The Effect of Fidget Spinners on Attention and Anxiety in Typically Developing Children

A Thesis
Submitted to the Faculty
of the Psychology Department

of

Washburn University

in partial fulfillment of
the requirements for

MASTER OF ARTS

Psychology Department

By

Taylor Kirby

Topeka, Kansas

March 5, 2020

Thesis Approval
Department of Psychology
Washburn University
Topeka, Kansas

March 2020

I hereby recommend that the thesis prepared under my supervision by

TAYLOR KIRBY

Entitled

THE EFFECT OF FIDGET SPINNERS ON ATTENTION AND ANXIETY FOR TYPICALLY DEVELOPING CHILDREN

be accepted in partial fulfillment for the

MASTER OF ARTS DEGREE

Cynthia L. Turk, Ph.D.
Chair of the Thesis Committee

Juliann Mazachek, Ph.D.
Vice President for Academic Affairs

Cynthia L. Turk, Ph.D.
Head of the Department

Recommendation Concurred by

Angela Duncan, Ph.D.

Linzi Gibson, Ph.D.

Committee for the Thesis

Acknowledgments

I would like to express the deepest appreciation to my committee chair, Dr. Cynthia L. Turk, and my committee members, Dr. Angela Duncan and Dr. Linzi Gibson. Their guidance and persistence allowed this research to come to life. I would also like to thank Dr. Christina Menager, whose work demonstrated to me that fostering the heart and minds of children should always transcend academia and research. Without these four mentors, this master's thesis would not have been possible.

I would like to convey my gratitude to my research assistants, Leyli Beims, Sarah Smith, and Caitlyn Nation, who provided support, integrity, and knowledge to this project. Without these three remarkable students, data collection simply would not have been possible. For their hard work, I am truly grateful.

I would like to acknowledge the many friends, teachers, mentors, and professors who encouraged me to chase my dreams. To list the individuals who have crafted my resiliency and determination would be too big of feat. Therefore, I will say to each of you, you are one piece of who I am and what I have accomplished as a being on this planet. I thank you.

Lastly, I would like to thank my parents, Robert William Kirby Jr. and Vicki Jo Kirby (Nott) for their love, guidance, and teachings. Thanks to my father's lifelong message of the "power of education" and my mother's spirit she instilled in me that "I can do anything that I put my mind to," I have been able to achieve my dream of helping others. I will give a piece of the two of you in me to each and every person I am able to impact.

Abstract

Advertisements have led consumers to believe that fidget spinners assist children in maintaining attention and decreasing stress (Libassi, 2017). The current study tested these claims with a sample of 47 typically developing children, ages 8 to 12. Participants were randomly assigned to use a fidget spinner or not (control group) while completing a test of attention and working memory as well as an anxiety-provoking task. The experimental and control group did not differ in age, gender, experience with fidget spinners, or parent-rated anxiety. However, the experimental group received higher parent ratings of hyperactivity compared to the control group prior to the experimental manipulation. Contrary to expectations, the experimental group (M = 22) and control group (M = 25) did not differ with regard to performance during the attention and working memory task, $t(45) = .605$, $p = .548$, $d = .18$. Additionally, the experimental group (M = 3.05; SD = 2.22) and control group (M = 3.54; SD = 2.08) also did not differ with regard to peak anxiety during the anxiety provoking task, $t(45) = -.266$, $p = .79$, $d = .08$. Fidget spinners do not appear to disrupt attention or decrease anxiety among typically developing children.

The Effect of Fidget Spinners on Attention and Anxiety in Typically Developing Children

A fidget spinner is a compact device that is weighted in the center with three prongs that a person rotates with their fingers in a spinning motion (Graziano, Garcia, & Landis, 2018). Within the first 6 months of being on the market, the founding company, Fidget360, earned $350,000 in sales. Fidget spinners are currently available in all 50 states and 30 countries around the world (Montag, 2017). Over 200 million fidget spinners have shipped to retailers (Libassi, 2017). Although many products are marketed as a "fidgeting" device, the fidget spinner is the current product of choice by consumers (Libassi, 2017). The inventors stated that the fidget spinner was created with the purpose of helping children and adults self-regulate their emotions, behavior, and restlessness (Graziano, Garcia, & Landis, 2018).

Parents hold a favorable attitude toward fidget spinners, as they keep their children occupied and can serve as a toy (da Camara, Agrawal, & Isbister, 2018). However, many teachers have complained that these devices cause distraction in the classroom, and physicians have found the small pieces as a choking hazard (Reeves et al., 2018; Thayer, 2017).

Currently, little data is available to parents, educators, and health care professionals regarding the impact of fidget spinners on children. The purpose of the current study was to test the effects of using a fidget spinner on attention and anxiety in typically developing children.

Fidgeting

Fidgeting, the act of engaging in manipulation of one's own body parts or other objects not central to the task at hand, is often viewed as an indication of boredom, discomfort, or distress (Mehrabian & Friedman, 1986). Fidgeting is a common behavior seen among individuals of all ages in a variety of settings, as movement is a ubiquitous part of the human experience. Fidgeting may be the physical manifestation of internal feelings such as restlessness, anxiety, or boredom, and moving can alleviate discomfort and decrease stress (Sachdev & Kruk, 1996). Humans may even experience fidgeting as pleasurable (Nocera, Colonna, Capobianco, Mastrangelo & Steinhage, 2014). However, socially, fidgeting holds a negative connotation as it is "distracting." Children are taught at a young age to "sit still" and "pay attention."

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), fidgeting is an impulsive and spontaneous behavior (APA, 2013). There have been several attempts to operationally define and accurately measure fidgeting. Yet, there is still a lack of consensus regarding what constitutes fidgeting. Many studies have coded fidgeting in broad terms while others have focused on classifying specific movements (Sachdev & Kruk, 1996).

In the first published study examining fidgeting, students in a lecture hall were observed and the amount of times students swayed their head, trunk, or arms was recorded (Galton, 1885). It was found when the student's attention was sustained, the amount of physical activity decreased by half.

Nearly 100 years passed before further research was conducted on fidgeting behaviors. Mehrabian and Friedman (1986) defined fidgeting as "engaging in manipulations of one's own body parts or other objects, such as actions being peripheral or nonessential to central ongoing events or tasks" (p. 425). They suggested that "fidgeting is an activity overflow and that it is

more likely when an individual's physical activity is constrained by the central or focal task" (p. 425). They classified fidgeting behaviors into three categories: localized self-stimulation, gross body movements, and object manipulations. Localized self-stimulation includes movements such as rocking while seated, biting one's lips, rubbing hands together and rubbing/pulling on one's ear. Gross body movements encompass rotating of the neck or head, tapping the foot and bouncing the leg. Object manipulation included behaviors such as bending paper cups or aluminum cans, jiggling a pen, fondling jewelry, kicking pebbles, rocks, or cans, playing with sand, adjusting a watchband, chewing the end of a pen, shredding cigarette filters, or constantly stirring coffee or tea. Of the three forms of fidgeting behaviors, object manipulation is one of the most frequent forms of fidgeting and often goes unnoticed due to its subtle manner. Mehrabian and Friedman's (1986) definition of fidgeting is still the most commonly used.

Attention

It is a common perception that attention can be affected by off-task behaviors and fidgeting. There is lack of agreement on whether fidgeting impedes one's ability to focus as there is only a small literature on the effects of fidgeting as it pertains to attention.

Returning to the original study in this area, Galton (1885) observed students listening to a lecture. The students remained still in their chairs while their attention was being maintained. When the students' attention began to wane, they made more frequent motions such as moving their heads and swaying. This study was the first study to draw a connection between and attention. With this connection in mind, fidgeting was thought to be associated with a lack of attention, boredom, and restlessness.

Many later studies found similar results, including one that replicated Galton's work observing students listening to a lecture (Farley, Risko, & Kingstone, 2013). These researchers

found that when attention began to decrease, there was a corresponding increase in fidgeting. Three important conclusions were made in regard to fidgeting from this study: 1) the more on-task an individual is, the higher their stress level, 2) the more on-task an individual is, the less fidgeting is displayed, and 3) if stress is high and the individual is fidgeting, a decrease in memory and lecture retention is likely to occur. Similarly, in a separate study, fidgeting occurred more often during periods of mind wandering than when individuals were on-task (Carriere, Seli, & Smilek, 2013; Seli et al., 2013).

Based on these findings, researchers have theorized that fidgeting may serve as a mental "break" through the relief experienced from physical movement. Remaining sedentary and focused for extended periods of time is not consistent with the evolution of the human species. Instead, frequent movement and spontaneous changes in topic of focus is considered the "norm" (Carriere, Seli, & Smilek, 2013). Individuals report feeling less mental strain while they are fidgeting, which in turn may be due to redirecting one's attention temporarily away from a stressful stimulus. This short-term diversion of attention provides a physical outlet for stress but can reduce one's ability to complete a mentally challenging task (Mohiyeddini, Bauer, & Semple, 2013). While the literature indicates fidgeting is related to one's ability to focus, a paucity of research has investigated whether fidgeting leads to an increase or decrease in concentration.

Typically Developing Children Versus Children with ADHD

"Typically developing" is a term used to describe normal development by which children change as they age by acquiring and refining knowledge, behaviors, and abilities (Mohammaed, 2017). In the few studies that have focused on typically developing (TD) children, fidgeting has shown a negative effect on cognitive performance, working memory, and attentiveness to tasks.

Children who are identified as TD produce different outcomes than their ADHD counterparts in working memory when fidgeting. Children with ADHD often benefit cognitively from fidgeting, while TD children who fidget at the same rate, display poorer working memory, more errors on cognitive tasks, and are more distracted (Hartanto, Krafft, Iosif, & Schweitzer, 2016; Sarver, Rapport, Kofler, Raiker & Friedman, 2015; Schecter, Shah, Fruitman, & Milanaik, 2017). Therefore, children with ADHD perform better on a cognitive task with the added stimulation of fidgeting while TD children performed superior with less intense rates of physical movements during a cognitive task (Hartanto, Krafft, Iosif, & Schweitzer, 2016). There are currently no studies solely testing TD children and fidget spinners. TD children are an important population for further study as they represent typical consumers who use a fidget spinner.

Physical movement has been found beneficial for concentration and focus of individuals diagnosed with ADHD. Hyperactivity, as described in the DSM-V, is frequent movement (i.e., fidgeting with or tapping hands or feet or squirming in seat, running or climbing in inappropriate situations) and manifests as appearing to "always be on the go" or in a constant state of motion (APA, 2013). In a recent study by Schecter, Shah, Fruitman, and Milanaik (2017), monitors were placed on participants' ankles to measure their amount of physical movement. They found that children diagnosed with ADHD who displayed high rates of movement performed better on cognitive tasks than those who displayed less movement. They theorized that limiting movement in children with ADHD may even have negative effects, although this was not investigated in this particular study. Fidgeting, even as minor as moving one's hands, may increase attention and focus in those with ADHD due to the release of dopamine and norepinephrine, which mimics the effects of psychopharmacological medications prescribed for the symptoms of ADHD (Schecter et al., 2017).

Hartanto, Krafft, Iosif, and Schweitzer (2016) compared a group of individuals with and without ADHD on their performance on a cognitive task called the Eriksen flanker paradigm. Using E-prime computer software, participants identified the orientation of a central symbol while ignoring the flanking symbols by hitting a button with the corresponding hand. A correlation was found between correct trials based on accuracy, speed, and intensity of physical activity in the ADHD group, suggesting that, when a child with ADHD is required to utilize more cognitive resources, they are more likely to engage in greater rates of fidgeting and movement.

Children with ADHD may use fidgeting and different forms of movement to enhance and self-regulate attentiveness. The Working Memory, Thought, and Action model states that hyperactivity compensates for a lack of arousal and enhances cognitive performance (Rapport et al., 2008). Originally, this model hypothesized a functional relationship between working memory and activity level. This model is consistent with empirical work comparing TD children and children with ADHD while wearing wrist and ankle actigraphs to track movement. Children with ADHD who engaged in higher rates of activity performed significantly better on a task of working memory in comparison to TD children who also engaged in high rates of activity (Rapport et al., 2018). Higher rates of activity in children with ADHD may serve to increase working memory due to an increase of dopamine in the Ventro Tegmental Area (VTA) that drives executive functioning in the prefrontal cortex (Sarver, Rapport, Kofler, Raiker, & Friedman, 2015).

Doodling

Doodling, while different from fidgeting, is a comparable behavior often seen during similar circumstances when fidgeting might be observed. Doodling was measured in a study in

which adults were told to shade printed shapes on paper with a pen during a telephone call (Andrade, 2010). Half of the participants were asked to concentrate on a mock telephone message while doodling (experimental condition) and the other half were asked to simply concentrate on a mock telephone message (control condition). The doodling condition recalled 29% more information on a surprise memory test compared to the control group. Doodling was found to improve focus during monotonous activities and enhance recall (Karlesky & Isbister, 2013). Doodling may aid in arousal and reduce levels of boredom. Doodling may also distract individuals from daydreaming, a behavior that is detrimental to concentration. Fidgeting, like doodling, uses repetitive, non-goal-oriented movements that may assist in focusing on the primary task.

Fidget Spinners

In the only study to date to examine children diagnosed with ADHD and their use of fidget spinners, researchers found fidget spinners were associated with poorer attention. When compared to the children's baseline functioning, more than double the number of "attention" violations occurred when using the fidget spinner in a classroom setting (Graziano, Garcia, & Landis, 2018). However, it remains unclear whether fidget spinners provided enough movement to improve attention through fidgeting as proposed by the Working Memory, Thought, and Action model. This study provides researchers with a starting point, but little scientific information can be garnered from one study of the effects of fidget spinners on attention.

Anxiety

According to the Anxiety and Depression Association of America (ADAA), in the United States alone, 18% of the population or roughly 40 million people, suffer from diagnosable anxiety disorders, making it the most common mental illness in the United States (Ritchie &

Roser, 2018). Globally, it is estimated that roughly 265 million people suffer from an anxiety disorder, with women experiencing higher rates than men (Ritchie & Roser, 2018). The National Survey of Children's Health (NSCH) in the United States in 2016 reported 7.1% of children between three and 17 years of age had current anxiety problems (Ghandour et al., 2019). Prevalence of anxiety is associated with older age and poorer child health or parent/caregiver mental/emotional health. Anxiety disorders are typically accompanied by apprehension, motor hyperactivity and autonomic overactivity (Ritchie & Roser, 2018).

Research shows individuals with anxiety are more prone to fidgeting because they experience heightened arousal, resulting in an increase in manipulations of self, objects, and overall restlessness (Mehrabian & Friedman, 1986). Fidgeting is often perceived as an outward expression of an individual's discomfort, stress, or anxiety. The higher one's stress level, the more likely they are to fidget. It is hypothesized that fidgeting serves to mediate the discomfort of stress in some people (Farley, Risko, & Kingstone, 2013). However, the claim that fidgeting is a method for reducing discomfort and arousal lacks causal evidence in the literature.

The physical movement of fidgeting is often considered voluntary. However, the urge to move can be powerful and, when suppressed, may result in greater physical and mental distress, thus increasing anxiety and arousal (Sachdev & Kruk, 1996). A recent study was conducted on whether fidgeting would increase in individuals after experiencing daily stressful life events, such as giving a presentation (Pollak and Hart, 2017). It was hypothesized that if an individual is not constrained physically or socially by a situation when feeling the urge to move, they can satisfy that urge with non-goal directed behavior, such as postural shifting or pacing. If the individual is constrained in any way and the urge to move is not satisfied, it may result in increased restlessness and fidgeting, in the form of pacing, frequent standing and more continual

postural changes (Pollark & Hart, 2017). This is especially true in situations of high arousal or after a stressful event. The hypothesis was supported as the participants in the study stood for longer, took more steps and made more postural changes after giving a presentation when compared to a regular day in class when they were not required to give a presentation. These results indicate that after a stressful daily life event, increased movement is more likely to occur due to increased arousal.

Fidgeting may also be used as a coping strategy to reduce stress during social situations. In 2013, displacement behaviors (i.e., minor forms of fidgeting) were measured as a coping strategy in stressful social situations for adults (Mohiyeddini, Bauer, & Semple, 2013). It was found that during the induced stress task, men were twice as likely to engage in fidgeting behaviors than women, as measured by scratching, licking of the lips, and raising the hand to the mouth (Mohiyeddini, Bauer, & Semple, 2013). However, men self-reported that they experienced less physiological arousal and reported lower levels of stress while fidgeting than women when fidgeted. The authors theorized fidgeting may allow a brief period of diversion from the attention given to the stressful stimulus or task. Women may display less of these behaviors because in Western societies some fidgeting behaviors can be perceived as "inappropriate" or "un-lady like" for women (Mohiyeddini, 2013).

The physical benefits of exercise have been long confirmed and recommended to reduce the symptoms and physiological arousal experienced when in an anxious or stressed state (Stubbs et al., 2017). Fidgeting, a form of movement, can be used to cope and reduce stress as it releases energy from the body, similar to that of exercise. The amount of energy expended in individuals while engaging in fidgeting-like behaviors was as follows: 6% while sitting motionless, 8% while standing motionless, 29% while fidgeting when seated, 38% while

fidgeting when standing, and 38% while walking (Levine, Schleusner, & Jenson, 2000). Significant quantifiable differences were noted in energy expenditure by all participants when engaging in fidgeting behaviors (Levine, Schleusner, & Jensen, 2000). Even the small act of fidgeting whether sitting or standing can serve to release and expel excess energy. Movement is a natural mood enhancer and stress reducer. Therefore, movement may serve to reduce anxiety as it releases physical energy from the body (Mohiyeddini, 2013).

Fidget spinners are claimed to assist in regulating anxiety and stress. Yet, fidget spinners have not been studied in relation to these emotional states, and limited research investigates fidgeting and anxiety. Research on anxiety and fidget spinners is important for understanding the validity of these claims so consumers are not misled into purchasing a device that does not serve its claimed purpose.

Summary and Current Study

Fidget spinners grossed 2.6 million dollars in total sales during 2017 (Koh, 2017). This three-pronged spinning device has taken the market by storm and found itself in millions of homes, classrooms, and workplaces around the world. Many are purchasing the product for the claim that it regulates emotions and increases focus.

While concentration has been studied in relation to fidgeting, the available body of literature is relatively limited, largely focused on correlational studies, and is inconsistent. Fidgeting appears to be detrimental to attention in TD children and adults, but doodling, a similar distracting task, has been found to be beneficial. In contrast, fidgeting may be helpful for children with ADHD. However, in the sole study that utilized a fidget spinner, attention outcomes were poor for children with ADHD. The majority of research is focused solely on

children with ADHD and does not include TD children, who represent the largest market for this product.

Movement has been associated with decreased arousal and stress, which is beneficial for mental health and anxiety. Fidgeting may be used as a coping strategy to reduce stress and anxiety. However, while research has examined energy expenditure and the underlying reasons for fidgeting as it relates to arousal, there are no experimental studies to determine how fidgeting, while using a fidget spinner or otherwise, impacts anxiety. There are no current studies that examine the relationship between anxiety and fidget spinners.

The current study aims to address these gaps in knowledge regarding the effect of fidget spinner use on anxiety and attention for TD children.

Hypothesis 1: The use of fidget spinners will be detrimental for typically developing children's concentration.

Hypothesis 2: The use of fidget spinners will reduce anxiety for typically developing children during a challenging task.

Method

Participants and Design

Participants included 47 children (25 female). Ages ranged from 8 to 12 years (M=9.45, SD=1.28). Of these participants, 22 were randomly assigned to the fidget spinner condition and 25 to the control condition.

Each parent and/or guardian completed a pre-screener answering whether their child had ever received treatment, medication, and/or a diagnosis of ADHD. If yes, they were informed that their child was not eligible to participate in the study (n=5). If no, the study was further explained to the parent and/or guardian, and an in-person appointment was scheduled.

Measures

Parent Questionnaire. The questions were designed to gather basic demographic information (age, gender & grade), to assess the participants' previous exposure to fidget spinners, and their current frequency of fidget spinner use. Two of the questions were asked in a yes/no format (e.g., Does your child own a fidget spinner? Does your child have experience with a fidget spinner?). The following question (e.g., How often does your child use a fidget spinner?) used a 4-point Likert scale with available answers as never (0), sometimes (1), often (2), and frequently (3). Scores ranged from 0-5, with higher scores indicating more frequent exposure to and use of fidget spinners.

Conners' Parent Rating Scale – Revised (S) (CPRS-R) (Conners', 2008)**.** The Conners' Parent Rating Scale – Revised (S) includes subscales relating to opposition (e.g., "Is angry and resentful" or "Argues with adults"), cognitive problems/inattention (e.g., "Is inattentive, easily distracted" or "Is messy or disorganized at home or school"), and hyperactivity (e.g., "My child is always "on the go" or acts as if "driven by a motor") with 27 questions using a 4-point Likert scale from 0 to 3. The available responses included 0, not true at all (seldom), 1, just a little true (occasionally), 2, pretty much true (often, quite a bit) and 3, very much true (very often, very frequent). The parent and/or guardian was instructed to rate each item according to their child's behavior in the last month. Raw scores were converted to T-scores that accounted for age and gender of participant. T-scores ranged from 42-90 depending on the scale, age, and gender. T-scores above 65 were in the "at-risk" range for a diagnosis of ADHD. The CPRS-R was tested with a replication sample (N = 2,200), with coefficient alphas ranging from .75 to .94 for males and .75 to .93 for females, suggesting strong internal reliability (Conners, Siatarenios, & Parker, 1998; Rogers, Sitarenios, Parker, & Epstein, 1998). A high test-retest reliability of .85

and an internal consistency of .61 to .95 was also found. The CPRS-R was found to have strong convergent validity with other common measures of ADHD symptoms, including the DSM-III-R, Disruptive Behavior Disorder Checklist (.92), Hyperactivity Index of 39-item scale (CTRS-39HI) (.89), Barkley's School Situations Questionnaire (SSQ) (.63), and Attention Deficit Disorders Evaluation Scale (ADDES), Home and School Version (.80, .61) (Green, Wong, & Atkins, 1999). See Appendix 1.

The Screen for Child Anxiety Related Emotional Disorders (SCARED), Parent Version (Birmaher et al., 1999)**.** This instrument screened for childhood anxiety disorders using 41 questions with a 3-point Likert scale including 0 (not true or hardly ever true), 1 (somewhat true or sometimes true), and 2 (very true or often true) (e.g., "when my child gets frightened, his/her heart beats fast"). The parent and/or guardian was instructed to indicate which response best represented their child's behavior over the past three months. Possible scores ranged from 0-82. Scores above or at 25 indicated the possibility of an anxiety disorder. The SCARED yielded five factors: somatic/panic, generalized anxiety, separation anxiety, social phobia, and school phobia (Birmaher et al., 1997). The total score and all scales demonstrated strong internal consistency (a =.74 to .93), test-retest reliability (intraclass correlation coefficients =.70 to .90), discriminative validity (both between anxiety and other disorders and within anxiety disorders), and moderate parent-child agreement *(r* =.20 to .47, *P* < .001, all correlations).

The Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) Digit Span (DS) Subtest (Wechsler, 2003). In order to test attention and working memory, the Digit Span (DS) subtest of the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) was administered. The WISC-IV is the golden standard for intelligence testing in children ages 6 to 16, including 15 subtests with each subtest allocated into four subscales. The Working Memory

Index includes digit span (DS) and picture span (PS). The DS subtest consists of the administrator orally reading numbers in a forward, backward, and sequencing manner. The participant is instructed to repeat the numbers aloud in the correct order, as instructed. The 27 possible items include 9 forward, 9 backward, and 9 sequencing with each item consisting of two trials. If the participant repeated both trials correctly, they received 2 points. If the participant repeated only one trial correctly, they received 1 point. If the participant answered both trials incorrectly, they received 0 points, and the forward, backward and/or sequencing items were discontinued. Each participant was provided with instructions and sample items to demonstrate how to properly complete the task. Participants scores were based on the standard administration and scoring procedures of the WISC-IV, in which the final DS total raw score is the sum of raw scores for DS forward, DS backward and DS sequencing. Raw scores were converted into standard scaled scores based on age. As revised versions of the WISC have been made, the reliability coefficients have continued to strengthen. On the WISC-IV, the Working Memory Index (WMI) has an internal consistency of .92, and DS subtest as .87 (Williams, Weiss, & Rolfhus, 2003). DS test-retest reliability was also high with a coefficient of .83. The WISC-IV is a valid measure when compared to the WISC-III with a coefficient of .77 for the DS subtest. See Appendix 3.

Subjective Units of Distress (SUDS) (Horowitz, Wilner, & Alvarez, 1979). In order to measure participant anxiety, the Subjective Units of Distress (SUDS) were used in a visual format for participant rating. SUDS ratings ranged from 0-10, with lower numbers indicating minimal experience of anxiety and stress, and higher numbers indicating more a more significant experience of anxiety and stress. While the visual thermometer was labeled up to the number 8, the highest rating of 10 was available and explained to participants. The visual of a thermometer

with color coded identifiers was used to encourage understanding of the scale in young children. During the anxiety induction, participants completed a total of 4 SUDS ratings, including prior to the induction, after passage 2, passage 4, and passage 6. Peak SUDS was the variable of interest, which was the participant's highest SUDS rating during the anxiety induction. The psychometric properties for validity of the SUDS scale was compared to the Symptom Checklist-90-Revised (SCL-90-R), The Impact of Event Scale-Revised (IES-R), Beck Depression Inventory (BCI), State and Trait Anxiety Inventory (SAI/TAI) and Clinical Global Impression-Change Scale (CGI-C) (Kim, Bae, & Park, 2008). It was found that the SUDS scale had significant convergent validity with the BDI (Spearman rho =.28, $p < .05$) and the State Anxiety Inventory (SAI) (Spearman rho =.31, $p < .05$). SUDS also showed a significant correlation with the PSDI of SCL-90-R (Spearman rho = .50, $p < .001$), indicating a moderate concurrent validity with the level of symptomatic distress. In addition, a significant correlation with the IES-R (Spearman rho = .46, $p < .001$) also suggested a moderate concurrent validity with the level of distress from traumatic or stressful events. The SUDS scale was found to have a test-retest reliability of r =.87, which indicated high reliability over a two-week period (Horowitz, Wilner, & Alvarez, 1979). The scale was moderately and negatively correlated with the Global Assessment of Functioning Scale (r = -0.439 and $p < .001$) and moderately correlated (r = 0.351, $p < .05$) with the Minnesota Multiphasic Personality Inventory, Second Edition (MMPI-2) (Tanner, 2012). See Appendix 4.

Procedure

Participants were recruited via social media, flyers, and emails to individuals in the Topeka, Kansas area. Parents and/guardians of the participants contacted the researcher either by phone or email. Potential participants were screened for a diagnosis of ADHD. If the participant

had a diagnosis of ADHD, they were excluded from the study. If the participant did not have a diagnosis of ADHD, the parent and/or guardian scheduled an in-person appointment.

The parent and/or guardian and participant were provided with an informed consent. Upon reading and understanding what the experiment entailed, both the parent and/or guardian and child were instructed to provide a signature and verbal assent to participate. The parent and/or guardian was then instructed to complete three questionnaires including: The Parent Questionnaire, Conners' Parent Rating Scale – Revised (S) (CPRS-R), and the SCARED questionnaire.

Participants were randomly assigned to the fidgeting or control condition using a random number generator. The participant entered the lab with the researcher. If in the experimental condition, the participant was given a fidget spinner. Time was spent with each participant instructing them on how to use a fidget spinner and were encouraged to spin it consistently throughout the session. All participants in the experimental condition self-reported familiarity, previous use, and willingness to engage with the fidget spinner throughout the session. If they were in the control condition, they were not given a fidget spinner and completed the activities as normal.

The participants first completed the test of attention and working memory. This included the Digit Span subtest from the WISC-IV. This subtest was administered according to standardized procedures.

The participants were trained in making Subjective Units of Distress (SUDS) ratings (0-10) using the Feelings Thermometer visual handout. The researcher described the rating scale and its purpose, providing examples of situations in which anxiety is commonly low and high. The researcher tested the participants' understanding of the ratings, as well as their ability to

provide variable responses, by asking them to rate different tasks (e.g., How afraid would you feel if you were riding on a roller coaster? Eating ice cream? Lying in bed?).

The participants then read a total of 6 short stories aloud in front of a video camera and the researcher. The participants were told they would be video recorded in order to grade their performance on number of reading errors in order to intentionally induce participant anxiety. They were instructed that the stories would increase in difficulty and to simply try their best. If the participant came to a word that they did not know or could not pronounce, they were instructed to simply skip the word and keep going. The passages used were from the Oral Reading Subtest of the Woodcock Johnson, Test of Achievement, IV (WJ-ACH-IV; Woodcock, 1989). The passages are standardized for individuals ages two to eighty years old. All participants were asked to read the same 6 passages, regardless of age, gender or grade. The researcher held the laminated passages roughly 12 inches from all participants, regardless of condition, in order to allow the participants in the experimental group to use both hands to spin the fidget spinner. Prior to the start of the anxiety induction, participants were asked to provide a SUDS rating, again after reading two passages, after reading four passages, and after reading six passages. SUDS ratings were documented and peak SUDS (i.e., participants highest SUDS rating during induction) were of interest and analyzed.

The participant's reading performance was not scored, and no video footage was recorded. The technique of using a video camera and telling the participant that their reading would be scored for errors was used to induce social evaluative anxiety. In the original study, this procedure induced an average SUDS rating of 12 out of 100, indicating slight to minimal anxiety (Sinclair, Soldat & Ryan, 1997).

The participants then completed the serenity mood induction to reduce anxiety and reduce any perseverance effects. To induce serenity, the Velten mood induction was used, which has been tested with young adults (Frost & Green, 1982; Neuvo, Montorio, Cabrera, Marquez & Izal, 2015; Sinclair, Soldat, & Ryan, 1997). In order to adapt the mood induction for children ages 8-12, four of the 60 questions were removed due to a lack of appropriateness for the developmental level (e.g., "This is one of those days when I'm not feeling bogged down with schoolwork," "I enjoy inviting my friends over for tea and quiet conversation," "I feel like humming quiet music to myself and taking a long walk," and "I feel free and unencumbered"). The remaining statements were adapted by exchanging complex nouns for basic nouns that are consistent with an 8 to 12-year-old's vocabulary (e.g., removing the word "knowledge" and replacing it with "smart"). The researcher read aloud 56 self-referent serenity statements at the rate of 15 seconds per statement. See Appendix 5.

Prior to reading the statements and after the instructions, the participant provided a SUDS rating. SUDS ratings were collected after statement 28 and once again after the total 56 statements. After the 56 statements, the researcher read aloud the serenity incubation script that instructed the participant to focus on their feelings of calmness. See Appendix 6. The participant then sat quietly for two minutes. After the two minutes passed, the participant was asked to rate their SUDS a final time. Anxiety ratings were collected during the mood induction to demonstrate relaxation and a decrease of anxious distress. After the serenity incubation, participants were informed that they were not video recorded and this was intended to induce performance anxiety.

The participant's parent and/or guardian was provided a debriefing form and list of local mental health services. The parent and/or guardian and the participant were offered one initial

session free of charge at the Washburn Psychological Services Clinic (WUSPC). The parent and/or guardian received $10 cash as compensation. This study was self-funded by the graduate student.

Results

Preliminary Analyses

Experimental and control groups were compared on demographic variables and pretreatment measures. See Table 1. No significant group differences were found for age and gender. No significant group differences were found for parent-reported participant frequency of fidget spinner use, parent-reported participant anxiety, oppositional behavior, and cognitive problems/inattention. On the parent questionnaire, 100% of parents and/or guardians of participants in both groups indicated their child had prior experience with fidget spinners. However, groups differed in parent reported participant hyperactivity, $t(45) = 2.531$, $p = .015$. Although the groups differed in hyperactivity, the mean of both groups were well within the "normal" range. The serenity induction was successful in producing a significant reduction in anxiety from peak SUDS to final SUDS rating, $t(46) = -9.345$, $p = .000$. See Figure 1.

Test of Hypotheses

Participants in the fidget spinner group did not differ from participants in the control group on Digit Span (DS), $t(45) = .605$, $p = .548$, $d = .18$. See Figure 2. Groups did not differ on peak SUDS rating, $t(45) = -.266$, $p = .791$, $d = .08$. See Figure 3.

Discussion

The purpose of this study was to evaluate the effect of using a fidget spinner on attention and anxiety in TD children. Results did not support the hypotheses that fidget spinners would be detrimental to concentration and would result in reduced rates of reported anxiety. Ultimately,

there were no significant group differences found between groups on Digit Span scaled scores. There were no significant group differences found between groups on SUDS ratings.

These findings contradict the claimed benefits of fidget spinners retailers have promoted. While further research should be conducted, findings from this study and previous research indicate the ineffectiveness of fidget spinners as a tool for concentration (Graziano, Garcia, & Landis, 2018). Therefore, consumers using fidget spinners and similar devices to address attentional or emotional needs in TD children may produce greater outcomes using evidenced based treatments and empirically supported behavioral techniques.

In the current study, TD children using a fidget spinner were not distracted, made regular eye contact with examiner, and completed the assigned tasks with ease. Presenting an "emotion regulation" tool to children requires the child to view the object as a "tool" and not as a toy to complete its promoted intended purpose. Currently, most children see fidget spinners as a toy rather than something to help them focus, which is similar to previous findings that demonstrated a lack of effectiveness for other "therapeutic toys" for children (Taipalus, Hixson, Kanouse, Wyse, & Fursa, 2017).

The most frequently referenced study regarding fidget spinners utilized a systematic classroom approach to examining fidget spinners with 60 young children (M= 4.86) diagnosed with ADHD by DSM-5 criteria (Graziano, Garcia, & Landis, 2018). Participants wore accelerometers to assess gross motor activity and were videotaped for five minutes during class on three separate days, in which behavioral and attentional data were coded. An A-B-A-B within-participant design was used to monitor children during the baseline (no fidget spinner) and intervention (with a fidget spinner). Results indicated fidget spinners were associated with poorer attention and less gross motor movement. The current study population differed as it

utilized 47 TD elementary aged children (M= 9.45) in a laboratory setting. While these studies made use of different populations (diagnoses and age), measurement procedures, and settings, the results of the only two studies experimentally examining fidget spinners and attention reveal either *no* effect or a *harmful* effect. This is contrary to the effectiveness being portrayed in the media.

The appeal of providing children with attentional deficits with a fidget spinner is for the hope of less distractibility, increased focus, and beneficial higher rates of gross motor movement, which is the basis for the functional Working Memory, Thought, and Action model of ADHD (Rapport et al., 2009). Graziano's study found that the use of a fidget spinner does not result in an increase in gross motor activity; rather it *decreases* gross motor movements. This decrease in gross motor activity is likely due to children only using their hands and a few fingers to utilize a fidget spinner, which are fine motor movements. The Working Memory, Thought, and Action model states hyperactivity serves a purpose for making up for a lack of arousal and works to enhance cognitive performance (Rapport et al., 2008). While additional movement has been proven beneficial for attention in children with ADHD, using a fidget spinner does not engage or increase gross motor movements. The benefit of additional gross motor movement is unclear for TD children.

Children in the fidget spinner and control condition experienced similar amounts of anxiety during the induction. While anxiety was not impacted by fidget spinners in the current study, if it had resulted in a decrease in anxiety, it would likely be due to distraction. Several studies have examined the use of distraction to reduce anxiety in medical, surgical, and dental situations (Sahiner & Bal, 2015). There are several situations in which the use of distraction can be beneficial for children experiencing anxiety. Distraction techniques can include listening to

music, balloon inflation, distraction cards, etc. While distraction can be a helpful tool on occasion for children in situations that induce anxiety, it is not an evidence-based technique for the long-term management of anxiety. Therefore, parents, teachers and physicians should not look to fidget devices or distraction techniques as an emotion regulation tool as a way of managing anxiety on a daily basis. Evidence based treatments for children include Cognitive Behavioral Therapy (CBT), exposures, modeling, and psychoeducation. In more severe cases, the use of psychopharmacological medications may be beneficial, as the conjunction of CBT and antidepressants have been found to be effective in a 12-week study in children (less than or equal to 12 years of age) (Piacentini et al., 2014).

Limitations & Future Directions

There are several limitations within the present research. Due to constraints of time, limited funds for compensation, and limited availability of child participants, only a small sample size was obtained. Future studies should aim to collect data on larger samples to increase statistical power. Another potential limitation was the pretreatment difference in hyperactivity between groups, although both groups were in the average range for hyperactivity. Group differences in baseline hyperactivity might have obscured some differences that could have emerged in response to the fidget spinner intervention. Another possible limitation is the attention and anxiety procedures were not counterbalanced. All participants completed the attention task prior to the anxiety induction in an effort to avoid any lingering symptoms of anxiety, which could potentially affect attentional performance. That said, DS is also a potentially anxiety-producing task which could also have carry-over effects to the next task. Counterbalance allows for the isolation of main effects between control and experimental conditions for order and sequence effects. A lack of counterbalance allowed for factors such as

time, desensitization of using the fidget spinner, and participant biases to potentially affect outcomes. If replicated, procedures should be counterbalanced to test for order effects. The reliance on parent-reported symptoms of anxiety and attention problems compared to assessing for psychopathology directly, may pose as a limitation. Parents may be biased in their reporting. A multitude of rationales may be the grounds for parental reporting bias, including culture driven parental expectations for perfection, the view that any shortcomings of the child are a negative reflection of the parent, and parental ignorance of symptomology. Additionally, with the majority of children in the US living in a home with two working parents, children are spending more time away from their parents, reducing the amount of exposure parents have to their children's behavior on a daily basis in a variety of situations. Future studies would benefit from assessing participants directly for anxiety and attention problems using the DSM-5.

Many commonly used procedures that are valid and reliable measures of attention and anxiety were unable to be utilized as the participant needed to be able to use both hands to spin the fidget spinner. Measures of anxiety and attention that possess stronger psychometric properties would increase the validity and assurance that the variable of interest is being measured. Given the anxiety induction resulted in minimal anxiety, a more anxiety producing task may have changed the outcome. However, limited available anxiety induction tasks not requiring the use of hands and is appropriate for children was limited. Future studies should aim to adapt valid and reliable measures of attention and anxiety to allow for the freedom of the participants hands to use the fidget spinner simultaneously. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), fidgeting is an impulsive and spontaneous behavior (APA, 2013). However, the two studies to experimentally examine the use of fidget spinners were directed and not spontaneous. Participants were instructed to use the

fidget spinner throughout the activities, rather than providing it as an option available if the participant felt inclined to use it. Future studies should measure fidget spinners and fidgeting in general with the understanding that fidgeting is typically impulsive and spontaneous. Therefore, rather than instructing the participant to use a fidgeting device or to manipulate their own body during times of focus or stress, observe the participants natural inclination to engage in these behaviors.

Marketing and advertising companies now have the ability to use technology to publicize their products, making claims regarding their product's efficacy, whether substantiated or unsubstantiated (Lopez, 2018). When mental health professionals or educators promote interventions not grounded in science, they are promoting "pseudoscience." This not only negatively affects consumers but the reputation of the field of psychology (Bensley, Lilienfeld, Rowan, & Masciocchi, 2019). This research is relevant to the importance of questioning untested claims, pseudoscience, and being an educated consumer.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Andrade, J. (2010). What does doodling do? *Applied Cognitive Psychology, 24*(1), 100-106.

B Moreno, Lopez (2018). The use of pseudoscience and experimentation as a persuasive resource in new advertising communication trends. *Revista Latina de Comunicacion Social,* 73, 1428-1443.

Bensley, D. A., Lilienfeld, S. O., Rowan, K. A., Masciocchi, C. M., & Grain, F. (2019). The generality of belief in unsubstantiated claims. *Applied Cognitive Psychology, 34*(1), 16-28.

Birmaher, B., Brent, D. A., Chiappetta, L., Bridge, J., Monga S., & Baugher, M. (1999). Psychometric properties of the screen for child anxiety related emotional disorders (SCARED): A replication study. *Journal of American Academy of Child & Adolescent Psychiatry, 38*(10), 1230-1236.

Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The screen for child anxiety related emotional disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(4), 545-553.

Carriere, J. S. A., Seli, P., & Smilek, D. (2013). Wandering in both mind and body: Individual differences in mind wandering and inattention predict fidgeting. *Canadian Journal of Experimental Psychology, 67*(1), 19-31.

Conners', C. K. (2008). Conners' 3rd edition manual. Toronto, Ontario, Canada: Multi-Health Systems.

Conners', C. K., Parker, J. D. A., & Epstein, J. N. (1998). The revised Conners' parent rating scale (CPRS-R): Factor structure, reliability and criterion validity. *Journal of Abnormal Child Psychology, 26,* 257-268.

da Camara, S. B., Agrawal, R., & Isbister, K. (2018, June). *Identifying children's fidget object preferences: Toward exploring the impacts of fidgeting and fidget-friendly tangibles.* Paper presented at the Proceedings of the 2019 on Designing Interactive Systems Conference 2018 – DIS 18, 301-311.

Farley, J., Risko, E. F., & Kingstone, A. (2013). Everyday attention and lecture retention: The effects of time, fidgeting, and mind wandering. *Frontiers in Psychology, 4,* 619.

Frost, R. O, & Green, M. L. (1982). Velten mood induction procedure effects. *Personality and Social Psychology Bulletin, 8*(2), 341-347.

Galton, F. (1885). The measure of fidget. *Nature, 32*(817), 174-175.

Ghandour, R. M., Sherman, L. J., Vladutiu, C. J., Ali, M. M., Lynch, S. E., Bitsko, R. H., & Blumberg, S. (2019). Prevalence and treatment of depression, anxiety, and conduct problems in US children. *The Journal of Pediatrics, 206,* 256-267.

Gomez, R., Vance, A., & Watson, S. D. (2016). Structure of the Wechsler intelligence scale for children – fourth edition in a group of children with ADHD. *Frontiers in Psychology,* 7.

Graziano, P. A., Garcia, A. M., & Landis, T. D. (2018). To fidget or not to fidget, that is the question: A systematic classroom evaluation of fidget spinners among young children with ADHD. *Journal of Attention Disorders*, *24*(1), 163-171.

Green M., & Wong, M. & Atkins, D. (1999). Diagnosis of Attention-Deficit/Hyperactivity Disorder. Rockville (MD): Agency for Health Care Policy and Research (US).

Hartanto, T. A., Krafft, C. E., Iosif, A. M., & Schweitzer, J. B. (2016). A trial-by-trial analysis reveals more intense physical activity is associated with better cognitive control performance in Attention-Deficit/Hyperactivity Disorder. *Child Neuropsychology, 22*(5), 618-626.

Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of event scale: A measure of subjective stress. *Psychosomatic Medicine, 41*(3), 209-218.

Karlesky, M., & Isbister, K. (2013, April). *Fidget widgets: Secondary playful interactions in support of primary serious tasks.* Paper presented at the meeting of CHI '13 Extended Abstracts on Human Factors Computing Systems on CHI EA '13, 1149-1154.

Kim, D., Bae, H., & Park, Y. C. (2008). Validity of the subjective units of disturbance scale in EMDR. *Journal of EMDR Practice and Research, 2*(1), 57-62.

Koh, E. (2017, May 4). *The woman who invented the fidget spinner isn't making a dime off their huge profits*. Retrieved from https://www.miamiherald.com/news/nation-world/national/article148558919.html

Levine, J. A., Schleusner, S. J., & Jensen, M. D. (2000). Energy expenditure of nonexercised activity. *The American Journal of Clinical Nutrition, 72*(6), 1451-1454.

Libassi, M. (2017). *The $500,000,000 trend spinning the toy industry upside down*. Retrieved from https://www.foxbusiness.com/features/the-500000000-trend-spinning the-toy-industry-upside-down.

Mehrabian, A., & Friedman, S. L. (1986). An analysis of fidgeting and associated individual differences. *Journal of Personality, 54*(2), 406-429.

Mohiyeddini, C., Bauer, S., & Semple, S. (2013). Displacement behavior is associated with reduced stress levels among men but not women. *PLoS ONE, 8*(2).

Montag, A. (2017, July 11). *These two teens made $350,000 in 6 months helping fidget spinners go viral.* Retrieved from https://www.cnbc.com/2017/07/10/fidget360-made-350000- in-6-months-and-sent-fidget-spinners-viral.html

Nocera, F. D., Colonna, S. P., Capobianco, C., Mastrangelo, S., & Steinhage, A. (2014, January). *Keep calm and don't move a muscle: Motor restlessness as an indicator of mental workload.* Chapter presented at the Proceedings of the Human Factors and Ergonomics Society Europe Chapter, 183-191.

Piacentini, J., Bennett, S., Compton, S. N., Kendall, P. C., Birmaher, B., Albano, A. M., …Walkup, J. (2014). 24- and 36-week outcomes for the child/adolescent anxiety multimodal study (CAMS). *Journal of the American Academy of Child & Adolescent Psychiatry, 53*(3), 297-310.

Polanczyk, G. V., Willcutt, E. G., Salum, G. A., Kieling, C., & Rohde, L. A. (2014). ADHD prevalence estimates across three decades: An updated systematic review and meta-regression analysis. *International Journal of Epidemiology, 43*(2), 434-442.

Pollark, M. H., & Hart, J. R. (2017). Physical activity increases after an affectively arousing daily life event. *Frontiers in Psychology, 8*, 518.

Rapport, M. D., Bolden, J., Kofler, M. J., Sarver, D. E., Raiker, J. S., & Alderson, R. M. (2008). Hyperactivity in boys with Attention-Deficit/Hyperactivity Disorder (ADHD): A ubiquitous core symptom or manifestation of working memory deficits? *Journal of Abnormal Child Psychology, 37(*4), 521-534.

Reeves, P. T., Nylund, C. M., Noel, J. M., Jones, D. S., Chumpitazi, B. P., Milczuk, H. A., & Noel, R. A. (2018). Fidget spinner ingestions in children – a problem that spun out of nowhere. *The Journal of Pediatrics, 197,* 275-279.

Ritchie, H., & Roser, M. (2018). Mental Health. Retrieved from https://ourworldindata.org/mentalhealth#anxiety-disorders.

Rogers, C. K., Sitarenios, G., Parker, J. D., & Epstein, J. N. (1998). The revised Conners' parent rating scale (CPRS-R): Factor structure, reliability, and criterion validity. *Journal of Abnormal Child Psychology, 26*(4), 257-268.

Sachdev, P., & Kruk, J. (1996). Restlessness: The anatomy of a neuropsychiatric symptom. *Australian & New Zealand Journal of Psychiatry, 30*(1), 38-53.

Sahiner, N. C., & Bal, M. D. (2016). The effects of three different distraction methods on pain and anxiety in children. *Journal of Child Health Care, 20*(3), 277-285.

Sarver, D. E., Rapport, M. D., Kofler, M. J., Raiker, J. S., & Friedman, L. M. (2015). Hyperactivity in attention-deficit/hyperactivity disorder (ADHD): Impairing deficit or compensatory behavior? *Journal of Abnormal Child Psychology, 43*(7), 1219-1232.

Schecter, R. A., Shah, J., Fruitman, K., & Milanaik, R. L. (2017). Fidget spinners: Purported benefits, adverse effects and accepted alternatives. *Current Opinion in Pediatrics, 29*(5), 616-618.

Seli, P., Carriere, J. S. A., Thomson, D. R., Cheyne, J. A., Martens, K. A. E., & Smilek, D. (2013). Restless mind, restless body. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(3), 660-668.

Sinclair, R. C., Soldat, A. S., & Ryan, C. A. (1997). Development and validation of Velten-like image-oriented anxiety and serenity mood inductions. *Basic and Applied Social Psychology, 19*(2), 163-182.

Stubbs, B., Vancampfort, D., Rosenbaum, S., Firth, J., Cosco, T., Veronese, N., … Schuch, F. B. (2017). An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. *Psychiatry Research, 249,* 102-108.

Taipalus, A. C., Hixson, M. D., Kanouse, S. K., Wyse, R. D., & Fursa, S. (2017). Effects of therapy balls on children with attention deficit hyperactivity disorder. *Behavioral Interventions, 32*(4), 418-426.

Tanner, B. A. (2012). Validity of global physical and emotional SUDS. *Applied Psychophysiology and Biofeedback, 37*(1), 31-34.

Thayer, K. (2017, May 03). Schools ban fidget toys as classroom distraction. Retrieved from https://www.chicagotribune/com/news/local/breaking/ct-fidget-toys-school-bad-met-20170429-story.html.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV).* San Antonio, TX, US: Psychological Corporation.

Williams, P. E., Weiss, L. G., & Rolfhus, E. L. (2003). WISC-IV technical manual #2. The Psychological Corporation, A Harcourt Assessment Company.

Table 1

Characteristics of Participants

	Group					
	Fidget Spinner (*n* = 22)			Control (*n* = 25)		
	M	*SD*	%	*M*	*SD*	%
Female			45.5%			60.0%
Male			54.5%			40.0%
Age	9.45	1.29		9.44	1.29	
Fidget Spinner Use	2.41	.59		2.40	.87	
Conners' Oppositional	49.82	8.857		48.68	5.618	
Conners' Inattention	49.36	11.362		50.12	7.934	
Conners' Hyperactivity	55.77*	8.981		50.36*	5.453	
SCARED Questionnaire	11.91	9.49		14.20	12.50	

Note. * *p*<.05; SCARED = Screen for Child Anxiety Related and Emotional Disorders

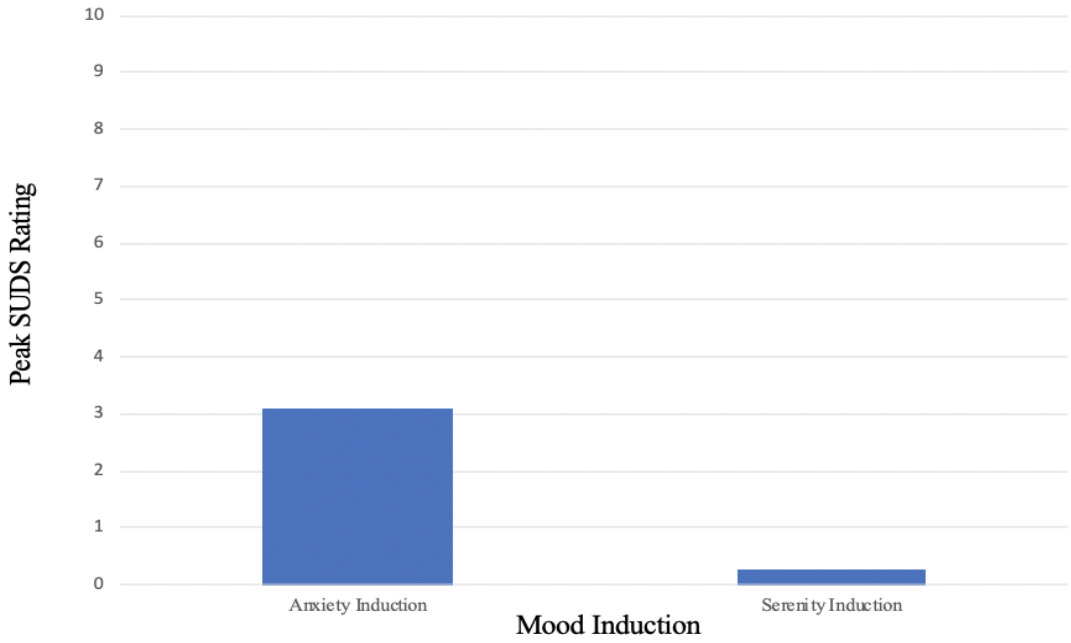


Figure 1. Reduction in SUDS from peak rating during the anxiety induction to the end of the serenity induction for the entire sample.

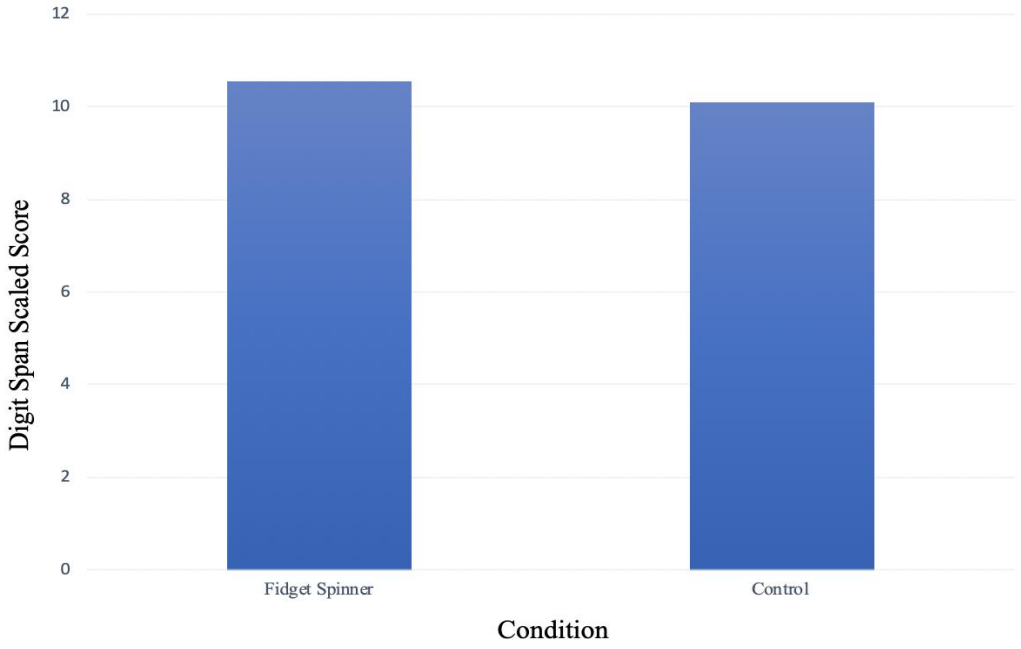


Figure 2. Digit Span score by condition.

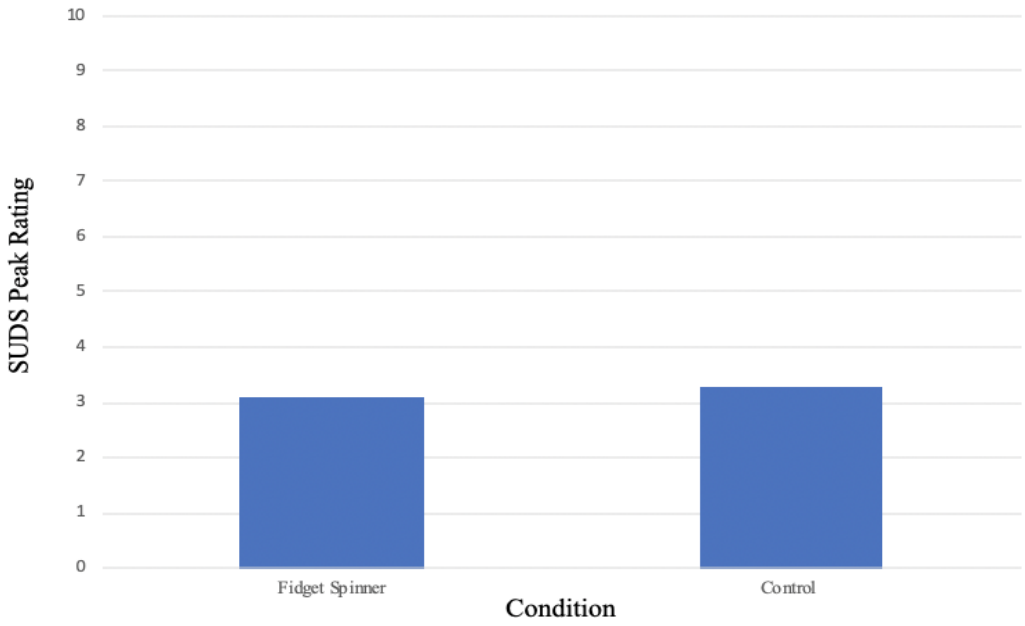


Figure 3. Peak SUDS ratings by condition.

Appendix 1

Conners' Parent Rating Scale–Revised (S)

by C. Keith Conners, Ph.D.

Child's ID: _____ **Gender:** M F (Circle One)

Birthdate: ___/___/___ (Month Day Year) **Age:** _____ **School Grade:** _____

Parent's ID: _____ **Today's Date:** ___/___/___ (Month Day Year)

Instructions: Below are a number of common problems that children have. Please rate each item according to your child's behavior in the last month. For each item, ask yourself, "How much of a problem has this been in the last month?", and circle the best answer for each one. If none, not at all, seldom, or very infrequently, you would circle 0. If very much true, or it occurs very often or frequently, you would circle 3. You would circle 1 or 2 for ratings in between. Please respond to each item.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
1. Inattentive, easily distracted	0	1	2	3
2. Angry and resentful	0	1	2	3
3. Difficulty doing or completing homework	0	1	2	3
4. Is always "on the go" or acts as if driven by a motor	0	1	2	3
5. Short attention span	0	1	2	3
6. Argues with adults	0	1	2	3
7. Fidgets with hands or feet or squirms in seat	0	1	2	3
8. Fails to complete assignments	0	1	2	3
9. Hard to control in malls or while grocery shopping	0	1	2	3
10. Messy or disorganized at home or school	0	1	2	3
11. Loses temper	0	1	2	3
12. Needs close supervision to get through assignments	0	1	2	3
13. Only attends if it is something he/she is very interested in	0	1	2	3
14. Runs about or climbs excessively in situations where it is inappropriate	0	1	2	3
15. Distractibility or attention span a problem	0	1	2	3
16. Irritable	0	1	2	3
17. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)	0	1	2	3
18. Restless in the "squirmy" sense	0	1	2	3
19. Gets distracted when given instructions to do something	0	1	2	3
20. Actively defies or refuses to comply with adults' requests	0	1	2	3
21. Has trouble concentrating in class	0	1	2	3
22. Has difficulty waiting in lines or awaiting turn in games or group situations	0	1	2	3
23. Leaves seat in classroom or in other situations in which remaining seated is expected	0	1	2	3
24. Deliberately does things that annoy other people	0	1	2	3
25. Does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behavior or failure to understand instructions)	0	1	2	3
26. Has difficulty playing or engaging in leisure activities quietly	0	1	2	3
27. Easily frustrated in efforts	0	1	2	3

Appendix 2

Screen for Child Anxiety Related Disorders (SCARED)

PARENT Version—Page 1 of 2 (to be filled out by the PARENT)

Name: _____ Date: _____

Directions:
Below is a list of sentences that describe how people feel. Read each phrase and decide if it is "Not True or Hardly Ever True" or "Somewhat True or Sometimes True" or "Very True or Often True" for your child. Then, for each statement, check √ the box that corresponds to the response that seems to describe your child *for the last 3 months*. Please respond to all statements as well as you can, even if some do not seem to concern your child.

	0 Not True or Hardly Ever True	1 Somewhat True or Sometimes True	2 Very True or Often True	
1. When my child feels frightened, it is hard for him/her to breathe.				PA/SO
2. My child gets headaches when he/she is at school.				SCH
3. My child doesn't like to be with people he/she doesn't know well.				SOC
4. My child gets scared if he/she sleeps away from home.				SEP
5. My child worries about other people liking him/her.				GA
6. When my child gets frightened, he/she feels like passing out.				PA/SO
7. My child is nervous.				GA
8. My child follows me wherever I go.				SEP
9. People tell me that my child looks nervous.				PA/SO
10. My child feels nervous with people he/she doesn't know well.				SOC
11. My child gets stomachaches at school.				SCH
12. When my child gets frightened, he/she feels like he/she is going crazy.				PA/SO
13. My child worries about sleeping alone.				SEP
14. My child worries about being as good as other kids.				GA
15. When my child gets frightened, he/she feels like things are not real.				PA/SO
16. My child has nightmares about something bad happening to his/her parents.				SEP
17. My child worries about going to school.				SCH
18. When my child gets frightened, his/her heart beats fast.				PA/SO
19. He/she gets shaky.				PA/SO
20. My child has nightmares about something bad happening to him/her.				SEP

Screen for Child Anxiety Related Disorders (SCARED)

PARENT Version—Page 2 of 2 (to be filled out by the PARENT)

	0 Not True or Hardly Ever True	1 Somewhat True or Sometimes True	2 Very True or Often True	
21. My child worries about things working out for him/her.				GA
22. When my child gets frightened, he/she sweats a lot.				PA/SO
23. My child is a worrier.				GA
24. My child gets really frightened for no reason at all.				PA/SO
25. My child is afraid to be alone in the house.				SEP
26. It is hard for my child to talk with people he/she doesn't know well.				SOC
27. When my child gets frightened, he/she feels like he/she is choking.				PA/SO
28. People tell me that my child worries too much.				GA
29. My child doesn't like to be away from his/her family.				SEP
30. My child is afraid of having anxiety (or panic) attacks.				PA/SO
31. My child worries that something bad might happen to his/her parents.				SEP
32. My child feels shy with people he/she doesn't know well.				SOC
33. My child worries about what is going to happen in the future.				GA
34. When my child gets frightened, he/she feels like throwing up.				PA/SO
35. My child worries about how well he/she does things.				GA
36. My child is scared to go to school.				SCH
37. My child worries about things that have already happened.				GA
38. When my child gets frightened, he/she feels dizzy.				PA/SO
39. My child feels nervous when he/she is with other children or adults and he/she has to do something while they watch him/her (for example: read aloud, speak, play a game, play a sport).				SOC
40. My child feels nervous when he/she is going to parties, dances, or any place where there will be people that he/she doesn't know well.				SOC
41. My child is shy.				SOC

The SCARED is available at no cost at www.pediatricbipolar.pitt.edu under resources/instruments.

January 19, 2018

Appendix 3

4. Digit Span

Start
Forward
Ages 6–16: Item 1

Backward
Ages 6–16: Sample, then Item 1

Sequencing
Ages 6–7: Qualifying Item, Samples A & B, then Item 1
Ages 8–16: Samples A & B, then Item 1

Discontinue
Forward: After scores of **0** on *both trials* of an item
Backward: After scores of **0** on *both trials* of an item

Sequencing
Ages 6–7: After an incorrect response to Qualifying Item OR after scores of **0** on *both trials* of an item
Ages 8–16: After scores of **0** on *both trials* of an item

Score
Score **0** or **1** point for each trial.

DSf, DSb, and DSs
Total raw score for Forward, Backward, and Sequencing, respectively

LDSf, LDSb, and LDSs
Number of digits recalled on last trial scored 1 point on Forward, Backward, and Sequencing, respectively

Forward

	Item	Trial	Response	Trial Score	Item Score
6–16	1.	2 – 9		0 1	0 1 2
		5 – 4		0 1	
	2.	3 – 9 – 6		0 1	0 1 2
		6 – 5 – 2		0 1	
	3.	5 – 4 – 1 – 7		0 1	0 1 2
		9 – 1 – 6 – 8		0 1	
	4.	8 – 2 – 1 – 9 – 6		0 1	0 1 2
		7 – 2 – 3 – 4 – 9		0 1	
	5.	5 – 7 – 3 – 6 – 4 – 8		0 1	0 1 2
		3 – 8 – 4 – 1 – 7 – 5		0 1	
	6.	2 – 1 – 8 – 9 – 4 – 3 – 7		0 1	0 1 2
		7 – 8 – 5 – 2 – 1 – 6 – 3		0 1	

continue

4. Digit Span *(continued)*

Discontinue after scores of **0** on *both trials* of an item.

Item	Trial	Response	Trial Score	Item Score
7.	1 – 8 – 4 – 2 – 7 – 5 – 3 – 6		0 1	0 1 2
	2 – 7 – 9 – 6 – 3 – 1 – 4 – 8		0 1	
8.	7 – 2 – 6 – 1 – 9 – 4 – 8 – 3 – 5		0 1	0 1 2
	4 – 3 – 8 – 9 – 1 – 7 – 5 – 6 – 2		0 1	
9.	6 – 2 – 5 – 3 – 1 – 9 – 8 – 5 – 4 – 7		0 1	0 1 2
	9 – 4 – 3 – 8 – 7 – 5 – 2 – 9 – 6 – 1		0 1	

LDSf (Max = 10)

Digit Span Forward (DSf) Total Raw Score (Maximum = 18)

Backward

	Item	Trial	Correct Response	Response	Trial Score	Item Score
6–16	S.	9 – 4	4 – 9			
		5 – 6	6 – 5			
	1.	2 – 1	1 – 2		0 1	0 1 2
		1 – 3	3 – 1		0 1	
	2.	3 – 9	9 – 3		0 1	0 1 2
		8 – 5	5 – 8		0 1	
	3.	2 – 3 – 6	6 – 3 – 2		0 1	0 1 2
		5 – 4 – 1	1 – 4 – 5		0 1	
	4.	4 – 5 – 8	8 – 5 – 4		0 1	0 1 2
		2 – 7 – 5	5 – 7 – 2		0 1	
	5.	7 – 4 – 5 – 2	2 – 5 – 4 – 7		0 1	0 1 2
		9 – 3 – 8 – 6	6 – 8 – 3 – 9		0 1	
	6.	2 – 1 – 7 – 9 – 4	4 – 9 – 7 – 1 – 2		0 1	0 1 2
		5 – 6 – 3 – 8 – 7	7 – 8 – 3 – 6 – 5		0 1	
	7.	1 – 6 – 4 – 7 – 5 – 8	8 – 5 – 7 – 4 – 6 – 1		0 1	0 1 2
		6 – 3 – 7 – 2 – 9 – 1	1 – 9 – 2 – 7 – 3 – 6		0 1	
	8.	8 – 1 – 5 – 2 – 4 – 3 – 6	6 – 3 – 4 – 2 – 5 – 1 – 8		0 1	0 1 2
		4 – 3 – 7 – 9 – 2 – 8 – 1	1 – 8 – 2 – 9 – 7 – 3 – 4		0 1	
	9.	3 – 1 – 7 – 9 – 4 – 6 – 8 – 2	2 – 8 – 6 – 4 – 9 – 7 – 1 – 3		0 1	0 1 2
		9 – 8 – 1 – 6 – 3 – 2 – 4 – 7	7 – 4 – 2 – 3 – 6 – 1 – 8 – 9		0 1	

LDSb (Max = 8)

Digit Span Backward (DSb) Total Raw Score (Maximum = 18)

continue

4. Digit Span *(continued)*

Sequencing

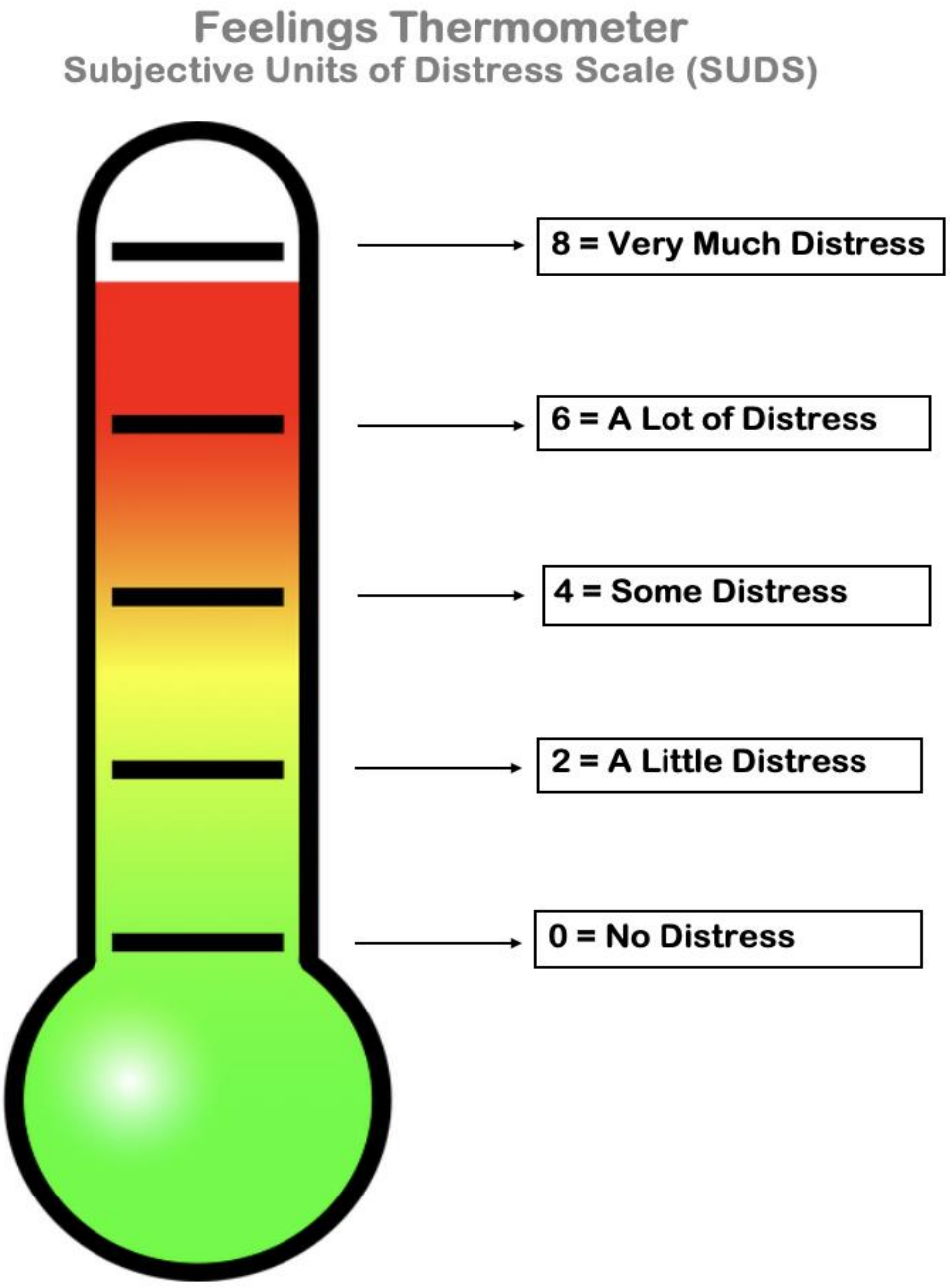
Discontinue after scores of **0** on *both trials* of an item.

	Qualifying Item	Correct Response	Correct
6–7	Counting	Child correctly counts to at least **3**.	Y N

	Item	Trial	Correct Response	Response	Trial Score	Item Score
8–16	SA.	3 – 1	1 – 3			
		8 – 6	6 – 8			
	SB.	5 – 2 – 4	2 – 4 – 5			
		4 – 3 – 3	3 – 3 – 4			
	1.	4 – 1	1 – 4		0 1	0 1 2
		3 – 2	2 – 3		0 1	
	2.	5 – 2 – 7	2 – 5 – 7		0 1	0 1 2
		1 – 8 – 6	1 – 6 – 8		0 1	
	3.	7 – 5 – 8 – 1	1 – 5 – 7 – 8		0 1	0 1 2
		4 – 2 – 9 – 3	2 – 3 – 4 – 9		0 1	
	4.	1 – 5 – 6 – 2 – 8	1 – 2 – 5 – 6 – 8		0 1	0 1 2
		2 – 8 – 4 – 7 – 9	2 – 4 – 7 – 8 – 9		0 1	
	5.	3 – 3 – 6 – 1 – 5	1 – 3 – 3 – 5 – 6		0 1	0 1 2
		4 – 9 – 4 – 6 – 9	4 – 4 – 6 – 9 – 9		0 1	
	6.	8 – 5 – 2 – 5 – 3 – 7	2 – 3 – 5 – 5 – 7 – 8		0 1	0 1 2
		6 – 1 – 4 – 7 – 9 – 3	1 – 3 – 4 – 6 – 7 – 9		0 1	
	7.	9 – 7 – 9 – 6 – 2 – 6 – 8	2 – 6 – 6 – 7 – 8 – 9 – 9		0 1	0 1 2
		3 – 1 – 7 – 5 – 1 – 8 – 5	1 – 1 – 3 – 5 – 5 – 7 – 8		0 1	
	8.	6 – 9 – 6 – 2 – 1 – 3 – 7 – 9	1 – 2 – 3 – 6 – 6 – 7 – 9 – 9		0 1	0 1 2
		1 – 4 – 8 – 5 – 4 – 8 – 7 – 4	1 – 4 – 4 – 4 – 5 – 7 – 8 – 8		0 1	
	9.	2 – 5 – 7 – 7 – 4 – 8 – 7 – 5 – 2	2 – 2 – 4 – 5 – 5 – 7 – 7 – 7 – 8		0 1	0 1 2
		9 – 1 – 8 – 3 – 6 – 3 – 9 – 2 – 6	1 – 2 – 3 – 3 – 6 – 6 – 8 – 9 – 9		0 1	

LDSs (Max = 9)	Digit Span Sequencing (DSs) Total Raw Score (Maximum = 18)	
	Digit Span Total Raw Score (Maximum = 54)	

Appendix 4


Feelings Thermometer
Subjective Units of Distress Scale (SUDS)
8 = Very Much Distress
6 = A Lot of Distress
4 = Some Distress
2 = A Little Distress
0 = No Distress

Appendix 5

Velten Serenity Induction

1. Today is neither better nor worse than any other day.
2. I feel mentally alert and calm.
3. I'm pleased to be in school – I'm learning a great deal.
4. Sometimes it feels good to get away from the noise by going to a park.
5. Mistakes I make don't bother me, I learn from them, I'm human.
6. I usually feel at ease when I meet new people.
7. I like to take my time doing things.
8. I feel that I maintain a hopeful, positive attitude.
9. Today is fine.
10. Whether I'm with others or alone, I can feel relaxed and calm.
11. I find that I'm most creative when I'm in this mood.
12. This might just turn out to be an easy day for me.
13. I'm happy with my life right now.
14. This spring should be a relaxing time for me.
15. The warmth of summer will be approaching soon; I can almost feel the calm.
16. The morning hours are the quietest time for me.
17. Everything seems to just naturally fall into place. No worries.
18. My parents are proud of me, and I feel secure and comfortable with this.
19. I have a fresh outlook on life. I'm secure in my happiness.
20. My friends have commented on how calmly I cope with life's stressors.
21. I feel smart and wise today.
22. I feel a calm acceptance of everyone.
23. I like to picture myself high up on a mountain top, fresh air, so quiet.
24. I feel a quiet calmness– like curling up with a book.
25. I feel laid back and relaxed.
26. I'm not worried about my future. Things will go well.
27. I feel a certain positiveness in everything that I do.
28. I feel like I know myself well, I feel smart.
29. What can I say… I'm just so calm.
30. I do feel relaxed and calm today.
31. My motto is to take it one day at a time – no rush.
32. I'm an accepting and honest person.
33. I can almost imagine a sea breeze blowing gently through my hair.
34. I feel calm and sure of myself right now.
35. The smell of spring blossom calms me.
36. Life is to be enjoyed, not worried about.
37. I like to savor these quiet moments.
38. I could just slip off my shoes and sit back and relax.
39. My muscles feel loose and heavy – so relaxed.
40. I feel that I have a certain inner peace.
41. I'm glad that I can take it easy today.
42. I could really go for a lazy day at the beach.

43. I'm relaxed and at ease.
44. This has been a really peaceful day for me.
45. I am sure that life will go well for me.
46. With each passing day, I feel more relaxed and sure of my life.
47. If your attitude is relaxed, then things are relaxed. I am relaxed.
48. I'm calm and content – I feel like I could doze off any time.
49. Never have I felt as calm as I feel at this moment.
50. Nothing can make me feel worried today.
51. I'm feeling quite calm now.
52. It fills me with a quiet inner peace to know that I am appreciated by such wonderful friends.
53. I feel like I have no cares in the world.
54. I'm feeling wonderfully calm and pleased today.
55. I don't think I've ever felt so peaceful as I do right now.
56. I feel so calm, so happy, so comfortable, so relaxed, so nice.

Appendix 6

Serenity Incubation

Now that you're feeling very calm, concentrate on this feeling. Feel it getting stronger and stronger; more and more peaceful. Let it continue to build. Think about things that have happened in your life that have made you feel very, very calm; like listening to soothing music, or walking along the beach on a warm summer day or sitting by a fire sipping hot chocolate without a care in the world. Concentrate on it. Let yourself feel very calm, relaxed, very peaceful, very laid-back. As you do, you'll feel the mood build. It'll become more and more serene. This in turn will make you think of other things in your life that have made you feel very, very calm. The mood will continue to build. Feel it become calmer. Feel it get stronger and stronger. It will happen. Do and think whatever you can to build this very calm mood. Feel very, very calm. Close your eyes for two minutes. Begin now.