, but was continually being asked the same question. At one point, he yelled, “I don’t understand!” It seemed best to conclude the interview at that time. Knowing that comprehension was an issue and one of his interviews was incomplete, his pre- and post-testing interviews and assessments were excluded from analysis even before the audio-recording was transcribed.

Additionally, two participants were unable to participate in post-testing due to illness. One participant had hand-foot-mouth disease and the other was hospitalized. Their interviews were rescheduled several times, but were canceled after three weeks because too much time had passed since the conclusion of the intervention to gain accurate responses.

It was also interesting to find that some of the participant responses were completely unrelated to the questions asked, which could have been a result of issues with comprehension. The responses were often still useful, but the analysis became much more answer-driven in response.

Initially, the video-recordings of the yoga sessions were going to be analyzed to evaluate change in behaviors, such as hand-flapping, self-stimulating, and rocking. Unfortunately, there were serious methodological issues with this data. Each session was recorded with an iPad; however, each participant was not visible in each video, and therefore, many behaviors were likely not identified. Additionally, the high noise level of the class likely prevented many verbalizations from being recorded. After analyzing half of the session recordings, it was decided that the data was not accurate enough to be included in the study.

Initially, the aim of the study was to examine the impact of an autonomy-supportive yoga intervention on the anxiety, self-determination, and quality of life of adults with IDD. However, it became clear that self-determination was the main focus of the study when writing the manuscript. The study was guided by SDT, which supports the inclusion of autonomy support to target the fulfillment of the need for autonomy,

competence, and relatedness. Therefore, it seemed more appropriate for self-determination to be the first outcome listed.

There was also an overlap between self-determination and quality of life, specifically between relatedness and social health, and competence and physical health. Initially, I categorized a number of participant responses as being related to social or physical health. However, when the second author and PI met to determine their level of agreement in the analysis, it was evident that these categories were not independently supported by the data, but instead were more representative of relatedness and competence. Additionally, the participant responses related to psychological health also seemed to be related to anxiety, and therefore, were put in that category. Following analysis, it was evident that the data supported self-determination rather than quality of life. For this reason, the study is solely focused on self-determination and anxiety.

Limitations

This study is limited by the small sample size, which reduces generalizability. In future studies, a larger sample size is recommended. Additionally, the duration of the intervention was completely dependent on the schedule of the recreation program. The intervention was initially scheduled for eight weeks, but was shortened due to program cancellations. Future studies should implement the intervention for at least eight weeks.

The use of open-ended interviews also presents limitations particularly related to comprehension. Participant responses may have been misunderstood by the researchers and the participants may have had difficulty comprehending interview questions and instrument items. Throughout pre- and post-testing, the interview questions had to be

rephrased a number of times to assist the participants with comprehension. Some of the questions became close-ended and may have become positively or negatively skewed, which could have influenced participant responses.

As the primary investigator, I also introduced bias into the study. I have a personal yoga practice and have been involved in other studies related to yoga with these participants before and after the current study. Due to the established rapport between myself, the other researchers involved in the study, and the participants, bias and social desirability could have influenced participant response and qualitative analysis. In the future, it would be interesting to see if the importance of the yoga staff was still evident with participants with whom the staff does not have an established relationship.

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APPENDICES

Appendix A

Pre-Testing Interview Questions

1. Tell me about a time that you felt worried. (Anxiety/Psych Health)
 - a. Tell me what it feels like when you are worried.
Good/bad/happy/sad/angry
 - b. What things do you worry about?
 - c. Tell me what you do to make yourself feel better when you're worried.
2. Tell me about a time that you chose to do something by yourself. (Autonomy)
 - a. Explain who makes decisions about what activities you do.
 - b. How often do you have to do something that you don't want to do?
3. Tell me about a time that you did something well. (Competence)
 - a. What did that feel like?
 - b. How do you feel when it is hard for you do something?
4. Tell me how you feel about the people in your life. (Relatedness/Social Health)
 - a. Tell me about your friends and family.
 - b. Tell me about a time that you felt connected to someone else.
 - c. How often do you feel connected to other people?
5. Describe your favorite things about life. (Quality of Life)
 - a. What are your least favorite things about life?

6. Describe how you feel about yourself. (Psychological Health)
 - a. Tell me what you like about yourself.
 - b. Do you ever feel bad about yourself? If yes, why?
7. Describe what kind of assistance you receive. (Physical Health)
 - a. What about when you're doing activities? Getting ready for the rainbow gang?
 - b. Are you always able to get the help you need?
 - c. How satisfied are you with your health?
8. Describe how you feel about starting the yoga group. (Yoga)
 - a. What do you want to get out of the group?
 - b. Tell me what you are most excited about in the yoga group?
 - c. Tell me what you are nervous about in the yoga group?

Appendix B

Post-Testing Interview Questions

1. Tell me about a time that you felt worried. (Anxiety/Psych Health)
 - a. Tell me what it feels like when you are worried.
 - b. What things do you worry about?
 - c. Tell me what you do to make yourself feel better when you're worried.
2. Tell me about a time that you chose to do something by yourself. (Autonomy/)
 - a. Who usually makes decisions for you?
 - b. How often do you have to do something that you don't want to do?
3. Tell me about a time that you did something well. (Competence)
 - a. What did that feel like?
 - b. Tell me about a time that something was hard for you in yoga.
 - c. How do you feel when it is hard for you do something?
4. Tell me how you feel about the people in your life. (Relatedness/Social Health)
 - a. Tell me about your friends and family.
 - b. Tell me about a time that you felt connected to someone else.
 - c. How often do you feel connected to other people?
5. Describe your favorite things about life. (Quality of Life/Environmental)
 - a. What are your least favorite things about life?
6. Tell me about a time that you felt good about yourself. (Psychological Health)
 - a. Tell me what you like about yourself.

- b. Do you ever feel bad about yourself? If yes, why?
7. Describe what kind of assistance you receive. (Physical Health)
- a. What about when you're doing activities? Getting ready for the rainbow gang?
 - b. Are you always able to get the help you need (Environmental)?
 - c. How satisfied are you with your health (Physical)?
8. Describe how you felt about the yoga group. (Yoga)
- a. How did you feel about yogi's choice?
 - b. Tell me your favorite thing about yoga.
 - c. Tell me your least favorite thing about yoga.
 - d. Do you want to continue practicing yoga?
9. Describe any changes you have noticed since starting the yoga group?
- a. Do you feel stronger?
 - b. Do you feel healthier?
 - c. Have you made new friends?
 - d. Do you feel happier?

Appendix C

Autonomy-Supportive Teaching Style Fidelity Checklist

Autonomy-Supportive Teaching Behavior	Demonstrated	Not Demonstrated	N/A
Description of Yoga and Benefits (1 st session only)			
Hands-On Assistance Cards			
Seeing Autonomy-Supportive Intention			
Yogi's Choice			
Yogi's Choice: Information about both poses			
Avoid extrinsic rewards			
Acknowledge and appreciate participant comments			
Acknowledge participant requests			
Allowed participant to perform requested pose			
Allowed participant to refuse a pose			
Encouraged participants to make their own decisions			
Positive feedback			