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Doctoral Thesis:

Transforming Learners Through Brain-Based Therapeutic Techniques

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Abstract

Throughout the country, school districts are dealing with the increase in violence, bullying, and/or crimes in our schools. In attempt to make schools safer, zero tolerance policies were established and enacted. Suspension and expulsion policies operate on the supposition that the removal of disruptive students will bring order to the school environment. Ultimately, these measures have had devastating repercussions for students diagnosed with social-emotional and behavioral disabilities. Reactionary policies have resulted in a significant increase in the number of in-house suspensions, suspensions and expulsions for these students. These reactionary measures, which only respond to incidents, have done little to prevent episodes from occurring.

This research explores the case of an eight-year-old elementary student, who is diagnosed with Post Traumatic Stress Disorder (PTSD). After several unsuccessful school placements, the student now attends an alternative educational day program. The program offers a brain-based therapeutic component, which focuses on a preventative approach to behavioral intervention. This single-case quasi-experiment investigates if the implementation of positive visual imagery will result in improved behavioral outcomes. This quantitative single-case experiment examines and compares behavioral outcomes at baseline, during the implementation of positive visual imagery, and at return to baseline phases to determine if a positive effect is evident.

Keywords: Post Traumatic Stress Disorder (PTSD), neuropsychology, brain-based interventions, trauma-sensitive schools, neuropsychology
Dedication

This doctoral thesis is dedicated to my two strongest supporters, my husband David and my daughter Hannah. Your never ending patience with having to share me with my courses and writing does not go unrecognized. Thank you for your encouragement and support when I would question myself. I love you both.
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Several individuals’ contributions warrant acknowledgement. In my attempt to keep the subject’s identity private, these acknowledgements will be rather generic. Let that not diminish the sentiment behind these tributes. The collective support and dedication of these individuals has concluded in this Doctoral Thesis.

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Chapter 1

Statement of problem

The Elementary Alternative Center for Education (ACE) program serves students, grades K-5, in a substantially separate, public day school program. ACE students present with inconsistent behavioral performance that is typically attributed to their inability to effectively self-regulate socially and emotionally. These inconsistencies often preclude their successful participation and integration within their neighborhood schools. The problem under investigation is one of insufficient behavioral student outcomes.

Students currently enrolled in this program have diagnoses such as ADD/ADHD, Post Traumatic Stress Disorder (PTSD), Bi-Polar, Reactive Attachment Disorder (RAD) and Oppositional Defiant Disorder (ODD). Several of the students have been victims of trauma; therefore, traditional educational environments and/or practices have proved ineffective and have not resulted in desired behavioral outcomes for these students. Traditional behavioral practices for students with social-emotional and behavioral challenges generally consist of punitive and/or consequence based discipline strategies. These strategies tend to focus on controlling the student’s behavior by punishing inappropriate actions. Emphasis is placed on students becoming compliant and submissive. Time-out and restraints are common practices in a punitive model. Time-out and restraints are not therapeutic; they are responses to a crisis. “Reacting to problems is not an effective management approach because emotions reduce the ability of the brain to think logically and instead trigger nonverbal behaviors that intuitively arouse others” (Sanchez, 2008, p.84). This increased threat of punishment ultimately leads to greater impulsive responses from the students with social-emotional disabilities.
Significance of the Problem

It may be asked why an educational facility places emphasis on social-emotional and behavioral achievement. The answer is that behavioral performance directly correlates to academic performance. If a child perceives the educational environment as threatening, stressful and/or chaotic, then the child’s brain will have a negative physiological response, and not be available for learning. Cole et al. (2005) explain that children exposed to trauma often demonstrate decreased level of organization, concentration, memory and language abilities. Therefore, one cannot look at behavior and academics as two separate entities; they are interdependent variables. If students are constantly being removed from the classroom to deal with their inappropriate behaviors, then they cannot access education.

In attempt to make schools safer, zero tolerance policies were established and enacted throughout the country. This policy is based on the supposition that the removal of disruptive students will bring order to the school environment. Ultimately, this policy has had devastating repercussions for students diagnosed with social-emotional and behavioral disabilities. These policies have resulted in a significant increase in the number of in-house suspensions, suspensions and expulsions for these students. Misguided school systems are spending an inordinate amount of money on security measures. These reactionary measures, which only respond to incidents, have done little to prevent the episodes from occurring. Time and finances need to be on teaching social skills and supporting the aggressors (Brynes 2002, Nunley 2002, Sanchez 2008).

To address the achievement gap presented by students with social-emotional disabilities, educators must be willing to look outside of the traditional discipline models. Nunley (2002) believes that increase in violent episodes in our schools can be attributed to the
widespread use of punishment-based management systems. Therapeutic models need to be developed that concentrate on preventative methods as opposed to customary reactive responses. "Science indicates that 75 percent of all negative behaviors can be managed only through prevention" (Sanchez, 2008, p.28). Sanchez (2008) suggests that responding to a crisis will not lower the occurrence of crisis. Schools need to focus on preventing episodes rather than wasting their time planning how best to respond. The goal of behavior management needs to be on creating therapeutic techniques that support the student with behavioral challenges. This doctoral research project examines brain-based therapeutic techniques that attempt to intervene in the behavioral cycle and achieve de-escalation.

**Practical and Intellectual Goals**

The goal of the research is to utilize the current findings in neuropsychology and trauma therapy to develop strategies for teachers and school personnel to employ in an educational setting. Many studies in neuropsychology today employ the use of EEG and brain scanning devices to analyze the brain waves in order to determine how/what the brain is processing. Because this is not feasible in most educational settings, this study will focus on observable characteristics, known triggers and other stress indicators to establish that the subject is experiencing distress in a given situation and then determine if it is possible to intervene before these feelings result in an inappropriate behavioral response.

If the strategies under investigation prove to be effective, they will be strategically implemented with a larger population of students in the future. Ultimately, the desired impact of this research project is to transform our Elementary ACE classrooms into therapeutic learning environments, which will reach a student population that has been unsuccessful in the traditional public school setting. It will assess whether this goal can be achieved through the
implementation of positive visual imagery. Improved behavioral outcomes would include a demonstration of increased independence for the following: self-regulatory behaviors, social/emotional regulation, tolerance of non-preferred activities, mood stability, impulse control, positive interactions with staff and peers, and the ability to follow school rules/ regulations. Consequently, improved behavioral outcomes would result in a decrease in disciplinary action such as time-out and restraints, and ultimately result in the student’s return to their home schools. As the ACE Elementary program director and researcher, this project aligns with both my personal and professional goals.

**Research Questions (Summary)**

This doctoral project proposes to examine the effectiveness of the brain-based preventative strategy of positive visual imagery. Positive visual imagery will be introduced in attempt to improve behavioral outcomes for students diagnosed with Post-Traumatic Stress Disorder (PTSD). This research project is intended to investigate the effect to which implementation of positive visual imagery will serve to reduce negative reactions to events that have been triggers in the past. It is questionable, if these techniques will result in a reduction of time-outs and restraints if implemented consistently.

**Paper Contents and Organization**

After the examination of the theoretical frameworks upon which this proposal is based, the reader will be introduced to the latest information regarding neurology, neuropsychology, and education. Within the educational domain, both brain-based education and trauma-sensitive schools will be reviewed. The author will reveal how this information pertains to children with Post Traumatic Stress Disorder (PTSD), the target population to be studied. Finally, the reader
will be introduced to the research design model and methodology being proposed to examine the effectiveness of positive visual imagery.

**Theoretical Framework**

The theory that serves as the lens through which the stated problem will be examined, is the Cognitive- Behavior Theory. This theory offers a unique perspective that espouses the implementation of brain-based therapeutic strategies and enriches our understanding of why this technique is warranted.

**Cognitive-Behavioral Theory**

According to Kalodner, “cognitive-behavioral theories are best conceptualized as a general category of theories, or a set a related theories, that have evolved from the theoretical writings, clinical experiences, and empirical studies of behavioral and cognitively oriented psychologists and other mental health workers” (Kalodner, 2011, p.193). Kalodner explains that the title cognitive-behavioral theory reflects the significance of both the cognitive and behavioral views, each with its own distinct beliefs and therapeutic modalities. Because of this, Kalodner points out that it is impossible to give one definition to the term cognitive-behavioral theory. However, in order for a therapy to be considered “…cognitive-behavioral, it must be based on the idea that cognitions mediate (lead to) behavioral change” (Kalodner, 2011, p.193).

After investigating the theorists within the cognitive-behavioral model, this researcher has determined that the research and viewpoints of Aaron Beck provide a sound theoretical framework, which supports the proposed research.

The cognitive-behavioral model made its appearance in the world of psychology at the end of the 1950’s through the research of American psychologist Albert Ellis. The theory gained
much recognition in the 1960’s with psychiatrist, Aaron Beck’s research and creation of Cognitive-Behavioral Therapy (CBT). Beck’s research originally concentrated attention to the concept of distorted and negative thought processes in patients who suffered from depression. His hypothesis was that individuals would form negative cognitive schemas based on their interactions and experiences. These distortions in thinking are the source of later maladaptive behavioral outcomes. Beck designed a therapeutic regime aimed at altering these distorted beliefs. This model is now known as Cognitive-Behavioral Therapy (CBT). Although Beck’s research originally focused on patients with depression, psychologists began to discover the efficacy of CBT in other psychiatric conditions such as Post Traumatic Stress Disorder (PTSD).

“Broadly speaking, the goal of CBT is to achieve symptom reduction and improvement in quality of life through the replacement of maladaptive emotional, behavioral, and cognitive response chains with more adaptive responses” (Craske, 2010, p.20).

According to Beck, “…adverse early life experiences contribute to the formation of dysfunctional attitudes incorporated within cognitive structures, labeled cognitive schemas (cognitive vulnerability). When activated by daily life events, the schemas produce an attentional bias, negatively biased interpretations, and mild depressive symptoms (cognitive reactivity)” (Beck, 2008, p. 971). Beck suggests that repeated activation of the negative schemas over time will become ingrained (See figure 1).
Beck constructed a negative cognitive triad, which encompassed the three dysfunctional belief schemas:

- The patients feel a sense of inadequacy.
- Patients view all past and existing experiences through the lens of negativity.
- Patients feel hopeless about their future.

Like Beck, Cohen, JA. & Mannarino, P. (2001) report that, when dealing with students diagnosed with PTSD, researchers have begun to pay closer attention to the child’s perceptions of the traumatic situation. The event as it is perceived is almost more important than the actual details of the event because it indicates how the child will store the traumatic event into their memory, thus assists in determining the future psychological impact of the event. The storage of events into memory is not a flawless process. “Human memory doesn’t function like a
camera to record an exact snapshot of a particular moment in time. Instead, your memory is surprisingly apt to change, with details being exaggerated, subtracted, or even added” (Cherry, 2010, p. 105). Trauma often results in distorted thinking because the biased traumatic recollections are stored in the child’s imperfect memory.

Craske (2010) explains that traumatic events may establish classically conditioned responses within the subject. These subconscious responses lead to appraisals of the world around them. Some will feel as if they are in constant danger. The authors explain that individuals with PTSD will often over react to benign situations as if they are being attacked. Craske (2010) also posits that trauma leads to conditioned responses regarding attributions of the victim’s own self-worth. Victims of trauma often feel that they are weak, unloved, or that everyone is out to get them. Both catastrophic appraisals (world and self) often lead to avoidance tendencies (Craske 2010).

Beck believes that achievement of positive behavioral outcomes is possible only if the subject can abandon their negative schemas. According to Craske (2010), in accordance with Beck’s theory, the premise behind cognitive-behavioral therapy is that alteration of dysfunctional thinking is possible through the systematic introduction of information that runs contrary to the ingrained negative schemas. Achievement of symptomatic relief is through cognitive therapy. According to Beck and Clark, “one of the most effective ways of deactivating the primal threat mode is to counter it with more elaborate, strategic processing of information resulting from the activation of the constructive, reflective modes of thinking” (Beck and Clark, 1997, p55). The research by Cohen & Mannarino (2001) substantiates that neuropsychology and cognitive-behavioral therapy have been instrumental at correcting children’s negative attributions. Their research indicates that abuse-related attributions must be examined systematically and in an
individualized manner. It is not fair to say that any two individuals will respond to traumatic events in the same manner; however the cognitive vulnerabilities of esteem, self-blame, powerlessness and or shame are cited often as common characteristics of young children with PTSD.

Craske (2010) explains that cognitive-behavioral therapy operates at the conscious level to promote outcomes in the subconscious level. This very concept is under investigation in this experiment through the introduction of positive visual imagery with a subject diagnosed with Post Traumatic Stress Disorder.
Chapter 2

Literature Review

In the literature review portion of this document, the reader will be introduced to the latest information in the fields of cognitive neuroscience, neuropsychology, and education. The literature review begins with a description of the anatomy of the brain and leads into an explanation of how the brain processes emotions, which inevitably dictates behavioral responses. The author then reveals how this information pertains to children diagnosed with Post Traumatic Stress Disorder (PTSD), the target population of the study. Because the field of neuropsychology is based on the study of human behavior as it relates to brain functioning, current literature in this area will be explained. The final section of the review introduces two educational practices, brain-based education and trauma-sensitive schools, which are based on the application of neuroscience. Both brain-based education and trauma-sensitive schools will be outlined and compared to the brain-based therapeutic techniques being currently administered at the ACE Elementary program, the site of the proposed study. This doctoral thesis focuses on how the brain processes emotion, in hopes of determining whether this chain of events can be altered by the introduction of positive visual imagery within the educational setting.

Neurology-Understanding the Brain and Behavior

With the assistance of brain imaging technology, scientists have unlocked the mystery of how the brain functions and develops. According to Ramachandran (2011), the brain is composed of 100 billion nerve cells called neurons. Neurons communicate with each other through synapses. “Each neuron makes from one thousand to ten thousand contacts with other neurons” (Ramachandran, 2011, p.14). Neurons are linked into networks that aid in the processing of information. The brain receives and interprets sensory information and then
disseminates commands to the body in response via these networks. The brain has many components that serve specific cognitive or physiologic duties, yet it has been determined that no area of the brain performs in isolation from the other areas. “Each structure makes patterned connections with other brain structures, thus forming circuits. Circuits pass information back and forth and in repeating loops, and allow brain structures to work together to create sophisticated perceptions, thoughts, and behaviors (Ramachandran, 2011, p. 14-15). In order to choose the correct response to given stimuli, the brain often relies on its stored data or memory.

To comprehend the concept of visual imagery and its intended purpose, the reader must be cognizant of the brain structures, which are the target of this intervention. The two primary brain regions are the limbic system and the cortex. *The limbic system* is comprised of the hippocampus, cingulate cortex, septum, basal ganglia, nucleus accumbens, and amygdala. This specific area of the brain will be a focal point of the research being purposed in this paper. This region is primarily responsible for the memory, perception, and responses of emotion. This area processes, interprets and regulates stress levels. Devinsky (2002) describes the amygdala as the “CEO of the social-emotional brain”. Sousa (2009) informs readers that the limbic region does not reach full maturity until approximately age 10-12. One area of importance in the limbic system is the nucleus accumbens. The nucleus accumbens is also known as the reward pathway of the brain. According to Sanchez (2008), it was discovered that the reward pathway became activated when individuals were engaged in the repetitive acts that they found pleasurable. The nucleus accumbens would respond to these activities by activating dopamine levels in the brain. According to Sanchez (2008), the production of dopamine during daily activities creates a feeling of satisfaction and well-being. The cessation of the dopamine production leads to feelings
of anxiety and negativity. The dopamine effect will be measured through observation of behavioral outcomes such as emotional regulatory status and positive affect.

The cortex is the outermost portion of the brain and is the last to develop. Sousa (2009) states that the human frontal lobe does not fully developed until the early to mid-twenties. The cortex is comprised of the temporal lobe, occipital lobe, parietal lobe, corpus callosum, cerebral cortex, and frontal lobe. The cortex is responsible for higher level executive functioning of perception, planning and attention. Problem solving and reasoning are the responsibility of this brain region. Ziegler (2002) explains that the orbitofrontal cortex (OFC) is positioned between the cortical and subcortical regions of the brain. The orbitofrontal structure expands into the right hemisphere and controls instinctive emotional responses through cognitive processes. The OFC is an area of interest in this research because of its role in emotional and social attunement. Arden (2010) explains that an individual’s OFC originally becomes wired by the bonding they experienced as infants. From that point, your brain will crave that positive social connection. A well-developed OFC interprets social situations, communicates effectively with the amygdala, and assists the hippocampus in establishing accurate memories. To properly interpret and match the emotions and actions of others the OFC relies on the mirror neurons. According to the authors (Sanchez 2008, Arden 2010, Ramachandran 2011) mirror neurons respond to social situations by imitating the behavioral practices and social norms that have been established. This statement has significant implications in the study of behavioral change, and in this research. Sanchez (2008) elaborates by stating that consistently observing a routine is as influential as performing the act yourself.

Billions of neurons connect the lobes of the brain. Arden (2010) explains that neurons “communicate with one another by sending chemical messengers called neurotransmitters across
a gap called a synapse. This is how one neuron gets another neuron to fire” (Arden, 2010, p.7).

Many varieties of neurotransmitters exist in the brain. Each serves to either excite or quiet brain activity. According to Arden (2010), the two transmitters that are credited for the majority of brain activity are gamma-aminobutyric acid (GABA) and glutamate. GABA slows down brain activity while glutamate incites brain activity. Ideal levels of GABA ensure that the individual will not exhibit anxiety. Medications can be utilized to reach optimum GABA levels for individuals who struggle with anxiety issues. The three best studied, thus most recognizable, neurotransmitters are serotonin, norepinephrine, and dopamine. Each of these neurotransmitters effect the functioning of GABA and glutamate in different ways. Serotonin assists in maintaining steady brain activity. It causes the GABA cells to reduce firing and prevents the amygdala from firing in response to meaningless stimuli which ultimately reduces production of the stress hormone, cortisol. Serotonin plays a critical role in emotional regulation.

Norepinephrine enhances attention by stimulating arousal and motivation. Like Norepinephrine, Dopamine improves attention, but it also transmits pleasure. According to Floresco, “Neurochemical, electrophysiological and behavioural evidence indicates that certain forms of goal-directed behaviours are mediated by complex and reciprocal interactions between limbic and dopamine (DA) inputs in the nucleus accumbens” (Floresco, 2007, p. 400). Depleted levels of dopamine result in inaccurate storage of memories and feelings of hopelessness, a critical detail when studying students with social-emotional challenges like PTSD. Arden (2010) suggests that individuals are able to alter these neuro-chemical connections, without the use of medications, but through the consistent presentation of positive social/emotional stimuli. This assumption is at the core of this research study.
Hypothesis 1: Exposure to positive visual imagery will promote emotional regulation, resulting in a reduction of time-outs and restraints as compared to baseline measures taken prior to the introduction of the intervention.

The brain and emotion.

Fully comprehending how the brain develops and processes information can and should be a guiding factor in establishing behavioral and social-emotional goals and expectations for students. Sousa (2009) explains that because the limbic region (emotional brain) is fully developed before the teenage years, yet the frontal lobe (logical brain) develops much later in the twenties, the behavior of younger students will be controlled chiefly by their emotional systems. Sanchez (2008) explains that the amygdala is the primary control mechanism of human behavioral responses. When the amygdala perceives danger, it will arrange a chemical response designed to respond to the situation and release the necessary chemicals into the bloodstream. The release of chemicals through the circulatory system enables the amygdala to seize control of the body. The amygdala overrides input to the cortex, which ultimately means that the behavior will be emotionally driven and without the benefit of conscious thought and reasoning (Arden 2010, Sanchez 2008, and Sousa 2009). To achieve emotional regulation, the overarching goal in this situation is to tame the amygdala and strike a balance between the amygdala and cortex. Ideally, the cortex should signal the amygdala so that reasoning takes place before emotional responses (fear/anxiety). The reverse pathway (amygdala to cortex) results in anxious or fearful feelings before one is able to make sense of why they feel this way. “Within a fraction of a second, the amygdala can use norepinephrine to spark electrical impulses throughout your sympathetic nervous system to activate your adrenal glands. These glands will dump epinephrine (adrenaline) into your bloodstream, which jolts your system to increase your
breathing, your heart rate, and your blood pressure. This is called the “fight-or-flight response” (Arden 2010, p.30). When the stressful episode lasts longer than the fight-or-flight response, the stress hormone called cortisol is produced by the adrenal glands. The production of cortisol on a short-term basis is beneficial, however high levels of cortisol are associated with chronic stress. The amygdala becomes hypersensitive with prolonged elevated cortisol levels. Chronic stress poses a threat to the cooperative balance between ones amygdala and cortex. In the case of PTSD, the amygdala is the winner of this competition.

**Childhood trauma (PTSD) and the brain.**

The intended participant in this study is an elementary age student, diagnosed with Posttraumatic Stress Disorder. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM IV), individuals diagnosed with Post Traumatic Stress Disorder (PTSD) exhibit persistent fear, helplessness or horror, avoidance of certain social stimuli, flashbacks, increased arousal, and/or distress lasting more than one month following exposure to a traumatic event. Diagnosis of PTSD occurs at any age. Cole et al. (2005) explain that it is common for children with PTSD to exhibit behaviors within all three diagnostic criteria: avoidance, flashbacks, and hyperarousal. Avoidance refers to the dissociation or evasion of stimuli. Students with avoidance tendencies appear to be zoning out, not attending and/or numb to their surroundings. To the contrary, students who exhibit hyperarousal seem to be vigilantly surveying their environment for potential threats. Schore (2002) explains that episodes of hyperarousal and disassociation are imprinted into the developing limbic and autonomic nervous systems of the early maturing right brain. In time, these events lead to structural changes in the brain, which produce inefficient stress coping mechanisms that lie at the core of Posttraumatic Stress Disorders. According to Schore (2001), individuals diagnosed with PTSD demonstrate critical
dysfunctions of the right brain. PTSD patients, especially when they are stressed, show severe deficits in the interpretation of facially-expressed emotion, thus have difficulty understanding the emotions of others as well as being unable to describe their own emotional status. Children with PTSD not only have difficulty interpreting the emotions of others, in addition, they exhibit challenges in maintaining their own emotional regulatory status, as well as recovering effectively from stressful situations.

Schore (2002) explains that research has shown orbitofrontal dysfunction in individuals diagnosed with PTSD. The right orbitofrontal system works to control instinctive emotional responses by involving cognitive processes. PTSD presents inability of the right prefrontal cortex to modulate amygdala functions. According to this supposition, individuals with PTSD operate primarily out of the limbic region. The two primary areas within the limbic system that are most significantly impacted in PTSD are the amygdala and hippocampus.

Sousa (2009) explains that exposure to trauma can impede the brain’s ability to modulate emotions resulting in behaviors that may appear immature when compared to that child’s chronological age. Sanchez (2008) posits that recurring trauma may eventually lead to a hypersensitive limbic system. “A hypersensitive limbic system response occurs when the response designed and stored by the amygdala is so repeatedly produced that it can be prematurely released in times of perceived stress, without the related trigger actually being present” (Sanchez 2008 pg. 34). Once this connection is established and repeated by the amygdala, the response is stored in the individual’s memory thus is readily accessed when the individual is exposed to similar situations in the future (Arden 2010, Sanchez 2008). It is common for an individual with PTSD to misread a given situation and perceive a benign situation as harmful. This theory explains behavioral incidents, which appear to have no
apparent antecedents, and emphasizes the challenges that children with PTSD present within the
school environment.

Functional magnetic imagining has revealed that children diagnosed with PTSD
demonstrate impaired hippocampus functioning. In some cases decreased volume and size of the
hippocampus has been noted in individuals with PTSD. Since one of the main responsibilities
of the hippocampus is the encoding, storage and retrieval of information, some researchers
consider PTSD an impairment of emotional memory. Flashbacks are symptoms of PTSD, which
occur when the individual feels or acts as though a traumatic event is happening again. A
flashback may occur if there is a connection made between the present situation and the
traumatic stored memory.

Ziegler (2002), states that there are actually six kinds of memory: emotional, behavioral,
factual, autobiographical, and body memory. Siegel (1999) further divides each category into
two distinct modes of memory, implicit and explicit. Explicit memory involves recall of facts
and information. It is an active/mindful process. Ziegler (2002) explains that implicit memory
is not reliant on experience and does not require the processing of information. In implicit
memory, experiences will be stored and strengthened due to repetition. Automatic
representations that are based on images, sensations, and emotions become stored memories.
Ziegler (2002) claims that trauma is stored in implicit memory. Implicit traumatic memory is
housed within the limbic system. “Memories of past trauma are not stored in the neo-cortex
where reasoning functions can have an impact on these recollections” (Ziegler, 2002, p.29). “For
children traumatized very early in life, the storage of trauma in the limbic system remains very
strong and is unavailable for normal cognitive recall or processing. In other words, the
individual is not able to recall why he feels or acts as he does; he simply switches to autopilot”
Ziegler (2002) cautions readers that because trauma is stored as implicit memory, most children will not be able to recall the facts of the incidents effectively. The memories are much more personal and internal. Stored memories can be easily recalled by sights, smells, or environmental stimuli. This may occur at a subconscious level and often affects the individual’s mood and temperament. According to Plummer (2011) mood serves to alter perceptions of the current situation, which may create a feeling that is not based on reality. Thus, triggers that result in inappropriate behavioral displays may not appear logical to the outside observer. Ziegler claims, “… you can take the child out of the trauma, but it is difficult to take the trauma out of the child” (Ziegler, 2002, p.40). Taking the trauma out of the child is one of the major goals of cognitive neuropsychology.

As mentioned previously, the amygdala and hippocampus are two primary areas within the limbic system that are most significantly impacted in PTSD. This fact has significant influence on the research project. When designing the visual imagery presentations, both the amygdala and hippocampus must be the target areas of change, to moderate the stress response.

Because the hippocampus is the keeper of stored traumatic memory, the visual imagery will attempt to create new neuro-pathways, which, with repetition, will attempt to replace the former negative memories. The amygdala will be targeted by capturing a safe, nurturing, accepting moments, which consistently celebrates student achievements. The support for this initiative can be found in the current practices of neuropsychology.

**Neuropsychology**

According to Ramachandran (2011) in the past fifteen years, brain science has advanced at an astonishing pace. These advances have begun lending fresh perspectives into other disciplines. Psychology is one of the disciplines that has been changed by these findings.
Neuroscience now offers totally new perspectives into theories of perception and emotion. The American Psychological Association (2003) defines neuropsychology as a specialty that utilizes the principles of assessment and intervention based on the study of human behavior as it relates to functioning of the central nervous system. The field is devoted to understanding the brain-behavior relationship and its application to human problems.

Current research in neuropsychology indicates that life experiences are stored in the brain and that these memories directly impact how individuals interpret and react to any given situation. The brains of children who have experienced trauma will ultimately develop differently, even if the child has no conscious memory of the traumatic event. Cognitive psychologists have begun using brain-based therapeutic techniques with traumatized students, and feel that this approach is beneficial for them.

Arden (2010) explains that the brain is not a hardwired organism. The brain and its neurons are malleable and modified by life experiences. This theory is known as neuroplasticity. If the brain was a fixed organ then no interventions could ever be effective in producing change. Your brain is actually able to make new constructive connections through exposure to positive experiences. In time, the older negative connections made by individuals with traumatic pasts, will disintegrate if they are not utilized. Given this simple theory, Arden (2010) claims that it is actually possible to rewire your brain. This concept is critical to the proposed hypothesis that therapeutic techniques can be beneficial to students. Since Post-traumatic Stress Disorder is characterized as a disorder of memory, this theory is of major significance to the population of individuals diagnosed with PTSD. According to Arden (2010), work in neuropsychology focuses on literally rewiring one’s brain. Ziegler supports this theory by explaining that the patterns, which are ingrained through trauma, can be changed if consistent positive experiences
are introduced. “The goal must be to develop new neuro-networks that have to do with safety, predictability, caring, and the child’s physical and emotional needs getting met” (Ziegler, 2009, p.12).

Literature in neuropsychology supports the position that reacting to behavioral issues is ineffective because the incidents are emotionally charged situations where the brain is unable to perform logically. According to Ziegler (2010), behaviors are manifestations of inner issues, so treatment should not just address the behavior. Interventions need to target the processes that create the behavior. Sanchez (2008) explains that the emphasis of successful behavioral management strives to meet the needs of the primitive emotional brain called the amygdala. Establishing emotional regulation and working to change perceptions is the primary goal when working with students that have been exposed to trauma.

Ziegler (2009) outlines 10 steps to effective trauma therapy. These steps include:

Step 1- Cultivating an environment of safety and security. This is best achieved through structure and routine.

Step 2- Discern the nature of the trauma and the impact that it has on that individual. It is not appropriate to assume that the individual will respond in the same manner that you would. For younger students, Ziegler recommends obtaining this information through play where one can investigate the inner workings of the child’s thought process.

Step 3- Analyze the trauma memories. In this stage it is important to note how the child communicates via gestures, actions, interactions with others, and verbal output when being reminded of his/her traumatic past.

Step 4- Deconditioning negative affective responses. This stage attempts to prevent the automatic physiological response. This stage is best accomplished by teaching the student to
develop internal control, which may be established through relaxation, guided imagery, or
distraction (focused concentration to another stimulus).

Step 5- Re-exposure to the trauma. Ziegler explains that this is accomplished through mental
visualization. It is not a physical experience.

Step 6- Reorganize the meaning of the trauma by having the child change the ending of the story.
This new ending should be one that the child can now feel as if they are now empowered.

Step 7- Replace the inappropriate behavioral reactions with socially appropriate ones.

Step 8- Construct a new internal perception of self.

Step 9- Teach coping strategies.

Step 10- Self-mastery that focuses on handling stressful experiences with resilience. Ultimately,
this stage describes the inner control that must be learned. Ziegler explains that “if we cannot be
in charge of our feelings, our memories, our perceptions, and our behaviors, we will not be

It is not advisable to attempt all of these stages within the educational setting. Stages
three and five require the expertise of a trained psychologist and are best suited to an
individualized setting. In the educational setting, focus on observed triggers, which reliably
produce the inappropriate response, will be substituted for these stages. With these few
exceptions, most of the recommended stages can be applied (in a modified manner) in a
therapeutic educational setting such as the site of the research project.
Educational Practices

Although the research in neuropsychology is critical to the proposed research, the goal is to implement the brain-based therapeutic technique of positive visual imagery within the educational setting. For this reason, it is important to review the relevant educational practices, which attempt to use the knowledge of how the brain functions. The first initiative is brain-based education. The second educational initiative which is significant to the study, because it deals specifically with educational practices for students who are the victims of trauma, is that of the Massachusetts movement known as the trauma sensitive schools initiative.

In 1983, a new dimension of educational practice emerged which blended the research in neuroscience with best practices in education. This initiative became known as the brain-based education movement. Brain-based learning is an instructional model of education that incorporates instruction with the optimal method in which the brain acquires and stores information. Jenson (2008) credits Leslie Hart for the acceptance of this initiative in her groundbreaking book titled, *Human Brain, Human Learning*. Hart (1983) called the brain "the organ of learning." He believed that educational settings should be designed based on what we know about how the brain processes and stores information. Hart expressed concern that intimidating classroom environments impaired cognitive processing in students.

Later in 1990, Caine and Caine developed twelve principles of brain-based learning. According to Caine & Caine (1990), the twelve principles include:

1. The brain is a parallel processor.
2. Learning engages the entire physiology.
3. The search for meaning is innate.
4. The search for meaning occurs through patterning.
5. Emotions are critical to patterning.
6. The brain processes wholes and parts simultaneously.
7. Learning involves both focused attention and peripheral perception.
8. Learning involves both conscious and unconscious processes.
9. We have two types of memory: spatial and rote.
10. We understand and remember best when facts and skills are embedded in natural, spatial memory.
11. Learning is enhanced by challenge and inhibited by threat.
12. Each brain is unique. (Caine & Caine, 1990, p.66-68)

Caine (1991, 1994) also outlined three techniques that need to be implemented in brain-based learning: 1) Orchestrated immersion 2) Relaxed alertness 3) Active processing.

*Orchestrated immersion* refers to the rich educational environments that focus on a multisensory approach to learning.

*Relaxed alertness* is the concept of providing a safe nurturing environment for students yet challenging them at the same time. It is believed that students will strive for greater endeavors when they feel free from judgment or criticism.

*Active processing* refers to the input, processing and storage of information in a manner, which is meaningful to that student. When learning new concepts students must be encouraged to relate concepts to previously learned/ stored memories. The new material will then be anchored to the previously stored concepts. A focus on rote memory is the antithesis of this principle.

Caine’s principles five, eleven and twelve directly support the proposed research project.
Principle 5 states that learning is influenced by our emotions. This is a significant fact when working with students diagnosed with PTSD. So much of what they have learned is tainted by their current emotional memories. Principle eleven has direct implications for the school and classroom environments. If we expect students to become available for learning then the setting must be conducive to it. As mentioned previously, schools must be perceived as safe nurturing environments. The teacher-student relationship must be built on trust, not intimidation. Finally, principle twelve teaches us that although we all have the same anatomy, each individual’s brain is wired differently. This very fact supports the rationale for examining each student’s behavior individually. Therapeutic behavioral interventions are based on this supposition.

Although the experiment is informed by research in brain-based education, this researcher finds that, with the exception of environmental supports, much of the brain-based educational literature to date focuses primarily on teaching methodology for academics. The current brain-based education literature supports the research being proposed, however this experiment focuses on an individualized approach to behavioral interventions within the educational setting.

In 2005, Massachusetts Advocates for Children in collaboration with The Hale and Dorr Legal Services Center of Harvard Law School and the Task force on Children Affected by Domestic Violence published a report and policy agenda titled “Helping Traumatized Children Learn”. The document was a result of several years of research and advocacy by this coalition. The result was a collection of proposed policies designed specifically for school-aged victims of trauma in the educational setting known as the trauma sensitive schools initiative. The authors claim that brain research is the basis of this groundbreaking work. According to Cole et al. (2005), the document contained educational policies intended to create supportive environments
Brain-Based Therapeutic Techniques

within schools that would enable the traumatized child to engage, behave properly, and learn. Cole et al. (2005) explain that their coalition along with the National Child Traumatic Stress Network (NCTSN) are strongly advocating for schools to become trauma-sensitive environments that support students by becoming therapeutic settings as opposed to reactive establishments that serve only to punish students by suspending and expelling them from school. This coalition has sponsored a two-pronged initiative, which provided grant money to 30 school districts and alternative education programs. The five-year initiative began in 2005, but according to Trauma and Learning Policy Initiative Coordinator, Anne Eisner, (2011-phone interview) the funding has been dramatically cut and it is not anticipated that any grant funds will be available in the future. Despite the financial setbacks of the program, its founders report that the “trauma sensitive schools are reporting reduced suspensions/ expulsions, disciplinary referrals, improved attendance and reduced special education referrals” (DESE, 2010, p.17). The initiatives of this impressive coalition and its followers truly serve to support the work in this research proposal because of its reliance on brain-based principles employed with a population of students with a history of trauma.

Hypothesis 2: Positive visual imagery will alter the current mood of the student resulting in decreased stress levels and achievement of emotional regulation as demonstrated by student ratings of 3-5 on the behavioral rating scale.

Brain-based therapeutic techniques.

The concept of restorative breaks and reset activities was first introduced to the Elementary ACE program by consulting behavioral psychologist Dr. Kevin Plummer. Plummer (2006) explains that restorative breaks are an effective strategy used when students are experiencing negative emotions and/ or increasing levels of stress. Restorative breaks are offered
to manage the students escalating stress levels effectively. Teachers will often intervene with students during stressful situations by attempting to rationalize and discuss the situation. Once immersed in the cycle of negative thinking and escalating behavioral responses, neuropsychology has taught us that students are incapable of accessing their ability to process language effectively and reason.

The intent of the restorative break is to shift the brain into a different direction. In essence, the goal is to subdue the amygdala and return the thought process from emotional to the more rational cortex.

Within the umbrella of restorative breaks is the strategy known as a “reset activity”. “A reset activity essentially resets the child’s tolerance when redirection, staff assistance, and other support strategies may have been ineffective” (Plummer, 2006, p. 1). According to Plummer (2006) reset activities are “designed to give students mental breaks while engaging them in a semi-structured, settling, relaxing, or organizing activity” (Plummer, 2006, p. 2). The reset activity should be individualized, of interest to the student, and strive to reach that child’s desired regulatory state. Through repetition, the goal is that the reset activity will become routinized and have long lasting positive outcomes. It is hoped that, through the consistent use of reset activities, the student will eventually learn to cope and deal with frustrations and triggers in a productive manner by learning how to transition from an anxious to a relaxed state. Introduction of restorative breaks takes place at the first sign of dysregulation. Both create a shift in brain activity out of the emotional amygdala and into the logical prefrontal cortex. The concept of restorative breaks and reset activities are not new to the staff at ACE, but now staff will be attempting to take this concept to a higher level based on the current research in neuropsychology.
This research project will introduce the concept of positive priming in an attempt to answer the question: Will the introduction of brain-based therapeutic techniques result in a reduction of behavioral incidents (time-outs, restraints)? Priming describes an event where a stimulus that takes place prior to another increases the likelihood that the desired response will occur. To do this, the educational team at Elementary ACE will be utilizing positive visual imagery in effort to generate positive affect and ultimately result in improved behavioral outcomes for students diagnosed with PTSD. This visual feedback will consist of individualized PowerPoint programs, which display the student engaging in positive interactions, student successes, and rewarding/motivating activities. Positive written scripts exist throughout the presentation. The visual presentations will be reviewed at strategic periods throughout the school day (prior to events that have proved challenging in the past). The visual imagery will serve as a situational prime. According to a study done by Nelson & Norton (2003), situational primes can influence not only spontaneous behavior, but also future behavior. The use of visual imagery as a priming technique capitalizes on the mirror neuron effect by having the student repeatedly observe positive behavioral practices. As Sanchez states, “Consistently seeing the practice is as influential as doing the behavior oneself” (Sanchez, 2008, p. 113). The short-term goal of this brain-based strategy is to alter the current mood of the student with positive imagery when negative memories/feelings intrude. The introduction of situational primes is intended to investigate the research question: Will positive visual imagery result in reduced stress and anxiety levels? The long-term goal is to rewire the student’s brain with new affirmative narratives. Creating consistent positive feelings will ultimately change the students’ perceptions of themselves. Educators hope that these restorative opportunities will create positive personal attributions as well as develop affirmative attributions of others. According to Plummer, “We
want to help children write a better story of their current experiences so that future triggers will lead to more positive affect and goal directed behavior rather than activate old experiences of stress and anxiety. Repeated recall of the new story strengthens the neural connections and shapes the memory by adding additional context and new emotion. This creates a richer, more complex, and enduring memory” (Plummer, 2011, p.10-11). Ultimately, this project proposes to answer the research question: To what extent will the utilization of positive visual imagery result in improved behavioral outcomes?

Context for the Purposed Research

The literature review provides critical perspectives, which form the foundation of the purposed research project. The assertion that neural connections within the brain are changed through consistent exposure to positive thoughts, images, and situations is paramount to the hypothesis under investigation in this research project. Based on the literature review, it appears that the work in our classrooms is two-fold. First, the environments within our classrooms and schools must be conducive to learning. Establishment of a positive, accepting culture where students feel as if he or she belongs (despite their disability) is critical. Students must feel that the school is a safe and nurturing place to be. The teacher-student relationship should be one of compassion not coercion. Programmatic emphasis is on social-emotional development. In the current days of high stakes testing and No Child Left Behind, this statement may appear contradictory, however the research supports that children are not available to achieve academically if they feel insecure within their environment. Focus on social-emotional development is a means to an end. Secondly, preventative programming that attempts to stop the
escalation of negative emotions by presenting visuals, which depict positive images, will be introduced. The effectiveness of the visual imagery intervention is the focus of the research.
Chapter 3

Research Design

Research Questions

Guided by the theoretical frameworks, this doctoral project examines the extent to which preventative strategies are effective in addressing the primal needs and environmental supports of students as a means of improving behavioral outcomes. This research project poses the following questions:

1. To what extent will the implementation of positive visual imagery result in the reduction of behavioral incidents that result in time-out and restraints?
2. To what extent will positive visual imagery result in reduced stress and anxiety levels as evidenced by the student's behavioral outcomes?

Review of the prominent research studies and current literature has revealed that existing behavioral practices, which focus on reacting to behaviors, are insufficient in improving behavioral outcomes of students. Determining the function of a student’s inappropriate behaviors, then applying brain-based prevention strategies to preempt those behaviors is the premise, which is under investigation in this doctoral project.

Methodology

Horner et al. (2005) state that research in the educational setting poses many obstacles due to the dynamic variables of student ability ranges, differing classroom environments, and teacher behavior. Capturing how these variables interconnect and influence student outcomes presents the greatest challenge in educational research. Conroy et al. (2008) found that the
current research in the field of emotional and behavioral disorders (EBD) has addressed some of these factors, but states that accounting for imposing variables while maintaining scientific rigor within the educational setting remains an issue.

The single-case experimental design (SCED) is proposed to avoid the complications associated with dynamic variables present in the classroom setting (various student ability ranges, differing classroom environments). This design, once known as the single subject design is now more readily known as single case design or n-of-1 trials in current literature. According to Kratochwill & Levin (2010), an individual case is defined as the unit being introduced to the intervention and subsequent data analysis. A case may be a single participant or a cluster of participants (classroom).

Horner (2005) states that single-case experimental design (SCED) is a rigorous methodology utilized to explain behavior, investigate interventions, and establish evidenced-based practices. This is the recommended methodology when the researcher intends to investigate the performance of a specific individual under a precise set of circumstances. Thus, this methodology has been extremely influential in the field of special education. Kratochwill & Levin (2011) explain that single-case experimental design, as the name implies, originally involved the use of a single participant, but now may include a few participants. The proposed research is being designed with a single participant. Utilization of a single participant, as the unit of analysis, is warranted when studying and analyzing behavior due to the uniqueness of responses to the intervention. Perdices & Tate (2009) explain that although individuals within the same diagnostic category may share some similar characteristics, each student requires treatment strategies that are unique to that individual. Both treatment strategies and outcome measures must be individualized. “Those single-case experimental designs (SCED also known
as n-of-1 trails) which control for extraneous variables and manipulate the independent variable are uniquely placed to provide empirical evidence of treatment effectiveness in the individual patient” (Perdices & Tate, 2009, p. 905). Although the researcher is cognizant that this may in fact be a probable limitation to her study, she contends that a multiple participant study is unwarranted and imprudent given the contextual features of the experiment. Perdices & Tate (2009) claim that the “SCED is ideally suited for documenting and evaluating interventions in neuro-rehabilitation” (Perdices & Tate, 2009, p. 924).

The intent of the single case experimental design is to document the relationship between the independent and dependent variables. In this research, the independent variable represents the positive imagery intervention and the dependent variable is the student’s behavioral response/outcome. The single participant serves as his or her own control. Behavioral performance will be measured at baseline (prior to intervention), during intervention, and after the intervention is introduced. A within-series single case design is utilized in the research. In this model the standard intervention design of baseline (A), intervention (B), and return to baseline (A) are implemented. To ensure replication, however, the study is designed with a second intervention phase to take place. The second phase will be utilizing the same intervention (positive visual imagery), but will target another period of the student’s day. This replication will also follow the standard A-B-A format. According to Horner et al. (2005) and Kratochwill & Levin (2010), the inclusion of the replication component enhances the scientific credibility of the experiment.

Research protocol regarding development, delivery and data collection of the visual imagery has been established. The researcher with input from the classroom teacher and behavioral psychologist developed the PowerPoint presentation. Targeted focal areas were determined by careful analysis of data collected throughout the school year. The visual imagery
is reviewed by the classroom teacher daily during the specified intervals. In the event that the teacher is absent, the lead para-professional will be responsible for the visual imagery review and data collection. The lead para-professional will be trained on evaluating behavioral outcomes according to the established rating system. Each numeration represented in the data collection form correlates to specific behavioral criteria.

“Single-subject research offers a powerful and useful methodology for improving the practices that benefit individuals with disabilities and their families” (Horner et al., 2005, p. 176). Upon examination, it appears that the single-case experimental design is the best match for addressing the posed research questions.

**Site and Participants**

The students currently enrolled in the Elementary Alternative Center for Education (ACE) present with inconsistent academic achievement that is typically attributed to their inability to effectively self-regulate socially & emotionally. These inconsistencies preclude their successful participation and integration within their neighborhood schools. In the past few years, there has been an influx of students with the diagnosis of Posttraumatic Stress Disorder (PTSD). This population of students has presented a challenge to staff members due to the intensity of the behavioral incidents and the absence of obvious antecedents before behavioral outbursts.

Prior to selecting a student to serve as a subject for the study, careful consideration was given to determining which classroom was prepared to meet the demands that a research project could place on the staff and students. The designated classroom must be one that is currently functioning at a high therapeutic level. This is critical because it proposes to reduce potential confounding variables within the research.

The established observable features that must be in place include:
• Posted schedule of the day that is referenced prior to transitions.
• A set routine for every item in the daily schedule is designed.
• Each routine has an attached set of expected behaviors.
• Behavioral data is consistently recorded.
• Every student has an effective reset break routine.
• Positive reinforcement and continuous recognition systems are evident.
• There is a strong sense of community within the classroom.

In this experiment, one “extreme case” will be thoroughly examined. Selection of the student for the single-case experiment is based on diagnosis of PTSD, tenure in the educational setting, projected continued enrollment in the program, and parental permission.

Data Collection

Consistent, objective, and repeatable data collection methods are critical to sound single-case experimental methodology. Several features of accurate data collection were introduced by Horner (2005) and Kratochwill (2010). Each stresses the importance of providing accurate outcome measures. Horner suggests that:

1. Outcome measures are operationally defined to allow for accurate measurement.
   “Operational specification is required to understand what outcome measures assess, and it represents an important construct validity issue in all experimental research” (Kratochwill, 2010, p 126).
2. The outcome measures in single-case research are assessed repeatedly in a time-series fashion.
3. Outcome measures are assessed for interobserver consistency throughout the experiment.
4. Outcome measures are selected for their social validity.
All of these principles are implemented in the data collection methodology of this research. Behavioral performance is measured at baseline, during intervention, and after the intervention is introduced. Data has been an ongoing process through the current school year at the Elementary ACE program. The data consists of behavioral performance rating on a scale from 0-5 during each activity throughout the school day. Each numeration represents specific behavioral criteria. Figure 2 illustrates the rating system to be utilized during the experiment.

Figure 2: behavioral outcome rating system

<table>
<thead>
<tr>
<th>rating</th>
<th>Behavioral Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>The student is following all of the rules and routines within the classroom and their schedule without requiring staff-directed prompts during the given activity and can function almost fully independently.</td>
</tr>
<tr>
<td>4</td>
<td>The student is following the rules and routines within the given activity in their schedule, but needs a couple of prompts to keep them on track.</td>
</tr>
<tr>
<td>3</td>
<td>The student is struggling somewhat within the activity, but does not require a timeout or directed removal from the room. The student may need a walk or a reset activity, but is eventually able to get back on track.</td>
</tr>
<tr>
<td>2</td>
<td>The student refused to participate in the given activity, but didn’t require any timeout/removal from the room.</td>
</tr>
<tr>
<td>1</td>
<td>The student requires a time-out from the activity and is struggling to follow the given routines of the specific activity. This timeout is short in nature (under 15 minutes)</td>
</tr>
<tr>
<td>0</td>
<td>The child requires removal from the given activity for unsafe and/or aggressive behavior and needs physical escort/restraint. The rating of 0 also denotes a long duration of timeout (greater than 15 minutes) and the student struggles to reset and rejoin the class.</td>
</tr>
</tbody>
</table>

Review of the subject’s behavioral baseline data revealed that the subject appears to display inappropriate behaviors at higher frequencies during academic work activities and at the end of the day. These times of day will be the intervals when the positive visual imagery intervention will be strategically implemented. During the first intervention phase, the visual imagery is introduced prior to the identified interval (academic activity). Responses are documented by recording the behavioral response in the exact manner that was recorded during the baseline period. Following the intervention phase when there is a return to baseline, the behavior is recorded in the same manner. During phase two of the experiment, the student is
introduced to visual imagery that addresses the second area of concern (dismissal). The student is introduced to positive visual representations of dismissal, the ride home on the bus, and arrival home. During this interval, data is collected on 1) the academic tasks at baseline and 2) the dismissal process. The layering of the data collection between phases ensures that there is no interruption in the intervention. This decision is based on the assumption that the intervention will be of therapeutic benefit. Removal of a proven beneficial intervention is unethical.

Data Analysis

Data are analyzed via visual analysis methodology. Brossart et al. (2006) identify visual analysis as the most published technique of data analysis in single-case experimental research. This methodology is based on individualized performance not on aggregated group data. All the data collected during the baseline and intervention phases are translated into graphs, using the 0-5 scale recorded during the data collection intervals. A time series analysis to determine if there is a trend in the data over time is conducted. According to Jones (2006), there are two main features involved in a trend analysis. The researcher conducts the visual analysis by examining the graphs for both the slope (going up, going down, or flat) and magnitude (if there is change, how rapidly is it occurring). The researcher examines the trends and then interprets the finding by determining if a relationship exists.

In the proposed study, the baseline performance data will be compared to the data taken after the introduction of the intervention in two settings (academics and dismissal) and during the return to baseline phase. This raw data is converted into graphs, which clearly delineate the stages of the experiment. The researcher analyzes the graphs by closely examining the patterns. In this project, an increase in slope from baseline would indicate that the student has
demonstrated improved behavioral performance. This visual analysis of the slopes depicted in the graph allows the researcher to determine if the intervention appeared to cause a change in the subject’s behavioral performance. This is determined by comparing the differences between baseline and post intervention scores. By closely examining the data points represented in the graph, the researcher is also able to determine the extent to which the intervention was effective.

Figure 3: visual analysis graph sample

An identified criticism of this analysis method is that analysis results may be biased and/or misinterpreted. To alleviate this issue, analysis will be conducted as a team. One of the key participants in this team will be the staff behavioral psychologist. Brossart et al. (2006) suggest four recommendations to improve visual analysis methods. All four components are implemented in the analysis of this research project. These recommendations include:

1. Graphs will be contextualized by isolating the subject’s target behaviors, time frame, and data collection tool.

2. Judges will be asked to interpret graphs according to the importance, effect or impact of the data; not attempt to predict the statistical significance or size.
3. Evaluators will interpret intervention effectiveness by judging the magnitude of the intervention’s effectiveness, not just make a yes/no decision about whether or not the intervention was effective.

4. Statistical analysis (t-test) may be an option if the visual analysis is inconclusive; however, if done, it will not be looked at as the validation of the visual analysis.

   Data analysis will adhere to the guidelines presented in the technical document developed by the “What Works Clearinghouse”. This document outlines the standards for conducting visual analysis of data. According to the standards, there are four stages of analysis, which includes six analytical elements (Kratochwill et al., 2010). These critical elements are detailed in Chapter 4.

   Data analysis via the visual analysis appears to be the most effective methodology in answering the proposed research questions due to the emphasis on determining the extent of the change, not just determining a statistical correlation. For this reason, it has been chosen as the data analysis method.

**Validity and Credibility**

   **external validity.**

   According to Horner et al. (2005), in single-case research, external validity is enhanced through replication of the effects across subjects, conditions, and/or measures of the dependent variable. This research project will involve replication of setting and time. The visual imagery is first introduced and monitored during an academic activity, which occurs in the morning and in the second phase of the study when the first stage returns to baseline, the visual imagery is introduced near the end of the school day prior to dismissal.
Horner et al. (2005) identify the importance of strengthening external validity through operational definitions of participants, context, and baseline behaviors. All of these elements are incorporated in this study. The study participant fits the diagnostic criteria for the study. Student characteristics are clearly defined. The site and setting where the experiment takes place have been identified and detailed, and finally the baseline behaviors have been examined and recorded since September of 2010.

**internal validity.**

Rassafiani & Sahaf (2010) outline three procedures for assuring strong internal validity within single-case experimental design. These methods include using repeated measures, obtaining baseline stability, and measuring only one variable. All of these procedures have been strictly adhered to in the collection of student behavioral data. The data collection methodology has been in place since the beginning of the school calendar year. This measurement technique will be repeated throughout the duration of the study. As recommended, data collection is focused on only one variable.

**construct validity.**

Kratochwill & Levin (2010) outline two critical components in ensuring construct validity when designing experimental research. The first recommendation is that the variable being manipulated must be clearly defined. In the proposed research project, this variable refers to the behavioral performance. In this experiment, construct validity is achieved by the consistent measurement of behavioral performance on a Likert scale from 0-5. To ensure objectivity, the scale includes specific observable characteristics within each assigned number. To eliminate individual bias/interpretation, the scores are assigned by the same individual (teacher). The second recommendation is that the intervention be monitored during the
implementation phase to ensure treatment fidelity. As recommended, observations will be conducted by the researcher routinely throughout the data collection period. The goal of the observations will be to assess the implementation of the intervention to ensure treatment fidelity. As the program director, the researcher’s presence in the classroom is a familiar event to the student, so it poses no threat to skew any of the data. “When both of these conditions are met, a single-case intervention study increases the validity of inferences concerning the researcher’s interpretation of the effects observed and analyzed” (Kratochwill & Levin, 2010, p.126).

credibility.

Strategies implemented in this research project to assure its credibility are:

- **Statement of Personal Bias:** As the program administrator and consultant to local districts, the researcher must be aware of her commitment to brain-based behavioral interventions. Being cognizant of obvious bias should assist in the researcher’s efforts to alleviate any misinterpretations of the data. As the researcher, she will not be the service provider, evaluator, author of clinical reports, or author of incident reports. This is an important factor because it indicates that the researcher will not able to produce falsified documentation that would skew the findings of the study.

- **Collaboration:** An analysis team is responsible for analysis of the study findings. One individual who will be instrumental in this review is the behavioral psychologist who has assisted the educational team in designing the individualized brain-based therapeutic techniques for the student.
Protection of Human Subjects

Creswell states “…the researcher needs to consider the special needs of vulnerable populations, such as minors, mentally incompetent participants, victims, persons with neurological impairments…” (Creswell, 2009, p89) The subjects identified as vulnerable in this passage, describe the intended case study participant. Caution and methodical program design of ethical considerations will be utilized to ensure the rights of all students. The student and all other study participants will be treated with respect. Any identifying student information will remain confidential. Due to the fact that our students are elementary school age, prior parent permission will be obtained. Parents will be kept informed during the research via progress meetings, correspondence, and parent workshops. Data collection on student behavioral incidents is already an element of the program; therefore, time will not be taken away from instruction. Any additional data collection will be the responsibility of the project author. Because the author is known by the students, and is generally visible in the building, no disruption to the student routine is anticipated.

With many experimental designs, the intervention is withdrawn at some point after the intervention phase. This often presents an ethical dilemma. To avoid this issue the experimental design being proposed implements a two-stage format that introduces the intervention at another interval while examining the return to baseline on the first intervention.

Conclusion

Neuropsychology informs us that developing effective therapeutic interventions is most beneficial when it is done on an individualized basis. Even within the same diagnostic category, it is not appropriate to make assumptions and generalizations regarding interventions. Doing so
implies that one believes that two individuals have identical brain structures, processing styles, memories, and/or cognitive abilities. Research informs us that in the case of PTSD, memory, perception and attributions play an important role in understanding the actions of students. These variables are decidedly specific to each individual. Thus, treatment methods and interventions should also be highly individualized. For these reasons, the single-case experimental design appears to be the most appropriate design for this research.

This proposal has outlined how the research project directly responds to the problems of practice. Findings from the literature review reveal that there is a plethora of books, articles, and research declaring the merits of neuropsychology, and cognitive-behavioral psychology. It was remarkable to discover that the research detailing attempts of taking this body of knowledge into the educational realm is almost non-existent. For this reason, the research is innovative and warranted. This research project serves as a potential contribution to education, psychology, and students diagnosed with Post-Traumatic Stress Disorder.
Chapter 4: Report of Research Findings

The purpose of this study is to investigate the effectiveness of visual imagery as it relates to improving behavioral outcomes for a student who diagnosed with Post-Traumatic Stress Disorder. To answer the research questions regarding positive visual imagery’s effect on the reduction of time-out incidents and emotional regulation, the researcher designed a single-case experiment.

As outlined previously in Chapter 3, the participant had to fit into the following criteria: diagnosis of PTSD, tenure in the educational setting, projected continued enrollment in the program, and guardian permission. According to Creswell (2009) and Shadish (2002), although experimental and quasi-experimental research designs share many similarities, quasi-experiments lack the element of random assignment (Shadish, 2002). The fact that the subject in the study was not chosen randomly, qualifies this study as a quasi-experiment. This researcher felt that random selection was not prudent because it posed possible threats to internal validity (Shadish 2002). These threats were avoided by establishing selection criteria and choosing the subject that met the criteria. Kratochwill et al. state that “in most single-case research, selection is generally not a concern because one participant is exposed to both (or all) of the conditions of the experiment (i.e. each case serves as its own control) (Kratochwill et al., 2010, p. 8).

Participant Profile

The subject is referred to by the pseudonym Molly throughout this document. Molly is a nine-year-old fourth grade girl. She currently resides with her grandparents. She is allowed visitations with her biological father, but has no contact with her biological mother. Molly was removed from her parents at an early age due to neglect. Psychological (10/15/09) and Neuropsychological (12/15/10) assessments report that Molly’s biological parents were both
substance abusers. Before being placed in the custody of her grandparents, Molly was residing in a homeless shelter. It is reported that she was unsupervised for long periods, and it is suspected that she was sexually abused.

Molly has a diagnosis of Post-Traumatic Stress Disorder. She has had a history of difficulties in school since the age of five. Molly has been in multiple educational placements, including a short stay in a residential facility, before enrollment in her current program. She has a longstanding history of physical aggression towards others, self-injurious behaviors, swearing/yelling and impulsive behaviors (bolting). Molly exhibits sudden and unpredictable shifts in mood, and emotional regulatory status. She displays limited confidence in her own abilities and is easily frustrated by demands placed on her by adults when she perceives that she will be unable to accomplish the task.

**Data Collection Procedures**

The development of the visual imagery PowerPoint presentation consisted of three stages (Figure 4).

Figure 4: stages of visual imagery construction

These steps guided the development of two PowerPoint presentations. The first visual imagery presentation focused on a morning academic activity known as literacy centers. A review of the
behavioral outcome data and incident reports indicated that this was consistently a problematic time of day for Molly. With the assistance of the staff behavioral psychologist, it was determined that the function of Molly’s difficulty at the time was primarily due to her lack of confidence, and need for staff assistance and reassurance. Her lack of confidence caused her to underestimate her academic capabilities. Unfamiliar (and at times familiar) academic work had become a trigger for Molly due to her defeatist attitude and the negative schemas that she had built around academic tasks. This was particularly evident in the content area of English Language Arts. Molly was often heard saying, “I can’t read” or “I am stupid”. Molly had convinced herself that she would not be able to be successful unless an adult did the work with her. Even with staff support, if she perceived that she would be unsuccessful, she would demonstrate “escape and attention securing behaviors” such as bolting, aggressions towards staff, and swearing/yelling, which would ultimately result in her removal from the class and time spent in time-out if the behaviors continued to escalate.

The positive visual imagery presentation designed for Molly entailed photographs of her successfully completing reading assignments. These photographs portrayed her as a student who appeared happy and proud of her accomplishments. The script that accompanied the pictures contained positive verbiage that emphasized her abilities to do the work independently and successfully. During the intervention phase, this visual imagery presentation was displayed to Molly prior to literacy centers. She would view the presentation alongside her teacher.

Data collection at the baseline phase indicated that there was a second time in the day that was consistently difficult for Molly. This was the time immediately before and during dismissal from school. Molly appeared dysregulated at this time of day and would often refuse to get on the bus. Our hypothesis regarding this refusal was that she was concerned about the transition
from school to home. The visual imagery for the dismissal presentation consisted of photographs of Molly during every stage of the transition process, including photographs of her being greeted at home by her grandmother and the routine that ensued immediately after her arrival home. The scripting included encouraging phrases of safety and predictability. As with the academic presentation, Molly was shown this presentation while seated alongside the teacher prior to the dismissal process.

In keeping with the experimental design, data was collected in three phases: baseline, intervention and return to baseline. The academic presentation was the first intervention. The dismissal presentation was the second. Time-out data and behavioral outcome data (scale 0-5), was collected throughout the three phases of the two interventions (academic and dismissal). Data was graphed, and then data from each phase was analyzed via visual analysis methodology to determine if the intervention produced behavioral outcomes.

**Presentation of Findings**

In accordance with the guidelines presented in the technical document developed by Kratochwill et al. (2010), the standards for conducting visual analysis of data must include four stages and include six analytical elements. The analysis of the positive visual imagery experiment adhered to all of the recommended components.

In stage one of the experiment, baseline data was taken on time-out incidents and emotional regulatory status. This baseline data indicated that there was a problem worthy of intervention. Our subject, Molly, was demonstrating high rates of misconduct, which required removal from the classroom and/ or time-out in a designated safety area. In addition, Molly was exhibiting severe dysregulation during the two-targeted sessions (literacy and dismissal).
In stage two, the data within each phase was examined to determine if a consistent pattern exists. Kennedy (2005) explains that it is the analysis of the patterns that allows researchers to draw conclusions from the data. The pattern variables that are examined within each phase are level, trend, and variability (Kennedy 2005). Level refers to the average score within a phase. “Attending to the level of data within a phase allows for the estimation of the central tendency of the data during a particular part of the experiment” (Kennedy 2005, p197). Trend is defined by its slope and magnitude. Slope depicts the upward or downward direction of the graphed data. The magnitude describes the size of the slope. Magnitude is depicted using the terms low, medium or high. In the time-out graphs of the positive visual imagery experiment, a downward slope indicates a decrease in the percentages of time-out incidents. Conversely, the graphs capturing emotional regulatory status will depict an upward trend when behavioral outcomes improve. The terms high, medium and low are also utilized when identifying the third dimension of level, which is variability. Variability refers to the degree of deviation from the predicted straight line (Kennedy 2005).

During stage three, the researcher compares the data from each phase to assess if the dependent variable (behavior) is affected by the introduction of the independent variable (visual imagery) (Kratochwill et al., 2010). This analysis is conducted by examining both the immediacy of effect, and overlapping data variables. Examination of the immediacy of effect is utilized to compare data patterns across phases. Kratochwill et al. (2010) explain, “immediacy of effect refers to the change in level between the last three data points in one phase with the first three data points of the next” (p.18). Immediacy of effect is defined using the qualitative terms rapid or slow (Kennedy 2005). A rapid effect from baseline to intervention suggests that the intervention was effective in creating an effect (Kratochwill et al., 2010). Overlapping of data
points between phases allows the researcher to investigate whether the data in one phase is similar to that in the next phase. A significant amount of overlap between phases suggests that the intervention has limited to no effect on the dependent variable (Kratochwill et al., 2010). In the analysis of whether positive visual imagery impacts emotional regulation, overlap does not play a significant role in this experiment because the rating system only includes six possible data points (0-5). Statistically speaking, this means that there is a much greater chance that overlaps will occur as opposed to a scale where there was 100-point spread. Kennedy (2005) explains that in such cases, the analysis of the trend overrides the significance of overlap in determining if a relationship exists between the dependent and independent variable.

In the final analytical step, stage four, the data from all phases of the entire experiment are examined to establish if there are at least three displays of an effect at different points in the study (Kratochwill et al., 2010). Similar to stage three, stage four encompasses the analysis of the immediacy of effect and overlap of data. In addition, this stage determines if consistency of data patterns across similar phases exists. In this experiment, determining consistency of data patterns involves the analysis of all data within similar conditions (baseline- intervention- return to baseline) during both the academic and dismissal series. Kratochwill et al. explain that consistency of data across phases and series leads to assumptions that a relationship likely exists between the dependent and independent variables.

**Time-Out Analysis**

The following research question and hypothesis was the focus of the graphs and analysis to follow:

- **Question 1**: To what extent will the implementation of positive visual imagery result in the reduction of behavioral incidents that result in time-out and restraints?
Hypothesis 1: Exposure to positive visual imagery will promote emotional regulation, resulting in a reduction of time-outs and restraints as compared to baseline measures taken prior to the introduction of the intervention.

Time-Out data - Academic series

Data on the frequency of time-outs was recorded during the targeted academic activity known as literacy centers. This data was combined into a weekly average by dividing the total number of time-out incidents by the number of literacy sessions, which resulted in a weekly average. Figure 5 depicts the weekly percentage of time-out incidents in all three experimental phases. No restraints were recorded during the entire duration of the experiment.

Figure 5: Time-out data in the academic series

Although the data during the baseline phase is highly variable, it clearly outlines that there is a problem in need of change. In week 5 it is evident that the subject was unable to be
successful in any interval of the literacy centers and in fact, required a time-out during all literacy center events.

**Level:** During the baseline phase, the average percentage of time-out incidents within the entire phase was 50%. During the intervention phase, the average percentage of time-outs within the entire phase decreased to 31%. In the return to baseline phase where the intervention is removed, the weekly incidents increased again to an overall within phase average of 44%.

**Trend:** The most notable trend captured by the graph is the consistency in scores during the intervention phase. After the dramatic decrease displayed in the first week of the intervention, the remaining weeks displayed a consistent trend that was not evident in any other phase. During the return to baseline, where the intervention was removed, the data went back to a more fluctuating pattern.

**Variability:** High variability exists within both the baseline and return to baseline phases. During the intervention phase, however, after a dramatic decrease in time-outs (0%) in the first week, the data stabilizes at 40% for the remaining 4 weeks of the intervention phase.

**Overlap:** When comparing the three phases, the examiner can detect only minimal amounts of overlap between weeks. Overlap is evident in week 2 of the baseline phase and week 2-5 of the intervention phase. This may be attributed to the fact that variability exists in both baseline phases, yet stabilization occurs at a rate of 40% throughout most of the intervention phase.

**Immediacy of the effect:** When analyzing the immediacy of effect it is clear that the intervention seemed to demonstrate a drastic reduction in time-outs from the last week in baseline to the first week in the intervention phase. According to Kratochwill et al. (2010), the more profound the effect, the more convincing the assumption that the change was caused by the introduction of the independent variable (visual imagery). In the first week of the intervention, the percentage of
time-outs dropped dramatically to 0%. This was also noted in the first week of the return to baseline phase, which has the team of analyzers questioning if there was a carry-over effect from the intervention.

**Summary of Time-out Data (academic series)**

According to the guidelines for visual analysis presented by Kratochwill et al. (2010) data, that demonstrates at least three indications of an effect at different points in time, often leads to the conclusion that a relationship exists. In the time-out analysis of the academic series, this effect was clearly demonstrated. The academic series results appear to indicate that the changes in outcome variable (reduction of time-out) may be a direct result of the introduction of the independent variable (positive visual imagery). The intervention leveled the mood spikes that were apparent in both baseline phases. Time-outs in the intervention phase occur at a steady 40% rate in weeks two through five. It appears that the intervention made an impact on the subject’s agitated mood, but not on her chronic mood. It is questionable whether a more intense effect would occur if the intervention were prolonged. The assumption of a positive relationship between the dependent and independent variables exists, due to the positive effects noted in all the analyzed elements (level, trend, variability, overlap and immediacy of effect).

**Time-Out Data- Dismissal Series**

Data on the frequency of time-outs was recorded during the period prior to dismissal. This data was combined into a weekly average by dividing the total number of time-out incidents by the number of dismissal periods, which resulted in a weekly average. Figure 6 depicts the weekly percentage of time-out incidents in all three experiment phases. The researcher was forced to make sudden alterations to the experiment timeline in the dismissal series due to unforeseen circumstances. These events included additions to the subject’s classroom student...
population and staffing arrangement. In the past, this proved to be a trigger for the subject. It was feared that these confounding variables would interfere with the fidelity of the experiment, so a decision was made to reduce the number of weeks in the intervention and return to baseline phases. The reduction in the length of the phases poses a limitation (for comparison) however, changing the controlled environment that existed throughout the study would have posed a much more severe limitation. Creswell (2009) identifies these situations as potential threats to the internal validity of an experiment. This threat was eliminated by modifying the intervention and return to baseline data collection timeline in the dismissal series.

Figure 6: Time-out data during dismissal series

The data outlined during the baseline phase clearly demonstrates that there is a problem in need of change. The frequency of time-outs occur at a very high rate.

**Level:** During the overall six-week baseline phase, the average percentage of time-out incidents was 43%. During the entire three-week intervention phase, the average percentage of time-outs
decreased to 28%. In the two-week return to baseline phase where the intervention is removed, the weekly incidents increased again to an overall average of 44%.

**Trend:** The most notable trend when analyzing the overall graph is the sudden downward trend of time-outs in the first week of the intervention phase. In that week, the subject was successful in each period prior to dismissal after viewing the visual imagery. After the dramatic downward trend displayed in the first week of the intervention, the subject’s performance returned to a more fluctuating pattern with percentages that were evident in the prior weeks of the baseline phase. This trend appears to indicate that initially the intervention was having an effect, but the effect seems to have been lost in the subsequent weeks of the intervention phase. During the return to baseline phase, the magnitude of the slope in the first week is also noteworthy. Week one in the return to baseline phase was equal to the highest average found in the original baseline; however, that was reduced greatly in the week to follow.

**Variability:** High variability exists within all three phases in the data taken during the dismissal stage of this experiment. Due to the variability in the initial baseline data, the researcher extended the phase to determine if the trend would stabilize. This proved to make no difference. Upon analysis, it appears that a variable trend is a consistent pattern for this subject. This statement is not surprising given the subject’s diagnosis. The high variability found within the intervention phase, however, makes it more challenging to detect any benefit from the intervention.

**Overlap:** Overlap in data was evident in week one of the baseline phase and week three of the intervention phase (40%). Week two and three in the baseline phase and week two of the intervention phase also produced overlapping averages (50%). As is often anticipated, overlap
between the two baseline phases (baseline and return to baseline) was noted during two weeks (60%).

**Immediacy of the effect:** When analyzing the immediacy of effect, a rapid reduction in time-outs from the last week in baseline to the first week in the intervention phase is evident.

**Summary of Time-out Data (dismissal series)**

Due to the high variability of the data presented in all phases within the dismissal series, reaching conclusions regarding the relationship of the independent variable on the dependent variable is more challenging in this series. However, there were at least three indications of an effect at different points in this segment of the experiment (level, trend, and immediacy of effect), which according to the guiding principles presented by Kratochwill et al. (2010) leads to the assumption that a causal relationship may exist.

**Phase comparisons**

To eliminate the challenges that the variability component presents, the researcher averaged the time-out data in each phase in both series for further analysis (Figure 7). When comparing the overall averages between phases, it is evident that the intervention phases produced lower percentages of time-out intervals than in both baseline phases where the intervention was not presented.
Consistency of data in similar phases: The data displayed in Figure 7 reflects the time-out total averages in both the academic (blue) and dismissal (red) series. In both phases of the experiment the baseline of time-out incidents were recorded at an extremely high average rate. Baseline measures indicate that 43 (dismissal) to 50 (academic) percent of attempts resulted in a time-out. During both series, the intervention data showed a decline in time-out incidents. Incidents of time-out decreased by 19%, from baseline, when the visual imagery was introduced in the academic series. Similarly, the intervention phase during the dismissal series showed a 15% reduction in time-out incidents. Both return to baseline phases also proved to have very consistent results and demonstrated an increase in time-out incidents when the intervention was removed. The academic series showed a 13 percent increase while the dismissal series showed a 16 percent increase during the return to baseline phases.
Analysis of Emotional Regulation/ Behavioral Outcomes

In the second segment of the study, the researcher attempted to investigate the effect that visual imagery would have on improving the mood and regulatory status of the subject. The literature review and cognitive behavioral framework support the existence of a correlation between memory, mood, distorted perceptions and behavioral outcomes/ responses. This section of the study attempted to answer the subsequent research question and hypothesis:

- **Question 2**: To what extent will positive visual imagery result in less agitation and improved mood as evidenced by the student's behavioral outcomes?

- **Hypothesis 2**: Positive visual imagery will alter the current mood of the student resulting in reduced agitation and achievement of emotional regulation as demonstrated by student ratings of 3-5 on the behavioral rating scale.

As depicted in Figure 2, the subject’s behavioral outcomes were recorded on a scale from 0-5. Level five depicts a student who is regulated and on task. Level four portrays a student that is regulated yet requires teacher prompting to remain on task. Level three indicates that accommodations and/or modifications to the activity must be made, however the student is somewhat regulated. Given the nature of the subject’s disability, a score of three and above is generally considered an acceptable score. A rating of two describes a subject who refuses to participate in the given activity, but does not require any timeout/removal from the room. Level one depicts a student who is dysregulated and requires a time-out from the classroom environment. This timeout is short in nature (under 15 minutes). A score of zero depicts a student who is displaying unsafe behaviors and requires isolation for a period longer than fifteen minutes or even physical restraint. All ratings were assigned by the teacher. To insure fidelity,
in the teacher’s absence, a para-professional was also trained to rate the student’s behavioral outcomes.

During sessions where brief removal from the activity (or time-out) was necessary initially, but then the subject was able to rejoin the activity, the student received two scores for that session (one score for the beginning of the session and the other for the remaining part of the session). The two scores were then averaged together to produce one final rating score.

As recommended in the visual analysis standards, each phase (baseline, intervention, and return to baseline) is examined in isolation and then compared as a whole. Finally, both the academic and dismissal series phases will be analyzed collectively.

**Baseline- Academic Series**

Figure 8: Emotional regulation- baseline in academic series

Baseline data prior to the introduction of the visual imagery intervention in the academic phase was taken over a 23-day period. This was a five-week period with two days of absences. Visual analysis of this period is as follows:
*Level:* During the baseline phase, scores ranged from 1.5 to 5. The average score recorded during this baseline phase was 2.8.

*Trend:* Within the 23 baseline data points, there were seven sessions rated as a 1.5, five sessions rated as 2, one session rated as a 3, five sessions rated as a 4, and four sessions rated as a five. No sessions received a rating of zero.

*Variability:* During the baseline phase, high variability exists within the small 3.5 spread.

**Intervention- Academic Series**

Figure 9: Emotional regulation- intervention phase in academic series

The data displayed in figure 9 depicts the introduction of the visual imagery intervention during the academic session known as literacy centers. Data in the intervention phase was collected over a nineteen-day period. The data reveals:

*Level:* The average score during the intervention phase was 3.4
**Trend:** Within the 19 intervention (academics) data points, there were no sessions rated as a 0, 1 or 1.5, three sessions rated as 2, six sessions rated as a 3, ten sessions rated as a 4, and no sessions rated as a five. A significant upward slope is evident in this phase.

**Variability:** Although low-level variability exits, it is only spread between a three-point span in this intervention phase. The highest rating is this phase is a 4, and the lowest is a 2.

**Return to Baseline- Academic series**

Figure 10: Emotional regulation - return to baseline phase in academic series

The data displayed in figure 10 depicts the return to baseline phase where the intervention was removed. Data in the return to baseline phase was collected over a fourteen-day period.

**Level:** During the return to baseline phase, the average score was 2.7.

**Trend:** Within the 14 return to baseline (academics) data points, there were no sessions rated as a 0, three sessions rated as a 1.5, two sessions rated as 2, five sessions rated as a 3, three sessions rated as a 4, and no sessions rated as a five. Similar to the initial baseline phase, high level upward and downward slopes are noted again within this phase.
Variability: In this phase, the variability of scores fall within a 4-point range, with 4 being the highest and 1.5 being the lowest.

Examination of Patterns Across Phases (academic series)

As recommended in the analysis standards written by Kratochwill et al. (2010) stage four of the analysis consists of comparing data across all phases within a series. This analysis entails examining the phases by assessing the immediacy of effect and overlap of the data between phases.

Immediacy of effect: According to Kratochwill et al. (2010), immediacy of effect is determined by comparing the last three points in one phase with the first three data points in the phase that follows. The last few data points of the baseline phase were at the 1.5 and 2 range. Although somewhat variable, the first few data points in the intervention phase (4, 2, 3,) were at a higher level. Upon examination of the final data points in the intervention phase and the transition in to the return to baseline phase, the examiners note the drop from the consistent ratings of 4 throughout the intervention phase. The beginning of the return to baseline phase returns to the higher ratings of four, but drops for the majority of the sessions throughout this phase. This delayed effect in the return to baseline phase has the examiners questioning if there was a residual beneficial effect to the intervention that diminished after a few sessions.

Overlap: In this experiment, overlap will not be a significant variable because of the limited number of possible data points. Of significance, however, is that the overlap of data points in the lower ranges (2 or below) appear to occur in greater frequencies in the baseline and return to baseline phases. According to Kratochwill et al. (2010), the smaller the ratio of overlapping points in the two baseline phases as compared to the intervention phase, the more compelling the
argument that a relationship exists. This was clearly the case in the data presented in the academic series.

The data presented in the academic series proved to demonstrate positive effects in both the immediacy of effect and overlap variables.

**Baseline 2- Dismissal series**

Figure 11: Emotional regulation- baseline phase in dismissal series

![Figure 11](image)

Figure 11 outlines the data taken during the baseline phase prior to the introduction of the visual imagery that addressed the challenges during the dismissal process. Data was collected over a 28-day period. Analysis consists of the following variables:

**Level:** During the initial baseline phase for dismissal, the data ranges from 1.5 to 5. The calculated baseline mean in the second series of the experiment is 2.9.

**Trend:** Within the 29 baseline data points, there were five sessions rated as 1 to 1.5, seven sessions rated as 2 to 2.5, five sessions rated as a 3, eleven sessions rated as a 4, and one session rated as a five. No sessions received a rating of zero.
Variability: During the baseline phase, high variability exists within a large five-point spread.

Intervention 2- Dismissal series

Figure 12: Emotional regulation - intervention phase in dismissal series

The data displayed in figure 12 depicts the introduction of the visual imagery intervention during the dismissal series. Data in the intervention phase was collected over a fourteen-day period. Analysis consists of the following components:

Level: During the intervention phase for dismissal, the data ranges from 1 to 4. The calculated baseline mean in the second phase of the experiment is 2.5.

Trend: Within the 14 intervention data points, there were five sessions rated as 1 to 1.5, three sessions rated as 2 to 2.5, two sessions rated as a 3, four sessions rated as a 4, and one session rated as a five. No sessions received a rating of 0 or 5.

Variability: During the baseline phase, high variability exists within a four-point spread.
Return to Baseline 2- Dismissal series

Figure 13: Emotional regulation- return to baseline in dismissal series

The data displayed in figure 13 depicts the return to baseline phase where the intervention was removed. Data in the return to baseline phase was collected over a fourteen-day period.

Analysis included the following variables:

Level: During the return to baseline phase, the average score was 2.6.

Trend: Within the 9 return to baseline (dismissal) data points, there were no sessions rated as a 0, four sessions rated as a 1.5, zero sessions rated as 2, two sessions rated as a 3, three sessions rated as a 4, and no sessions rated as a five.

Variability: In this phase, the variability of scores fall within a 3-point range, with 4 being the highest and 1.0 being the lowest.
**Examination of Patterns Across Phases (dismissal series)**

As was completed in the academic series, the researcher performed an analysis of the immediacy of effect and overlap variables by examining the three phases within the dismissal series as a whole.

*Immediacy of effect:* In the dismissal series, the final three points in the baseline are variable in that they range from 4 to 1. The three data points that follow in the intervention phase are all 4’s. In the return to baseline phase, the three introductory data points are once again stable, but are significantly lower at 1.5 than the two other phases. Although the overall examination of series two shows limited evidence of a relationship between the independent and dependent variable, the analysis of immediacy effect, which isolates beginning and ending data points, seems to offer a different perspective and detects minimal evidence of an effect.

*Overlap:* Due to the limited spread of available rating points, analysis of data overlap will not play a critical role in this experiment, however, overlap is evident in all phases of the dismissal series, which leads to the conclusion that no relationship exists between the dependent and independent variable.

**Examination of patterns in 1&2**

The visual analysis standards developed by Kratochwill et al. (2010) outline a final stage of analysis that involves integrating information from all phases within both series to establish if there are at least three displays of an effect at different points in the study. The variables to be analyzed in this stage are immediacy of effect, consistency of patterns, and overlap of data.
Figure 14: Emotional regulation data across all phases in the academic series

Figure 15: Emotional regulation data across all phases in dismissal series

**Immediacy of effect:** Although the overall examination of the dismissal series seems to show limited evidence of a relationship between the independent and dependent variable, the analysis of immediacy effect, which isolates beginning and ending data points, seems to offer a different perspective and detects minimal evidence of an effect.
**Consistency of patterns:** When comparing the two initial baseline phases in both series, it is evident that this student’s overall performance is highly variable and differs between sessions. One could say that this student is consistently inconsistent in her performance. The steady pattern that is apparent in the series one (academic) intervention phase is striking, yet it is not demonstrated regularly in the second series (dismissal). The return to extreme variability patterns continues in the return to baseline phases in both series.

**Overlap:** In this experiment, the analysis of overlapping data point will not play as an important role as level, trend, variability, consistency and immediacy of effect due to the fact that there is such a small range of data points (0-5). According to Kratochwill et al. (2010) ranges, which overlap because of the limited number of available data points, are less of a concern than ranges in which the points are similar within a large span of potential options.

**Conclusion**

A single-case quasi experiment was designed and implemented in an effort to address the problem of practice. The purpose of the experiment was to investigate whether the introduction of the brain-based therapeutic technique known as positive visual imagery would result in a reduction of time-out incidents and/or improved emotional regulatory status in the subject. The experiment consisted of two series, one that focused on an academic task, and the other centered on dismissal. Both series attempted to address the questions of decreasing time-out incidents and achieving emotional regulation by utilizing positive visual imagery. Selection of the academic and dismissal periods was based on data analysis, which noted that the subject struggled most during these two periods of the day. Baseline, intervention, and return to baseline data was collected, graphed and subsequently analyzed to determine if the intervention (independent variable) made an effect on the student outcomes (dependent variable).
The graphed data was analyzed using the single-case design technical document standards by Kratochwill et al. in (2010). According to those standards, session one (academics) demonstrated “Strong Evidence” of a relationship between the visual imagery and the reduction of time-out incidents. This rating is based on the positive results in trend, level, and immediacy of effect. There were more than three indications of an effect at different points in time, which according to Kratochwill et al. (2010) leads to the assumption that a relationship exists.

Session two (dismissal) appears to show “Moderate Evidence” of an effect because there were at least three indications of an effect at different points (level, trend, and immediacy of effect) however a “non-effect” is also noted in variability, overlap, and consistency.

When combining the results of both series (academic and dismissal), the researcher is lead to conclude that there is “Moderate Evidence” of a relationship between the positive visual imagery and its effect on time-out incidents.

Again, according to the standards set by Kratochwill et al. 2010, session one and two were rated on the effect that the positive visual imagery had on the subject’s emotional regulatory status. Session one (academics) showed evidence of effect changes in all six-outcome variables (level, trend, and variability, immediacy of the effect, overlap, and consistency. This lead to a rating of “Strong Evidence”. In session two (dismissal) positive effects were noted in only the immediacy of effect analysis variable. Therefore, the dismissal series of this study would be considered a “Non-effect” due to the following factors:

- There was a failure to establish a consistent pattern in any phase.
- Significant data overlap between the baseline and intervention phases was noted.

The visual analysis of the overall experiment concludes that there proved to be “Moderate Evidence” of an intervention effect on the subject’s behavioral outcomes. This overall evidence
rating is based on the mixed results of session one and session two. Analysis of the discrepancies between the two series yields a vital hypothesis. The analysis team believes that the dismissal process was less effective because it involved supervising adults outside of the educational team (bus driver, monitor and guardians). The classroom staff were the only ones trained in the project protocol, thus rating always occurred before the subject left the building. This fact ensured the credibility of the data; however, the confounding variables still may have had an impact on the subject’s behavioral responses. This may have posed an issue of treatment fidelity. In the academic series, these confounding variables were managed more effectively due to the predictable scheduled structure inherent in the school day routine. Based on this supposition, considerations surrounding the dismissal process emerge as research implications. Perhaps it is possible to train the transportation staff so that our practices are consistent. If this is not feasible then perhaps the organization should consider providing transportation for the students that attend our classrooms.

Given what we know about Molly’s past, her confirmed diagnosis of PTSD, clinical assessment results, and her observable behaviors, it has been determined that Molly presents with lack of confidence. Clinical documentation (Carleton 2010) indicates that Molly presents with a fragile sense of self, fear of retaliation and/or consequences. She requires constant reassurance and support from the adults with whom that she interacts. It appears that she has developed negative cognitive schemas around her abilities to be successful without the assistance of an adult. To compound these issues, Molly has trust issues with most of the adults with whom she interacts. Confidence must be reestablished constantly. The visual imagery presentation in the academic series targeted Molly’s negative thoughts around her ability to complete academic tasks successfully and independently. The overarching mission was to provide her with a more
stable positive memory of her abilities. Study results indicate that the positive visual imagery was effective in improving her regulatory status and behavioral outcomes during these academic intervals. Researchers can only speculate that perhaps the underlying reason was that the intervention might also have had an effect on reducing her negative feelings around attempting the academic tasks.

Although the overall analysis results were favorable regarding the effects of the intervention, it is prudent to note another variable that may have contributed to positive results. The analysis team identifies that the implementation of the project itself called for individualized attention for the subject. Given the subject’s identified need for constant reassurance, it is possible that this need was met in part due to the individualized attention given. However, given the results of the dismissal series, the identical individualized attention did not appear to produce the same favorable effect. Given the importance of this comparison, the team is crediting the intervention itself for the positive behavioral outcomes.
Chapter 5: Discussion of Research Findings

Chapter 5 will focus on the implications of the findings of the positive visual imagery single-case experiment. This chapter will link the research findings to implications for current educational practices and the stated problem of practice. In addition, discussion of recommendations for further research will follow.

Interpretation of Findings

The purpose of this single-case experiment was to determine the effectiveness of the brain-based therapeutic technique called positive visual imagery. This study documented the behavioral outcomes of a single subject through the baseline, intervention, and return to baseline phases in two different segments (academic and dismissal). The experiment examined the following research questions and/or hypotheses:

- **Question 1:** To what extent will the implementation of positive visual imagery result in the reduction of behavioral incidents that result in time-out and restraints?

- **Hypothesis 1:** Exposure to positive visual imagery will promote emotional regulation, resulting in a reduction of time-outs and restraints as compared to baseline measures taken prior to the introduction of the intervention.

- **Question 2:** To what extent will positive visual imagery result in less agitation and improved mood as evidenced by the student's behavioral outcomes?

- **Hypothesis 2:** Positive visual imagery will alter the current mood of the student resulting in reduced agitation and achievement of emotional regulation as demonstrated by student ratings of 3-5 on the behavioral rating scale.

The ultimate goal of the positive visual imagery is to trigger positive memories which will stabilize mood and reduce episodes of acting out. The experimental design tested the research
questions and related hypothesis statements. Evaluation of data occurred via the visual analysis of graphed data. This methodology allowed the researcher to examine patterns of behavioral change throughout the study.

Data analysis is in accordance with the standards presented in the single-case technical document prepared by Kratochwill et al. (2010). The panel of researchers designed a scale that qualifies the strength of the effect demonstrated within the experiment. The categories include “Strong Evidence”, “Moderate Evidence” and “No Evidence/ Non-effect” (Kratochwill et al., 2010, p. 16). In the positive visual imagery experiment, the academic series demonstrated “Strong Evidence” of a relationship between the visual imagery and its positive effects on time-out incidents and regulatory status. The dismissal series demonstrated only “Moderate Evidence” of a relationship between the visual imagery and its positive effect on time-out incidents, but a “Non-effect” rating on regulatory status.

As the researcher and her analysis team examined these findings, we are drawn to the differences between the results from series one (academics) and series two (dismissal). The academic series produced evidence of positive effect in both the reduction of time-out incidents and regulatory status, while the dismissal series demonstrated a “moderate effect” in the reduction of time-out incidents and a “non-effect” in emotional regulation. Evaluators have determined two possible hypotheses for this phenomenon. The first hypothesis is that there was an error in determination regarding the function of the behavior during the behavioral analysis phase. Initially, the assumption was that the student was dysregulated because of concerns she had regarding the transition itself. Due to this assumption, the positive visual imagery was designed around predictability and safety of the routines. If the function of the behavior is incorrect then the visual imagery will ultimately be less effective. Secondly, and perhaps more
likely, according to the analysis team, is the supposition (regarding the inadequate findings in the dismissal series) that there were too many variables not within the examiners control to adequately support and assess the subject throughout the entire dismissal process. The dismissal process entails a shift of personnel from trained classroom staff to the bus driver and monitor, and ends with the guardians when the student arrives home. The variables, which were out of control of the examiners, were the subject’s interaction with bus personnel, interactions with peers during transport, and variations in who would be receiving the subject at home. Shortly after viewing the positive visual imagery, the student transitioned from the structure and safety of the therapeutic classroom environment to a less structured ride in a vehicle filled with students and untrained bus personnel. Ultimately, the reality of the bus conditions may have been a complete contradiction to the message of safety and security presented in the visualization.

There is much to learn from the inadequate outcomes produced in the dismissal series. The analysis team believes that the positive visual imagery lost its effectiveness after the first week because it was no longer creditable. In actuality, the visual imagery did not match the reality of what really occurred in the dismissal process. If the reality of what occurs does not match with the memory the project is hoping to create, then it is impossible to trigger a positive reaction (Plummer, 2012, interview). In comparison, in the academic series, where the positive visual imagery showed images of successful endeavors in a supportive environment, the subject was consistently provided with the support and encouragement that matched the image presented in the PowerPoint. This made the visual imagery creditable because the visualization matched reality. During the dismissal series, however, the trained staff was not available to facilitate the proper therapeutic environment and/ or rapport, thus the positive visual image created by the PowerPoint was not realized.
The conclusion, regarding positive visual imagery and its need to be based in reality, is a compelling finding within this study. Analysis clearly indicates that the positive visual imagery was effective when the environment was consistent, predictable and therapeutic (as in the academic series). When those conditions were not present, the same intervention was not as effective. It reveals that the positive visual imagery in itself is not as effective. The analysis team learned volumes about the intervention by being able to examine the mixed results of the two parts of the experiment. The conclusion is that the school environment must be at a therapeutic level if the educators are expecting to impact behavioral outcomes for students with Post-Traumatic Stress Disorder.

**Implications for Educational Environments**

Although this research represents only one subject out of thousands of students diagnosed with Post-Traumatic Stress Disorder, its significance should not be diminished. The results have implications that could change the way students with PTSD are educated. Through analysis and deliberation, several research considerations have evolved. In the proceeding section, the researcher will discuss the study implications through the lens of the original stated problem of practice. Subsequently there will be discussion regarding the implications for educational environments, which are formulated based on the study findings. These recommendations focus on the premise that classrooms need to be therapeutic environments, which utilize preventive brain-based techniques. Specifically the suggestions include recommendations regarding staff training and philosophy, classroom therapeutic components, and safe crisis management.

**implications on the problem of practice.**

Study results indicate that a preventative strategy is effective in decreasing the time-out incidents of the subject. They also demonstrate that the subject displayed positive changes in
regulatory status during the introduction of positive visual imagery. These findings support the value of preventative strategies and suggest that emphasis on prevention strategies, as opposed to reactionary, when dealing with students diagnosed with PTSD is warranted. The experiment results offer solutions to the issue of insufficient behavioral outcomes that was articulated in the original problem of practice. The experiment results demonstrate the promise of prevention measures when educating students with PTSD.

Reliance on reactionary strategies (discipline, segregation, suspension) operate on the premise that all misconduct is deliberate and at a conscious level. It suggests that the behavioral reactions of the student diagnosed with PTSD are always within their control, which our review of neurobiology clearly demonstrates is not the case. Cole et al. explain, “When teachers don’t understand why a child is acting out, they are likely to focus on the behavior, not on the emotion behind it. Training should help staff understand that a traumatized child’s disruptive behavior often is not a matter of willful defiance, but originates in feelings of vulnerability” (Cole et al., 2005, p. 57). Training educators to recognize that misconduct is not always volitional is an enormous task, but one worth the effort. This researcher contends that one’s belief system regarding the intentionality of a student’s misconduct dictates an individual’s response to that behavior. If an individual believes that a student’s misconduct is intentional then they will most likely feel the need to respond to that behavior with consequences and/or punishment. On the contrary, if the individual understands that the student’s misconduct is related to their disability and is due to factors often beyond the student’s control, then that individual will most likely seek to support that student.

This researcher is not suggesting that if positive visual imagery is introduced in all schools that behavioral issues will magically disappear. It is being proposed that perhaps
preventative strategies such as positive visual imagery should be considered as one tool in a large toolbox of positive preventative strategies. Findings indicate, however that this tool, although effective, must be utilized within a therapeutic environment.

**therapeutic classroom components.**

Generalizability of these research findings to typical elementary aged students should be interpreted with caution. As an alternative educational setting, the school prides itself on providing a therapeutic environment that is rich in behavioral supports. Therapeutic accommodations are often not available in the traditional school setting. These supports include staff trained in social-emotional disabilities, a high staff to student ratio, structured environment with embedded routines, expert behavioral consultation from a behavioral psychologist and developmental pediatrician, and onsite individual/group therapy. A brain-based therapeutic philosophy is the underpinning of the strategies in our setting. Future researchers need to note the contextual factors incorporated in this approach when attempting to generalize this to other settings. Kennedy (2005) explains that contextual information assists others to comprehend the larger effects of the intervention.

The explanation regarding the additional therapeutic supports found within the alternative school is not meant as an excuse for the public schools to remain at status quo. Quite the contrary, this researcher is identifying that in their current state, most public schools may not be prepared to provide the services and brain-based therapeutic techniques that should be considered best practice when working with students diagnosed with PTSD, however this researcher challenges school systems to get prepared. The work being done by the Massachusetts Advocates for Children in collaboration with The Hale and Dorr Legal Services Center of Harvard Law School and the Task force on Children Affected by Domestic Violence in
2005 attempted to meet that very challenge. The task force set forth to create trauma sensitive schools in Massachusetts. Although the initiative proved to be successful at providing education for students who were the victims of trauma within their home schools while “reporting reduced suspensions/ expulsions, disciplinary referrals, improved attendance and reduced special education referrals” (DESE, 2010, p.17), its funding was reduced so that the impressive mission was not allowed to flourish. It appears that the rationale behind reductions in special education initiatives such as this are generally financially based.

As discussed previously, this project was conducted in a classroom that was functioning at a high therapeutic level. The determination of the classroom’s therapeutic level was based on the characteristics found in Figure 16 and signified by the analysis team. The therapeutic level of the classroom was a critical factor in measuring the effectiveness of the visual imagery because it isolated many possible confounding variables. If the experiment was conducted in a classroom that was not at a therapeutic level then the changes in behavioral outcomes could be attributed to any positive changes made in the classroom. Researchers who may attempt to replicate this study should heed this warning. A significant obstacle to implementation of the positive visual imagery in a setting that is not at a therapeutic level is that, as was discovered in the dismissal process, the positive visual imagery will not match the reality of the classroom surroundings. The implementation of the experiment and its subsequent findings has led to classroom recommendations. Figure 16 outlines the recommended components of a therapeutic classroom.
Figure 16: components of a therapeutic classroom.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Therapeutic Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Posted schedule of the day that is referenced prior to transitions.</td>
</tr>
<tr>
<td>2</td>
<td>A set routine for every item in the daily schedule is designed.</td>
</tr>
<tr>
<td>3</td>
<td>Each routine has an attached set of expected behaviors.</td>
</tr>
<tr>
<td>4</td>
<td>Children are grouped, the space arranged, and staff assigned so that the routines have the right level of support and the minimal level of interference</td>
</tr>
<tr>
<td>5</td>
<td>The classroom is organized and free of clutter.</td>
</tr>
<tr>
<td>6</td>
<td>There is a strong sense of community within the classroom.</td>
</tr>
<tr>
<td>7</td>
<td>Every student has an effective reset break routine.</td>
</tr>
<tr>
<td>8</td>
<td>Strategic ignoring is utilized.</td>
</tr>
<tr>
<td>9</td>
<td>Reduced recognition for students not on track, but consistent praise for those on track.</td>
</tr>
<tr>
<td>10</td>
<td>Settling area routines are established.</td>
</tr>
<tr>
<td>11</td>
<td>A hierarchy of time-out options is available. Students have no more than 4 seclusion time-outs in one week.</td>
</tr>
<tr>
<td>12</td>
<td>Positive reinforcement and continuous recognition systems are evident.</td>
</tr>
<tr>
<td>13</td>
<td>Behavioral data is consistently recorded. Decisions are driven by data.</td>
</tr>
<tr>
<td>14</td>
<td>Every student has a clear and appropriate leisure routine.</td>
</tr>
<tr>
<td>15</td>
<td>Character development is a focal point.</td>
</tr>
<tr>
<td>16</td>
<td>A 4:1 ratio of positive recognition to corrective statement exists.</td>
</tr>
<tr>
<td>17</td>
<td>Student/ teacher relationships of mutual respect and caring are maintained.</td>
</tr>
</tbody>
</table>

Figure 17: Written by Carolyn McKearney with information extrapolated from the work of Dr. Kevin Plummer and input from Stacey Kaminski and Frank Gallishaw
safe crisis management.

As depicted in Figure 16, the therapeutic classroom relies heavily on the prevention of misconduct by structuring the classroom in a supportive nurturing fashion. Out of the seventeen therapeutic components listed, only item eleven depicts a reactionary strategy. Although the focus of a brain-based therapeutic environment is truly on preventative strategies, it is imperative to be prepared to react safely when working with students diagnosed with PTSD. If students are exhibiting flashbacks of traumatic experiences, or are entrenched in their common fright or flight reactions, educators need to handle these episodes in a calm and respectful manner. Sanchez (2008) explains, “Crisis is best defined as an outcome resulting from a dramatic shift in chemicals produced by the brain that alerts the amygdala of a threat or a perceived threat. The failure to understand this scientific process has led to many misperceptions and much ill-advised planning related to crisis” (Sanchez, 2008, p. 28). Hysterical reactions from staff will only exacerbate the student’s responses. Students are comforted by the fact that the staff is able to handle the situation effectively.

According to Sanchez (2008), once a situation has reached the crisis level, there appears to be limited options to restore the brain’s chemical balance quickly. This statement emphasizes the importance of therapeutic techniques continuing well after the crisis. Once the student has regained their composure after a physically disruptive episode, the time for therapeutic rapport begins again. When the student is able to process the event effectively, (the transition from amygdala to cortex has taken place); staff then assists the student to recall the incident and make suggestions for future alternative responses. Students who are anxious about their return back to the classroom often benefit from repair strategies. Plummer (2006) explains, repair strategies may directly relate to the incident (i.e., writing an apology note, cleaning up a mess made during
the struggle). These strategies are designed so that the student feels that they have contributed to the community and can begin feeling regulated and in a positive mood. Repair strategies are not consequence based and/or punishments. They should be posed as an option not a requirement. With some students, repair strategies are effective at resetting the student’s regulatory status.

**staff training and philosophy.**

Therapeutic classrooms do not exist in an isolated bubble; they are grown from a sound philosophical base. The mission and vision of the organization must fully support the brain-based therapeutic techniques and strive for each classroom to be at a high therapeutic level. A crucial component of the creation of brain-based therapeutic programming is professional development. Opportunities for all staff members to become well versed in these techniques are essential. In many public schools, professional development opportunities are available only to professional teaching staff and related service providers. This is not acceptable in the proposed model. Like Cole et al. (2005), this researcher feels that every staff member who interacts with the students must be trained. A therapeutic preventative approach is based on consistency of practice. If not all staff members are on the same page, then therapeutic fidelity is at risk. All staff members who interact with students are relied on as therapeutic mentors to the students. The staff/student supportive relationship is the hallmark of this approach. Each member of the staff should be aware of the background of the student diagnosed with PTSD, and the impact that it places on the student being successful in the school environment. Knowledge of emotional triggers and situations that may foster dysregulation is instrumental in developing corresponding preventative strategies for each child. Certification in non-violent crisis prevention is a mandate for all individuals that carry out the listed protocols. According to Cole et al., “training should help educators understand the significance of their role as mentors and caring adults in the lives
of traumatized children and focus on the supports they need to fulfill this role” (Cole et al., 2005, p. 52).

The findings of the experiment serve to support the recommended educational strategies because of their focus on prevention as a means of changing behavioral outcomes. Consequence-based reactions will never be effective at creating behavioral change with students diagnosed with PTSD because they fail to address the underlying cause of the behavior and do not attempt to teach replacement behaviors. In fact, Sanchez (2008) contends that the threat of consequences and/or punishment will often lead to an increase in impulsivity and dysregulation because the perceived threat will activate the amygdala (Sanchez, 2008, pg. 86). The review of the literature in neuroscience helps us to understand why preventive strategies, such as positive visual imagery, make sense from a neurobiological perspective. According to brain development, the behaviors exhibited by Molly and her elementary aged peers will be chiefly controlled by the limbic system (emotional brain) (Sousa, 2009). When a young child feels anxious or threatened, the amygdala will take control and diminish the input to the cortex (rational brain). The result is that behaviors will be emotionally driven and without the benefit of conscious thought and reasoning (Arden 2010, Sanchez 2008, and Sousa 2009). Our goal, as educators, should be to strike a balance between the amygdala and cortex. This balance is achieved when the child is regulated emotionally. In the case of students diagnosed with PTSD, it is important to remember that their memories are stored with emotion. Negative emotions are often triggered by their memories. This cycle of triggers leads to mood based perception and behavior. According to Plummer (2011- interview), the positive visual imagery presentation designed in this study attempted to intervene in the memory/ mood, perception, behavior cycle,
and was effective at improving the subject’s regulatory status and reducing time-out incidents during activities that are identified triggers.

**Implications for Positive Visual Imagery**

The research findings appear to support the work of Aaron Beck’s and his cognitive behavioral theory framework. Beck focuses attention on the concept of distorted and negative thought processes. His hypothesis is that individuals form negative cognitive schemas based on previous experiences. These distortions in thinking are the source of later maladaptive behavioral outcomes. When discussing the research findings and their implications on the stated theoretical framework, it is prudent to use great caution. It would be irresponsible to suggest that the introduction of visual imagery was able to change the negative thought processes of the subject. Without the subject being able to testify to that fact, the researcher has no way of validating that supposition. The researcher is forced to draw conclusions and hypotheses from the data itself, given this limitation. This limitation leads to a recommendation for future research in positive visual imagery. Perhaps soliciting a response from the subject following the viewing of the positive visual imagery would aid the researcher in assessing the impact that the intervention had on changing the negative thought processes.

Analysis of the experiment results and findings has led to additional suggestions for the utilization of positive visual imagery. The researcher and her team have identified four recommendations for improving the quality and effectiveness of prospective positive visual imagery presentations.

First, it is imperative to ensure that the function of the target behavior is clearly defined and established. The limited results in the dismissal series led the analysis team in this study to question if the identification of the function of the behavior was accurate. The term “function of
the behavior” refers to the hypothesis behind what drives the individual to behave in the way they do. This hypothesis is the base on which the positive visual imagery is created. If the hypothesis surrounding the cause of the behavior is incorrect, then the visual imagery presentation will most likely not be effective at improving behavioral outcomes.

Secondly, the analysis team ascertained that the positive visual imagery presentation must match the reality of the environment in order to be effective. The immediate goal of the positive visual imagery presentation used with Molly was to decrease her agitated mood and anxiety levels. The ultimate goal, with time and success, is to create new positive memories. This appeared to be successful in the academic series when the presentation was able to shed light on Molly’s accomplishments and give her confidence. In reality, the educators created a supportive environment in the classroom that matched the visions seen in her PowerPoint presentation. With repetition, it is presumed that Molly began to believe the messages conjured from the positive visual imagery. If the supporting environment is not available, then the positive imagery created in the PowerPoint loses its credibility. The match between the visual imagery presentation and environment must exist to strengthen the neuro-pathways and eventually create new positive memories. As Dr. Merzenich’s research uncovered, “Neuron’s that fire apart wire apart- or Neuron’s out of sync fail to link” (Doidge, 2007, p64). This now famous theory of neuroplasticity is used to explain that if an individual’s actions are reinforced or found to be pleasurable then the act will be most likely repeated. Repetition of acts in turn strengthens neuro-pathways. If not validated or reinforced the neuro-pathway will eventually fade. The true mission of visual imagery and education of students with PTSD should always be around strengthening the neuro-pathways that deal with positive attributes while letting the negative memories of a traumatic past eventually fade.
A third concept was realized through the implementation of the positive visual imagery project. In order for the visual imagery to remain effective, it must continue to hold the attention of the viewer. Achievement of focus and attention are through novelty. According to the research of Dr. Russell Poldrack (2010), the brain’s natural response is to overlook old information and concentrate on the unfamiliar material. Visual media and advertising capitalize on this concept. To attain novelty, the photographs within the PowerPoint presentation are routinely changed, and the student will remain motivated to view the positive visual imagery repeatedly. This concept is critical if the researcher is designing the positive visual imagery intervention to last for extended periods.

The final finding that was a culmination of the implementation of the experiment deals with the photographs utilized within the positive visual imagery PowerPoint presentation. The photographs utilized in the presentation should focus on the target behavior and limit background images. The subject’s cognitive processing of the photograph needs to be immediate and succinct. The researcher should not take the chance that the subject will focus their attention on any extraneous details in the photograph. Accompanying each photograph is a script, which illustrates the meaning/feeling that the photograph should evoke. Photographs must accurately elicit a pleasurable feeling in the student. Posed pictures with faux expressions may compromise the effectiveness of the presentation.

**Recommendations for Future Research**

Interpretation of the findings of the positive visual imagery experiment, have guided the researcher to formulate suggestions for future research. Each suggestion focuses on the basic premise of the positive visual imagery experiment, as they are preventative in nature, focus on
creating positive behavioral change, and support the cognitive-behavioral theory theoretical framework.

The first recommendation involves a change in the delivery method of the positive visual imagery. The researcher is questioning if utilizing photo albums with audio output in place of a PowerPoint presentations would be effective. This modality is portable, convenient and user-friendly. Similar to the positive visual imagery, these photo albums will contain several photographs of the student being successful/happy/safe. Below each picture, are corresponding positive scripts, which are both visible and auditory. The subject will view the photographs while accessing the positive audio message. Protocols and experiment design would be identical to this experiment; however, the ease of application may be beneficial in some settings.

A second consideration for future research is the addition of music to the PowerPoint presentation. The supplement of music to the presentation is to facilitate positive mood changes. Brain research has shown that music produces a rise in serotonin levels. Serotonin has positive influences on the brain chemistry and controls mood. According to a study administered at Penn State University, college students reported increased levels of positive emotions after listening to music. Even positive mood states were intensified after music was introduced (Stratton & Zalanowski 2009). The addendum of a music component may serve to strengthen the presentation; however, its implementation is determined on an individualized basis and depends on the subject’s preferences.

The third suggestion for future research is to develop classroom wide visual imagery projects. This project proposal differs from the individualized approach utilized in the positive visual imagery experiment. Because it is intended for multiple users, there will be no attempt to identify a function of the behavior. Instead, the focus will be on facilitating a positive mood
within a group. The photographs within the PowerPoint will consist of happy, smiling and laughing people and animals. The viewing of others in joyful spirits will capitalize on the mirror neuron effect. Arden (2010) credits the mirror neurons for assisting individuals in interpreting the emotions of others at a subconscious level. These neurons are responsible for a human being’s ability to have empathy for others. Sanchez (2008) explains that mirror neurons respond keenly to facial expressions and physical gestures/postures. These neurons are credited for a great deal of our acquisition of social skills. Sanchez (2008) posits that repetitively observing a behavioral repertoire is as instrumental at creating behavioral change as performing the act yourself. As was discovered in our experiment, however, the visualized positive behavioral repertoire must be consistent with the everyday practices, rituals and routines of the environment. Simply visualizing happy individuals will not be an effective tool if the environment is threatening to the individual. Once again, the reality must match the proposed intervention.

Experiment results indicate the promise of positive visual imagery for a subject with PTSD. Therefore, the introduction of positive visual imagery to students whose diagnoses fall within the social-emotional and behavioral disability realm appears to be a natural recommendation. Another diagnostic category whose characteristics are very different from PTSD yet may prove to be a match for positive visual imagery is Autism Spectrum Disorder (ASD). This assumption has led to the fourth recommendation for positive visual imagery utilization. According to the DSM-IV, one of the main characteristics of autism is impairment in reciprocal social interaction, which may be a result of unusual activation of certain areas of the brain utilized in comprehension of social skills (DSM-IV, 1994). An intervention utilized to teach the misinterpretation of social skills with student in the Autism spectrum is Social Stories.
Author and ASD consultant, Carol Gray, introduced Social Stories in 1991. Social Stories facilitate simple and clear descriptions of social cues and appropriate behaviors that students with ASD appear to lack. They can be written in sentence format or utilize pictorial representations. Written from the student’s perspective, Social Stories provide ASD students with the words and images of everyday social situations in attempt to de-mystify the social situations that are challenging for these students. These stories are rehearsed prior to the situation in hopes that the story will guide the behaviors of the student once placed in the situation (Gray & Garand 1993). Social Stories, like positive visual imagery, serve as a situational prime. From a neurobiological perspective, “consistently seeing the practice is as influential as doing the behavior oneself” (Sanchez, 2008, p. 113). Both interventions strive to strengthen neural connections through repetition. Given the similarities between the two interventions, it appears sensible to attempt the positive visual imagery with students in the Autism spectrum.

The final recommendation is to measure the actual responses in the brain during the implementation of positive visual imagery. It is now possible to accomplish this through video-telemetry. Video-telemetry places EEG electrodes directly on the subject’s scalp. The electrodes are attached via cable to the EEG recording device and video camera. The arrangement allows researchers to observe how stimuli are processed in the different areas of the brain during the implementation of the intervention. Although this technology is becoming more widely available, its feasibility in most educational settings remains questionable.
Conclusion

As the federal and state mandates around safe schools encroach, educators are faced with the dilemma of providing an appropriate education for students diagnosed with PTSD and other social-emotional and behavioral disabilities. Currently, reactionary measures such as time-out, restraint, and suspension are the common reactionary strategies. These widely practiced methods ultimately serve to deny access to education for these students. Research, such as this, illustrates the impact that preventative behavioral techniques which capitalize on how the brain processes and stores emotional memories play on designing behavioral intervention plans. Perhaps the most significant finding within this study is that the positive intervention in itself cannot be effective. Analysis of the study results clearly indicated that the intervention was effective when the environment was consistent, predictable and therapeutic (as in the academic series). In the dismissal series, where those conditions were not present, the same intervention was not as effective. The analysis team learned volumes about the intervention by being able to examine the mixed results of the two parts of the experiment. Our overall conclusion is that the appropriate use of positive visual imagery, when administered in a therapeutic environment, may be able to reduce the need for reactive interventions such as time-out and restraint.

School-wide prevention strategies and brain-based therapeutic techniques, such as positive visual imagery, should be the emphasis of future educator training and policy development. The researcher hopes that this experiment will be used as a catalyst for other studies that focus on improving student behavioral outcomes in our schools.
References


