Reducing Adolescent Anger and Aggression with Biofeedback: A Mixed-Methods Multiple Case Study

Jedidiah S. Savard
Antioch University Seattle

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REDUCING ADOLESCENT ANGER AND AGGRESSION WITH BIOFEEDBACK:
A MIXED-METHODS MULTIPLE CASE STUDY

A Dissertation

Presented to the Faculty of
Antioch University Seattle
Seattle, WA

In Partial Fulfillment
of the Requirements of the Degree
Doctor of Psychology

By
Jedidiah S. Savard
May 2017
REDUCING ADOLESCENT ANGER AND AGGRESSION WITH BIOFEEDBACK:
A MIXED-METHODS MULTIPLE CASE STUDY

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been approved by the committee members signed below
who recommend that it be accepted by the faculty of the
Antioch University Seattle at Seattle, WA in partial fulfillment
of requirements for the degree of

DOCTOR OF PSYCHOLOGY

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May 23, 2017
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ABSTRACT

REDUCING ADOLESCENT ANGER AND AGGRESSION WITH BIOFEEDBACK:
A MIXED METHODS MULTIPLE CASE STUDY

Jedidiah S. Savard
Antioch University Seattle
Seattle, WA

Adolescent anger, aggression, and violent outbursts are social problems significantly affecting each of us. Individual therapeutic management of pathological anger is treated in various ways depending on practitioners’ theoretical orientations and competency levels. Popular psychological individual and group therapies addressing anger and aggression in adolescents focus primarily on cognitive-behavioral techniques that manage anger’s symptoms. Evidence-based cognitive-behavioral therapies often require clients to self-identify emerging antecedents of anger without assistance; such therapies employ predetermined strategies to assist the client to emotionally de-escalate prior to an angry or aggressive episode. However, cognitive responses to an emotional upheaval stemming from an emergence of anger can annul the sensitivities and awareness required to prompt desired or predetermined de-escalation technique commencement. A physiological antecedent of anger is an increase in heart rate, identifiable with a personal heart rate monitor. The use of a systematic continuous heart rate biofeedback technique in antecedent anger management could not be found in the publishable research prior to this study’s development. This empirical mixed methods multi-case study evaluated the efficacy of routine heart rate self-monitoring to enhance the identification of anger’s antecedents in adolescents and subsequently diminish their expressions of anger and aggression. Five adolescents participated in the study; they regularly monitored their heart rates and paired them with their fluctuations of
emotional states. Using objective assessments completed by the adolescent participant, homeroom teachers, and parents, the researcher measured five baselines. During post-treatment interviews the adolescents, teachers, and three parents provided their perceptions of the therapy process. Individual and cross-case analysis of the objective and subjective data reinforced the hypothesis that anger expressions and experiences can diminish through heart rate biofeedback therapy. Post-treatment interviews also revealed information for further research and improved therapy applications. This dissertation is available in open access at AURA, http://aura.antioch.edu/ and Ohio Link ETD Center, https://etd.ohiolink.edu/etd.

*Keywords:* adolescent, aggression, anger, biofeedback, case study, mixed-methods, school psychology
Dedication

Many people feel that if they had only known, really known, earlier they would have lived their lives differently. ...The belief in personal specialness is extraordinarily adaptive and permits us to emerge from nature and to tolerate the accompanying dysphoria: the isolation; the awareness of our smallness and the awesomeness of the external world, of our parents’ inadequacies, of our creatureliness, of the bodily functions that tie us to nature; and, most of all, the knowledge of the death which rumbles unceasingly at the edge of consciousness.

~ Dr. Irvin D. Yalom (1980, p. 121)

This dissertation is dedicated to the eldest of my younger brothers—Ryan James Savard. He entered this life on February 27th, 1983, and incomparably shaped my own life’s trajectory and development. His unwavering innocence, gentle disposition, and will to love and explore untethered, permeated my shell, and taught me with each interaction. He was the older brother I should have been; challenging and motivating me to do better, to improve myself, to let go of my excuses and fears, to return to formal education, pursue my dreams, and live my life without applying a cost/benefit analysis to every decision.

He kept the courageous, playful, wide-eyed, open, curious, unmolded, unbounded boy in me alive. I reentered the academic arena with his encouragement. I pushed through the barriers and hurdles, and because of him I solidified my resolve to live my life in his honor, to make my life meaningful, to benefit the lives of others, and to carry him with me everywhere I go.

His ability to humbly elevate himself through the ranks is my inspiration and motivation. Others call him a hero, memorialize his image across the country’s highways and social media, and guard his resting terminus. He carried his portion of my heart for 29 years – 7 months – and 15 days, culminating in becoming the tip-of-the-spear, the big brother for each of us, and protected us in our cocoons. To me he will always be the strong, resilient, and doe-eyed little boy who wanted to be like his big brother. Ironically his big brother became his biggest fan; an
appreciative recipient of his love. Many people are responsible for this dissertation, but none more than the soul we called Ryan.
Acknowledgements

Most of the time I spent on this dissertation I felt alone on a deserted island with no escape in sight. However, I could not have done this on my own. I received support and encouragement when I needed it most, some when I least expected it and others when I set aside my pride and asked for help. There were many who contributed to my life in the past couple of years and helped me along my path. The following are a few of those wonderful people who gave of their time and expertise without asking for a thing in return.

Most notably is Dr. Dana Waters who inspired me, listened to me, and guided me when I needed it. She never turned me down and always picked me up. And then there was Brian Kennedy, a former coworker and friend of mine back in New Hampshire, who called me every Tuesday “to make sure you’re still breathing” and remind me that I can do, and get through anything.

My dissertation committee also needs a special acknowledgement and explanation. These three different clinical psychologists allowed me to pursue my own unique interest and topic, to develop a plan of studying a therapy I designed, and they always responded supportively. They even accommodated my work style and allowed me the autonomy, time, and self-guidance I needed to navigate this project in my own unique way.
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Chapter I: Introduction to the Study

Background

Anger is a residual core emotion rooted in the evolutionary process. It fundamentally benefits the spread of humanity as well as its development. However, anger inhibits current societal living standards, and socially accepted and agreed upon interactions. Prior to the present social system’s zeitgeist and advocation of equality, anger was an inherent weapon that served to strengthen and unite clans and other societies to overcome obstacles of progress. Anger has also contributed to the development of males’ enhanced muscular development as well as their heightened testosterone levels (Sell, Hone, & Pound, 2012; Stanton, Wirth, Waugh, & Schultheiss, 2009). Consequently, ancient pervasive patriarchal systems, maintained by aggressive behaviors, emerged and survived. A confusing message is transmitted and instilled in children and adolescents as these undesired emotions and actions are popularized and revered in television programming, the film industry, popular video games, and common literature that persistently promotes and venerates lifestyles filled with, at times perceived non-consequential, anger and aggression (Gunter, 2008). Today anger and its consequential aggressive manifestations and violent behaviors are increasingly identified as socially unacceptable, fundamental human emotions and behaviors that often lead to difficulties at home, at school, and at the work place; such anger can create criminal judicial barriers to a healthy and rewarding life (Greenberg, 2013).

Truman and Langton (2015) released the U.S. Department of Justice (USDOJ), Office of Justice Programs, Bureau of Justice Statistics 21st Annual Report on nationally reported criminal victimizations prior to 2015. They reported that rates of violent crimes have risen since 2010 in the United States, but no statistically significant change occurred between 2013 and 2014 in the
rate of violent crimes, serious violence, domestic violence, intimate partner violence, violence resulting in an injury, violence involving a firearm, violent crime reported to police, and violent crime victims receiving assistance from a victim service agency (Truman & Langton, 2015). Figure 1 illustrates the overall 14,060,900 violent crimes reported in 2013 and 13,341,620 overall violent crimes reported in 2014, broken down into categories of type of violent crime committed.

United States violent crimes occur in all age groups with the 35 to 49 age group committing 25% more violent crimes than adolescents (Truman & Langton, 2015). Anger, aggression, and violence are progressive individual and social problems that rise in prevalence with chronological age and consequential autonomy. Clinically aggressive behavior is exhibited by 5% to 10% of children and adolescents, with males exhibiting two to three times the frequency of females (American Psychiatric Association, 2013; Larson & Lochman, 2011).

The American Psychiatric Association’s (2013) 5th edition of the Diagnostic and Statistical Manual (DSM-5) describes several childhood and adolescent mood dysregulating clinical disorders with signs and symptoms of socially unacceptable behaviors across settings and time (e.g., attention-deficit hyperactive disorder [ADHD], disruptive mood dysregulation disorder [DMDD], intermittent explosive disorder [IED], oppositional defiant disorder [ODD], and conduct disorder [CD]). Etiologies, symptoms, and signs include poor attachment development, depression, anxiety, trauma, features of autism, inattentive and hyperactive tendencies, explosive anger, and aggressive behaviors. The inability to regulate socially constructed emotions expresses in multiple settings (e.g., classrooms, home, playground, and places of worship). Emotional outbursts often result in school suspensions, disrupted learning and achievement, and strained relationships with peers, parents, teachers, and others.
Available prevalence rates of disruptive adolescent disorders are primarily based on DSM-IV criteria for diagnosis (see Table 2). Angry and aggressive children and adolescents, as characterized by the documentary “Child of Rage” (Monet, 1990) were often diagnosed with a reactive attachment disorder (RAD) beginning with the DSM-III. DMDD is an updated diagnosis recently included in the DSM-5, primarily absorbing the angry and aggressive
diagnostic criteria of the DSM-III and DSM-IV RAD diagnosis. Therefore, DMDD prevalence rates are premature.

Table 1 shows the diagnostic criteria of RAD, disinhibited social engagement disorder (DSED), and DMDD. All three diagnoses were previously categorized as RAD until recently. They share characteristics stemming from an unhealthy attachment manifesting in atypical ways. The DSM-IV (2000) reported the prevalence of RAD to be “very uncommon” (p. 129). Horner (2008) reported a prevalence rate of 1% distributed throughout the entire population. He noted that 38% of children entering the foster care system with a history of child abuse prior to age four are diagnosed with a RAD.

Many childhood and adolescent diagnoses have significant prevalence rates. Table 2 illustrates the estimated number of children and adolescents in the United States diagnosed individually or comorbidly with a CD, an ADHD, an ODD, and/or an IED. These disorders are, unfortunately, frequent present, with angry and aggressive socially, undesirable behavioral symptoms characterizing each diagnosis.
### Table 1

**DSM-5 Diagnostic Descriptors of RAD, DSED, and DMDD**

<table>
<thead>
<tr>
<th>Reactive Attachment Disorder (RAD)</th>
<th>Disinhibited Social Engagement Disorder (DSED)</th>
<th>Disruptive Mood Dysregulation Disorder (DMDD)</th>
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<tr>
<td>Rarely or minimally seeks comfort when distressed</td>
<td>Reduced or absent reticence in approaching and interacting with unfamiliar adults.</td>
<td>Severe recurrent temper outbursts manifested verbally (verbal rages) and/or behaviorally (physical aggression toward people or property) that are grossly out of proportion in intensity or duration to the situation or provocation.</td>
</tr>
<tr>
<td>Rarely or minimally responds to comfort when distressed</td>
<td>Overly familiar verbal or physical behavior</td>
<td>The temper outbursts are inconsistent with developmental level.</td>
</tr>
<tr>
<td>Minimal social and emotional responsiveness to others</td>
<td>Diminished or absent checking back with adult caregiver after venturing away</td>
<td>Occur three or more times a week.</td>
</tr>
<tr>
<td>Limited positive affect</td>
<td>Willingness to go off with an unfamiliar adult</td>
<td>Persistently irritable or angry most of the day</td>
</tr>
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**Unexplained irritability,** sadness, or fearfulness even during nonthreatening interactions with adult caregivers.

**Note.** Attachment is a pivotal part of human development that produces significant negative effects when on a divergent trajectory. The above structure illustrates negative types of attachment development in personality as determined by the American Psychiatric Association (2013) DSM-5. All criteria were formerly diagnosed at Reactive Attachment Disorder prior to the DSM-5. Table 1 Diagnostic criteria retrieved from “Diagnostic and statistical manual of mental disorders fifth edition DSM-5” by the American Psychiatric Association, 2013, Washington, DC; American Psychiatric Publishing.
Table 2

Prevalence Rates of CD, ADHD, ODD, and IED

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<th>Diagnosis</th>
<th>Prevalence</th>
<th>Diagnostic Criteria</th>
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<td>CD</td>
<td>9.5%</td>
<td>Physically cruel to people and/or animals; Stolen while confronting a victim; Forced someone into sexual activity; Engaged in fire setting with the intention of causing serious damage; Deliberately destroyed others’ property.</td>
</tr>
<tr>
<td>ADHD</td>
<td>8.7%</td>
<td>Often blurts our answers before questions have been completed; Often runs about or climbs excessively in situations in which it is inappropriate; Often interrupts or intrudes on others.</td>
</tr>
<tr>
<td>ODD</td>
<td>12.6%</td>
<td>Often loses temper, argues with adults, actively defies or refuses to comply with adults’ requests or rules, deliberatelyannoys people, blames others for his or her mistakes or misbehavior, touchy or easily annoyed by others, often angry and resentful, and spiteful or vindictive.</td>
</tr>
<tr>
<td>IED</td>
<td>7.4%</td>
<td>Episodes of failure to resist aggressive impulses that result in serious assaultive acts or destruction of property; Degree of aggressiveness expressed during the episodes is grossly out of proportion to any precipitating psychosocial stressors.</td>
</tr>
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</table>

Note. The approximate prevalence rates of conduct disorder (CD), attention-deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and intermittent explosive disorder (IED) diagnoses are produced from research based on DSM-IV diagnostic criteria as illustrated in the Diagnostic Criteria section of the table. (Al-Hamzawi et al., 2012; American Psychiatric Association, 2000; Merikangas et al., 2010; Nock, Kazdin, Hiripi, & Kessler, 2006).

As these adolescents emerge into adulthood, they leave their parents’ homes, the structure of the education system, and other organizations devoted to the development of our youth into productive citizens who can integrate into the complex society they inherit. Therefore, anger and
aggression interventions focus on maturing the client and decreasing the client’s angry feelings, aggressive behaviors, and explosive outbursts. In order for these early preventative interventions to be effective, they need to address the unique learning styles, perspectives, and environments of the adolescent demographic.

Children and adolescents exhibiting explosive aggression are capable of maturing and are willing to make positive changes when the correct tools and support are provided. Current treatments and therapies for aggression and anger in adolescence often treat an underlying biochemical imbalance and focus on training de-escalation techniques and improving social support. Pharmacotherapies, focused on altering neurotransmitter levels in the neuronal synapses, are difficult to prescribe effectively due to varying individual physiologies, developing physiologies, and adherence to medication regimens. These variables can impede the hermeneutic development of agency and self-efficacy towards self-psycho-management. Typical therapeutic treatments entail parent and sibling training, modeling behaviors, operant conditioning techniques, and talk, play, exposure, anger management, and child centered therapies.

Treatments for explosive anger in adolescents do not provide these clients with the ability to detect the biological antecedents of an angry episode. These antecedents include cardiovascular escalations that are related to dysregulated emotional episodes leading to anger and aggressive outbursts (Mostofsky, Maclure, Tofler, Muller, & Mittleman, 2013). Future therapies for explosive anger need to target the antecedents of anger to provide an opportunity for intervening strategies that can improve personal anger and aggression regulation. Technological advancements are increasingly providing therapists and clients, almost exponentially, with affordable and easily obtained biofeedback devices that can be used in
de-escalation therapies focused on the physiological antecedents of anger and aggression. However, it is critical that these biofeedback technologies and therapies have an underlying psychological theoretical scaffold applied to implement growth and productive change in clients.

**Purpose of the Study**

This study was developed to meet the need for an antecedent intervention. The intent of this study was to examine the therapeutic efficacy of adolescent students routinely monitoring their personal heart rate and pairing their heart rate with their emotions as an antecedent forewarning of explosive anger. Adolescents exhibiting clinically dysregulated anger in the classroom, home, and other settings may benefit from a biofeedback warning system indicating a need to engage in predetermined de-escalation techniques. This study sought to determine if a biofeedback warning system could be achieved through persistent heart rate monitoring. This study’s intention was also to begin a foundation of research on the use of biofeedback, specifically regular use of a personal cardiovascular monitoring device for the enhanced management of clinically dysregulated anger in adolescents.

**Research Questions**

The primary research question probed the generalizability of effectively using a wrist-worn heart rate monitor to identify elevations in heart rate that are antecedents of episodic explosive anger and aggression and to diminish the occurrence of angry and aggressive episodes. This was accomplished through analysis of data produced by observing the change in self-reported anger states, traits, and control standardized observations, and qualitative as well as quantitative data produced by parent, teacher, and adolescent self-reports. Regulated observations assessed the potential for diminished outward expressions of anger and aggression.
Specific Quantitative Questions

The specific quantitative questions were designed to answer the primary overarching question: Will heart rate monitoring reduce anger? This was accomplished through objective self-reported measurements of anger and behavior as explained in the methodology section. The following specific questions were studied.

1. Adolescent heart rate monitoring coupled with individually designed anger de-escalation strategies will reduce self-report anger symptoms measured by the State-Trait Anger Expression Inventory 2nd edition Child/Adolescent (STAXI-2 C/A) scales.

2. Adolescent heart rate monitoring coupled with individually designed anger de-escalation strategies will reduce self-reported behavior problems measured by the Achenbach Behavior and Observation Assessment System (ABOAS) Youth Self-Report for Ages 11–18 (YSR 11–18) scales.

3. Adolescent heart rate monitoring coupled with individually designed anger de-escalation strategies will reduce parent-reported adolescent behavior problems measured by ABOAS’s Child Behavior Checklist (CBCL) scales.

4. Adolescent heart rate monitoring coupled with individually designed anger de-escalation strategies will reduce teacher-reported student behavior problems measured by ABOAS’s Teacher Report Form (TRF) scales.

5. Adolescent heart rate monitoring coupled with individually designed anger de-escalation strategies will reduce researcher-reported adolescent participant behavior problems measured by ABOAS’s Direct Observation Form (DOF) scales.
Qualitative Inquiry

The primary inquiry of this study was the discovery of effective change in anger and the experience of the participants, parents, and teachers. The qualitative inquiry sought to determine what the participant’s experience was in the therapeutic process. A characteristic of the qualitative inquiry is its ability to illicit new and often unforeseen information. Only after a qualitative interview or investigation can questions elicited from research be fully developed. In general, the qualitative component of this study was to uncover the experience of the participant and the participating teachers and parents. In other words, what unforeseen benefits, risks, interferences, and complications to using a wrist-worn heart rate monitor with adolescents to prevent and diminish the expression of anger and aggression could be detected? Additionally, what could be learned from participant, parent, and teacher feedback to improve the therapy design and process?

A comprehensive participant case profile was produced for each participant with the intention that these case files would provide information regarding the efficacy of the biofeedback training therapy. A comparison of multiple cases served to produce some generalization data that would create an inference of the efficacy of the treatment for future studies and therapies conducted by psychologists and other mental and behavioral health providers.

Significance of the Study

The therapeutic biofeedback procedure this study focused on intends to benefit clients lives and interactions. Access to the non-invasive biofeedback technology used for the therapy is continually improving in cost and availability. Also, the evidence-based treatment is rooted in
scientific research, and tangible and measureable physiological operations, which align with many similar therapies that are covered and reimbursed by insurance payers.

The technologically driven therapeutic method can be easily administered and assists clients with minimal training to self-identify and self-intervene prior to an angry episode. Traditional therapeutic training for clinical anger in adolescence focuses on teaching techniques for managing stress after an episode has begun to manifest outwardly (Henwood, Chou, & Browne, 2015). Current pre-episodic therapies generally focus on pharmacological interventions and cognitive training that emphasizes the maturation of the individual’s awareness of anger triggers, feelings, and reactions (Creed, Reisweber, & Beck, 2011). Instead, this study focuses on a noninvasive, antecedent, and chemical free method of enhancing the client’s executive functioning skills in anger and aggression regulation.

Adolescents who use a personal heart rate monitoring biofeedback technique to identify emerging anger and implement predetermined interventions for preventing escalations in anger and aggression may benefit with long-term maturation of executive functioning. Saddock and Saddock (2007) determined “school-based prevention programs have the potential to strengthen social and emotional skills and diminish aggressive behavior[s]” (p. 1224). Teachers and parents using this system would be alerted through the wireless Bluetooth link with the device, the preset vibration, or by the change in color of the device’s display, thus enabling them to intervene to prevent an explosive episode. This would potentially improve the classroom and overall educational experience for adolescents, peers, and teachers.

This study’s therapeutic method focused on the prevention of anger and aggressive episodes, aims to improve the lives of adolescents struggling to regulate angry emotions. Benefits for mood dysregulated children can include spending less time in detentions, in-school
suspensions, and out-of-school suspensions, as well as dealing with difficult peer relationships (Chalamandaris & Piette, 2015). The biofeedback therapy is simple to implement; child-therapists can prescribe and track progress inexpensively and complete therapy in fewer than ten weeks, and adolescents can benefit from recent technological advancements. The historical theoretical orientations and past research that led to this study’s theory and therapeutic strategy are explored in the next chapter.
Chapter II: Literature Review

The mind creates meaning through lifelong development. It continuously works . . . to monitor or evaluate the meanings created by the thinking function; it evaluates how positive and negative the events of our lives are, given the meaning we ascribe to them. It continually creates feelings and emotions that reflect thoughts. The emotion-forming dimension of the mind continually reads what the intellect is telling us and forms emotions to match those thoughts. . . . They tell us either: “Things are going well for you!” or “Things are not going well for you!” (Paul & Elder, 2006, pp. 1–3)

Anger is a core emotion fundamental to our evolutionary success, warning of danger and assisting in repelling it (Fessler, 2010). The evolutionary benefits of anger can conflict with current societal norms that presently govern (Dearing et al., 2002). Adulthood hypertension is a significant concern related to frequent heightened levels of anger, as well as domestic violence, intermittent and irregular employment, pervasive societal costs, and an individual’s self-esteem (Erdogan & Corapcioğlu, 2004; Jang et al., 2014; Mason et al., 2012; & Starner & Peters, 2004). Unrestrained anger in childhood and adolescence leads to peer, teacher, parent, sibling, and other relationship problems, including impediments in school achievement and emotional and cognitive developments. Anger is a strong emotion that can control us and cause substantial problems but that can be controlled.

The large body of research into anger’s effects, therapy, and management has not effectively resolved current complications stemming from anger in the 21st century. Often the etiology of adolescents’ expression of anger and aggression is viewed as parentally influenced developments along the lifetime growth trajectory. Adolescents emerge from childhood and experience the increasingly autonomous social shaping of the contemporary teenager.
Contributing to each other’s experiential teenage zeitgeist, adolescents share learned behaviors, speech, dysregulations, and other perceived aggressive coping strategies that reinforce an immediate outlook of control over the individual’s environment. Current therapies focus on teaching avoidance and de-escalation strategies and building personal awareness, improved self-efficacy, self-esteem, and self-awareness.

In this chapter the evidence produced extensively by professional researchers and writers who created the body of literature and historical pathways of childhood, adolescent, and adulthood anger that led to this study is reviewed. The antecedent and therapeutic theories and practices of anger and aggression are explored. Special focus is attended to adolescent anger and aggressive behavior. Anger’s effects on human cognition, emotion, physiology, and society are explored.

Upon review of the literature, an inference was evident that present and historical research has not coalesced emerging technologies and therapies to serve as adjunctive biofeedback in popular anger management strategies. Thus, the available research is incomplete in producing effective anger management techniques for adolescents that include emerging technologies in heart rate biofeedback to enhance traditional and newly developed therapeutic strategies. Additionally, identified and reviewed biofeedback therapy and research does not employ round-the-clock access to personal physiological assessment as a tool of evidence-based operant conditioning.

The results of the studies reviewed in this chapter are reported in various effect sizes. Three different effect sizes (e.g., Cohen’s \( d \), Glass’s \( \Delta \), Hedges’ \( g \)) are used to measure estimations of how sigma is calculated for the scaled difference between means with a 95% confidence interval. Cohen’s \( d \) uses the pooled sample standard deviation of both groups or
treatments. Glass’s $\Delta$ uses the control group standard deviation. Hedges’ $g$ is an adaptation of Cohen’s $d$ that tries to correct for bias using an $n-1$ for samples. Cohen’s $d$ is primarily used in reporting the research in this literature review. The interpreted threshold for a small effect size is 0.20, a medium effect size threshold is 0.50, a large effect size threshold is 0.80, and a very large effect size threshold is 1.30 (Cohen, 1988).

**Childhood and Adolescent Anger**

Emotion regulation in childhood and adolescence is the result of an elaborate external and internal feedback loop that blends the holistic development of an individual’s experiences with his or her ability to self-regulate. The process of emotional development and regulation is complex and has spawned a plethora of research pathways. Albert Bandura was one of the most famous childhood aggression researchers, describing the comprehensive Social Learning Theory (SLT). Bandura demonstrated through the BoBo doll experiments that aggression is a learned behavior similar to any other behavior taught to a child (Bandura, Ross, & Ross, 1961). He theorized that anger and aggression were a result of classical and operant conditioning, along with other influencing observations.

Bandura’s exploration of anger and aggressive human development is echoed and reinforced in the research of adult intimate partner violence (IPV) perpetrators. Birkley and Eckhardt’s (2015) meta-analysis of anger’s link to violence occurring between intimate partners led them to conclude, “IPV perpetrators are more likely than nonperpetrators to report witnessing IPV in the family of origin and to have been physically abused as children” (p. 42). Therefore, unhealthy anger and aggressive behaviors can be viewed as an early socially and environmentally instilled set of internal and external expressions. With this view, anger and
aggression create an influential fluid state reflective of varying degrees of personal development of identity and self.

Research into emotion regulating skills, strategies, and therapies can vary in approach, from the physiological to the environmental. The psychological approach is often all-inclusive, combining all aspects of the underlying etiology while teasing out specific parts of the feedback loop that serve to stimulate, regulate, and reinforce an emotion. Anger can be viewed as an “arousal that results from social conditions involving threat of frustration” (Averill, 1982, as cited in Kerr & Schneider, 2007, p. 560). Anger research focuses on the basis, expression, and regulation of the emotion with environmental (e.g., parents, peers, authorities), physiological (e.g., nervous system regulation), spiritual, combined (e.g., environmental and physiological), and other perspectives. Psychological research of anger seeks to combine all contributing variables into a comprehensive understanding. Research results are used to enhance theorists in conceptualizing and therapists in changing the regulation and expression of an individual’s or group’s anger expressions.

**Anger Prevalence**

Previous research into mood dysregulations resulting in angry outbursts in adolescence uncovered a complex problem affecting many youth, leading to misconduct and antisocial behaviors in adolescence and adulthood. A Harvard Medical School (2011) study of more than 6000 adolescents in a nonclinical setting revealed that almost two-thirds of American adolescents experience anger leading to threats of violence, destruction of property, or violent actions towards others (McLaughlin et al., 2012). The study also revealed that more than 8% of teenagers meet the Diagnostic and Statistical Manual fourth edition’s (DSM-IV) criteria for intermittent explosive disorder (IED). The number of teenagers meeting the diagnosis increases
when using updated DSM-5 criteria (e.g., verbal aggression and non-destructive or non-injurious physical aggression) for diagnosing IED. Untreated explosive anger can lead to harming others, monetary costs for private and public property damage, and continuous complications in emotion dysregulation throughout adulthood (Temcheff et al., 2008).

**Individual and Societal Effects**

Aggressive actions that emerge from anger produce negative consequences in a variety of ways. Chemtob, Novaco, Hamada, Gross, and Smith (1997) studied the effects of post-traumatic stress disorder (PTSD) and found anger and aggression to be seriously, socially, and interpersonally debilitating responses to trauma. These traumatic effects are also systemic, effecting entire cultures, races, and ethnicities. Gibbons et al. (2012) concluded that Black American adolescents dealing with the negative persistent traumatic effects of racism often turn to the use of illegal substances, suggesting that anger is a significant contributing factor to substance abuse and other risky behaviors. Contrary to popular media’s depiction of Black American youth, substance abuse prevalence rates among Black youth are consistently lower than Whites and Hispanics (National Institute on Drug Abuse [NIDA], 1998). Unmanaged and uncontrolled anger can result in complications pervading an individual’s life and radiating throughout society.

The United States Center for Disease Control (CDC) collects data on aggression throughout the United States. In 2012 the CDC published their Youth Violence Fact Sheet. In it the CDC’s findings indicated aggressive and violent adolescents caused an average of 13 adolescent homicides daily, ended the lives of male adolescents six times more often than females, and used a firearm six times as often in adolescent murders. Additionally, non-Hispanic Black males were killed almost four times as often as Hispanic males and almost 18 times as
often as non-Hispanic White males. The CDC (2012) also found that 32.8% of adolescents surveyed, almost twice as many males than females, were involved in a physical fight in the previous year, with almost half occurring on school property.

Individual effects of anger and aggression in adolescence can inhibit healthy psychological development. An adolescent’s self-esteem, self-respect, self-efficacy and teacher, parent, sibling, and peer relationships are affected by delays in emotional maturation (R. W. Greene & Ablon, 2006). Emotional immaturity leads to classroom disruption and deficits in academic achievement. Physical and somatic complaints, domestic violence, personal property damage, and frequent employment disruptions elevate with the expression of anger and aggression (Raval, Martini, & Raval, 2009; Shorey, Brasfield, Febres, & Stuart, 2011).

The societal costs of anger and aggressive behavior are pervasive. Angry and aggressive youth strain the social frame through vandalism, forensic investigations, judicial proceedings, incarcerations, appellate procedures, and bail and parole management. Restorative justice efforts have improved the judicial response through the cooperation of civilian volunteers, school district personnel, and local police in preventing judicial action for first-time illegal adolescent offences (Laundra, Rodgers, & Zapp, 2013).

As previously described, early development of unhealthy angry and aggressive emotions and expressions leads to adulthood anger and aggressiveness. One of the primary arenas hosting adulthood anger and aggression is intimate relationships (Birkley & Eckhardt, 2015). Domestic violence is a pervasive challenge for our society, and intimate partner violence is a sensitive area of study conducted by many researchers to identify the causes, correlates, and effective interventions.
Birkley and Eckhardt (2015) updated the literature by reviewing 61 studies to produce a comprehensive meta-analysis identifying anger and hostility ($d = .64$) as the primary correlate of violent behaviors between intimate partners. Table 3 is an adaptation of Birkley and Eckhardt’s meta-analysis, displaying 17 of the studies used to focus on assessing anger’s correlation to violence within intimate partner relationships and nonviolent intimate partners. These various studies employed a variation of two different standardized anger assessments. The measurements used were the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1998), State-Trait Anger Expression Inventory 2 (STAXI-2; Spielberger & Brunner, 2009) and the Multi-dimensional Anger Inventory (MAI; Siegel, 1986), which are all extensively studied, vetted, and normed. The STAXI-2 is comprehensively reviewed in Chapter III: Methodology. Through their analysis Birkley and Eckhardt uncovered an overall medium correlation between anger and intimate partner violence ($d = .48$).
Table 3

*Review of Intimate Partner Violence Associated With Anger*

<table>
<thead>
<tr>
<th>Author(s) &amp; Publication Date</th>
<th>Sample Size (N)</th>
<th>Measurement(s) Used</th>
<th>Description of Results</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babcock et al. (2005)</td>
<td>102</td>
<td>STAXI-2</td>
<td>Anger correlation moderate among violent intimate partners than nonviolent partners</td>
<td>0.67</td>
</tr>
<tr>
<td>Barbour et al. (1998)</td>
<td>88</td>
<td>STAXI</td>
<td>Anger correlation high among violent intimate partners than nonviolent partners</td>
<td>0.87</td>
</tr>
<tr>
<td>D. J. Boyle &amp; Vivian (1996)</td>
<td>312</td>
<td>STAXI, MAI</td>
<td>Anger correlation medium among violent intimate partners than nonviolent partners</td>
<td>0.50</td>
</tr>
<tr>
<td>Dutton &amp; Starzomski (1993)</td>
<td>75</td>
<td>MAI</td>
<td>Anger correlation medium among violent intimate partners than nonviolent partners</td>
<td>0.49</td>
</tr>
<tr>
<td>Dutton et al. (1994)</td>
<td>160</td>
<td>MAI</td>
<td>Anger correlation medium among violent intimate partners than nonviolent partners</td>
<td>0.31</td>
</tr>
<tr>
<td>Dutton et al. (1996)</td>
<td>185</td>
<td>MAI</td>
<td>Anger correlation medium among violent intimate partners than nonviolent partners</td>
<td>0.41</td>
</tr>
<tr>
<td>Dye &amp; Eckhardt (2000)</td>
<td>257</td>
<td>STAXI</td>
<td>Less anger control for violent intimate partners than nonviolent intimate partners</td>
<td>0.51</td>
</tr>
<tr>
<td>Eckhardt (2007)</td>
<td>102</td>
<td>STAXI-2</td>
<td>Anger correlation high among violent intimate partners than nonviolent partners</td>
<td>0.80</td>
</tr>
<tr>
<td>Eckhardt et al. (2002)</td>
<td>33</td>
<td>STAXI-2</td>
<td>Anger correlation high among violent intimate partners than nonviolent partners</td>
<td>1.73</td>
</tr>
<tr>
<td>Feldbau-Kohn et al. (1998)</td>
<td>89</td>
<td>STAXI</td>
<td>Anger correlation moderate among violent intimate partners than nonviolent partners</td>
<td>0.58</td>
</tr>
<tr>
<td>A.F. Greene &amp; Coles (1994)</td>
<td>40</td>
<td>STAXI</td>
<td>Anger correlation high among violent intimate partners than nonviolent partners</td>
<td>1.38</td>
</tr>
<tr>
<td>Kendra et al. (2012)</td>
<td>496</td>
<td>MAI</td>
<td>Anger correlation medium among violent intimate partners than nonviolent partners</td>
<td>0.47</td>
</tr>
<tr>
<td>Leonard &amp; Senchak (1993)</td>
<td>607</td>
<td>STAXI</td>
<td>Anger correlation moderate among violent intimate partners than nonviolent partners</td>
<td>0.61</td>
</tr>
<tr>
<td>Shorey et al. (2011)</td>
<td>80</td>
<td>STAXI-2</td>
<td>Anger correlation high among violent intimate partners than nonviolent partners</td>
<td>1.07</td>
</tr>
<tr>
<td>Sullivan et al. (2013)</td>
<td>396</td>
<td>STAXI-2</td>
<td>Anger-in correlation moderate among violent intimate partners than nonviolent partners</td>
<td>0.63</td>
</tr>
<tr>
<td>Sullivan et al. (2013)</td>
<td>396</td>
<td>STAXI-2</td>
<td>Anger-out correlation high among violent intimate partners than nonviolent partners</td>
<td>0.98</td>
</tr>
<tr>
<td>Swan &amp; Snow (2003)</td>
<td>95</td>
<td>STAXI-2</td>
<td>Non-violent victims scored higher on anger-in than the intimate partner violence groups</td>
<td>-0.44</td>
</tr>
<tr>
<td>Tweed &amp; Dutton (1998)</td>
<td>114</td>
<td>MAI</td>
<td>Impulsive violent intimate partners had moderate anger correlated more so than nonviolent partners</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Anger and Development

Approaches to research vary based on age, gender, and other demographic variables. State-specific anger in early childhood development produces persistent intergenerational difficulties stemming from environmental and inherent origins. Responses to parental stimulations are a primary source of anger development in infants and toddlers (Damon & Lerner, 2008). Infants and toddlers who demonstrate high levels of anger towards their parents can develop resiliencies and vulnerabilities (Razza, Martin, & Brooks-Gunn, 2012). Razza et al. (2012) found that high-anger children were more likely to develop self-soothing strategies and delays in gratification, leading to increased overall self-regulation of emotions. Additionally, diminished maternal and other caregiver supports and attention coaxes high-anger children into vulnerable situations.

Parents have a pervasive influence on childhood anger development (Kerr & Schneider, 2007). Parental modeling of social coping and distress skills produce children who have similar and sometimes exaggerated developments. Low parental socioeconomic status (SES) and parental hostility stemming from early childhood can be an overwhelming socio-environmental influence leading to a trajectory of hostile and angry development throughout a lifetime (Hakulinen et al., 2013). Mothers have been shown to influence the socializing transfer of anger more than fathers (Zeman, Perry-Parish, & Cassano, 2010).

Gottman, Katz, and Hooven (1996) studied older children and found that childhood physiological and psychological regulations, dubbed meta-emotion philosophy, is directly influenced by a parent’s ability to regulate her or his own emotions and the ability to support and promote healthy psychological growth in a child. Meta-emotion philosophy theory was developed from a longitudinal study of children between their fifth and ninth birthdays. Gottman
et al. focused on parenting styles related to childhood negative emotional development and regulation. The child’s social intelligence and ability to recognize and regulate emotional expressions were seen as outcomes of the child’s ability to regulate her or his own physiology.

Gottman et al.’s (1996) theory and research primarily focused on physiological regulation strategies that developed from parenting. Their research grew out of Redl’s (1966) work that “emphasized intervening with a child’s strong negative emotions while the child is having the emotions. . . . [and] . . . intervening directly, dealing with the child’s conscious thoughts and actions” (p. 244). Unhealthy development of emotion regulation research established a significant link between personal physiology and emotion regulation and the need for effective intervention.

Jackson, Kuppens, Sheeber, and Allen (2011) also studied the link between child and parent depression and anger. They monitored the heart rates of biological parent and child dyads while working together on different tasks. Some were clinically diagnosed with depression, and others were not. Mother and child's heart rates elevated together as stressful tasks were introduced and sustained.

**Anger States and Traits**

Language allows us to distinguish between varying expressions of emotions in intensity, duration, and other characteristics of the human emotion experience. In developing a cross-cultural assessment of anger used throughout the world in various languages, Spielberger, Gorsuch, Lushene, Vagg, and Jacobs (1983) defined the difference between state anger and trait anger as dependent on several expressive characteristics as well as observer education and bias. Spielberger et al. defined an anger state as a temporary anger response to internal or external stimuli, which will fluctuate in intensity before the person returns to homeostasis. An anger trait
was defined as an angry feeling and occasional demeanor that can be constant, or almost constant, in a person. Therefore, states of anger are reactionary responses targeted in therapy. Traits do not require a stimulus to activate and can intensify when stimulated. These anger traits are continuous and may be targeted in a holistic approach to therapeutic goals.

States and traits of expressing anger and aggression can be confused and cause serious and pervasive effects. Traits of anger are often assigned to ethnic groups who repeatedly live with the negative effects of racism throughout their lives (Clark, 2006). Black Americans, often labeled as having traits of anger, are more accurately defined as living with persistent underlying states of anger, dependent on the continuous hostile environmental impact of oppressive systemic racism. Clark (2006) found that elevated blood pressure and associated negative cardiac effects in Black American communities starts in adolescence and is rooted in racism, instead of in an inherent ethnic disorder.

Therefore, what we label as trait anger can be difficult to diagnose and treat because it can often be caused by an unseen state-like response to environmental causes. Additionally, personality development is fluid in children and adolescents more so than adults (Berger, 2015). Assessment of anger and other personality features in children and adolescents can only produce a snapshot of feelings as understood by the individual assessor’s experience of interpreting the individual assessee. Therefore, it is important to view all expressions of anger and aggression from children and adolescents as state-like features that are products of environmental stimulants developed into schema-like responses as Bandura et al. (1961) demonstrated.

**Physiology and Anger**

Anger has been linked to many physiological processes. Anger affects hormone levels, cardiac system regulation, and overall homeostasis (Stemmler & Wacker, 2010). Several studies
have concluded that diminishing levels and frequency of anger will lead to improved health (Williams, 2015). The health benefits affect specific organ function, physiological feedback loops, and the overall health of the individual.

Anger is one of several core emotions that are often referred to as core affect produced from human cognitive interpretations of subjective feelings. Traditional views of core affect are built upon a dichotomous premise (e.g., anger ≠ calmness; see Figure 2).

![Figure 2](image)


Environmental and developmental stimulations within the brain process these emotions in complex ways. Papez (1937) developed the limbic lobe theory seating physiological emotional
processing in the amygdala, hypothalamus, hippocampus, olfactory bulb, septum, fornix, and the cingulate cortex interactions. After years of assigning primary emotion regulation to various areas of the limbic system, the amygdala and prefrontal cortex have become favorite locations of the brain for research focused on cognitive processing of emotion (Kolb & Whishaw, 2015).

**Heart rate and anger.** Anger and other emotional upheavals have a physiological affect. Siegel (1984) investigated the risks associated with heightened blood pressure and coronary heart disease during adolescence. She found that adolescents who expressed more anger were at higher risk for high blood pressure and coronary heart disease. She also found these adolescents to be more type A in personality expression, over weight, living sedentary lifestyles, regularly smoking cigarettes, more likely to report negative life events, having greater life dissatisfaction, and having a lowered self-esteem.

The link between anger and heart rate includes systems throughout the body. The vagus nerve, running from the hypothalamus to the intestines, stimulates and regulates emotion, including anger (Gottman et al., 1996). Artificial regulation of the heartbeat is achieved by attaching a nerve stimulator (i.e., pace maker) to the vagus nerve (Huston & Tracey, 2011). Along with regulating heart rate, the vagus nerve regulates the anti-inflammatory feedback system, leads to fainting from stress, and is linked to the ability to learn and control emotions through hormone release regulation (Huston & Tracey, 2011; Porth, 2014).

Vogele, Sorg, Studtmann, and Weber (2010) studied the vagal response in adolescents who faced perceived injustices. They found that adolescents who ruminated and remained frustrated and angry exhibited extended and heightened activity of the vagus nerve. Starner and Peters (2004) also linked adolescent anger to an increase in physiological responses leading to a heightened blood pressure. They found that blood pressure increased more often when teens
struggled with anger dysregulation, and the societal norms that reward and reinforce anger can lead to increased health risks.

Focusing attention can also increase heart rates and stimulate anger. Reynard, Gevirtz, Berlow, Brown, and Boutelle (2011) studied heart rate elevation in response to a person’s increased need for self-control during a task. They asked a group of participants to perform a task while thinking about a white bear and another group to perform a task while trying not to think about a white bear. Reynard et al. determined that participant’s heart rate increased when focusing harder on tasks. Also, Conley and Lehman (2012), of Washington State University, studied academic stressors in relation to blood pressure and heart rate. They found acute academic stressors increased blood pressure and heart rate variability (HRV) in participants. They determined that even typical daily academic stressors affect blood pressure and HRV.

**Health risks of anger.** Reilly and Shopshire’s (2014) research produced a manual to be used for therapy in anger management cases. In the manual they noted,

> Anger becomes a problem when it is felt too intensely, is felt too frequently, or is expressed inappropriately. Feeling anger too intensely or frequently places extreme physical strain on the body. During prolonged and frequent episodes of anger, certain divisions of the nervous system become highly activated. Consequently, blood pressure and heart rate increase and stay elevated for long periods. This stress on the body may produce many different health problems, such as hypertension, heart disease, and diminished immune system efficiency. Thus, from a health standpoint, avoiding physical illness is a motivation for controlling anger. (p. 9)

Health risks are directly affected by anger’s physiological response. Mostofsky et al. (2013) studied patients in a hospital, experiencing heart complications and anger. They found
elevating rates of experienced anger correlated with increased heart attacks and damage. Recommendations were to use medications to reduce heart rates and lower consequent anger. Lowering anger is a common recommendation that results in difficulties in actual therapeutic progress.

Michels et al. (2013) demonstrated the relationship between cortisol levels and reported stress in children. They showed that the autonomic nervous system (ANS) and the hypothalamic–pituitary–adrenal system (HPA) are activated during stress and anger, leading to heart rate fluctuations (See Figure 3). Michels et al. determined that heart rate is a good indicator of stress hormone increases in children.

May, Sanchez-Gonzalez, Hawkins, Batchelor, and Fincham (2014) determined that anger has negative effects on the heart muscle, and forgiveness can be a clinically effective tool to teach and develop. They termed anger cardiotoxic, causing significant complications leading to heart disease and heart failure. May et al.’s study concluded that implementing forgiveness techniques relieved stress and could be cardioprotective.

Recently, Williams’ (2015) longitudinal study concluded that participants whose heart rates increased due to anger were more likely to have heart difficulties in the future. He followed up on participants 13 years after studying the links between anger and physical responses, such as cortisol levels and heart rate. Williams found that those with increased heart rates later had increased coronary artery calcification.
Figure 3. Emotional Stimulation Process Diagram of the emotionally stimulated process of information flowing through the central nervous system. Information flows through the pituitary to release stress hormones. Information flows through the brainstem to the autonomic nervous system (ANS), evoking emotional behavior, and suppressing of pain. Information flows through the basal forebrain and stimulates the arousal and attention response. Diagram adapted from Fundamentals of Human Neuropsychology 7E (p. 559) Figure 20.8, by B. Kolb and I. Q. Whishaw, 2015, New York, NY: Worth Publishers. Copyright [2015] Worth Publishers. Used by permission of the publisher.

Psychological Theoretical Views of Anger

There are several theoretical views that can be applied to therapeutic conceptualization, originally developed from centuries of philosophical discourse and medicines. Theorists with the motivation to find mental healing outside of mesmerism and hypnosis tended to hold a psychodynamic theoretical view, one that primarily lingers in the pockets of the psychoanalytic elites (Cushman, 1995). The humanistic theoretical view applies a less mechanistic view, incorporating environmental stimuli with the individual’s current perception and ability to
mature. Most evidence-based treatments stem from a cognitive-behavioral theoretical view that incorporates conditioning responses cognitively and behaviorally. These three primary theoretical views of psychology are attributed too much of the research and therapeutic developments.

Other theories and therapies (e.g., family systems, art therapy, etc.) incorporate the principles of the three primary theoretical views. Additionally, there are many systemic social inequality views (i.e., sexual, gender, racial, ethnic, and religious discriminations and disproportionate SES) that can be applied to developing a theory to operate with in psychological research and therapy. Each of the three primary theoretical views and the systemic social inequality views are reviewed here and applied to anger dysregulation. Special attention is applied to the cognitive-behavioral theoretical view because it is primarily used in developing therapies that employ biofeedback techniques; however, all of these theories are important in producing an efficacious theoretical formulation.

**The psychodynamic theoretical view.** In the latter half of the 19th century, an evolution in philosophy changed the way practitioners’ viewed human development (Cushman, 1995). Steeped in the patriarchal zeitgeist of the Victorian Western European era, neurologist Sigmund Freud posited humans were not born a tabula rasa but, instead, developed in specific stages dependent on environmental interference and the ocean of collective unconscious past experiences of sentient beings (Goodwin, 2012). Freud constructed the oral, anal, Oedipal, and latent stages of psychosexual development, theorizing that rigidity can set in during early infant development, shaping the libidinal and natural violent life force. Freud believed the inherent instinct or drive towards violence encourages the expression of anger.
Some of Freud’s colleagues split from his influence and expanded on the unconscious sexually charged development enslaved in childhood experience. Carl Jung developed his own theory that allowed for less sexual and more generalized libidinal influence (Goodwin, 2012). He also posited a lifelong developmental influence that is shaped by archetypal structures. Around the same time, Alfred Adler broke away from Freud to develop a more humanistic approach emphasizing a human inferiority complex causing self-assertive motivation management to overcome difficulties throughout life (Goodwin, 2012). Many other theorists, including England’s Melanie Klein who focused on object relation development, have worked to elaborate and explain human development and conflict.

After Freud and his psychodynamic oriented colleagues worked to develop their theories, several theorist and analysts thought sterilizing the process of psychoanalysis was necessary to eliminate transference and countertransference (Mitchell & Black, 1995). There was an ascending initiative focused on removing the interaction between analyst and client. Then in the mid 20th century, analysts began to realize that some countertransference was an inevitable part of the therapy process and could be beneficial (Cushman, 1995).

Since then, many psychological and philosophical theorists have continued the work of teasing out what causes anger, aggression, and hatred in humans. At the end of the 20th century, Kimberlyn Leary (2000) captured the complicated underlying discontent that is experienced in American racial conflict and countertransference between those of similar and different races. Deeming the everyday invisible conflict to be racial enactments, she wrote about the underlying communication stirring between individuals and groups as we compete for an often-unconscious superiority. With this view, anger becomes a consequence of often-unconscious, misguided, underlying societal influences pressing between the lines of interaction.
Volkmar and Martin (2011) defined the psychodynamic approach to treating children and adolescents as *insight-oriented*. “The therapist attempts to understand the patient’s difficulties in light of his or her early history and experiences as well as in the context of the direct observations and interaction with the patient” (Volkmar & Martin, 2011, p. 286). This approach can be difficult to implement therapeutically with aggressive and angry adolescents due to the therapy’s length of time and advanced communication skill prerequisite.

**The humanistic theoretical view.** The Humanistic movement emerged out of a void in the psychological theory focused on a mechanistic billiard like view of human development (Cushman, 1992). Freud theorized that subconscious drive and instinct-driven human behavior could be repaired through indirect intervention. This theory spawned a new movement in psychological theory. The humanists incorporated free will and purpose into a drive for self-actualization, branching into person-centered, existential, and gestalt perspectives, narratives, and approaches to therapy.

Working from Maslow’s theoretical orientation that champions the subjective and free-will, including high functioning persons having achieved self-actualization, Carl Rogers, Irvin Yalom, Fritz Perls, and others reshaped how human development was conceived (Goodwin, 2012). The humanists approached individual human development more phenomenologically, realizing the individual’s innate psychological drive towards, and ability to create, personal homeostasis and improved mental health.

A phenomenological existential crisis stemming from a fear of perceived threat, including death anxiety, is seen as leading a person to act inharmoniously, diminishing psychological homeostasis (Yalom, 1980). Yalom (1980) wrote, “all human beings are in a quandary, but some are unable to cope with it: psychopathology depends not merely on the presence or the
absence of stress but on the interaction between stress and the individual’s mechanisms of defense” (p. 13). Anger then is a defense spawned out of fear, able to be overcome with a safe and loving presence and client-centered analysis. The existential humanistic approach attends to the creation of a space in the individual or group psyche where natural healing can occur.

Anger’s etiology is also approached through the humanistic lens as something a person hides from oneself or others intentionally or unintentionally. Frederick Perls and Carl Rogers emphasized the non-secluding interaction between the environment and the individual. With Perls’ and Rogers’ view, anger is a result of the interaction, without the environment or the individual holding total responsibility (Miller, 2006; Perls, 1969). Rogers emphasized the subjective unique manifestation of emotion that developed out of an individual’s emersion into the environment that was one’s unique etiologic feeling (Miller, 2006). Anger then is also an ultimate feeling, brought on by defenses emerging from the interface of self and environment, unnaturally culled by the healing power of human instinct. The therapist is an environmental stimulus promoting self-actualizing acceptance restoration.

The cognitive-behavioral theoretical view. The cognitive and behavioral evidence-based approaches to understanding and working with angry and aggressive clients are rooted in faulty thinking and unconscious habit forming (alias, conditioning; Volkmar & Martin, 2011). Birkley and Eckhardt (2015) described the mental process of individual anger and aggression prior to expression as the

- encoding of sensation and perceptual cues (subject to attentional biases);
- integration of cues with memory/past experience and forming interpretations (subject to hostile attribution biases);
- generation of response styles (e.g. anger control, anger expression, and aggression);
- and evaluation of consequences and selection of response. [This process
results in] individuals at risk for interpersonal aggression [, which] may selectively encode certain aspects of instigating situations and interpret them in ways that increase hostile cognitions, promote angry affect, and endorse aggressive response styles. (p. 43)

The cognitive and behavioral approaches are rooted in thoughts and behaviors that can be measured and altered. These theories merged into holistic evidence-based approaches.

Cognitive therapy was built on the research of Albert Ellis, Aaron Beck, and others who found that changes in thinking lead to changes in how one feels and, ultimately, what one does (Goodwin, 2012). Cognitive therapy developed out of a theoretical approach to understanding faulty thinking that can be applied to anger development and reinforcement. A person who is angry inappropriately catastrophizes, magnifies or minimizes, uses black-and-white thinking, personalizes, abstracts selectively, infers arbitrarily, denies evidence, overgeneralizes, and focuses on the negative (Volkmar & Martin, 2011). These faulty cognitions are addressed in specific therapeutic approaches.

Behavioral therapy was built on the research of Edward L. Thorndike, John B. Watson, Ivan Pavlov, Burrhus Frederic Skinner, and other behaviorists who developed a scientific understanding of paired learned conditioning in sentient beings. Behavior therapy developed out of a theoretical approach to understanding how paired associations cause habitual behaviors (Goodwin, 2012). Various conditioned responses to environmental cues in development create repetitive behaviors that can be reinforced or exaggerated.

Classical and operant conditioning, framed by Pavlov and Skinner respectively, are the traditional scaffolds used in understanding and modifying behaviors in research and psychological evidence-based therapies. Classical conditioning uses a fundamental view of anger development by employing a stimulus to create an involuntary response that can be
produced from a neutral stimulus paired with the original stimulus (Dobson, 2012). Therefore, stimulated anger caused by an older male figure can be triggered by another older male figure associated with the original older male prior to or during the anger response. This is a fundamental principle applied to racism, sexism, and many other systemic forms of hatred where an individual is associated and condemned based on a person’s beliefs of similar people.

Operant conditioning (OC) is achieved with a voluntary behavioral response to an antecedent stimulus and reinforced through consequences, causing the behavioral response to reoccur and increase in frequency (Antony & Roemer, 2011). Behavioral theory is reviewed in more detail in the Theoretical Perspective section of the methodology chapter of this text.

**The social inequality views.** Societal inequality has a pervasive effect on the generational environmental transfer of anger (Schieman, Pearlin, & Meersman, 2006). The seemingly epistemological impasse is a fundamental aspect of individual development. Power and privilege can stimulate and reinforce supercilious misanthropic anger. Those victimized by racism, sexism, ageism, and other forms of discrimination can feel a persistent threat sensation manifesting in daily-elevated levels of anger (Broudy et al., 2007).

**Sexual discrimination.** After the death of Sigmund Freud (1856–1939), a strong proponent of homosexuality as a natural part of sexual development, the shift in power swayed medicine and psychology to adopt an open anti-homosexual stance that lasted until 1973 (Abelove, 2003; Milar, 2011). The New York City Gay community erupted with anger in 1969 after decades of systemic binary sexist hate directed towards discriminating the LGBT community and pathologizing sexual orientation (Abelove, 2003). The Stonewall riots of June 1969 in the Greenwich Village district of Manhattan, New York City, was a result of decades of mistreatment, discrimination, and, ultimately, a betrayal by public servants sworn to protect but
who were corrupted by illegal compensations (Burgette, 2011). Four years later the American Psychiatric Association retracted homosexuality as a formal pathological diagnosis, yet systemic sexual discrimination persists four decades later, perpetuating systemic trauma and consequential underlying anger. Sexually discriminated anger is magnified in adolescents when sexuality emerges into peer relationships and social stigmas are passed on generationally, thus governing interactions.

**Gender discrimination.** Sexist discrimination includes gender inequality stemming from a patriarchal system that privileges males (Zinn, 2003). Cultures with systemic male dominance exaggerated by biology’s development in physical strength and evolving from ancient systems of patriarchy, have persisted in present societies outside of necessary evolutionary advantages (S. Greene, 2003). An antiquated cultural phenomenon, systemic male privilege instills and reinforces anger and aggression in young males’ development and is the source of female trauma, inequitable treatment, and consequent anger.

**Ethnic and religious discrimination.** Ethnic and religious discrimination has origins in tribal disputes of borderless groups (Baumann, 1999). Modern ethnic and religious discrimination is enflamed by political and financial interests that vary, depending on location maintained by mooring historical beliefs. Systemic religious and ethnic anger is used as a weapon to gain collective support stimulated by fear; as seen in the recent and current dominant Western view towards Muslim religious sects, cultures, and subcultures. Religious belief can also oppose other beliefs, creating cognitive dissonance in individuals. Anger and aggression stemming from ethnic and religious philosophies and doctrine impasses cause difficulties in relationships, social discomforts, and even death.
**Racial discrimination.** As an attempt to distinguish between *purebloods* and those converting to avoid expulsion from their homes, 15th century religion developed a lineage distinction that created racial division (James, 2011). While the wealth of nations shifted during the second half of the second millennium anno domini, slavery expanded worldwide, disproportionately benefiting European White race cultures expanding west and south (Zinn, 2003). The lingering effects of racial distinction and the mistreatment of people-of-color has been, and continues to be, a significant cause of individual and collective traumas, manifesting in percolating and erupting anger (Kivel, 2011). The advantage of the white and light pigmented cultures produces a systemic and inherited anger, built under a throne of superiority and inflamed by social justice pressure to address unearned privilege. Inherited anger of the oppressed people-of-color is routinely stimulated with racial insult.

**Disproportionate socio-economic status.** Low socio-economic status (SES) affects many people (Sandoval, Rank, & Hirschl, 2009). Neighbors and neighborhoods disadvantaged by low-income lifestyles consistently demonstrate higher levels of anger (Schieman et al., 2006). With worldwide systems designed to maintain and increase poverty, deficits in resources cause a mistreatment of individuals, families, and groups of people. In some cultures, poverty is hidden from the affluent while in other cultures affluence is regularly exposed to those in poverty. Feelings of systemic betrayal due to a disproportionate distribution of resources can ignite and maintain anger.

Social discriminatations rooted in gender, ethnic and religious disparity, racism, sexism, and disproportionate economic allocations have a pervasive global systemic and individual effect of anteceding and reinforcing anger. Psychological researchers and therapists extensively study and treat the social influences that diminish mental and physical health and happiness and
systemically impede positive human relations. Social inequalities that stimulate and reinforce anger are humanity’s comorbid psychological disorders.

**Therapeutic Approaches to Adolescent Anger**

There are a variety of therapeutic approaches that therapists employ in anger management training for adolescents. Often medications are employed to manage and stabilize emotions by regulating hormone and neurotransmitter levels. Education and primary psychological therapies generally focus on CBT techniques, developed out of years of evidence-based research. Additionally, alternative psychological therapies (i.e., art, music, etc.) are occasionally used. In some cases adjunctive therapeutic strategies, such as self-monitoring with biofeedback devices, can enhance the therapeutic experience. These various approaches are reviewed here.

**Psychopharmacotherapy.** Working with children and adolescents can be difficult when communication and learning is blocked by an overactive or under-stimulated mind. In some cases psychopharmaceuticals can assist in developing a productive space where a therapist and client can come together and form new ways of diminishing anger. Although medication research on children is limited, there is a growing foundation of evidence that some children benefit from psychopharmaceutical interventions (Stahl, 2013).

Saddock, Saddock, and Ruiz (2014) determined that treating adolescent aggressiveness with pharmaceuticals is a customary and common adjunctive therapeutic treatment. They found that antipsychotics have been shown to diminish aggressiveness in a variety of mental disorders. Haloperidol was a primary effective pharmaceutical, replaced by the atypical antipsychotics (e.g., risperidon, olanzapine, quetiapine, ziprasidone, and aripiprazole) due to diminished side effects. Clozapine has been shown to lower aggression in schizophrenics, lithium has beneficial effects in anger management of adolescents with or without manic symptoms, and clonidine is
showing promise in some studies (Saddock et al., 2014). Selective serotonin reuptake inhibitors (SSRIs) have become popular in use due to minimal side effects (e.g., extrapyramidal side-effects), with fluoxetine, sertraline, paroxetine, and citalopram demonstrating efficacy in mood regulation, including anger (Saddock et al., 2014). As pharmaceutical use with children and adolescents increases, various medications are emerging as effective intervention assistants with minimal or manageable side effects.

**Psychotherapy.** Psychologists have studied and developed various theories and therapeutic approaches to address anger in childhood, adolescence, emerging adulthood, and adulthood. Primarily, therapeutic approaches focus on cognitively processing angry feelings and developing social skills to prevent anger from erupting (J. A. Cohen, Mannarino, & Deblinger, 2012). Treatments intend to diminish the external expression of anger, while preventing an individual from repressing and internally experiencing anger and its negative physiological effects. Holloway (2003) wrote, “psychologists help patients see alternative ways of thinking and reacting to anger. …clinicians train patients in progressive relaxation until they can quickly use personal cues, such as words, phrases or images . . . to relax in an anger-inducing situation” (p. 54).

Beck and Fernandez (1998) conducted a meta-analysis to evaluate the efficacy of using CBT in the treatment of anger in a range of age groups. The 50 studies they analyzed evaluated 1,640 participants and discovered a significant improvement in anger when treated with CBT, with a reported medium weighted mean effect size ($d = 0.70$). Eliminating adult studies, Tables 4 and 5 summarize 32 studies conducted prior to the 21st century that evaluated children and adolescents in various environments and emerging adults in the college setting.
Studies summarized in Table 4 used a treatment-vs.-control variable design to determine therapeutic efficacy of using CBT for anger. This study design style compares the change occurring between subjects or groups of subjects when one is treated and another is not, or is given a placebo treatment. The mean effect size of the treatment-vs.-control design studies with college age and younger participants was medium ($d = 0.72$) with a median effect size of 0.82. There was no significant trend in effect size that occurred with correlation to sample size as illustrated in Figure 4.
Table 4

**CBT for Anger Management Treatment Versus Control Design Studies**

<table>
<thead>
<tr>
<th>Author(s) and Publication Date</th>
<th>Sample Size (N)</th>
<th>Participants</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boswell (1984)</td>
<td>30</td>
<td>School children</td>
<td>0.32</td>
</tr>
<tr>
<td>Deffenbacher et al. (1987)</td>
<td>32</td>
<td>College students</td>
<td>1.04</td>
</tr>
<tr>
<td>Deffenbacher et al. (1988)</td>
<td>30</td>
<td>College students</td>
<td>1.27</td>
</tr>
<tr>
<td>Deffenbacher et al. (1990a)</td>
<td>32</td>
<td>College students</td>
<td>0.59</td>
</tr>
<tr>
<td>Deffenbacher et al. (1990b)</td>
<td>29</td>
<td>College students</td>
<td>0.45</td>
</tr>
<tr>
<td>Deffenbacher &amp; Stark (1992)</td>
<td>36</td>
<td>College students</td>
<td>1.43</td>
</tr>
<tr>
<td>Deffenbacher et al. (1994)</td>
<td>94</td>
<td>College students</td>
<td>0.82</td>
</tr>
<tr>
<td>Deffenbacher et al. (1996)</td>
<td>80</td>
<td>School children</td>
<td>1.32</td>
</tr>
<tr>
<td>Feindler et al. (1986)</td>
<td>21</td>
<td>Clinical adolescents</td>
<td>1.16</td>
</tr>
<tr>
<td>Feindler et al. (1984)</td>
<td>36</td>
<td>School adolescents</td>
<td>1.43</td>
</tr>
<tr>
<td>Glick &amp; Goldstein (1987)</td>
<td>111</td>
<td>Juvenile delinquents</td>
<td>0.72</td>
</tr>
<tr>
<td>Hinshaw (1984)</td>
<td>22</td>
<td>School children</td>
<td>1.29</td>
</tr>
<tr>
<td>Jackson (1992)</td>
<td>40</td>
<td>Clinical adolescents</td>
<td>0.32</td>
</tr>
<tr>
<td>Larson (1991)</td>
<td>37</td>
<td>School children</td>
<td>0.21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Author(s) and Publication Date</th>
<th>Sample Size (N)</th>
<th>Participants</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lochman (1985)</td>
<td>80</td>
<td>School Children</td>
<td>0.38</td>
</tr>
<tr>
<td>Lochman et al. (1984)</td>
<td>76</td>
<td>School children</td>
<td>0.28</td>
</tr>
<tr>
<td>Lochman et al. (1989)</td>
<td>32</td>
<td>School children</td>
<td>0.24</td>
</tr>
<tr>
<td>Mandel (1991)</td>
<td>26</td>
<td>Adolescent volunteers</td>
<td>0.53</td>
</tr>
<tr>
<td>McDougall et al. (1990)</td>
<td>18</td>
<td>Juvenile delinquents</td>
<td>0.64</td>
</tr>
<tr>
<td>Moore &amp; Shannon (1993)</td>
<td>42</td>
<td>Clinical adolescents</td>
<td>0.22</td>
</tr>
<tr>
<td>Omizo (1988)</td>
<td>24</td>
<td>School children</td>
<td>0.84</td>
</tr>
<tr>
<td>Pascucci (1991)</td>
<td>28</td>
<td>Clinical adolescents</td>
<td>0.56</td>
</tr>
<tr>
<td>Rosengren (1987)</td>
<td>13</td>
<td>Adolescent volunteers</td>
<td>1.00</td>
</tr>
<tr>
<td>Saylor (1985)</td>
<td>14</td>
<td>Clinical adolescents</td>
<td>1.13</td>
</tr>
<tr>
<td>Schlichter &amp; Horan (1981)</td>
<td>19</td>
<td>Juvenile delinquents</td>
<td>1.20</td>
</tr>
<tr>
<td>Shivrattan (1988)</td>
<td>28</td>
<td>Juvenile delinquents</td>
<td>0.22</td>
</tr>
<tr>
<td>Steele (1991)</td>
<td>19</td>
<td>Juvenile delinquents</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Figure 4. Sample size compared with effect size of treatment vs. control studies. Sample size and effect size comparison of the studies included in Table 4. The comparison indicates no significant correlation between the effect size and sample size. Effect size ranged from 0.21 to 1.43 with a sample size range of 13 to 111.

Studies summarized in Table 5 used a pre/post design style to determine therapeutic efficacy of using CBT for anger. The pre/post design evaluates the change in anger overtime that occurs within each subject. The control variable is the subject’s initial angry expression. The mean effect size of the pre/post design studies with children and adolescent participants was medium ($d = 0.71$) with a median effect size of 0.80. The effect size dropped significantly and consistently as the sample size increased (see Figure 5), lending to a conclusion that small sample size pre/post design studies overestimated the effect size. Correcting for sample size estimation still produces a significant change.
Table 5

*CBT for Anger Management Pre/Post Design Studies*

<table>
<thead>
<tr>
<th>Author(s) &amp; Publication Date</th>
<th>Sample Size (N)</th>
<th>Participants</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benson, Rice, &amp; Miranti (1986)</td>
<td>54</td>
<td>Intellectually Disabled Individuals</td>
<td>0.40</td>
</tr>
<tr>
<td>Dangle, Deschner, &amp; Rasp (1989)</td>
<td>12</td>
<td>Clinical Adolescents</td>
<td>0.92</td>
</tr>
<tr>
<td>Lochman &amp; Curry (1986)</td>
<td>20</td>
<td>School children</td>
<td>0.36</td>
</tr>
<tr>
<td>Lochman, Nelson, &amp; Sims (1981)</td>
<td>12</td>
<td>School children</td>
<td>0.65</td>
</tr>
<tr>
<td>Wilcox &amp; Dowrick (1992)</td>
<td>10</td>
<td>Clinical adolescents</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Figure 5. Sample size compared with effect size of pre/post design studies. Sample size and effect size comparison of Table 5. The comparison indicates that the effect size significantly decreases as the sample size increases. Effect size ranged from 0.40 to 1.20 with a sample size range of 54 to 10 respectively.

The remaining 18 adult participant studies Beck and Fernandez (1998) included in their meta-analysis had an overall large mean effect size ($d = 1.00$), with a large median effect size ($d = 0.92$). Removing these studies from analysis meets two objectives: it allows for inflated or cumulative outliers to be removed and a more realistic portrayal of anger management treatment with CBT to emerge, primarily for children, adolescents, and emerging adults. Also, adult studies using forensic clients or inmates, abusive spouses and parents, and other adult participants do not represent the focus of this study, except to provide an insight into a possible unsuccessfully treated or intervened future for the target population of this study. Additionally, prevention in adolescence of trait-like characteristics of anger is a focus of this study.

Even with the removal of the adult studies, CBT provided a significant intervention strategy for anger management in the 32 studies of children, adolescents, and younger emerging
adults. CBT’s comprehensive focus on cognitive preparation, skill acquisition, and application training works on improving various phases of anger on an individual level. Therapy participants acquire skills and strategies through individual and group trainings, verbal interactions, and modeling behaviors depending on communication and developmental levels.

DiGiuseppe and Tafrate (2003) conducted a comprehensive meta-analysis of 57 studies that evaluated the efficacy of CBT for treating anger. Similar to Beck and Fernandez’s (1998) meta-analysis previously discussed, DiGiuseppe and Tafrate evaluated primarily between-group studies measuring treatment and control variable comparisons. The between-group studies produced a medium effect size ($d = 0.71$) with a medium effect size ($d = 0.69$) at the follow-up inquiry. Seven other studies DiGiuseppe and Tafrate evaluated used the within-group design measuring the pretest and posttest difference. The seven within group studies produced a large effect size ($d = 1.13$), indicating a strong improvement when a participant is measured based on his or her own initial baseline.

Vecchio and O’Leary (2004) performed an updated meta-analysis of CBT and other therapy’s efficacy in treating anger. Beck and Fernandez (1998) and others previously analyzed eight of the 23 studies chosen, and eight additional previously unanalyzed studies were published between the years 2000 and 2002. Deffenbacher and various associates published 12 of the studies analyzed, consisting primarily of undergraduate college student participants. The analysis determined that relaxation training was the most effective treatment when comparing CBT, cognitive training, relaxation training, and other combined treatments (See Table 6).
Table 6

Different Therapies Efficacy in Anger Treatment

<table>
<thead>
<tr>
<th>Type of Therapy</th>
<th>Total Number of Studies Analyzed</th>
<th>Total Number of Participants</th>
<th>Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBT</td>
<td>18</td>
<td>713</td>
<td>0.68</td>
</tr>
<tr>
<td>Cognitive Therapy</td>
<td>7</td>
<td>370</td>
<td>0.82</td>
</tr>
<tr>
<td>Relaxation Therapy</td>
<td>8</td>
<td>410</td>
<td>0.90</td>
</tr>
<tr>
<td>Other Therapies</td>
<td>6</td>
<td>237</td>
<td>0.61</td>
</tr>
</tbody>
</table>


Ozabaci (2011) completed a meta-analysis of six studies to evaluate the effectiveness of employing CBT in treating angry and aggressive children and adolescents. She tentatively concluded that CBT alone might not be as effective in treating children and adolescents as in treating adults. The overall cumulative mean effect size of $d = -0.094$ implies that CBT can improve its outcome with an alternative or adjunctive therapy to increase effectiveness with children and adolescents. Ozabaci contrasts Sukholdosky, Kassinove, and Gorman’s (2004) findings from their meta-analytic review of 40 studies using CBT for anger and aggression management in children and adolescents. An overall medium mean effect size ($d = 0.67$) was determined by Sukholdosky et al., which is similar to meta-analyses of adult and multi-generational studies using CBT for anger treatment.
Table 7 shows various effect sizes that Sukholdosky et al. (2004) uncovered in their meta-analysis. CBT similarly affected anger and aggressiveness, with anger in adolescents and children slightly more impacted by treatments. Teacher reports and self-reports had comparable efficiency in capturing the experience of the child and adolescent. Observation style reporting was less effective, and parent reporting was found to be significantly less. This could be a result of teachers spending a significant amount of time with the child or adolescent during the day and the parents’ role in modeling negative behaviors the child or adolescent expresses.

Behavioral interventions are a specific type of CBT that focuses on expressions of behavior that are undesired. Psychologists’ use of a formal behavioral intervention is an extensively applied and comprehensively studied method. Typical behaviors targeted for behavioral interventions are undesired symptoms of ADHD and autism training.
Table 7

Various Effect Sizes of 40 Studies CBT for Anger in Children and Adolescents

<table>
<thead>
<tr>
<th>Domain</th>
<th>Sample size (N)</th>
<th>Mean effect size (d)</th>
<th>Median effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall effect size</td>
<td>51</td>
<td>0.67</td>
<td>0.62</td>
</tr>
<tr>
<td>Aggression</td>
<td>36</td>
<td>0.63</td>
<td>0.63</td>
</tr>
<tr>
<td>Anger</td>
<td>29</td>
<td>0.72</td>
<td>0.47</td>
</tr>
<tr>
<td>Self-report</td>
<td>40</td>
<td>0.68</td>
<td>0.56</td>
</tr>
<tr>
<td>Parent report</td>
<td>5</td>
<td>0.48</td>
<td>0.29</td>
</tr>
<tr>
<td>Teacher report</td>
<td>37</td>
<td>0.69</td>
<td>0.64</td>
</tr>
<tr>
<td>Observation</td>
<td>18</td>
<td>0.60</td>
<td>0.43</td>
</tr>
<tr>
<td>Random Group Assignment</td>
<td>41</td>
<td>0.67</td>
<td>0.65</td>
</tr>
<tr>
<td>Non-random Group Assignment</td>
<td>10</td>
<td>0.66</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Table 8

Results of Three Meta-Analyses of Behavioral Interventions Efficacy

<table>
<thead>
<tr>
<th>Author(s) &amp; Publication Date</th>
<th># of studies reviewed</th>
<th>Targeted behavior(s)</th>
<th>Effect Size (d) (g) (Δ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marques et al. (2015)</td>
<td>26</td>
<td>Depression</td>
<td>g = 0.41 @ post-treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depression</td>
<td>g = 0.37 @ follow-up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anxiety</td>
<td>g = 0.28 @ post-treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anxiety</td>
<td>g = 0.25 @ follow-up</td>
</tr>
<tr>
<td>Toplak et al. (2008)</td>
<td>8</td>
<td>ADHD Parent Reports</td>
<td>∆ = 0.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADHD Teacher Reports</td>
<td>∆ = 1.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADHD Self-Reports</td>
<td>∆ = 2.18</td>
</tr>
<tr>
<td>J Virués-Ortega (2010)</td>
<td>22</td>
<td>Autism Daily Living Skills</td>
<td>d = 0.62</td>
</tr>
</tbody>
</table>

Note. Effect sizes are reported in ∆ = Glass’s effect size calculation, g = Hedges’ effect size calculation, and d = Cohen’s effect size calculation.

A review of the literature on the use of CBT and behavior focused interventions illustrates that anger management training and therapies can be an affective therapeutic practice in diminishing anger in adolescents. An adjunctive therapeutic component can enhance and improve the efficacy of anger management therapy in adolescents. Pre/post design style testing reveals that larger groups of participants increase the effectiveness. This could be a result of a group-effect where participants reinforce each other’s resolve and willingness to demonstrate improvements.
Alternative Therapies

There are various alternative therapies employed in treating anger. These therapies are cross-cultural, use alternative medications, and have artistic components. An example is Rickson and Watkins’s (2003) study of the efficacy of music therapy with aggressive adolescent boys. The eight-week client-centered humanistic oriented music therapy produced no significant improvement and a temporary increase in disruptive classroom behaviors. The genre of music used in the therapy may have been a negative influence on the outcome of the study.

Studying the use of art therapy for anger management in school age students, Groves and Huber (2003) concluded that art therapy provides a non-threatening environment where students can develop self-control, solve problems, and learn respect. Alternative therapies emerging out of Eastern philosophies have continued to demonstrate some efficacy in anger management. These therapies include meditation, yoga, mindfulness, and naturopathic approaches. Nikerson and Hinton (2011) found that “Buddhist-based anger management strategies identified as useful by the monks included education about Buddhist doctrines, mindfulness meditation practices, and the use of herbal medication and holy water” (p. 1).

Wongtongkam, Ward, Day, and Winefield (2013) studied the efficacy of meditation in reducing anger and aggressive behavior in Thai adolescents. Quantitative data suggests no significant reduction in anger occurred, and qualitative inquiries suggested an improvement occurred in self-regulation skills and self-awareness. Made famous by Eastern healers practicing within Western societies, (e.g., Thich Nhat Hanh), Eastern collective cultural meditation techniques continue to be taught and increase in popularity while being altered by an individualistic Western cultural filter.
Centeio, Whalen, Kulik, Thomas, and McCaughtry (2015) studied the amplifying phenomenon of restricted classroom childhood and adolescent physical movement, coupled with the highly prized and reinforced culture of athletic superstars that is creating a serious problem with urban youth. Social reinforcements from parents, teachers, friends, and others instill an athletic, hyperactive, and aggressive demeanor in children and adolescents. Centeio et al. found that movement-encouraging activities such as Yoga can help diminish aggression in the classroom.

Herbal management of anger is a continual choice for those seeking an alternative to pharmaceutical interventions. Usually intended to be a healthier choice or a response to allergens, popular remedies test the personal effectiveness of herbal supplements such as St. John’s Wart and Dandelion root to alter neurotransmitter levels and cleanse the body (Wong & Townley, 2010). A November 2015 search of Proquest and Ohiolink databases uncovered no scientific research resulting in the efficacy of holistic and herbal use in anger management. One possible explanation is that pharmaceuticals are often derived from plants that have demonstrated in clinical trials the properties of healing and positive change with known side effects (Preston, O’Neal, & Talaga, 2013).

**Self-Monitoring Therapy**

Self-monitoring is occasionally used in therapy as an adjunctive component of routine CBTs (J. S. Cohen, Edmunds, Brodman, Benjamin, & Kendall, 2013). Typical self-monitoring is implemented with the use of homework assignments and diary keeping. Self-monitoring facilitates:

- clients’ increased role in leading the empirical examination of their thoughts and behavior… [through] monitoring and recording target behaviors [that] have been thought
to implicitly provide clients a sense of control over their behavior . . . [and] explicitly help clients identify potential causes and consequences of their actions, providing clear points of intervention for them to pursue. (J. S. Cohen et al., 2013, p. 421)

Dialectical Behavioral Therapy (DBT) employs self-monitoring strategies in treating borderline personality disorder (BPD) and other reasons for seeking therapy (Linehan, 2015). Jamilian, Malekirad, Farhadi, Habibi, and Zamani (2014) found that DBT could be effective in diminishing impulsivity linked to explosive anger. Combining Buddhist traditional mindfulness with CBT, DBT promotes the awareness of faulty thinking and assignment of emotions and works to improve self-monitoring techniques (Linehan, 2015). DBT focuses on self-monitoring to develop awareness of underlying antecedents to negative and unhealthy thoughts and feelings. Fernandez and Beck (2001) found that self-monitoring of anger was not enough to effect change in college students. They studied the difference in anger expression with a group that self-monitored anger and another that applied a self-intervention technique. Results indicated that self-intervention had a significant effect on reducing anger, perhaps because it required self-monitoring and the additional component of active prevention.

Biofeedback in Therapy

As technology emerges, the opportunity for medical and psychological applications becomes an interest to researchers. Schwartz (1973) conducted a historical review of biofeedback’s implications and impact and concluded, “biofeedback is clearly an important discovery, one that may prove to have some value in medical and psychological treatment. However, there are many problems that need to be solved, particularly when applied to the individual patient” (p. 672). Individualized biofeedback apparatuses were not as readily available in the early 70s as they presently are.
Raczynski, Thompson, and Sturgis (1982) evaluated biofeedback models and developed a singular model of biofeedback training. The models they evaluated in previous studies were operant learning model, motor skills model, cybernetic or systems model, antistress or relaxation model, discrimination model, and cognitive model. Raczynski et al. (1982) determined “in the case of clinical disorders, the goal is to promote self-control of the dysregulated physiological response(s)” (p. 342). They developed a flow-chart to identify the process of biofeedback in a generic therapeutic model as summarized in Figure 6.

Biofeedback can be a useful tool in many different therapeutic applications. It combines technology with biology to form a feedback loop. In psychological therapies, biofeedback links biological operations with the conscious mind to form an integration of information that works to alter and manage cognitions and behaviors consciously and unconsciously.
Figure 6. Biofeedback training model proposed by Raczynski et al. (1982). Adapted from “An evaluation of biofeedback assessment and training paradigms” by J. M. Raczynski, J. K. Thompson, and E. T. Sturgis, 1982, Clinical Psychology Review, 2, Figure 1, p. 342. Copyright 1982 by Pergamon Press Ltd. Adapted with permission.
A common and simple use of this theory and technology is the moisture sensor alarm used in nocturnal enuresis management. Urine elimination is monitored with a moisture alarm, which senses the child beginning to urinate and wakes the child; such monitoring is thought to help develop a waking response when in need of urination. This type of therapy has been used since 1904 and is presumed to be a successful part of enuresis management (Ilyas & Jerkins, 1996). Fazeli et al. (2015) completed a recent meta-analysis to establish evidence for biofeedback in childhood urinary incontinence management and therapy. They determined that biofeedback is not an effective tool for childhood urine voiding disorders.

Golden and Consorte (1982) demonstrated some successes with angry and aggressive intellectually disabled individuals. They sought to diminish the expressions of anger and aggression by using an electromyogram (EMG) biofeedback paired with CBT. Of the four cases reported, each had a reduction in anger and outbursts after a year’s interventions. However, the muscle monitoring biofeedback technique can be disadvantaged by interference and contamination by other muscle movements, and is not an all-day intervention (Turker, 1993).

Biofeedback has demonstrated some successes and failures in various therapeutic methods. It is often used in clinical applications for managing cardiac arrhythmias through monitoring heart rate. It has also been used in the following areas: electroencephalogram (EEG), EMG, temperature, galvanic skin response, and blood pressure (Paskewitz, 1975). Biofeedback is potentially an effective tool for monitoring heart rate to manage anger, anxiety, and aggression. It employs the somatic marker hypothesis which theorizes “an array of somatic marker signals from the body impact[ing] emotion and are additionally crucially involved in decision-making and attentional processes as well as working memory formation and retrieval” (Domschke, Stevens, Pfleiderer, & Gerlach, 2010, p. 2). Therefore, in biofeedback therapy for
anger, anxiety, and aggression, an emergence of somatic feelings and sensations arise; then, the cardiac system responds, and the heart rate response is detected by a device that alerts the individual of the emerging sensation and the need for an intervention.

Domschke et al. (2010) conducted a review of 28 studies using biofeedback to measure heart rate as a therapeutic tool for clinical anxiety. They uncovered a medium mean effect size ($d = 0.50$). Table 9 is a partial reproduction of Domschke et al.’s (2010) results from their meta-analysis: Mean Effect Sizes ($d$) for the Relationship Between Heartbeat Perception and Anxiety Sensitivity, Trait Anxiety, and Panic Disorder (p. 5). Each of the five domains had significantly large cumulative sample sizes, ranging from 149 participants in the anxiety sensitivity domain to 609 participants in the panic disorder domain. Heart rate variability biofeedback measurement was an effective tool for lowering anxiety in each of these studies.

Breach (2012) conducted a study of heart rate variability biofeedback use in depression therapies (see Table 10). She did not find a difference in effect among multiple therapies using biofeedback but found an improvement overall for participants in both groups. Breach’s findings reinforced previous studies of depression that used biofeedback as qualitatively outlined in Table 10.
### Table 9

*Anxiety Management Through Heart Rate Monitoring*

<table>
<thead>
<tr>
<th>Domain</th>
<th>Sample size (N)</th>
<th>Mean effect size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety Sensitivity</td>
<td>149</td>
<td>0.61</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>202</td>
<td>0.37</td>
</tr>
<tr>
<td>Panic Disorder: All tasks</td>
<td>609</td>
<td>0.52</td>
</tr>
<tr>
<td>Panic Disorder: Schandry task</td>
<td>460</td>
<td>0.64</td>
</tr>
<tr>
<td>People with panic attacks</td>
<td>186</td>
<td>0.37</td>
</tr>
</tbody>
</table>

### Table 10

**Heart Rate Biofeedback Use in Depression Therapy**

<table>
<thead>
<tr>
<th>Author(s) &amp; Publication Date</th>
<th>Sample Size (N)</th>
<th>Study Purpose</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallman, Olsson, von Scheele, Melin, &amp; Lyskov (2011)</td>
<td>23</td>
<td>Heart rate biofeedback vs. control group</td>
<td>Both groups demonstrated effect in depression reduction.</td>
</tr>
<tr>
<td>Karavidas et al. (2007)</td>
<td>11</td>
<td>Heart rate biofeedback efficacy</td>
<td>Biofeedback was effective treatment</td>
</tr>
<tr>
<td>Mussgay, Reineke, Mohnke, Gevirtz, &amp; Ruddel (2008)</td>
<td>54</td>
<td>Heart rate biofeedback efficacy vs. CBT</td>
<td>Biofeedback was effective treatment within group but not between.</td>
</tr>
<tr>
<td>Nolan et al. (2005)</td>
<td>46</td>
<td>Heart rate biofeedback vs. active concurrent control</td>
<td>Both groups demonstrated effective reduction of depression.</td>
</tr>
<tr>
<td>Siepmann, Aykac, Uterdorfer, Petrowski, Mueck-Weymann (2008)</td>
<td>26</td>
<td>Heart rate biofeedback efficacy</td>
<td>Biofeedback was effective treatment</td>
</tr>
<tr>
<td>Zucker, Sammuelson, Muench, Greenberg, &amp; Gevirtz (2009)</td>
<td>38</td>
<td>Heart rate biofeedback efficacy vs. stress reducer vs. progressive muscle relaxation</td>
<td>Biofeedback demonstrated more effective use than stress reducer or progressive muscle relaxation</td>
</tr>
</tbody>
</table>

*Note.* Adapted from “Heart rate variability biofeedback in the treatment of major depression” by N. B. Breach, 2012, *Doctoral Dissertation: Rutgers Graduate School of Applied and Professional Psychology*, pp. 95-103. Copyright 2012 by Nasya Breach. Adapted with permission. Table 10 reviews studies that used biofeedback for measuring heart rate variability, EEG, respiration, and cortical levels in anxiety, depression, PTSD, chronic neck pain, epilepsy, heart failure, stress, fibromyalgia, and hypertension.
Literature Review Summary and Conclusion

There is a deficit in the research of biofeedback use in anger and aggressiveness control and diminishment, specifically in heart rate variability (HRV) biofeedback. Francis, Penglis, and McDonald (2015) researched heart rate variability modification through short-term biofeedback as an anger controller. They concluded that HRV is “an index of emotion regulation, specifically anger. Further research is needed to determine whether long-term HRV biofeedback can have a lasting effect on managing anger” (p. 1).

More than a century of worldwide formal psychological research has led to a comprehensive foundational understanding of emotion dysregulation, specifically anger. The evidence establishes an inference that improved preventative intervention strategies for adolescent anger and aggressive behaviors are still unaddressed in its potential entirety. The literature review uncovered a deficit in efficacious preventative therapeutic research and practice that diminishes the expression of adolescent anger and aggressive behavior. Adjunctive features of CBT such as biofeedback can enhance anger therapy in adolescents. Physiological research demonstrated a link between heart rate and anger. Evidence based CBT addressing the antecedents of adolescent anger and aggression should incorporate a physiological monitoring component used as a warning system and preventative measure. No such research or therapy was uncovered in the literature.
Chapter III: Methodology

Introduction

The goal of this research project was to uncover evidence of the potential effectiveness in employing heart rate monitoring to be used as an antecedent warning of an increased potential for anger and aggressiveness and to engage in prescribed de-escalation techniques in the diminishment of excessive, undesirable emotional outbursts. The population, sample, theoretical perspective, method, and outline of research, as well as data analysis, are explained in detail in this chapter.

Setting

The research setting was New Horizon School in Renton, Washington: a small, non-profit, private school, founded in 1995 to educate special learners in elementary, middle, and high school. New Horizon School is an accredited school whose motto is “where children come first.” They maintain an average of 50 students during the traditional academic year and 15 to 20 students during the summer months. The school is funded through local school districts, private donations, and parent, guardian, and other family tuition payments. The school specializes in providing an education to 4th through 12th graders with moderate to severe learning disabilities (e.g., impairment in reading, written expression, and mathematics). Many of the students also have comorbid developmental, neurological, and psychological disorder diagnoses (e.g., attention-deficit hyperactivity disorder [ADHD], autism spectrum disorder [ASD], and traumatic brain injury [TBI]). Several students demonstrate symptoms of attachment disorders (e.g., reactive attachment disorder [RAD], disinhibited social engagement disorder [DSED], and disruptive mood dysregulation disorder [DMDD]). Some students display symptoms of the developmental trajectory, previously discussed, that is often diagnosed as oppositional defiant
disorder (ODD) in children and younger adolescents, conduct disorder (CD) in older adolescents, and antisocial personality disorder (APD) in adulthood (New Horizon School, 2017). Students do not carry a diagnosis of intermittent explosive disorder (IED) even though some display symptoms of explosive anger because their symptoms are better explained by other disorders.

**Participants**

The participants were selected non-randomly by the researcher, using convenience sampling, resulting in 5 students between the ages of 13 and 18. Participants are currently enrolled students with a demonstrated history of frequently exhibiting anger-related behaviors (e.g., loses temper, argues) at school on a daily basis. Additionally, the participants’ parents and special education homeroom teachers participated in several stages of the study as outlined below. Each participant was asked for verbal assent, or consent where applicable, and the teachers and parents were asked to agree by providing informed consent.

**Participant inclusion criteria.** As described in Table 2, participants included in the study were those with a diagnosis of an anger-related condition such as CD, an ODD, or an IED, or they had to meet one or several comorbid disorder descriptors: such participants had not been formally diagnosed or did not meet the full criteria for a diagnosis (e.g., age restrictions, time restrictions, inadequate symptom reporting, absence of the signs needed to make a diagnosis), but they were frequently exhibiting problematic anger-related behaviors at school such as:

- often loses temper;
- argues with adults or other adolescents;
- actively defies or refuses to comply with rules or requests;
- is touchy or easily annoyed by others;
• is angry, resentful, spiteful, vindictive;
• is physically cruel, forceful, dangerous, and harmful to self or others;
• interrupts and intrudes on others; and/or
• is aggressively impulsive.

Exclusion criteria. The participants must have been able to attend school for the 12 weeks of total interaction during the study. A primary criterion for participant exclusion was poor student attendance. New Horizon School maintains a strict policy resulting in automatic failure of courses if 12 or more classes in a semester are missed. Although some excessive absences are unavoidable (e.g., hospitalizations), adolescents with a history of repeated absence patterns were excluded from the list of potential participants to prevent participant absence from school interfering in the training process. Additionally, to limit the interference of factors that may inhibit comprehension and use of the biofeedback device, the use of the protocols, and the ability to follow the prescribed methods of the therapy process, a potential participant must have had at least a below average range of cognitive potential. Moderate and severe intellectually disabled individuals were excluded. A screening of school records provided the data necessary to confirm cognitive abilities.

Informed consent and assent. Student participants and their parents and homeroom teachers were provided information about the study’s intentions, timeline, and procedures. They were each given a choice to participate or not and were notified that they could opt out at any time. Participant attrition in case study research is part of the analysis and does not disqualify data, unlike research that is bounded by within-subject or control group analysis (Creswell, 2014). Each participant and the corresponding parent and teacher who chose to participate also read and signed an age appropriate consent or assent form (See Appendices C, D, and F).
Additional informed consent form signatures were obtained in which participants and the corresponding parent and teacher agreed to audio recording of post-treatment interviews.

**Ethical Considerations and Study Approval**

A dissertation committee, the Institutional Review Board (IRB) of Antioch University Seattle, and the school principal at New Horizon School approved this study. The IRB completed a full review and approved the research as outlined in Appendix A. The New Horizon School principal approved the study as outlined in Appendix C. All approvals were obtained prior to contact with participants.

**Study Design**

This study idea came out of a 2½-month course assignment requiring the creation and use of an antecedent intervention for an identified challenge in a person’s life (see Appendix O for a course and assignment description). Through a functional behavioral assessment (FBA) and development of a behavioral intervention plan (BIP) the idea was fully developed. The completed course FBA and BIP can be reviewed in Appendix P.

During the intervention creation phase of the assignment, an intervention meeting with a parent, multiple teachers, and the school principal focused on an individual adolescent student’s explosive anger in the classroom. Results of the meeting produced no significant or effective interventions or solutions for the repeated disruptions caused by the student’s anger and aggressive behaviors. The focus of the suggestions were on producing an identifier for an anger episode that the adolescent could use to warn teachers, the parent, and himself. No such antecedent monitor or management tool was identified.

As discussed in the literature review, an antecedent to elevations in anger, especially explosive and uncontrollable anger is an elevated heart rate, such as a physiological response to
elevated anxiety, anger, and frustration (Herrero, Gadea, Rodriguez-Alarcon, Espert, & Salvador, 2010). At the time of the initial idea, current marketing throughout the United States had placed personal wrist-worn heart rate monitors on the forefront for consumer technology enthusiasts, primarily in the areas of medical health and athletics. The technology created by Mio Global’s founder Liz Dickinson entered the U.S. market in early 2013 as Mio Fuse. The device used infra-green sensing to measure capillary blood flow in the wearer’s skin by measuring light reflection (Wauters, 2013). Additional wrist-worn devices were created to monitor heart rate, such as Apple Watch, Moto 360, and Fitbit Charge HR.

An informal single-subject case study was performed to complete the course assignment. In this study the researcher, as the subject, used a Fitbit Charge HR device to monitor the researcher’s heart rate. Regular heart rate monitoring and record keeping created an awareness of elevations in heart rate associated with emotions. The hypothesis was formed that an adolescent could be taught to regularly monitor his or her own heart rate through a wrist-worn device, which appears and operates like a wristwatch.

It was posited that elevations in heart rate, paired with knowledge of the internal feelings associated with early development of anger, could provide a subject with an early warning system to be used in seeking and employing early anger interventions. Some devices (e.g., Mio Fuse; see Figure 7) offer vibrations and colored lights to indicate a predetermined heart rate uniquely associated with the individual’s threshold prior to uncontrollable anger or aggressive behaviors.
Figure 7. Mio Fuse heart rate training and all-day activity tracker. Photo [original produced by author] displays a Mio Fuse heart rate monitor, a trademarked product of Physical Enterprises Inc. Acknowledgement of device use, and contribution of devices were obtained by Physical Enterprises Inc. (alias, Mio Global). Devices do not use the traditional adjunctive chest strap to obtain a wearer’s heart rate. It employs light sensing technology located under the device’s display that detects blood flow through capillaries in the skin as explained in Appendix J.

Theoretical Perspective

In formulating a theoretical roadmap for studying the efficacy of personal heart rate monitoring as an intervention for explosive anger in adolescents, the researcher employed operant learning theory (OLT). Two primary psychological views of behavior modification are classical or operant conditioning. Operant conditioning (OC) was theorized to occur when the organism actively influences the environment and then reacts to a desired or undesired consequence. OC was described by American psychologist Edward L. Thorndike in his research using puzzle boxes to train felines (Thorndike, 1898). A half a decade later it was popularized by American psychologist Burrhus Frederic Skinner who performed behavioral research into
voluntary responses to stimuli using a single-subject method of OC, occasionally referred to as the Skinner box, producing and measuring learned behaviors in small rodents (Skinner, 1950).

OLT suggests that an organism will adjust its action based on a reward or a punishment (Pierce & Cheney, 2013). An antecedent will stimulate a behavior followed with a consequence. The consequence either rewards the organism with a benefit or punishes with an undesired reaction. A reward will lead the organism to habituate towards the same behavior in order to continue receiving the reward. Alternatively, a punishment will deter behavior for the organism.

Anger is often represented as an autonomic response to psychological, physiological, and environmental stimuli (Weisz & Kazdin, 2010). The hermeneutic perspective can be overlooked, discounting an individual’s ability to sense and choose a course of action, to effect and alter physiological responses, and have the will to improve quality-of-life (Bergman, 2010). Larson and Lochman (2011) concluded that consequences produced from self-monitoring improves behavior functioning more so than external monitoring. Self-monitored anger management can provide education and training for personal anger regulation (Weisz & Kazdin, 2010).
**Principle of Operant Conditioning**

\[ A \Rightarrow B \Rightarrow C \]

Antecedent \( \Rightarrow \) Behavior \( \Rightarrow \) Consequence

---

**HPA Axis Activation & OC Theory**

- Heart Rate Elevates \( \Rightarrow \) Explode with Anger \( \Rightarrow \) Punishment Received
- OR
- Heart Rate Elevates \( \Rightarrow \) Soothe or Seek Solution \( \Rightarrow \) Reward Received

---

*Figure 8.* Operant conditioning applied to anger.

Left unmanaged, the physiological response activated and leading to an anger experience can be overwhelming. In adolescence the frontal lobe that is responsible for regulating mood and producing rational thought is not fully formed (DeHouwer & Herman, 2010). Anger can quickly escalate to an uncontrollable rage, often leading to undesired consequences. As physical symptoms (e.g., elevated heart rate) emerge (anteceding uncontrollable anger), regular monitoring can provide an early warning for an individual. The early antecedent awareness can provide the individual with an increased opportunity to intercede prior to an uncontrolled anger expression.
Figure 9. OC applied to anger reduction through heart rate monitoring. Illustration demonstrates emerging angry feelings prompt anteceding heart rate increase that is detected by the personal heart rate monitor. Awareness of the increased heart rate prompts employment of de-escalation strategies. Internal awareness of anger management and external praise begins to build self-efficacy and a sense of control of emotions leading to a decrease in anger outbursts and aggression. As the cycle continues with future anger events, an increase in time between events sets in, and diminished levels of anger occur, further enhancing an individual’s self-efficacy and control of anger.

Mixed Methods Approach

A study’s efficacy pivots on seemingly countless variables. From observation to intervention, the way we answer questions has evolved along with the methods researchers employ. Two primary methods of scientific inquiry and data gathering and analysis were used in this study, separately and in combination, during final analysis. This study focuses on designing an effective, practical, and multicultural therapy by using a mixed methods intervention research method.
The quantitative portion of the study assigns a number to variables and effects to remove the researcher’s influence as much as possible (Creswell, 2014). This was the method used for pretest, baseline test, and posttest analysis. The qualitative portion of this study provided a way of discovering and understanding the meaning participants, teachers, and parents apply to the anger treatment therapy and to learn about their experiences. Both are mono-method single-phase designs used conjunctively in mixed methods research throughout a study (Teddli & Tashakkori, 2009).

**Quantitative research design.** Several single-subject operant conditioning (OC) research methods can be used in training adolescents to manage anger with a heart rate monitor. Heffner (2015) said the A-B, A-B-A, A-B-A-B, and multiple baseline designs for single subject research can effectively produce results based on the goals of the researcher. The size of N, treatment type, and variable interactions were considered when choosing the research design. When mapping out a design, Creswell (2014) recommended using O to signify a measurement and X to signify the independent variable (experimental variable).

**O1---XO2-----O3---XO4.** The A-B-A-B design was chosen to begin the research in determining the efficacy of this new treatment strategy. The concurrent multiple baseline measurement, treatment, and return-to-baseline measurement method provided an individual, quantitative evaluation of each participant. The baseline measurement occurred during the first week. An in-treatment self-soothing anger management strategy was taught to each participant upon completion of the initial baseline assessment. Treatment was implemented in two-week intervals with a return-to-baseline and consecutive anger rating measurement lasting for one week. There were three treatment and return-to-baseline segments, with each participant completing a 10-week therapeutic training session.
**Qualitative research design.** Upon completion of the quantitative pre-experimental cross-behaviors design measuring the pretest, intervention, and posttest actions, it was scientifically beneficial to expand the process of inquiry qualitatively. Researchers seeking to learn from the experience of the participant and extrapolate unexpected or unpredicted experimental information can use one or more qualitative designs. The phenomenological design explores the participant’s experience of an event. The case study design explores a case (or cases) through various sources of information.

Creswell (2013) said a case study design is ideal for developing and providing “an in-depth analysis [and understanding] of a case or multiple cases,” and using up to four or five cases is recommended for generalizability of the results (p. 104). Creswell (2014) also said that a qualitative “single-subject design . . . involves observing the behavior of . . . a small number of individuals over time” (p. 170). In a case study design, the researcher combines multiple sources of information, drawing from researcher “observations, interviews, audiovisual material, and documents and reports” (Creswell, 2013, p. 97) as well as quantitative data. This single-subject collective, multi-sited instrumental phenomenological case study used a multi-bounded system to evaluate results of individual cases and to compare and generalize information from the cases collectively with a within-group design.

**Mixed methods design.** Implementing a mixed methods research design requires a set priority for the methodological approach (Teddlie & Tashakkori, 2009). Accessible academic records were reviewed for each participant. An initial interview was completed with each participant’s parent to gather background information (see Appendix I). Each parent, participant, and homeroom teacher completed a behavior assessment. Each adolescent participant completed
a standardized anger assessment and self-reported behavioral assessment. Additionally, each participant was trained in an anger de-escalation technique.

The qualitative component in the design was secondary and not simultaneous to the quantitative component. The in-treatment A-B-A-B design measured the participant’s initial baseline functioning, an interval of regular therapeutic use of the personal heart rate monitor and measurement ratings, and a return to baseline with corresponding measurement. A repeat of the heart rate monitoring with concomitant measurements was completed as well as a second and third return to baseline measurement. Following the final return to baseline and measurement the qualitative interviews were conducted with the adolescent participants, participants’ parents, and the participating homeroom schoolteachers.

Data analysis was then completed within a multi-theoretical application. The traditional numerical quantitative analysis method and thematic qualitative analysis method preceded any hermeneutic content and thematic analysis. The successive hermeneutic content and thematic analysis of the mixed methods research analysis process is an aspect of inquiry that is essential to developing a full explanation of the study by assessing relationships between themes, the conditions that produce themes, and other substructures that yield unexpected results (Bergman (2010).

Instrumentation, Procedures, and Data Collection

Quantitative measurements.

Pretest and initial baseline assessment. There were two phases of baseline measurement, the initial clinical assessment and the anger baseline assessment. In assessing children and adolescents behaviorally, it was essential to use measures with researched psychometric properties instead of convenient methods (Ollendick, McLeod, & Jensen-Doss,
To eliminate measurement interference, the initial observations and assessments used to produce a baseline were partially modeled after a typical clinical adolescent full behavioral assessment and evaluation (Song, Sandelowski, & Happ, 2010).

The traditional clinical adolescent behavioral assessment that psychologists employ covers objective measurements for standardized self-reported behavioral reports from the parent(s), teacher(s), and adolescent; clinical interviews; and assessors’ standardized observations (Ollendick et al., 2013). Reports of explosive anger were evaluated with standardized assessments as well. The purpose of the evaluation, protocol validity, reliability, standardized populations, and administration and scoring time were considered. To initially evaluate the participants of this study, self-reported behavior reports by the adolescent, parent, teacher, and researcher, along with a standardized assessment of anger level, rate of occurrence, and corresponding characteristics were used.

Behavior assessment. There are a variety of narrow and broad behavioral assessments designed for measuring and diagnosing specific psychological disorders and general behavioral characteristics in adolescents respectively. Some broad range behavioral assessments commonly used by assessors are the Conners Third Edition (Conners 3), Behavior Assessment System for Children-Student Observation System-Second Edition (BASC-2), Behavior Rating Inventory of Executive Function System (BRIEF), and the Achenbach Behavior and Observation Assessment System (ABOAS). The Conners 3, BASC-2, and BRIEF systems were “subjected to factor analysis as part of the development process, but items were ultimately assigned to scales on the basis of the authors’ judgments, rather than directly reflecting statistically identified associations among them” (Achenbach, 2013, pp. 133-34). Therefore, they were excluded from use in this study.
The ABOAS is a developmentally appropriate set of instruments measuring a broad spectrum of child and adolescent problems developed by “directly reflecting statistically identified associations among items” (Achenbach, 2013, p. 134). Three self-report style forms capture the adolescent, parent, and teacher’s perceptions. The Youth Self-Report for Ages 11–18 (YSR) is a child or adolescent Likert style response self-report of 119 items and four open-ended questions. The Teacher’s Report Form for Ages 6–18 (TRF) is a Likert style response self-report of 126 items evaluating the teacher’s perspective and observations on basic school achievement and behaviors. The Child Behavior Checklist for Ages 6–18 (CBCL) is a Likert style response self-report similar to the TRF evaluating the parent’s perspective and observations of behaviors at home, school, and other settings.

The YSR, TRF, and CBCL are combined with the clinician’s direct observation form (DOF) that is used to observe and systematically record behaviors through a Likert response style in ten-minute increments to form a baseline profile. Cross-informant measurements produce a profile separated into categories for anxious depression; withdrawn depression; somatic symptoms and complaints; social, thought, and attention problems; rule-breaking behavior; and aggression (Achenbach, 2013). Test validity studies indicate that the ABOAS is repeatedly equal to, or superior to similar behavior measurements, even in DSM-IV disorder diagnoses (Achenbach, 2013). Combined measure research of the test and retest reliability after a latent period of 8 to 16 days resulted in a 0.87 average (Achenbach, 2013). Therefore, the ABOAS was selected and used for this study.

Anger assessment. A standardized assessment protocol was administered to measure various aspects of anger expression. The U.S. Department of Veterans Affairs (VA) and Department of Defense (DOD) determined the State-Trait Anger Expression Inventory Second
Edition (STAXI-2) is the most valid objective protocol for assessing soldiers suffering from symptoms of post-traumatic stress disorder (PTSD) and demonstrating consequential explosive anger (Taft, Creech, & Kachadourian, 2012). An adolescent version of the STAXI-2 has been modified to more accurately assess state and trait anger symptoms of teenagers.

The State-Trait Anger Expression Inventory-2 Child and Adolescent (STAXI-2 C/A) uses 35 responses from children and adolescents, ages 9 to 18, to “assess the experience, expression, and control of anger while accounting for state and trait aspects of anger” (Brunner & Spielberger, 2015, p. 1). Developed out of the popular adult version produced in 1985, it is a widely used measure of adolescent anger that produces a five scale profile: The State Anger (S-Ang) and Trait Anger (T-Ang) scales produce two subscales each, State Anger-Feelings (S-Ang/F), State Anger-Expression (S-Ang/VP), Trait Anger-Temperament (T-Ang/T), and Trait Anger-Reaction (T-Ang/R). Additionally, the Anger Expression-Out (AX-O), Anger Expression-In (AX-I), and Anger Control (AC) scales measure the experience, expression, and control of anger.

The STAXI-2 C/A identifies temporary and more permanent trait like features of anger from a 4th grade reading level to produce a standardized T-score profile (see Table 11). It was originally standardized on 944 children and adolescents between the 4th and 12th grades. The internal-consistency reliability values for scales and subscales were 0.70 and above (Brunner, 2003). Multiple validity studies demonstrated positive correlations between the STAXI system and similar assessments (G. J. Boyle, Saklofske, & Matthews, 2015). Spielberger and Brunner (2009) found positive correlations between all scales and subscales of the STAXI-2 C/A except the AX-I and AC.
Table 11

**STAXI-2 C/A Scales and Subscales Measure Intentions**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[S-Ang]</td>
<td>measures the intensity of angry feelings and the extent to which a youth</td>
</tr>
<tr>
<td></td>
<td>feels like expressing anger at a particular time.</td>
</tr>
<tr>
<td>[S-Ang/F]</td>
<td>measures the intensity of the angry feelings a youth is currently</td>
</tr>
<tr>
<td></td>
<td>experiencing.</td>
</tr>
<tr>
<td>[S-Ang/VP]</td>
<td>measures the intensity of current feelings related to verbal or physical</td>
</tr>
<tr>
<td></td>
<td>expressions of anger.</td>
</tr>
<tr>
<td>[T-Ang]</td>
<td>measures how often angry feelings are experienced over time.</td>
</tr>
<tr>
<td>[T-Ang/T]</td>
<td>measures the disposition to experience anger without specific provocation.</td>
</tr>
<tr>
<td>[T-Ang/R]</td>
<td>measures the frequency that angry feelings are experienced in situations</td>
</tr>
<tr>
<td></td>
<td>that involve frustration and/or negative evaluation.</td>
</tr>
<tr>
<td>[AX-O]</td>
<td>measures how often angry feelings are expressed in verbally or physically</td>
</tr>
<tr>
<td></td>
<td>aggressive behavior.</td>
</tr>
<tr>
<td>[AX-I]</td>
<td>measures how often angry feelings are experienced but not expressed.</td>
</tr>
<tr>
<td>[AC]</td>
<td>measures how often a youth tries to control the inward or outward</td>
</tr>
<tr>
<td></td>
<td>expression of angry feelings.</td>
</tr>
</tbody>
</table>


**Therapeutic in-treatment measurements.** Each school day the adolescent participants monitored their own heart rate and corresponding emotional state during the treatment process.
Each participant’s heart rate and emotional state was recorded on a protocol designed specifically for this study’s use. Upon the hour and half-hour throughout the school day, the participant recorded the heart rate displayed on the provided therapeutic wrist-worn device and circled an emoticon representing either his or her feelings of happiness or anger. See Appendix H for the Adolescent In-Treatment Measurement. The intention of the in-treatment measurement was to increase the participant’s awareness of his or her affect and pair it with a quantifiable number produced from the heart rate monitor and physiological changes. It also provided regular in-treatment feedback of the participant’s willingness to accurately adhere to the protocol and quantitative data used in the final analysis of this study.

The researcher conducted a weekly non-invasive in-classroom observation of the participant’s progress. As previously discussed, the Achenbach DOF has a substantial test and retest reliability for quantitative observation measurements of children and adolescents. The DOF provided a consistent reasonable profile of observable behavior from the researcher’s perspective throughout the study.

**Return to baseline and post-treatment assessment.** Upon conclusion of the regular heart rate monitoring 2-week phases a return to baseline for one week was measured at the end of the baseline week with a re-administration of the STAXI-2 C/A.

**Qualitative Measurements**

Proper research uses questions that will inform and expand the study without creating research errors. Maxwell (2013) warned that qualitative research questions should not create tunnel vision through overly focused questions or illicit unrelated answers from vague questions, nor should it impose a conceptual framework through questions, thus transferring assumptions. Adolescent participants, parents, and teachers were asked questions focused on their own
experience and perspective of the study’s treatment phases and outcomes. Table 12 lists questions the adolescent participants were asked. Table 13 lists questions the parents of participants were asked. Table 14 lists questions the teachers of the participants were asked.

Table 12

Adolescent Qualitative Interview Questions

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQ1. What was difficult about using the wristwatch heart rate monitor?</td>
</tr>
<tr>
<td>AQ2. What was easy about using the wristwatch heart rate monitor?</td>
</tr>
<tr>
<td>AQ3. What was difficult about recording your heart rate and emotions?</td>
</tr>
<tr>
<td>AQ4. What was easy about recording your heart rate and emotions?</td>
</tr>
<tr>
<td>AQ5. What was it like to manage your feelings of anger with the heart rate monitor?</td>
</tr>
<tr>
<td>AQ6. What would you tell other teenagers who might use this therapy?</td>
</tr>
<tr>
<td>AQ7. What changes would you make to the therapy process?</td>
</tr>
<tr>
<td>AQ8. How well do you think the therapy worked for you?</td>
</tr>
<tr>
<td>AQ9. During the study, what did you notice that was unexpected?</td>
</tr>
</tbody>
</table>

Note. Table lists questions that are asked of each adolescent participant after completing the biofeedback training.
Table 13

*Parent Qualitative Interview Questions*

| PQ1. How long have you been the participant’s parent or guardian? |
| PQ2. What did you observe after your son or daughter began the therapy? |
| PQ3. How well do you think the therapy worked? |
| PQ4. What would you tell other parents who might use this therapy? |
| PQ5. What changes would you make to the therapy? |

*Note.* Table lists questions that are asked of each parent or guardian of the adolescent participants after completion of the biofeedback training.

Table 14

*Teacher Qualitative Interview Questions*

| Table 14. Teacher qualitative interview questions. |
| Each participating teacher will be asked, |
| TQ1. How long have you known the participant? |
| TQ2. What did you observe after your student began the therapy? |
| TQ3. How well do you think the therapy worked? |
| TQ4. What would you tell other teachers who might use this therapy? |
| TQ5. What changes would you make to the therapy? |

*Note.* Table lists questions that are asked of each homeroom teacher of the adolescent participants after completion of the biofeedback training.
**Four (or five)-week post-treatment follow-up.** To further evaluate the effectiveness of the therapy, a post-treatment follow-up assessment was conducted. Each parent completed the CBCL, the homeroom teacher completed the TRF, the researcher conducted a formal observation with the DOF, and the adolescent participant completed the YSR and STAXI-2 C/A. This allowed for further analysis of the baseline change.

**Anger De-escalation Training**

Upon completion of the initial baseline assessment each participant was trained in an anger de-escalation intervention to be used when escalating anger is self-detected. The intervention was adapted from the APA’s fact sheet published for controlling anger (Spielberger & Deffenbacher, 2011). The APA recommends relaxation in four steps:

1. Breathe deeply, from your diaphragm. Breathing from your chest won’t relax you, so picture your breath coming up from your “gut.”
2. Slowly repeat a calming word or phrase, such as “relax” or “take it easy.” Keep repeating it to yourself while breathing deeply.
3. Use imagery. Visualize a relaxing experience from your memory or your imagination.
4. Try non-strenuous, slow exercises. Yoga and similar activities can relax your muscles and calm you down.

Each participant was trained to employ a proper breathing technique: breathing in using the diaphragm, through the nose, and exhaling through the mouth. The researcher assisted each participant to create a unique calming word or phrase and accompanying, relaxing imagery. Stretching and an alternative “go for a walk” strategy was identified and practiced. Participants were provided with a laminated, print version of the unique relaxation strategy procedure they created with the researcher to be used as a reminder during escalating, angry feelings.
Initial Participant Training and Procedures Follow-Up

**Initial training.** To improve and insure regular compliance of the procedure as designed, each participant underwent a succession of repetitive trainings. The initial training of the de-escalation technique was followed up with repetitive training in the use of the heart rate monitoring device. The repetitive training occurred daily during the bi-weekly heart rate monitoring sessions.

Once each selected participant completed the initial baseline phase, he or she participated in an individual training session with the researcher for one-half hour. In the training session the participant was taught the anger de-escalation technique previously described. Then the participant was taught the proper use and care of the heart rate monitoring device. At the end of the training session the researcher conducted a review of what was learned.

**In-treatment daily training.** Each weekday morning during the two-week in-treatment phases, the participants were provided a monitoring device at the onset of the school day. At that time the participant reviewed with the researcher the proper procedure for use of the device, proper implementation of the anger de-escalation technique, and the expected use of the Participant Daily Heart-Rate Monitoring Form (PDHMF; see Appendix H). The heart rate monitoring devices and the PDHMF were collected by the researcher at the end of the school day.

**Data Summary and Analysis**

The quantitative and qualitative data were analyzed separately and concurrently to produce an expanded set of results. This provided an enhanced interpretation of the experience of each participant and the efficacy of the therapy. The quantitative data was measured using a linear analysis of regression for each case and across cases due to the small sample size ($N = 5$)
and the limits of the five baselines measured. The qualitative data was evaluated by combining adolescent participants’, parents’, and teachers’ responses to gain a broader and more generalizable perspective of their experience of the therapy process.

**Challenges of a Mixed Methods Intervention Study**

Traditional researchers often cite the need for extremely objective measurements to eliminate the researcher’s influence as much as possible (Creswell, 2014). The adherence to this principle can eliminate methods other than a strict quantitative double blind within-subject study. Those who have embraced qualitative inquiry and analysis procedures in the social and behavioral sciences cite the benefits of information that cannot be retrieved from a traditional quantitative inquiry, especially the sterilizing results of a double-blind within-subject study (Creswell, 2014).

Song et al. (2010) warned that combining the two methods could create unique aspects of intervention research. They noted that qualitative and quantitative measurements can produce knowledge and interfere with the actual therapy or intervention being studied. They recommended the pretest measurements should be the same as those used by clinicians prior to the application of therapy. Similarly, the application phase measurements should be the same measurements used during post-research application.
Phase I: Approval & Consent

**Phase IA: Approvals**
- Dissertation Committee Approval
- Institutional Review Board Approval @ Antioch University Seattle

**Phase 1B: Consents & Assent**
- New Horizon School Principal Informed Consent
- Parental Informed Consent
- Adolescent Informed Consent and Assessment
- Teacher Informed Consent

Phase II: Participant Selection

- School Principal List
- Student File Review
- Committee Final Selection

Phase III: Establish Baseline (Quantitative)

**Phase IIIA: Adolescent Psychological Assessment**
- Adolescent Background Interview with Parent
- Adolescent Clinical Interview
- Objective Assessment Administrations

**Phase IIIB: Adolescent Training**
- Device use and Procedures
- Anger De-escalation Technique Development and Training

*Figure 10.* Research method design process.
**Phase IV: Heart Rate Monitoring Implementation (Quantitative)**

<table>
<thead>
<tr>
<th>Phase IVA1: Heart Rate Monitoring Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear Device Daily for 2 Weeks</td>
</tr>
<tr>
<td>Monitor and Document Heart Rate</td>
</tr>
<tr>
<td>Every ½ Hour at School</td>
</tr>
</tbody>
</table>

**Phase IVA2: Return to Baseline**

| One Week Latent Period | STAXI-2 C/A retest |

**Phase IVB1: Heart Rate Monitoring Use**

| Wear Device Daily for 2 Weeks         |
| Monitor and Document Heart Rate       |
| Every ½ Hour at School                |

**Phase IVB2: Return to Baseline**

| One Week Latent Period | STAXI-2 C/A retest |

**Phase IVC1: Heart Rate Monitoring Use**

| Wear Device Daily for 2 Weeks         |
| Monitor and Document Heart Rate       |
| Every ½ Hour at School                |

**Phase IVC2: Return to Baseline**

| One Week Latent Period | STAXI-2 C/A retest |

**Phase V: Qualitative Interviews**

| Adolescent Qualitative Interview     |
| Parent Qualitative Interview         |
| Teacher Qualitative Interview        |

**Phase VI: 5 Week Post-Treatment Follow-up (Quantitative)**

| Parent: CBCL | Teacher: TRF | Adolescent: YSR & STAXI-2 C/A |

*Figure 10. Research design method process (continued).*
Chapter IV: Results

This chapter reviews the study’s participants, implementation, data gathering, and data analysis. First the identified cases’ demographics and individuals’ information is reviewed. Then the process of the three months’ study is reviewed. The objective quantitative data is analyzed with a case and cross-case data analysis. Finally, the qualitative data is reviewed across cases to form a collective summative subjective reported experience and recommendations from the adolescents, parents, and teachers.

Participant Identification

During the proposal phase of the study, there were several students identified for participation in the study. Some students had complications stemming from uncontrollable anger leading to school expulsion. For many of these adolescents, expulsion meant the loss of their last-resort school before attending a school focused solely on severe behavioral disorders with minimal attention to academic achievement.

Several other students were identified post-IRB by the principal and researcher as potential participants. Ultimately five adolescents participated in the study. Four males and one female consented and were able to gain written consent from their parents. Three participants began the study together at the initial start date, and two alternates began three weeks later.

Participating Adolescents—Identified Cases

Participant 1—BA. BA was a 17 year old Caucasian-American heterosexual born and identifying male. His adoptive-mother reported that he displayed the average maturity of a typical 2 year old when he was adopted at age four. At the time of the study, he was in the 11th grade.
Relevant developmental history.

- According to his adoptive mother and court records, his biological mother abused alcohol and drugs, leading to his abandonment.
- His weight continues to remain below average, and he is medically prescribed a diet designed to add weight.
- He unnecessarily hoards and hides food in his bedroom.
- As a young child he did not want to be alone and was always seeking something.
- He has struggled with not knowing how to fill his unstructured time.
- He was diagnosed with attention deficit disorder in the second grade and medicated with Daytrana.
- He has a history of medication-induced tics.
- He took himself off medications six months prior to the onset of the study.
- He was also diagnosed with enuresis, encopresis, and a tic disorder as a child.

Relevant anger and aggressiveness. When BA entered the United States at 4 years old, he attended regular therapy with a child psychologist for a year. His mother recalled, “it was two steps forward and one step back” with his general progress. The following year an in-home therapist worked with BA. He has attended therapy on and off throughout his life for behavior and social skills development. Since he was 14 years old, he attended therapy regularly with a psychologist to work on his negative attention and abuse toward his sister and adoptive mother. To deescalate, he voluntarily goes on long walks by himself. He walked five to 10 miles to see his girlfriend at times; other times he walked into town and back “for something to do.” He reported it is nice to walk because he has time alone to think. He also attends occupational therapy for fidgeting.
His adoptive mother said he demonstrated “constant underlying anger that has persisted throughout his life.” She believes it stems from a jealously toward his younger sister and others. He reported his anger is significant and continuous at home and he tries not to show it at school or other settings.

**School.** At school he demonstrated explosive anger that seemed to be unprovoked at times and sporadic in onset. He dressed and presented himself as the “cool kid” of the school and drew attention from his and other parents and teachers as the student likely to use drugs. To fit in with other teenagers from his neighborhood, he took up electronic-smoking of non-nicotine tobacco fluid. He was sensitive to the anger of other students and proposed starting and helping to facilitate a group therapy with other students at school during the lunch period; however, he did not eat lunch and often looked for another activity.

His anger had a destructive quality. His first explosive episode at New Horizon scared several students and teachers when he punched a hole in the wall of his classroom. As the school year continued and he became more comfortable at school, his explosive, angry swearing and yelling escalated. He quickly gained a reputation in the small school as a nice young man with an angry streak. He is a charming young man, nice to younger students, usually respectful toward teachers, but has little patience for peers. He identified as an outsider who did not belong at the school. He regularly volunteered in the main office, helping staff with organizing and other projects.

**Participant 2—DA.** DA was an 18 year old Caucasian-American heterosexual born and identifying as male. He was attending school as an 11th grader. He struggled with several complications stemming from an early-life traumatic brain injury (TBI). He stood approximately six feet tall, weighed approximately 260 pounds, and was able to think and interact at his typical
chronological developmental age. However, his emotional maturity and mood regulation were stunted by the TBI, presenting as is typical of an eight year old.

**Developmental highlights.** DA’s mother reported he injured his head at 7 years old. According to a neuropsychological evaluation, he sustained a right parietal skull fracture, right brain contusion, and a subdural hematoma, as well as hypodensities in his bilateral parieto-occipital regions and infarctions of multiple cranial arteries. After several months of hospitalization and infection in his head wound, his mother recalled that he began to relearn everything. He struggled with severe prospective memory difficulties.

**Relevant anger and aggressiveness.** DA’s mood often shifted toward a negative outlook, excessive worry and anxiety, and feelings of inadequacy. At the age of 13, his scores on the Behavior Assessment System for Children-Second Edition (BASC-2) indicated significant elevations in T-scores for teacher, parent, and self-reports anxiety (76), somatization (92), atypicality (84), hyperactivity (77), withdrawal (79), and internalization of problems (86). A year later the BASC-2 parent and teacher reports were again significantly elevated. Domains of internalizing problems (110), behavioral symptoms (85), anxiety (93), depression (105), somatization (100), and atypicality (89) were all clinically elevated.

**School.** During the study DA was prescribed Abilify, Trileptal, and Ritalin. He experienced large mood swings that changed in seconds with little or no stimuli or trigger. When in a good mood, he was very friendly, caring, sensitive, gregarious, happy, charming, and enthusiastic. He became angry, sad, insecure, anxious, lost, lonely, and expressed a strong sense of hopelessness and a will to die when he shifted. Consequently, he struggled socially most of his life. He regularly focused on one individual he identified as his *best friend*, identified something to fix in the person’s life, and often caused a problem that strained the friendship.
Participant 3—NA. NA was a 15 year old Caucasian-American identifying as heterosexual, both born and identifying male. He struggled with auditory processing difficulties, a speech impediment, social anxiety, autism spectrum disorder, attention-deficit hyperactivity disorder, vitamin D deficiency, autism spectrum disorder, and general anxiety. He operated throughout the school day as a self-selected ambassador or representative of the school. He arrived an hour early to school to assist teachers and staff in preparing for the day. He regularly monitored and redirected other students and demonstrated a strong desire to please adults.

Developmental highlights.

- Reoccurring social deficits started in kindergarten and included understanding others’ emotions and speech, relating to others, and matching tone to environment.

Relevant anger and aggressiveness. At the age of 10 he was evaluated behaviorally. The assessment revealed that teachers thought he was “an impulsive, anxious, immature, easily distracted, fearful, worried, disruptive loaner” who had “difficulties in relationships with peers.” They also reported that he:

- physically pushes others when frustrated;
- likes to tell peers what to do, wants to boss others, and acts as a nonconformist;
- “is his own person” and says what is on his mind;
- worries about the future—wants things done according to schedule—has difficulties with changes;
- is challenged by a short attention span and experiences frustration when things are not perfect;
- explodes under stress;
- has experienced an increase in irritability from prior years; and
• exhibits a low frustration level and limited tolerance of others.

His mother reported that he “yells and slams doors. Doesn’t listen to you until you take something away that is very important to him; or he doesn’t care.” She also reported he and his sister have social difficulties, and his father also has attention and anxiety challenges. There were no reported medications taken during the study; he had a history of medication use to manage attention in elementary school.

**School.** NA consistently demonstrated an aggressive interactive style with limited or missing awareness of others’ feelings, interests, tone and cadence of voice, or others’ interest in conversing. He regularly spoke over others, blurted out or yelled in the classroom, stormed out of the classroom, and walked around campus. He demonstrated a routine in this behavior, with specific classes triggering an often avoidant behavior channeled through anger and aggressiveness.

He had a tendency toward entering others’ personal spaces and speaking loudly within a few inches of their faces. His speech difficulties at times further frustrated him as he struggled to express himself clearly. Others he interacted with had difficulty conversing with him and would ask him to repeat what he said. Teachers, school staff, and his parents regularly directed him to walk-away and cool down.

He referred to his angry self as his “goalie personality.” He was very proud of his achievements in hockey, reported almost every day on the advancements of the team he played on and that of several other professional teams. As he identified a difference between his calm and rational self and his angry and aggressive presentation, he named his angry self the *goalie personality*. He related various positions and moves of a hockey goalie to the interactions he had with others.
Participant 4: EA. EA was a 16 year old Caucasian-American heterosexual born and identifying female.

Relevant developmental highlights. EA was diagnosed with a perinatal injury of the central nervous system (CNS) shortly after birth. She was 5.95 pounds at birth, and the birth mother rejected EA, leaving her Central Asian government to raise her for several years. In the crowded orphanage she received substandard care to include being left lying on one side of her body for excessive periods of time leading to a permanently flattened skull on her left forehead and cheekbone area. She was diagnosed with encephalopathy that was related to several teratogenic and postnatal insults. She also suffered from a severe vitamin deficiency and low weight at the time of adoption. In the United States she was diagnosed with an auditory processing disorder and clinical anxiety and depression.

Relevant academic history.

• She preferred to work alone; group work was challenging.

• She was very sensitive to being singled out.

Relevant anger and aggressiveness.

• She had a strong sense of right and wrong.

• She had a need for “fairness in an ideal world.”

• She became very argumentative if things did not follow her moral compass.

• Changing her mind “is nearly impossible” when she made her mind up.

• She “throttled” another student who cut in line in front of her during kindergarten.

• She was increasingly “aggressively argumentative” with her parents, teachers, and peers.

• She “picks fights” with her siblings and peers daily.
**School.** On a daily basis EA was one of the more disruptive students at the school. In the classroom she regularly filled silence with noises and yelling. She rarely was able to remain in a classroom for an entire period and found reasons to leave the room, walk around campus and visit others. Her presentation toward new people could be characterized as a disinhibited attachment. However, upon winning over new people and getting close to them, she quickly shifted to identifying them as strangers (inhibited attachment).

**Participant 5 AA.** AA was an adopted 18-year-old Caucasian-American heterosexual born and identifying male. Prior to the study he was diagnosed with a neurobehavioral disorder associated with prenatal alcohol exposure (ND-PAE; alias: fetal alcohol syndrome), generalized anxiety disorder, and specific learning disorder—both reading and mathematics. He was prescribed Lamictal and Vyvanse.

**Developmental highlights.** His diagnoses included aphasia; apraxia; frontal lobe syndrome; hyperarousal; reading, writing, and mathematics learning disorder, and cognitive disorder with mixed expressive and receptive language and motor coordination difficulties. He experienced gastrointestinal issues until he was 7 years old. School avoidance started in preschool, along with excessive crying and aggressiveness toward peers. He held and imposed strong opinions about politics, male superiority, and his religious beliefs (e.g., concrete thinking). In the 2nd grade his threatening and violent behavior toward his brothers led to psychiatric hospitalization. In the 3rd grade he began school-imposed isolation from his peers.

**Relevant anger and aggressiveness.** AA lived with continuous anxiety, keeping him excessively alert. He alienated himself from others by identifying things he did not like and yelling and swearing in the classroom. His angry expressions would last for a significant amount of time, and he would often ruminate for weeks until he found a new reason to be angry.
**Study’s Progression**

The researcher/author kept notes of the study’s progress in a secured notebook that was used to produce the following.

**Baseline measurements and training.** Participants completed the STAXI-2 C/A and the YSR. BA’s and DA’s shared homeroom teacher and NA’s and EA’s homeroom teacher completed the TRF, and BA’s and DA’s parents completed the CBCL. NA’s mother did not return the CBCL and AA’s teacher did not return the TRF for the initial baseline. All participants were trained individually in the daily acquisition and correct use of the device and completion of the daily record form. A summary of all baseline forms that were completed can be found in Table 15 below.
### Table 15

**Checklist of Completed Assessments and Interviews**

<table>
<thead>
<tr>
<th>Participant</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>B5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BA</strong></td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>STAXI-2 C/A</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>YSR</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
</tr>
<tr>
<td>CBCL</td>
<td>✓</td>
<td>✓</td>
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**Note.** A checklist of the retrieved objective measurements and qualitative interviews retrieved and completed by all five participants, their homeroom teachers, and their parents. The final DOF and TRF were not completed because that baseline occurred after the school year ended. Additionally, EA ended her participation three weeks early.
**Individual de-escalation plans.** Each of the participants developed his or her own unique de-escalation plan according to guidelines outlined in the APA’s anger management process, in particular that of detected emerging angry feelings intervention procedure. The plans were printed and laminated for each to carry and reference throughout the day.

**BA’s de-escalation plan.**

1. Breathe deeply, *from your diaphragm*.
2. Repeat a calming word silently and stay quiet.
3. Imagine being at a friend’s house or listen to music.
4. Walk or jog *around the school*.

**DA’s de-escalation plan.**

1. Breathe deeply, *from your diaphragm*.
2. Repeat *the phrase* “It will be ok, God will guide me.”
3. Imagine seeing and holding [redacted name] (*baby nephew*).
4. Walk slowly, taking various walks.

**NA’s de-escalation plan.**

1. Breathe deeply, *from your diaphragm*.
2. Repeat *the phrase* “Take a break.”
3. Imagine sleeping; lying down and sleeping.
4. Walk slowly and be left alone.

**EA’s de-escalation plan.**

1. Breathe deeply, *from your diaphragm*.
2. Repeat *the phrase* “Don’t let people bring you down, because they only bring themselves down.”
3. Imagine gymnastics (*routines and competing*).

4. Listen to my music or color.

**AA's de-escalation plan.**

1. Breathe deeply, from your diaphragm.

2. Repeat the phrase “[redacted name].”

3. Imagine hugging my dog.

4. Walk around the school.

**Analysis Process**

The data from individual cases were analyzed separately to produce participant profiles of their experience and then were analyzed collectively to form a more generalizable experience. As illustrated in Figure 11, the objective measurements the adolescent participants, homeroom teachers, parents, and the researcher completed during each baseline were combined for each case. Then the adolescents were combined, the homeroom teachers were combined, and the parents were combined to reveal any trends they may have reported. A case profile was then produced for each adolescent participant, and, ultimately, an overall summary of findings evaluated the cases as a group to determine any trending information that may be applied to future research or application.
Figure 11. Overview of the multiple case study quantitative data analysis process.
Quantitative Analysis

The researcher used the objective information obtained from the STAXI-2 C/A, YSR, CBCL, TRF, and DOF assessments during each baseline to visually analyze for trends of regression using standardized T-scores. T-score location with respect to typical trends of response and those found in a clinical population were irrelevant to this analysis. The intent was to evaluate linear regression of T-score results to determine change, if any, which could be associated with the biofeedback therapeutic process.

Due to the low sample size \((N = 5)\), an analysis using repeated-measures ANOVA or another related analytic process would be ineffective and produce no functional results. Final analysis of the participants’, parents’, teachers’, and researcher’s objective assessments revealed individual and collective trends towards participants improving executive functioning of emotions and awareness in several domains of testing related to the study’s specific research questions and the overall intent of the study. Reported results begin with the STAXI-2 C/A assessment to evaluate change in anger, then analyses trends of change revealed in the ABOAS assessments, and, finally, a review of the overall change across measurements and participants.

**Quantitative Question 1.** The initial research question intended to extrapolate measureable change in the adolescent participants’ self-reported anger symptoms, using the STAXI-2 C/A, after participants regularly monitored their heart rates and employed individually designed anger de-escalation strategies.

**BA STAXI-2 C/A results.** As illustrated in Figure 12, BA’s reported state and trait anger fluctuated in almost all domains. All but two domains decreased in intensity or frequency, one increased, and one had no overall change.

*Measures that decreased in intensity and frequency:*
• the intensity of the angry feelings he was currently experiencing;
• the intensity of angry feelings and the extent to which he felt like expressing anger at a particular time;
• the disposition to experience anger without specific provocation;
• how often angry feelings were experienced over time;
• the intensity of current feelings related to verbal or physical expressions of anger;
• the frequency that angry feelings were experienced in situations that involved frustration and/or negative evaluation; and
• how often angry feelings were expressed in verbally or physically aggressive behavior.

*Measures that increased in intensity and frequency:*

• how often he tried to control the inward or outward expression of angry feelings.

*Measures that remained stable:*

• how often angry feelings were experienced but not expressed.

BA’s response profile for anger experience reinforced the hypothesis that anger would diminish. His control of anger increased while he internalized his experiences of angry feelings. All anger state and trait measurements, as well as his outward expressions of aggression, diminished, going against the null hypothesis.
Figure 12. Analysis of STAXI-2 C/A for participant BA. Illustrates a linear line of regression and projected progress based on the results of participant BA’s STAXI-2 C/A assessment during five baseline (e.g., B1, B2, B3, B4, B5) evaluations. See Table 11 for an explanation of each scale and subscale and Table 11’s preceding section for an explanation of the STAXI-2 C/A.
**DA STAXI-2 C/A results.** As illustrated in Figure 13, DA’s reported state and trait anger had significantly remarkable fluctuations in all domains. Seven domains decreased in intensity or frequency, and two increased.

*Measures that decreased in intensity and frequency:*

- the intensity of the angry feelings he was currently experiencing;
- the intensity of angry feelings and the extent to which he felt like expressing anger at a particular time;
- the disposition to experience anger without specific provocation;
- how often angry feelings were experienced over time;
- the intensity of current feelings related to verbal or physical expressions of anger;
- the frequency that angry feelings were experienced in situations that involved frustration and/or negative evaluation; and
- how often angry feelings were expressed in verbally or physically aggressive behavior.

*Measures that increased in intensity and frequency:*

- how often angry feelings were experienced but not expressed; and
- how often he tried to control the inward or outward expression of angry feelings.

As hypothesized, DA’s control over his anger increased significantly throughout the study. He shifted to an internalizing method of experiencing his anger internally and not expressing it. All other states, traits, and expressions of anger diminished significantly in intensity and frequency, confirming the original hypothesis of decreasing anger and aggression. His results indicate a need for coaching in how to properly express his internalized feelings of anger.
Figure 13. Analysis of STAXI-2 C/A for participant DA. Illustrates a linear line of regression and projected progress based on the results of participant DA’s STAXI-2 C/A assessment during five baseline (e.g., B1, B2, B3, B4, B5) evaluations. See Table 11 for an explanation of each scale and subscale and Table 11’s preceding section for an explanation of the STAXI-2 C/A.
NA STAXI C/A results. NA’s reported state and trait anger measurements were unremarkable. Overall, 6 slightly decreased, and 3 slightly increased. See Figure 14.

Measures that decreased in intensity and frequency:

- the intensity of the angry feelings he was currently experiencing;
- the intensity of angry feelings and the extent to which he felt like expressing anger at a particular time;
- the disposition to experience anger without specific provocation;
- how often angry feelings were experienced over time; and
- the intensity of current feelings related to verbal or physical expressions of anger.

Measures that increased in intensity and frequency:

- how often angry feelings were expressed in verbally or physically aggressive behavior;
- how often he tried to control the inward or outward expression of angry feelings; and
- how often angry feelings were experienced but not expressed.

Measures that remained stable:

- the frequency that angry feelings were experienced in situations that involve frustration and/or negative evaluation.

NA’s goal-driven and stable presentation throughout the study is evident in his anger state and trait profile. Although he reported an increase in the ability to control his anger, he also increased in expressions of anger, especially in frustrating situations. This reinforced the “pressure cooker” theory of anger management. However, his states of anger decreased as well as some traits of anger. His changes in measured anger were minimal compared to other cases.
Figure 14. Analysis of STAXI-2 C/A for participant NA. Illustrates a linear line of regression and projected progress based on the results of participant NA’s STAXI-2 C/A assessment during five baseline (e.g., B1, B2, B3, B4, B5) evaluations. See Table 11 for an explanation of each scale and subscale and Table 11’s preceding section for an explanation of the STAXI-2 C/A.
**EA STAXI-2 C/A results.** As illustrated in Figure 15, EA’s reported state and trait anger fluctuated in almost all domains. Four domains increased in intensity or frequency, three decreased, and two had very little change overall.

*Measures that decreased in intensity and frequency:*
- the intensity of the angry feelings she was currently experiencing;
- the intensity of angry feelings and the extent to which she felt like expressing anger at a particular time; and
- the disposition to experience anger without specific provocation.

*Measures that increased in intensity and frequency:*
- how often angry feelings were experienced but not expressed;
- the frequency that angry feelings were experienced in situations that involved frustration and/or negative evaluation;
- how often she tried to control the inward or outward expression of angry feelings; and
- how often angry feelings were expressed in verbally or physically aggressive behavior.

*Measures that remained mostly stable:*
- how often angry feelings were experienced over time; and
- the intensity of current feelings related to verbal or physical expressions of anger.

In her shortened six-week participation, she had an unintended change in her trait anger and expressions of anger in that they increased in frequency and intensity, thus confirming the null hypothesis. However, her reported ability to control her anger improved significantly, and her states of anger declined in intensity and frequency, confirming the hypothesis in the first research question.
Figure 15. Analysis of STAXI-2 C/A for participant EA. Illustrates a linear line of regression and projected progress based on the results of participant EA’s STAXI-2 C/A assessment during four baseline (e.g., B1, B2, B3, B4) evaluations. See Table 11 for an explanation of each scale and subscale and Table 11’s preceding section for an explanation of the STAXI-2 C/A.
AA STAXI-2 C/A results. As illustrated in Figure 16, AA’s reported state and trait anger fluctuated in almost all domains. All but two decreased significantly in intensity or frequency, one slightly increased, and one had no overall change.

Measures that decreased in intensity and frequency:

- the intensity of the angry feelings he was currently experiencing;
- the intensity of angry feelings and the extent to which he felt like expressing anger at a particular time;
- the disposition to experience anger without specific provocation;
- how often angry feelings were experienced over time;
- the frequency that angry feelings were experienced in situations that involved frustration and/or negative evaluation;
- how often angry feelings were expressed in verbally or physically aggressive behavior; and
- how often angry feelings were experienced but not expressed.

Measures that increased in intensity and frequency:

- how often he tried to control the inward or outward expression of angry feelings.

Measures that remained stable:

- the intensity of current feelings related to verbal or physical expressions of anger.

AA’s overall anger state and trait profile throughout the duration of the study confirmed the hypothesis captured in the first research question. His expressions of state anger did not change, but his ability to control his angry feelings and reactions, and all other expressions, states, and traits of anger, captured by the STAXI-2 C/A, significantly improved.
Figure 16. Analysis of STAXI-2 C/A for participant AA. Illustrates a linear line of regression and projected progress based on the results of participant AA’s STAXI-2 C/A assessment during five baseline (e.g., B1, B2, B3, B4, B5) evaluations. See Table 11 for an explanation of each scale and subscale and Table 11’s preceding section for an explanation of the STAXI-2 C/A.
Combined participant analysis. The collective evaluation of the participants’ STAXI-2 C/A evaluations focused on three primary measurements: the S-Ang (i.e., state anger), T-Ang (i.e., trait anger), and AC (i.e., anger control) scales. Inter-respondent trends were identified and could be applied to future research hypothesis formation and the application of treatment across demographics, diagnoses, and gender.

State anger. In all cases the reported state anger measurements indicated a decrease in intensity of angry feelings and the extent to which participants felt like expressing anger, as indicated in Figure 17. BA and DA had a similar significant decline in their measurement of state anger. Their overall nine-week T-score linear decrease was twenty points. AA experienced an eight-point decrease over the nine weeks. EA and NA experienced a five-point decrease over their six-week and nine-week (respectively) progression through the study. There was a mean ten-point reduction in state anger for all participants.
Figure 17. State anger participant analysis. Five baseline (B1) measurements (T-scores) of State Anger (S-Ang) as assessed with the STAXI-II C/A. First five are individual participants’ linear regressions. The sixth is participants’ average baseline linear regression.
**Trait anger.** In most cases the reported trait anger measurements indicated a decrease in frequency of angry feelings experienced over time, as indicated in Figure 18. DA’s thirty-eight-point decline in trait anger was the most significant. BA and AA had a similar 11-point decline in trait anger over the nine and six week trials respectively. NA’s shift was no more than a point decline of linear trend. Similarly, EA’s shift was no more than a one point increase in linear trend. There was a mean 13-point reduction in trait anger for all participants.
Figure 18. Trait anger participant analysis. Five baseline (B1) measurements (T-scores) of Trait Anger (T-Ang) as assessed with the STAXI-II C/A. First five are individual participants’ linear regressions. The sixth is participants’ average baseline linear regression.
Anger control. In all cases the reported anger control measurements indicated an increase in frequency of controlling the inward or outward expression of angry feelings, as indicated in Figure 19. BA and DA had a significant 15-point increase in each of their anger control measurements. EA’s ten-point increase in anger control occurred over her six-week participation. NA and AA each had a small 2-point increase in their anger control measures. The mean participant increase in anger control was measured at 10-points.
Figure 19. Anger control participant analysis. Five baseline (B1) measurements (T-scores) of Anger Control (AC) as assessed with the STAXI-2 C/A. First five are individual participants’ linear regressions. The sixth is participants’ average baseline linear regression.
Quantitative Questions 2-5. The second, third, fourth, and fifth research questions sought to extrapolate measureable change in adolescent participants’ behavior problems after participants regularly monitored their heart rates and employed individually designed anger de-escalation strategies. The data was produced by adolescent participants’, teachers’, parents’, and researcher’s observations and self-reports of participants’ behaviors over time. Changes were measured by the ABOAS system (i.e., YSR 11-18, CBCL, TRF, DOF). Five significant and relative domains of assessment emerged across the four assessments: (a) social problems; (b) rule-breaking behavior; (c) aggressive behavior; (d) oppositional-defiant problems; and (e) conduct problems. The DOF, YSR, CBCL, and TRF produced results for the domain of oppositional-defiant problems. The four remaining domains were produced by the YSR, CBCL, and TRF only.

Social problems results. While the parents’ and adolescents’ mean report of social problems decreased, as revealed by linear regression analysis over five baselines, the teachers’ collective report did not change throughout the study. A case analysis reveals several different profiles. Figure 20 graphically illustrates the reported social problems of participants as reported by themselves, their parents, and homeroom teachers during the five baseline measurements.

BA. BA’s report of his own social problems indicated a significant decline, of approximately 10 points in T-score, greater than any other participants’ self-reports. His mother similarly reported an approximate 3-point T-score decrease in social problems at home. However, his homeroom teacher’s report indicated she observed an approximate 10-point T-score increase in his social problems in the classroom.

DA. DA’s report of his own social problems indicated a decline of approximately 7-points in T-score. His mother’s report was similar with an approximate 7-point decrease at
home over the course of the study. His homeroom teacher reported an observed approximate 8-point increase in social problems in the classroom.

**NA.** NA was the only participant to report an increase in social problems. He reported an approximate 3-point T-score increase throughout the study. In contrast, his mother reported a 4-point T-score decrease at home, and his homeroom teacher reported a 3-point decrease in social problems in the classroom.

**EA.** EA had a very different perspective on her trend of social problems throughout the course of the study, which could have influenced her early departure. She reported an approximate 12-point T-score increase in social problems. In contrast, her mother reported a 29-point decrease at home, and her homeroom teacher reported an approximate 10-point T-score decrease in the classroom.

**AA.** All of AA’s reports of social problems declined as revealed in linear analysis of regression. He reported the smallest change for himself, with a 2-point T-score decrease. His mother indicated a 46-point T-score decrease in social problems at home throughout the course of the study. His homeroom teacher reported an observed 15-point T-score decrease in social problems in the classroom.
Figure 20. ABOAS social problems analysis. Illustrates a linear line of regression and projected progress based on the results of the YSR, CBCL, and TRF assessments for each participant and the mean of all participants across five baselines.
Rule-breaking behavior results. Through a linear regression analysis over the five baselines, it was revealed that all but one adolescent’s self-report indicated a decrease in rule-breaking behaviors. The case analysis revealed several different profiles. Figure 21 graphically illustrates the rule-breaking behaviors of participants as reported by themselves, parents, and homeroom teachers during the five baselines.

BA. BA reported a 4-point T-score decrease in his rule-breaking behaviors. However, his mother and homeroom teacher did not report a change in these behaviors at home or in the classroom over the course of the study.

DA. DA reported an 11-point T-score decrease in his rule-breaking behaviors. This was approximately double his mother’s and homeroom teacher’s report of a decrease of approximately 5 to 6 T-score points at home and in the classroom respectively.

NA. NA reported a 9-point T-score decrease in his rule-breaking behaviors. His report did not align with that of his mother who only reported a 1-point T-score decrease at home. His homeroom teacher’s report fell in the middle; she reported a 4-point T-score decrease linearly in the classroom over the course of the study.

EA. EA reported a 7-point T-score decrease in her rule-breaking behaviors. Her mother saw a significantly larger reduction, a 40-point T-score decrease, in her rule-breaking behaviors at home over the course of the study. Her homeroom teacher was more conservative with a reported 12-point T-score decrease in her rule-breaking behaviors.

AA. AA reported a small 3-point T-score increase in his rule-breaking behaviors. In contrast, his mother reported an approximate 14-point T-score decrease at home. His teacher also reported a decrease, calculated to be an 11-point T-score decline in rule-breaking behaviors in the classroom.
Figure 21. ABOAS rule-breaking behavior analysis. Illustrates a linear line of regression and projected progress based on the results of the YSR, CBCL, and TRF assessments for each participant and the mean of all participants across five baselines.
Aggressive behavior results. Through a linear regression analysis over the five baselines, it was revealed that aggressive behaviors declined in all reports except from one teacher. The case analysis revealed several different profiles. Figure 22 graphically illustrates the rule-breaking behaviors of participants as reported by themselves, parents, and homeroom teachers during the five baselines.

BA. BA reported a 7-point T-score decrease in his aggressive behaviors throughout the study. His mother reported a similar observation with a 9-point T-score decrease at home. However, his homeroom teacher observed and reported a 4-point T-score increase in his aggressiveness in the classroom.

DA. DA reported a 12-point T-score decrease in his aggressive behaviors throughout the study. His mother did not reveal much change, indicating a 1-point T-score decrease at home. However, his homeroom teacher observed and reported an 8-point T-score decrease in the classroom over the course of the study.

NA. NA’s was the most modest report: a 4-point decrease in aggressive behaviors. His mother reported a 7-point decrease in his aggression. His homeroom teacher reported an approximate 11-point T-score decrease in aggressive behaviors.

EA. EA reported a 6-point T-score decrease in her aggressive behaviors throughout the study. Her mother’s report resulted in an 18-point T-score decrease within the two baselines in which she participated. Her homeroom teacher observed and reported a 12-point T-score decrease in aggressive behaviors in the classroom.

AA. AA reported a 1-point T-score decrease in his overall aggressive behaviors. His mother reported differently, with a 22-point T-score decrease in aggressive behaviors. His teacher’s 3-point T-score reduction report was more in line with his self-report.
Figure 22. ABOAS aggressive behavior analysis. Illustrates a linear line of regression and projected progress based on the results of the YSR, CBCL, and TRF assessments for each participant and the mean of all participants across five baselines.
**Oppositional defiant problems results.** Through the linear regression analysis over the five baselines, it was revealed in reports that oppositional defiant problems primarily decreased, with some exceptions. The mean of each report indicated a decline overall. The case analysis revealed different profiles. Figure 23 graphically illustrates the oppositional defiant problems of participants as reported by themselves, their parents, and their homeroom teachers during the five baselines.

*BA.* BA reported a 6-point T-score increase in his oppositional defiant problems throughout the study. His mother, in contrast, reported a 10-point T-score decline in his oppositional defiant problems at home. His homeroom teacher was more aligned with his self-report, reporting a 4-point T-score increase in oppositional defiant problems in the classroom. The author/researcher observed an average 1-point T-score decrease during the study in BA’s oppositional defiant problems in the classroom.

*DA.* DA reported a 6-point T-score decrease in his oppositional defiant problems throughout the study. His mother indicated there was no change in this domain of behaviors at home. His homeroom teacher observed a 7-point T-score decrease in his oppositional defiant problems in the classroom. The author/researcher observed an average 16-point T-score decrease in DA’s oppositional defiant problems in the classroom.

*NA.* NA reported a 10-point T-score decrease in his oppositional defiant problems throughout the study. His mother reported a 5-point T-score decrease in the oppositional defiant problem behavior at home. His homeroom teacher saw a larger shift, with a reported 17-point T-score decrease in the classroom. The author/researcher observed an average 10-point T-score decrease in NA’s oppositional defiant problems in the classroom.
EA. EA reported an 8-point T-score decrease in her oppositional defiant problems throughout the study. Her mother reported a 21-point decrease in EA’s oppositional defiant problems at home in the two baselines in which her mother participated. EA’s homeroom teacher observed and reported a 10-point T-score decrease in the classroom. The author/researcher observed an average 10-point T-score increase in EA’s oppositional defiant problems in the classroom.

AA. AA reported a moderate 1-point T-score increase in his oppositional defiant problems throughout the study. His mother reported a 12-point T-score decrease in his oppositional defiant problems at home. His homeroom teacher observed and reported a 3-point T-score decrease in the classroom. The author/researcher observed an average 9-point T-score decrease in AA’s oppositional defiant problems in the classroom.
Figure 23. ABOAS oppositional defiant problems analysis. Illustrates a linear line of regression and projected progress based on the results of the YSR, CBCL, TRF, and DOF assessments for each participant and the mean of all participants across five baselines.
Results of the conduct problems measurement. Through a linear regress analysis, it was revealed that the mean measurement of participants’ conduct problems declined. The individual case analysis revealed several different profiles. Figure 24 graphically illustrates the conduct problems of participants as reported by themselves, parents, and teachers.

BA. BA reported a 24-point T-score decrease in his conduct problems throughout the study. His mother reported an 8-point T-score decline in his conduct problems at home. His homeroom teacher observed a 2-point T-score increase in the classroom for his conduct problems.

DA. DA reported a 7-point T-score decrease in his conduct problems throughout the study. His mother reported a 2-point T-score decline in his conduct problems at home. His homeroom teacher observed a 9-point T-score decline in his conduct problems in the classroom.

NA. DA reported a 7-point T-score decrease in his conduct problems. His mother reported no change in his conduct problems at home. His homeroom teacher observed a 6-point T-score decline in his conduct problems in the classroom.

EA. EA reported a 9-point T-score decrease in her conduct problems throughout the study. Her mother reported a 12-point T-score reduction over the two baseline measurements in which she participated. Her homeroom teacher observed a 19-point T-score decline in her conduct problems in the classroom.

AA. AA reported no change in his conduct problems throughout the study. His mother reported a 20-point T-score decline in his conduct problems at home. His homeroom teacher observed an 8-point T-score decline in his conduct problems in the classroom.
Figure 24. ABOAS conduct problems analysis. Illustrates a linear line of regression and projected progress based on the results of the YSR, CBCL, and TRF assessments for each participant and the mean of all participants across five baselines.
Daily record form. The participants’ daily record form (DRF) was expected to be completed by each participant during the school day. While retrieving the heart rate monitoring device, which was left to charge throughout the night or over the weekend in the researcher’s office, each participant was also expected to obtain a new DRF at the onset of the school day. The DRF was used to record participant heart rate every half hour starting at 8:00 in the morning and concluding at 2:30 in the afternoon when the school day ended. Participants also recorded feeling happy or mad according to each individual’s definition of those feelings.

The use of the DRF was irregular across participants. Some participants made a daily attempt to complete the DRF for the duration of the study. One participant (DA) refused to complete the DRF after the second baseline except when he received regular prompts throughout the day. The other four participants randomly used the DRF as an opportunity to expel frustrations toward varying situations of irritation, anger, and aggression by writing a note or letter to the researcher in the space provided at the bottom of the DRF and on the back of the form. NA kept track of the minutes prior to or after the expected time when he recorded his heart rate and feelings.

The general trend of linear analysis for all participants was a decline in the number of mad responses each day (see Figure 25). The case with the least number of submitted forms (DA) had the steepest decline in negative responses. As the case’s number of submitted forms increased the linear regression lessened in decreasing negative responses. This finding suggests that the longer it took for participants to change their mad reports to a happy report during the day, the longer they continued to fill out the forms.
Figure 25. DRF-frequency of mad responses. Linear regression illustrating number of mad responses participants reported each day on the daily report form throughout the course of the study. Additional linear regression of mean responses shown for all five participants. 

Individual cases' summaries of results. The study’s intent was to examine the therapeutic efficacy of individual adolescent cases routinely monitoring personal heart rate as an antecedent forewarning of explosive anger. Analysis of the five participants produced five individual profiles of change throughout the study. Summary of each unique case covers the five adolescents’ three-month process of daily participation, baseline measurements, and long-term baseline measurement after the intervention.

BA’s quantitative case summary. BA was an early-life adopted 17 year old Russian-American heterosexual Caucasian born and identifying male. Early on his developmental trajectory was stunted in physical, emotional, academic, and intellectual benchmark acquisition. He struggled with hoarding food, irregularly eating and below average weight, internalized and explosive anger in and out of the classroom, general learning differences, medication management, and encopresis. He was a popular student, experimented
with e-cigarettes and varying hair colors and styles, and often volunteered to help with various events before, during, and after school.

He started the study in the first round of participants and followed the process through as prescribed. He created a personal de-escalation plan that included silence, listening to music, and walking or jogging around the school. He obtained his, and often another participant’s, devices and daily record forms each morning and returned them each evening without prompts. Throughout the study he built a reliance on and appreciation for the therapy process. He requested the use of the device during baseline weeks and incorporated the therapy process into his weekly counseling at the school.

Results from objective measurements were produced from all five baselines with the exception of the third and fifth CBCL. BA’s overall change, as measured by several sources, was significant and trended toward a decline in the targeted behaviors. His STAXI-2 C/A measurements revealed a decrease in his state and trait anger experiences and intensities and an increase in his sense of control over expressing angry feelings. However, his unexpressed angry feelings did not change during the study. His monitored social problems, aggressive behaviors, and conduct problems declined according to him and his mother while his teacher reported an increase. He reported a decrease in his rule-breaking behaviors, his mother did not observe a change, and his teacher saw a slight increase. He and his teacher reported an increase in oppositional defiant problems while his mother and the researcher/author saw a decrease. Additionally, his daily record form revealed a decline in negative responses throughout the day.

**DA’s quantitative case summary.** DA was an 18 year old Caucasian-American heterosexual born and identifying male. His developmental trajectory was stunted at the age of eight from a traumatic brain injury. He maintained an emotional status of a 7 year old, struggled
with academic achievement, and had a low IQ, high self-unregulated sexual interest, and often severe concern for perceived potential failures or social problems. He exhibited an internalizing anger, often shifting to obsessions and rumination; he would suddenly shift his moods or expressions of anger.

He started the study in the first round of participants and followed the process through as prescribed. He created a personal de-escalation plan that included remembering his faith in God, thinking about his infant nephew, and slowly walking around campus. He relied on others to provide and return the device and daily record form each day and often forgot to fill out the form.

Results from objective measurements were produced from all five baselines, and every measurement was completed. DA’s overall change, as measured by several sources, was significant and trended toward a decline in the targeted behaviors. His STAXI-2 C/A measurements revealed a decrease in his state and trait anger experiences and intensities and an increase in his sense of control over expressing angry feelings and unexpressed angry feelings. His monitored social problems declined, according to him and his mother, while his teacher reported an increase. All three reported a decrease in his rule-breaking, aggressive behaviors, and conduct problems, and all but his mother reported a decline in oppositional defiant problems. Additionally, the daily record forms that he completed revealed a decline in negative responses throughout the day.

**NA’s quantitative case summary.** NA was a 15 year old Caucasian-American identifying as heterosexual and born and identifying male. He struggled throughout his life with physical, mental, academic, and emotional developmental delays, resulting in many diagnoses. He was shorter than average, above average in weight, spoke with an impediment, and walked
with a V-shaped gait. He displayed an overly traditional masculine social interaction style, was heavily interested in trains and hockey, and framed or labeled his angry persona as his goalie personality.

He started the study in the first round of participants and followed the process through as prescribed. He created a personal de-escalation plan that included taking a break, sleeping or lying down, and walking slowly or being left alone. He obtained his device and daily record form each morning about an hour before school started and returned it at the end of the day without any supports. He struggled with sharing a common location for charging the devices with others and became frustrated if anyone touched or shifted the carefully placed device.

Results from objective measurements were produced from all five baselines with the exception of the first CBCL and second TRF. NA’s overall change, as measured by several sources, was minimal and trended toward a decline in the targeted behaviors. His STAXI-2 C/A measurements revealed the least changes of all participants with some decrease, some increase, and one measurement stabilizing. He increased in his attempt to control and express his angry feelings. His experience of anger stemming from frustrating stimuli did not change; however, his general state and trait anger measurements decreased. He reported an increase in social problems while his mother and teacher saw a decrease. He and his teacher reported a decrease in rule-breaking behaviors and conduct problems, and his mother indicated there was no difference. All respondents reported a decline in his aggressive behaviors and oppositional defiant problems. Additionally, his daily record form revealed a small decrease in negative responses throughout the day.

**EA's quantitative case summary.** EA was an adopted 16 year old Kazakh-American heterosexual Caucasian born and identifying female. She struggled throughout her life with
developmental delays emotionally, academically, and intellectually that were attributed to fetal alcohol exposure and postnatal orphanage neglect, trauma, and inadequate care. She struggled with unhealthy low weight; hoarding of objects; academic, social, and familial challenges; and many medial and psychological diagnoses. She often disrupted the school’s daily activities with dramatic vocal and emotional outbursts stemming from feelings of persecutions.

She started the study in the second round of participants and followed through two-thirds of the study process before excusing herself, citing device irritation and general overwhelming feelings. During her participation she obtained and returned the device and daily record form most mornings and afternoons autonomously, with a reminder usually on Monday mornings. She created a personal de-escalation plan that included a personal mantra attributing other’s negativity to her angry activation, thinking about her favorite sport (i.e., gymnastics), and coloring or listening to music. She obtained special permission from the school’s principal to listen to music during classes. Her primary struggle throughout the study was acclimating to the process’s requirement of wearing the device. She exhibited a tactile irritant that caused a daily distraction.

Results from objective measurements were produced from four baselines with the exception of the second and fourth CBCL and the second TRF. Her overall change, as measured by several sources, was minimal and fluctuated with an increase in some areas and decrease in others. Her STAXI-2 C/A measurements revealed a decrease in her temperament and states of anger. Her trait anger measurement increased along with her control of anger. She reported an increase in her social problems while her mother and teacher reported a decrease. All three reported a decrease in rule-breaking and aggressive behaviors and oppositional defiant and conduct problems. The researcher/author observed an increase in oppositional defiant
symptoms. Additionally, the participant’s daily record form revealed a decrease in negative responses throughout the day.

*AA’s quantitative case summary.* AA was an adopted 18 year old Caucasian-American heterosexual born and identifying male. He struggled with various developmental delays in academics, emotional regulation, and maturity that were attributed to fetal alcohol syndrome. He had a typical height, weight, and gate; often planned sick time off from school; and displayed explosive, typically nonphysical, anger, lashing out at teachers and peers. His mood regulation challenges almost resulted in expulsion right before graduation.

He started the study in the second round of participants and followed the process through as prescribed. He created a personal de-escalation plan that included saying his dog’s name, thinking about hugging his dog, and taking a walk around the school alone. He obtained and returned his device and daily record form each day without any supports. He demonstrated a capacity for flexibility in the process, a characteristic unique to AA. However, in the classroom he struggled and had an outburst and swore at another student, causing some concern.

Results from objective measurements were produced from the first four baselines. He and his mother did not participate in the fifth baseline; they also missed CBCL for the fourth baseline and TRF for the first baseline. His overall change, as measured by several sources, was a decline in his anger, aggression, and associated problems. His STAXI-2 C/A measurements revealed significant changes in almost all areas. He had no change in his feelings of anger. All other measurements of state and trait anger or expressions decreased and his control of anger increased. He reported a slight decrease in social and conduct problems while his mother and teacher reported a larger decrease. He reported an increase in his rule-breaking behavior, and his mother and teacher reported a decrease. He and his teacher reported a small decline in
aggressive behaviors while his mother reported a significant decline. He reported a small increase in oppositional defiant problems while all other respondents reported a decrease. Additionally, his daily record form revealed a decrease in negative responses throughout the day.

**Quantitative summary.** Four of the five participants finished the study’s process and one excused herself during the third baseline. The STAXI-2 C/A, ABOAS, and daily record form measurements revealed a general trend of decreasing the targeted anger and aggressive behaviors. Three had a generally significant decline in these behaviors, one had a small decline, and one had a mixed experience that may be attributed to some of the reasons why she stopped participating early.

**Qualitative Analysis**

The qualitative interviews were completed after the study to assess for the experience of the participants. There were 12 participating adolescents, teachers, and parents who completed the audio recorded structured interviews, producing 3.95 total hours of audio recordings and one written response provided by a participant’s mother. The median individual interview time was 14 minutes and 29 seconds. Two participants’ mothers did not respond to a request for a recorded interview or written response. All interviews were transcribed, analyzed, and coded by the researcher/author.

There were several themes that emerged from the analysis producing a summary of collective experiences and recommendations. Ten questions were asked of the adolescents, teachers, and parents, producing eight different areas of analysis. The questions that ultimately produced the collective participant experience were as follows:

- What was easy or difficult about using the wristwatch heart rate monitor?
- What was easy or difficult about recording your heart rate and emotions?
What was it like to manage your feelings of anger with the heart rate monitor?

What would you tell other’s who might use this therapy?

What changes would you make to the therapy process?

How well do you think the therapy worked?

What did you notice that was unexpected?

What did you observe after your child or student began the therapy?

The questions were used to initially categorize the responses and identify themes.

**What was difficult about using the wristwatch heart rate monitor?**

*Primary difficulty using the heart rate monitor was mechanical issues.*

Interviewee: “It comes off; can’t keep it on.”

Interviewee: “Selecting the options on the device.”

Interviewee: “Couldn’t keep it on; wouldn’t stay on.”

Interviewee: “Had a hard time putting it on.”

Interviewee: “It can’t find your heart rate, then it would, then wouldn’t and it would turn off.”

*Secondary difficulty using the heart rate monitor was tactile issues.*

Interviewee: “Felt weird.”

Interviewee: “Squeezed my wrist.”

Interviewee: “Got itchy after a while.”

Interviewee: “Don’t like wearing things on wrist.”

*Tertiary difficulty using the heart rate monitor was following directions.*

Interviewee: “Recording the heart rate on time.”

Interviewee: “Acquiring the device and returning it to the charger.”

Interviewee: “Looking at it relentlessly.”
What was easy about using the wristwatch heart rate monitor?

Primary ease of using the heart rate monitor was mechanical.
Interviewee: “That was easy. You don’t have to go through all this crap.”
Interviewee: “Find out how many miles I walked.”
Interviewee: “Does what the doctors do to check heart rate.”
Interviewee: “Not that hard to figure out. It’s not like those clocks with the hands.”

Secondary ease of using the heart rate monitor was in following directions.
Interviewee: “Taking off and putting it back on the charger.”
Interviewee: “The responsibility for the device being charged by researcher.”

What was difficult about recording your heart rate and emotions?

Primary difficulty recording the heart rate and emotions was remembering to do so.
Interviewee: “Actually recording it.”
Interviewee: “Getting all of the heart rates recorded.”
Interviewee: “Just remembering.”
Interviewee: “Being late. Some went up to 30 minutes late.”
Interviewee: “Just taking the time to do it.”

Secondary difficulty recording the heart rate and emotions was mechanical issues.
Interviewee: “It was just like, make sure that the clocks are right.”
Interviewee: “It takes a while to press through four things before you get to the heart rate.”

What was easy about recording your heart rate and emotions?

Primary ease of recording the heart rate and emotions was simplicity of method.
Interviewee: “It was pretty simple.”
Interviewee: “Just write like a normal person.”
Interviewee: “There wasn’t anything really hard about it.”
Interviewee: “It was pretty easy.”
Interviewee: “It wasn’t that difficult.”
Interviewee: “Just writing it down.”
Interviewee: “Figuring it out.”
Interviewee: “Writing, I was writing like a normal person, 3, ok, put 3 down.”

Secondary ease of recording the heart rate and emotions was the time intervals.

Interviewee: “It was only every 30 minutes.”
Interviewee: “This was only like every 30 minutes, so it was a lot easier, and a lot less complicated.”

What was it like to manage your feelings of anger with the heart rate monitor?

A general perception was an improvement of angry feelings management with the heart rate monitor.

Interviewee: “Helped me get a better result and not show my goalie side.”
Interviewee: “It was easier to manage my anger. When I saw my heart rate was high, really high, I calmed down.”

Another general perception was no change of angry feelings from the heart rate monitor.

Interviewee: “I didn’t notice anything different from when it was written down.”
Interviewee: “It was stupid. It’s stupid because it’s like, my heart rate is always high.”

A single perception of managing angry feelings with the heart rate monitor was being hard to do so.

Interviewee: “Actually kind of hard; hard as the devils ballsack. It was seriously hard.”
What would you tell others who might use this therapy?

The teenagers’, parents’, and teachers’ primary message to others was that it does help.

Interviewee: “Imagine something that you like, and match something that you would like and it will help you calm down.”

Interviewee: “You don’t have to be perfect, just do your best, and imagine something that you love or like, that you would think of every day, and think about that more and that will help you calm down.”

Interviewee: “I would probably tell them, it’s a good thing.”

Interviewee: “Well it couldn’t hurt, and if their kid is a little more aware it might be a little more helpful.”

Interviewee: “It helped him realize that not every problem is as huge as he thinks.”

Interviewee: “There’s always something to get out of examining yourself.”

Interviewee: “This is a great tool to use because it does actually work in the favor of the teacher and the student as far as getting the desired outcomes that we like to see.”

Interviewee: “It helped him realize and notice things differently.”

Interviewee: “It does actually work in the favor of the teacher and the student as far as getting the desired outcomes that we like to see.”

The teenagers’, parents’, and teachers’ secondary message to others was that buy-in matters.

Interviewee: “The kids who buy into it more and are more intensive seem to get more out of it, and those who have no buy-in and don’t attend to it at all, it’s like it never happened.”

Interviewee: “I would tell someone else to do more of an active involvement.”
Interviewee: “I think it’s a great tool, plus it gives self-initiative of the student, if they buy into it.”

Interviewee: “I think it depends on the student and how well they buy into it.”

Interviewee: “If they buy into it, that’s going to make them more consciously aware of what they are doing and how they are interacting and would change their behavior.”

_The teenagers’, parents’, and teachers’ tertiary message to others was to follow the process even if it’s easy or difficult._

Interviewee: “It’s not as easy as it looks, yet it’s not as hard as it sounds.”

Interviewee: “It’s easy. I would use it. Ya. I’m still going to use it.”

Interviewee: “It’s worth just trying.”

Interviewee: “Record according to the thing, don’t just write in random things, because that didn’t help anybody. Stay accurate and stay true to the original thing.”

Interviewee: “Beware of the steps and the overall system, the overall scope of it and what it’s meant to do.”

Interviewee: “I would definitely say support it, support it and watch it, really touch base with them.”

Interviewee: “I would suggest trying to integrate it, trying to use it next level. Integrating with the direct instruction of the idea that connects the heart rate going up as the behaviors are going up and ramped up.

_Singular suggestions from the teenagers, parents, and teachers were:_

Interviewee: “Don’t lose sight of who you are, and while wearing this, never forget where you come from.”

Interviewee: “Give you something to do in a boring class.”
Interviewee: “It depends on what they like and how they work.”

Interviewee: “If your kids can get something out of it, then it’s worth doing.”

Interviewee: “I think it’s a good thing for teachers to be aware.”

Interviewee: “Having the teachers wear the bracelet for a day so we can experience it and know what and how it works.”

**What changes would you make to the therapy process?**

*The primary general suggested change was to alter the device used to measure the heart rate.*

Interviewee: “If it dies in the middle of the day, have a charger with you, a battery pack, plug the charger in and charge it.”

Interviewee: “It had a little battery setting so that you can turn off all the little parts that you don’t use very much, like the stop watch and those other settings.”

Interviewee: “I would change the shape of the watch, just because the parts break a lot. Like where the clips are, the little clip is, it just doesn’t stay.”

Interviewee: “It’s not super-strong material and it’s not like a watch.”

Interviewee: “In certain lights it’s like you can’t really see it, so you have to cover it up because the red light is like a little LED light, basically that you can’t really see.”

Interviewee: “You don’t need so much of it, because we look at the time and heart rate. You don’t need running and how many millimeters. It’s just a distraction.”

*The secondary general suggested change was the time expectations.*

Interviewee: “Have it be every hour instead. 8, 9, 10 o’clock…. So only like 7 hours.”

Interviewee: “Just how long it is, like during the day. Like how long during the day.”

Interviewee: “Instead of every half hour, do it every 15 minutes.”
Interviewee: “I would change it to every two hours.”

Interviewee: “When you’re not busy you would jot down something instead of a certain time.”

**The tertiary general suggested change was to increase the teacher involvement.**

Interviewee: “The next step is integrating it into our teaching. It’s a mature way of expressing and an age appropriate way of describing anger with heart rate. Instead of saying how is my engine, we can get into the autistic mind and have facts with how they are feeling.”

Interviewee: “Get the teachers more involved in the process and have the teacher be in on whatever. I’m not sure what connection you two are making and what I can do different that will help support that.”

Interviewee: “A little more information on what I could do to support both of you.”

Interviewee: “Bring the teachers in on it a little more.”

**Another general suggested change were various alterations to the overall procedure.**

Interviewee: “Maybe just an easier way to record or log.”

Interviewee: “Bring it home, like once a week at home, then it would be interesting, because I know I get angry at home a lot more.”

Interviewee: “Instead of daily, have one day on one side and one day on the other side.”

Interviewee: “What other way would there be to be accountable? Is this so far distant from his usual paperwork? Is there just a way to incorporate it into something, or is there a particular reward?”

Interviewee: “Try some things and see if you have some control over that number to breathe.”

**How well do you think the therapy worked?**

**The primary response about how well the therapy was perceived to work was beneficial.**
Interviewee: “Very well. It helped me not be angry at all the teachers and other students here and especially the counselors here.”

Interviewee: “I think it was a great process, and how it works for him is that he had something that he was going back to and from this monitoring and self-reflection he can talk about what’s bothering him.”

Interviewee: “It worked very well for me. If people don’t take it seriously and take it as a joke it won’t work. If people take it seriously it will work.”

Interviewee: “It was a great experience. I really enjoyed it. I know some of our people were having trouble with keeping their stuff together, but I was doing great.”

Interviewee: “It was great. Well enough to calm me down when I needed to. When I was really mad at someone, most of the time I didn’t get frustrated with people, I just calmed down.”

Interviewee: “Overall I think there’s a good nucleus of connection with maybe a huge step of addressing anger, or sad, or happy, and a physical piece of what it is doing to his body. I think there was an increased level of that, an awareness of his emotions, what to do with it at all, or how to manage it, or how often.”

Interviewee: “It helped work for me so that I can make sure my emotions are in check. So I didn’t pull out the goalie side of me in school.”

Interviewee: “Got him more motivated to do things. He is now volunteering at the YMCA and going to do mission work this summer and working too.”

Interviewee: “It didn’t not work, (laughing) you could say that. So I would say it is successful. I do actually think he did benefit from that.”

Interviewee: “I think it did help in some way. Because like I said, he would check himself.”
Interviewee: “It helped me to be a better person that anyone else.”

Interviewee: “I did notice that he did more often, ‘I have to take a walk now; I’m going to go ride my skate board.’”

Interviewee: “I think that as part of the persistence of coming and getting it every day and religiously filling it out and making sure he did fill it out, I think that was good for him. So if I was to say how well it worked for him, if I was to put it on a scale of 1 to 10, 10 being really good, maybe like a 6.5.”

*The secondary response about how well the therapy was perceived to work was that it did not.*

Interviewee: “I don’t know, the anger is still there, I didn’t really notice anything different.”

Interviewee: “Horrible. Considering what the options were and how you had to wear it every single day from this time to this time.”

Interviewee: “Didn’t really do much. My impression is that I don’t think she looked at herself.”

*The tertiary response about how well the therapy was perceived to work was a small change.*

Interviewee: “It was fine, I just noticed a difference in different times of the day.”

Interviewee: “I didn’t notice it that much with the anger or anything, but ya, I noticed it. I didn’t get angry that much.”

**What did you notice that was unexpected?**

*The primary reported unexpected awareness was device complications.*

Interviewee: “The software updates on the watch.”

Interviewee: “The no-memory thing, that was unexpected.”

Interviewee: “Not having it plugged in; people bumping it.”
Interviewee: “I didn’t have a clock for the first 4 weeks because it wasn’t accurate.”

The secondary reported unexpected awareness was the psycho-bio-educational benefit.

Interviewee: “My heart rate would get higher than the 100. I didn’t know you could get higher than 130. I had a 136 was my highest. My heart rate went up high, I thought it was more of a low thing. When I was mad it would be a little higher up, and when I was chill it would be a little more down.”

Interviewee: “How high it was. It hit 300 once. That was if I was running. After somebody hit me and I was running after them because I was so mad that someone hit me with the laptop.”

Another secondary reported unexpected awareness was the interest of other students.

Interviewee: “People are interested in your heart rate and ask you what’s that.”

Interviewee: “Everyone wanted one. People kept on asking me where did you get those, I want one of those, well we’re doing a test for Jed and that’s all I said.”

Another secondary reported unexpected awareness was that the therapy process worked.

Interviewee: “Helped me calm down.”

Interviewee: “Seeing how happy I was actually.”

A singular tertiary reported unexpected awareness was teacher supporting the process.

Interviewee: “The teachers didn’t care about us always looking at our watches. Every time we looked at anything else they got mad.”

What did you observe after your child or student began the therapy?

The primary observation after the therapy began was an increase in the adolescents’ self-awareness.
Interviewee: “He noticed that he was one of the outsiders.”

Interviewee: “I think he was more self-reflective, constantly having to think about where he was at.”

Interviewee: “As far as the process goes, it made him stop and think a little bit, and I think that he became self-reflective, but doesn’t know what to do with it once he gets there.”

Interviewee: “I think he was more consciously aware of choices he was making; kept looking at that bracelet to see how am I doing, or where am I at.”

Interviewee: “More aware of checking at times. Because you know you had them checking the list every so often so he would check even between times to see where he was at, so there was some checking that I observed seeing.”

Interviewee: “I think it may have made him more consciously aware of you know, probably, at some point.”

*The secondary observation after the therapy began was an improvement in behaviors.*

Interviewee: “He was more calm and willing to listen to reason.”

Interviewee: “It went right into long-term emotional memory for him which was great. He wanted to do well. In his world he wanted to pass the test, whatever that is.”

Interviewee: “I would say that when he peaked negatively with his behaviors and got out of that point, he has been able to calm himself down. That’s been the big thing. He has been able to calm himself down faster.”

Interviewee: “The biggest area of improvement is about short of regulating after the moment, so he is just not leaving himself amped up.”

*The tertiary observation after the therapy began was the adolescents’ buy-in to the therapeutic process.*
Interviewee: “That he was excited about it. He was aware about it.”

Interviewee: “He was pretty invested in it. He wanted to participate, always monitoring, getting set up and filling out his paperwork, he was pretty invested in doing all that.”

*An additional tertiary observation after the therapy began was no change in the adolescents.*

Interviewee: “I don’t know that I noticed anything, is the truth.”

Interviewee: “I don’t know if I saw any real change from what I knew her previously. She has her ups and downs.”

*A singular reported observation was that the therapy was helpful.*

Interviewee: “All I know is that he said it was helpful.”

**Qualitative analysis summary.** The qualitative interviews produced several emerging themes that combined for an overall summary of the participants experience and recommendations.

**Participant qualitative experience and recommendations.** The heart rate monitor was easy to use, except for some mechanical and tactile issues and the occasional need to explain or clarify the directions. The method for recording the heart rate and emotions was simple to follow with acceptable time intervals, although some adolescents found it hard to remember to do so and there were some interfering mechanical issues. Unexpectedly, there were device complications, psycho-bio-educational benefits, other non-participating adolescents expressed interest in the therapy, and the therapy worked. Almost all interviewees reported the therapy worked well, a couple reported a small change, and a few reported it did not work. Some of the adolescents believed their anger management abilities improved, and the others found it hard or perceived no change. The parents and teachers observed an increase in adolescent
self-awareness and behaviors, a high level of adolescent buy-in, and no change in some behaviors. The interviewees wanted to convey to others that the therapy helps when the process is followed and the adolescent embodies a buy-in. They also suggested simplifying the device, changing the monitoring and recording time intervals, and increasing teacher involvement.
Chapter V: Discussion, Conclusions, and Recommendations

This study hypothesized that participants’ bihourly monitoring of heart rate and emotions would decrease their experience of anger and aggressive behaviors. The change in anger and aggression would be measured with five baselines using the STAXI-2 C/A and ABOAS’s YSR 11–18, CBCL, TRF, and the DOF. Additionally, a qualitative inquiry would explore the subjective interpretation of the experience and change as observed and assessed by the adolescent participants and their parents and homeroom teachers. The hypothesis would be confirmed with a decrease in all the behavioral measurements of the ABOAS and STAXI-2 C/A except STAXI-2 C/A’s Anger Control (AC) measurement, which would increase.

Four of the five participants (i.e., BA, DA, NA, and AA) completed the study in its entirety and one (EA) completed two-thirds before an early completion due to irritations and daily distractions. The STAXI-2 C/A assessment produced three relative domains of measurement, the State Anger (SA), Trait Anger (TA) and AC. The ABOAS assessments produced five relative domains of measurement, the Social Problems (SP), Rule-Breaking Behavior (RBB), Aggressive Behavior (AB), Oppositional Defiant Problems (ODP), and Conduct Problems (CP). Domain T-scores were analyzed using a linear regression analysis to determine change, if any.

As indicated in Figure 26, participants’, teachers’, and parents’ across-case objective assessments supported the original hypothesis except the teachers’ report of SP. The SA measurement declined by 9 T-scores across all participants; the TA declined by 13 T-scores across all participants; and the AC elevated by 9 T-scores across all participants as hypothesized.
**Figure 26.** Mean T-score regression results. Illustrates the increase or decrease in T-score averages for all five participants, across five baselines, using the STAXI-2 C/A’s State Anger (SA), Trait Anger (TA), and Anger Control (AC), and ABOAS’s Social Problems (SP), Rule-Breaking Behaviors (RBB), Aggressive Behaviors (AB), Oppositional Defiant Problems (ODP), and Conduct Problems (CP).

The SP measurement declined by 3 T-scores across all participants and 12 T-scores for the parents while the teachers reported a 1-point increase. The RBB measurement declined by 4 T-scores across all participants, 6-points for the parents, and 3-points for the teachers. The AB measurement declined by 7 T-scores across all participants, 9-points for the parents, and 4-points for the teachers. The ODP measurement declined by 3 T-scores across all participants, 7 for the parents, and 5 for the teachers. The CP measurement declined by 9 T-scores across all participants, 10 for the parents, and 5 for the teachers.
As discussed earlier, SA measured the temporary anger response to internal or external stimuli, which fluctuates in intensity before returning to homeostasis (Spielberger et al., 1983). Using Deffenbacher’s (2011) conceptualization of an anger response as a product of a “pre-anger state, including temporary conditions” (p. 1) the regular awareness of emotion and physiology functioned to diminish participants’ state anger creating an alteration in their pre-anger state. As participants monitored their anger and heart rate they maintained an awareness of their potential for an angry response and then unconsciously regulated their emerging pre-anger state, effectively changing their \textit{state anger}. Through the regular management of their emotions by way of activating their executive functioning skills, focusing on their anger management and potential vulnerabilities, the participants were able to clear their previously unacknowledged build-up of pre-anger emotions prior to being triggered.

TA measured the angry feelings and occasional demeanor that can be constant, or almost constant (Spielberger et al., 1983). The traits presenting in individuals that serve to maintain repetitive and reoccurring clinical expressions of anger, regardless of the environment, diminished beyond SA by four additional T-scores. Results indicate the regular monitoring of emotion, paired with regular monitoring of physiology, has a greater impact on a person’s mood, demeanor, and thinking that is unrelated to their environmental influencers. The therapy’s benefits are then transferrable to other environments and stimuli, supporting the diminishment of anger across settings and increased control of anger. Also, as expected, the participant’s control of their anger (AC) increased as their SA and TA went down.

SP measured the interactions, thoughts, and intentions that participants, teachers, and parents assigned and associated with the participant’s peers. The participant and their parents reported a significant change, larger than any other domain measured. The significant change
can be explained by Brendgen, Vitaro, Turgeon, Poulin, and Wanner’s (2004) study with aggressive 6th-graders. Brendgen et al. found that teenagers “positive illusions about their social relations with classmates… were related to an increase in children’s peer-rated social preference and fostered the stability of children’s dyadic friendships” (p. 1). As the participant’s daily interactions diminished in hostility and anger-filled engagements, their assessment, or *positive illusions*, of friendships and peers improved, effectively improving how they interacted and related to their peers.

However, this was the only domain that teachers reported an elevation in the negative behaviors throughout the study. Teachers witness daily peer interactions and have a unique perspective. This would indicate the participants changed the way they felt and viewed their relationships, reported differently to their parents at home about their daily interactions with peers, and instead the teachers saw no change in interaction and a small increase in negative interactions. This supports Brendgen et al.’s (2004) conclusion that actual peer interactions do not necessarily decrease in concert with the change in perception and feelings.

RBB measured the ability to follow rules and guidelines and maintain expectations. The RBB was the smallest average decrease and the most consistent across reporters. Parents reported the most improvement in rule-breaking behaviors, indicating the therapy affected the participant’s conscious efforts to comply even when not actively focused on monitoring their emotions and heart rate.

AB measurement was a primary inquiry of the study, capturing the tangible expressions of a person’s anger regulation. Participants were close to their parents in their belief of a change with parents leading in their perceptions of diminished aggressiveness at home. Teachers were
less optimistic in their report, although they were consistent in their conservative perspective and reporting in comparison to the parents.

The ODP domain is a strong predictor of not only the symptoms of an oppositional defiant disorder diagnosis, but the frequency of the diagnosis in relation to the measured clinical scale scores (Bellina, Brambilla, Garzitto, Negri, & Nobile, 2013). The rate and level of change the participants perceived versus their parents and teachers were remarkable. In the classroom and at home, the teachers and parents indicated a higher level of change in the participant’s oppositional and defiant behaviors, more than doubling the participant’s perception of the same. This would indicate that the participants were less verbal and expressive of their oppositional and defiant thoughts and feelings and were more appropriately processing these thoughts and feelings instead of acting on them.

The CP domain can be a highly sensitive and adjunctive measurement used in diagnosing a conduct disorder (Lowe, 1998). Conduct behavior problems are often elevated negative antisocial behaviors that emerge when an oppositional-defiant child continues to decline in their behaviors. Uniformly, the participants, parents, and teachers reported a decline in conduct problems at school and home. This indicates that addressing teenage anger and aggression has positive effects on their delinquencies and other conduct related problems that often lead to academic and social developmental challenges.

Collectively, results were encouraging and supported the diminishment of negative childhood and teenage challenges in behavior and interpersonal development when anger is focused on and addressed therapeutically. As the participants routinely worked throughout each school day to monitor their negative emotions, specifically their anger, as well as heart rate, they
were able to improve their overall peer relationships and behaviors. A general maturation in personal and social development was encouraged and activated in the participants.

**Summary and Analysis of Subjective Findings**

The qualitative interviews supported objective findings. The interviews revealed ease in the use of a heart rate monitor although there were some mechanical and tactile complaints and difficulty in remembering the procedure without a reminder. Some of these complications may have been associated with some participants’ symptoms of autism spectrum disorder, auditory processing difficulties and sensitivities, and traumatic brain injury. These complications were minimal, easily addressed, and ultimately led to a simple method of successfully recording the participants’ heart rates and emotions each day.

The interviewees collectively reported that the therapy worked with some minor interfering device complications spawning many psychological and biological educational benefits and an interest from other peers to join and participate. Aligning with the objective data previously reviewed, a general sense of benefit was presumed by all. This could be accounted for by the homogeneity of the sampling. The participants shared very similar demographics, attended a very small school where all classmates and teachers were informed, aware, and involved in some form of the process. There was little for discouragement, forgetfulness, or distraction from the process.

The adolescents were mixed in their reported belief of the change in their angry feelings. One participant who reported no change was unable to complete the study due to various difficulties. Another who reported believing he experienced little change also reflected in his objective reports a belief in a small but positive change. The other three participants expressed a strong level of change within them and were eager to continue working on their behaviors and
self-control. It appeared that the participants who recognized the most ability to control and change within themselves were those with the most actual change, effectively recognizing and improving self-efficacy. Also, encouragingly, the parents and teachers reported an increase in self-awareness and most participants bought into the process.

For future applications of the therapy the interviewees recommended the following: they encouraged clients’ put an honest effort into the therapy process, use a simpler device, change the tracking intervals, and incorporate more involvement by the support systems. The level of buy-in that was exhibited was encouraging for this study and most teachers and parents reported to be impressed with their student’s and child’s level of commitment. EA’s inability to capture a similar level of commitment to the process was reflected in her outcome data and reinforced the importance of a participant’s willingness and commitment to the process. The heart rate monitoring device had other features that were at times a distraction, however a reliable device that only monitored heart rate was not identified. The tracking intervals seemed to be the right amount at every half hour, some interviewees thought it would be beneficial to extend the intervals and some thought a shorter interval would improve the process. There was no consensus for another option. Additionally, adding support systems to the process may benefit or may interfere. Participants were expected to take responsibility for their daily monitoring and it was the intention to instill a sense of personal responsibility to foster growth. Therefore, added supports could enable and interfere, and may be of a benefit when maintaining the intent of personal growth and self-efficacy development.

**Implications**

This study forms a foundation for many new research opportunities and therapeutic practices. Small personal technologies are rapidly evolving and providing research and therapy
with enhanced procedural opportunities. This study demonstrated that recent advances in heart rate monitoring could be applied in an all-day therapy practice to train clients in consciously being aware of their physical and emotional fluctuations to improve their self-awareness and mature their regulation of emotions and mood.

**Limitations**

There were several identified limitations in the design, implementation, and analysis of this study.

**School size and other participants.** The participants attended the same small school, and many were in the same small classes during the day. This may have interfered in some of the participant’s processes. However, the use of this therapeutic strategy beyond this study will have peers influencing in many different ways. The present study’s confounding variable of multiple peers using this therapy strategy may have benefitted or disadvantaged the outcome of the individual cases. The cross-case analysis is more revealing of the influence of multiple participants using the same strategy simultaneously. However, AA was the only participant actively engaged in the therapy process during his final two-weeks of use.

**School schedule.** The school’s schedule for days off, especially during spring break at the beginning of April, was a primary consideration as to the start and end dates of the two groups of participants. To complete the study before the end of the academic year, the participants began the initial baseline and two-week heart rate and emotions monitoring immediately prior to the first week of April, which was scheduled for spring break. Spring break was incorporated into the study as the second baseline for the first group of participants and the initial baseline for the second group of participants. Because the first group’s second baseline was at home, instead of a regular school week, there may have been some alteration in the
process. However, this also evaluates the effects of regular school schedule baselines and vacation baselines. Vacation time can heavily influence the behavior of children and adolescents at school because they become dysregulated due to the interference of the structures they need for self-regulation.

**Other professional observers’ perspective.** The gathered data did not capture all stakeholders’ experiences. The adolescent participants regularly interacted with para-professionals, the principal, and other school staff. The school’s model and small size allows for all students to be known individually by all faculty and staff and interact daily with them. Several of the para-professionals offered unsolicited observations, advice, and recommendations about each of the participant’s experience in the study process. Other employees, especially the front office employees, are regularly involved in the behavioral fluctuations and expressions during the school day. They can have a unique perspective on the behaviors of students. Also, the school’s principal acts as the dean, vice principal and principal of the small school, handling and addressing all behavior problems. The principal’s perspective could have been beneficial in monitoring behavioral changes in the adolescent participants.

**Limited teacher participation.** Many of the teachers reported they would have participated more actively if instructed to do so. It was assumed by the researcher/author that the level of teacher instruction was adequate. The teachers were introduced to the study in a group meeting during a weekly faculty meeting before the school day started. Then, prior to her or his student beginning the study, each participating homeroom teacher was individually trained in the process. The researcher limited his interactions with teachers to the minimal amount during the study to limit confounding influencers. Reoccurring teacher encouragement and retraining may have benefitted the process.
Participant sample. The sample used in the study was a non-randomized sample conveniently selected and identified by the researcher and school principal. The study did not employ a control group to control for causal variable. Without control groups, the results cannot be attributed to a single variable (e.g., heart rate monitoring or anger de-escalation technique) or a combination of variables (i.e., heart rate monitoring and the subsequent anger de-escalation technique).

Researcher bias and the response demands. The researcher performed the roles of study designer, participant recruiter, participant trainer, participant therapist or counselor, and data collector. Therefore, instead of an independent person or persons filling these roles the researcher’s outcome interests may have been served both consciously and unconsciously. This bias also should be recognized in the participants’, teachers’, and parents’ self-reports where each participant may have responded with reports of improving to meet the perceived desires and goals of the researcher.

Recommendations for Future Research

The findings of this foundational study establishes groundwork for future research in many different directions.

School size. The small size of the school hosting this study does not represent many school sizes. When an adolescent attends a school of hundreds or thousands of other students, the level of personal interaction with teachers will most likely change. It is recommended that future research evaluate the impact of school population size on the level of attention and support given to the adolescent using this therapy during the school day.

Therapy time and environment. This study was controlled by using the therapy only at school during the regular school day. Children and adolescents experience dysregulation outside
of school during non-school hours. It is recommended that future research employ the therapy in other settings and during all waking hours. This would include weekends, holidays, and vacations.

**Different participant comparison.** The study employed a multiple case study design with five participants attending the same school. Participants may have influenced each others’ outcome by reminding others to check the heart rate, by retrieving and returning heart rate monitors and daily record forms for others, and by encouraging or discouraging other participants to follow the process. Future research should seek to isolate cases by using a single case study, or multiple cases from various non-interacting locations, to control for participants’ influencing the others’ outcome.
References


Appendix A

Antioch University Seattle IRB Application Form
1. Principal Investigator’s name: Jedidiah S. Savard

2. Academic Department: Psy.D. School of Applied Psychology

3. Departmental Status: 3rd yr. Matriculated Psy.D. Student

4. Phone Number: 603-XXX-XXXX (cell)

5. Name of research advisors:
   
   Mark Russell, Ph.D., ABPP, ABCCAP  
   Steve Curtis, Ph.D., NCSP, MSCP  
   Elise Murowchick, Ph.D.

6. Name & email addresses of other researchers involved in this project:

<table>
<thead>
<tr>
<th>a) Name of Researchers</th>
<th>b) E-mail addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jedidiah S. Savard</td>
<td><a href="mailto:jsavard@antioch.edu">jsavard@antioch.edu</a></td>
</tr>
<tr>
<td>Dr. Mark Russell</td>
<td><a href="mailto:mrussell@antioch.edu">mrussell@antioch.edu</a></td>
</tr>
<tr>
<td>Dr. Steve Curtis</td>
<td><a href="mailto:scurtis@antioch.edu">scurtis@antioch.edu</a></td>
</tr>
<tr>
<td>Dr. Elise Murowchick</td>
<td><a href="mailto:elisem@uw.edu">elisem@uw.edu</a></td>
</tr>
</tbody>
</table>

7. Project Title:

   Reducing adolescent anger and aggression with biofeedback: A mixed methods multiple case study

8. Is this project federally funded? NO

   Source of funding for this project (if applicable):

   The Mio company that produces the Mio Fuse heart rate monitoring wristwatch will provide the heart rate monitoring devices used in the study at Mio’s expense.


10. Expected completion date for data collection: 3/06/2017

11. Project Purpose(s):

   The intent of the study is to examine the use of noninvasive heart rate monitoring to reduce anger. The study will employ routine personal heart rate monitoring as a forewarning of explosive anger in adolescence. A possible outcome of this study is that adolescents exhibiting dysregulated anger in the classroom, home, and other settings can use a round the clock biofeedback warning system that indicates a need to engage in anger de-escalation techniques. The study’s intention is to begin a foundation of research
on the use of personal heart rate monitoring in adolescent anger reduction.

12. Describe the proposed participants- age, number, sex, race, or other special characteristics. Describe criteria for inclusion and exclusion of participants. Please provide brief justification for these criteria.

The multiple case study approach aims to include no more than five adolescent participants between the ages of 13 and 18. Both males and females are welcome to participate. The participants are middle and high school students enrolled full-time at the New Horizon School private school in Renton, WA. New Horizon School specializes in educating students with significant learning disabilities and comorbid childhood and adolescent disorders (e.g., autism, ADHD, etc.). Due to the nature of the study and the population that participants are sampled from, the final participant selection is expected to be primarily males.

Additionally, each participating adolescent will be required to have a participating parent or guardian and homeroom teacher participate in the study. The parent or guardian and teacher will complete questionnaires and a short interview. Their participation is limited to reporting observations and experiences.

The primary inclusion criteria will be adolescent students identified by the researcher in collaboration with the school’s principal who have repeatedly displayed dysregulated anger and aggression in the classroom. Potential participants identified who have demonstrated a reading level below the second grade will be excluded. Also, students who have demonstrated a pattern of truancy behaviors and a tendency to destroy other persons property or their own will be excluded.

13. Describe how the participants are to be selected and recruited.

Participants will be selected from the active enrolled student body at New Horizon School in Renton, WA. The school principal will provide a list of students identified as having regular anger dysregulations in and out of the classroom. The researcher will introduce himself as a doctoral student researcher at Antioch University Seattle, and explain the purpose of the research to each adolescent, parent or guardian, and homeroom teacher. Each will be provided information about the study and asked for volunteer participation.

The homeroom teacher will be contacted after the adolescent and parent or guardian has agreed to participate. A minimum goal of one adolescent, parent or guardian, and homeroom teacher set is expected. No more than five participant case studies will be accepted for this case study.

14. Describe the proposed procedures, (e.g., interview surveys, questionnaires, experiments, etc.) in the project. Any proposed experimental activities that are included in evaluation, research, development, demonstration, instruction, study, treatments, debriefing, questionnaires, and similar projects must be described.
Appendix G lists all standardized assessments used in the study.

The adolescent participant will initially complete a standard psychological behavioral assessment comprised of 2 protocols, a clinical interview, and a mental status exam. The State-Trait Anger Expression Inventory-2 Child and Adolescent (STAXI-2 C/A) will be used for all adolescent participants to measure anger and the Achenbach Youth Self Report For Ages 11-18 (YSR 11-18) will be used to identify their perception of general behaviors at the beginning and end of the study.

Each adolescent participant will be provided a Mio Fuse wrist worn watch, which is a non-invasive heart rate monitoring device. See Appendix J for more information about the device. The device uses infragreen light technology to monitor blood flow through capillaries in wearers’ skin, producing an EKG like measurement of their heart rate. The participant will regularly monitor his or her heart rate during the school day and record the heart rate and mood each half hour on a provided form produced by the researcher (Appendix H).

Three consecutive heart rate monitoring procedures will last two weeks with a one-week dormant period and a retest of the STAXI-2 C/A during. At the end of the study, each adolescent participant will be asked questions in Appendix I and complete the STAXI-2 C/A and YSR 11-18 again. The parent or guardian will complete the Achenbach Child Behavior Checklist for Ages 6-18 (CBCL) before and after the study is conducted. Additionally, each parent or guardian will be asked questions in Appendix I at the end of the study. The homeroom teacher will complete the Achenbach Teacher’s Report Form for Ages 6-18 (TRF) before and after the study is conducted. Additionally, each teacher will be asked questions in Appendix I at the end of the study.

A weekly in-treatment classroom observation will occur using the Achenbach Direct Observation Form to measure the participant’s change in behavior. The observation is visual and non-interactive.

15. Participants in research may be exposed to the possibility of harm - physiological, psychological, and/or social - please provide the following information:

a. Identify and describe potential risks of harm to participants (including physical, emotional, financial, or social harm).

There is no identified potential participant physical or financial harm associated with this study. Emotional discomfort could arise for any of the participants at any time. They will be informed that they can stop their participation at any time during the study.

b. Identify and describe the anticipated benefits of this research (including direct benefits to participants and to society-at-large or others)

The anticipated benefits from this research will be to begin a foundation of research into
the use of convenient and inexpensive heart rate monitors that could improve the lives of adolescents, parents, and teachers living with the effects of explosive uncontrolled adolescent anger outbursts and aggressions. It would provide therapists an inexpensive and easy to implement technology-based therapy. Additionally, this study will begin a new foundation of research that will lead to many other research studies.

c. Explain why you believe the risks are outweighed by the benefits described above as to warrant asking participants to accept these risks. Include a discussion of why the research method you propose is superior to alternative methods that may entail less risk.

The benefits of this research are outweighed by the risks because any unforeseen emerging risk will be addressed immediately and appropriately to be resolved. Also, the study can inform the field of psychology of the efficacy of using newer heart rate self-monitoring technology for diminishing explosive anger in adolescents. This will potentially provide a significant evidence-based therapeutic strategy for mental health therapists working with angry and aggressive adolescents. Consequently reducing adult anger and aggression, which leads to significant societal problems with violent crimes.

d. Explain fully how the rights and welfare of participants at risk will be protected (e.g., screening out particularly vulnerable participants, follow-up contact with participants, list of referrals, etc.) and what provisions will be made for the case of an adverse incident occurring during the study.

All identifying information about each participant will be de-identified and coded with a participant number. Only the researcher will have the participant-number coding list, which will be kept confidential, and password protected on the researchers encrypted computer. Participation will be on a voluntary basis. Each participant will be allowed to cease assessment, interview, or therapeutic participation at any time and can request that their information not be used in the analysis and subsequent research.

16. Explain how participants' privacy is addressed by your proposed research. Specify any steps taken to safeguard the anonymity of participants and/or confidentiality of their responses. Indicate what personal identifying information will be kept, and procedures for storage and ultimate disposal of personal information. Describe how you will de-identify the data or attach the signed confidentiality agreement on the attachments tab (scan, if necessary).

Each parent or guardian participant will be provided an informed consent document (Appendix B). Each teacher participant will be provided an informed consent document (Appendix C). The New Horizon School Principal will be provided an informed consent document (Appendix D). Each adolescent participant will be provided an informed consent/assent document (Appendix E).

To protect all signatures, paper copies of the informed consents and assents will be locked-up. The informed consent and assent documents include notices of audio
recording of the post-treatment interviews and requires separate consent signatures for audio recording. Appendix F lists all collected demographic information for participants.

17. Will electrical, mechanical (electroencephalogram, biofeedback, etc.) be applied to participants, or will audio-visual devices be used for recording participants?
If YES, describe the devices and how they will be used:

Each adolescent participant will be provided a wrist worn device, similar to a wristwatch, which monitors the wearer’s heart rate. The device uses noninvasive infragreen technology to monitor blood flow in the capillaries of the wearer’s skin, translating it to a number that is displayed on the devices screen. Several devices provide this technology including the Mio Fuse, FitBit HR, and Apple iWatch. The Mio Fuse has been identified as the preferred device for this study due to its programmable heightened heart rate indicators and large visual information output.

Additionally, each interview at the end of the study will be audio recorded using two separate devices to ensure capture of information. Both audio capturing devices are digital recorders; password protected, and will have activated encryption technology accessible only by the interviewer.

18. Type of Review: Full

Please provide your reasons/justification for the level of review you are requesting.

We are requesting a Full research review due to the age of the participants. The devices used in the study are noninvasive and potential for harm to participants is minimal, which would traditionally require an Expedited review. However, the participants are under the age of 18 and considered vulnerable. We are asking permission to study adolescents under the age of 18 in the use of a wrist worn noninvasive device, conducting interviews, and collect and process data. Additionally, we are asking permission to conduct interviews with adult parents or guardians and teachers, and to collect and process that data.

19. Informed consent and/or assent statements, if any are used, are to be included with this application. If information other than that provided on the informed consent form is provided (e.g. a cover letter), attach a copy of such information. If a consent form is not used, or if consent is to be presented orally, state your reason for this modification below. *Oral consent is not allowed when participants are under age 18.

*See attached form Appendix B for parental consent, Appendix C for teacher consent, Appendix D for school principal consent, and Appendix E for adolescent consent.

20. If questionnaires, tests, or related research instruments are to be used, then you must attach a copy of the instrument at the bottom of this form (unless the instrument is copyrighted material), or submit a detailed description (with examples of items) of the research instruments, questionnaires, or tests that are to be used in the project. Copies will
be retained in the permanent IRB files. If you intend to use a copyrighted instrument, please consult with your research advisor and your IRB chair. Please clearly name and identify all attached documents when you add them on the attachments tab.

I have agreed to conduct this project in accordance with Antioch University's policies and requirements involving research as outlined in the IRB Manual and supplemental materials.

__________________________________________________________
Researcher Signature/Date
Appendix B

Antioch University Seattle IRB Approval
Fwd: Online IRB Application Approved: Reducing adolescent anger and aggression with biofeedback: A mixed methods multiple case study March 18, 2016, 1:59 pm

Mark Russell <mrussell@antioch.edu>  Thu, Mar 24, 2016 at 5:43 PM
To: Jedidiah Savard <jsavard@antioch.edu>

---------- Forwarded message ----------
From: <mrussell@antioch.edu>
Date: Fri, Mar 18, 2016 at 10:59 AM
Subject: Online IRB Application Approved: Reducing adolescent anger and aggression with biofeedback: A mixed methods multiple case study March 18, 2016, 1:59 pm
To: mrussell@antioch.edu, bsammons@antioch.edu

Dear Jedidiah S Savard,
As Chair of the Institutional Review Board (IRB) for Antioch University Seattle, I am letting you know that the committee has reviewed your Ethics Application. Based on the information presented in your Ethics Application, your study has been approved.

Your data collection is approved from 03/18/2016 to 03/17/2017. If your data collection should extend beyond this time period, you are required to submit a Request for Extension Application to the IRB. Any changes in the protocol(s) for this study must be formally requested by submitting a request for amendment from the IRB committee. Any adverse event, should one occur during this study, must be reported immediately to the IRB committee. Please review the IRB forms available for these exceptional circumstances.

Sincerely,
Mark Russell
Appendix C

Parent or Guardian Informed Consent Form
CONSENT TO RESEARCH

Antioch University Seattle
PARENT OR GUARDIAN CONSENT FORM

Researchers:
Jedidiah Savard, Psy.D. Student, (603) XXX-XXXX
Mark Russell, Ph.D., ABPP, ABCCAP, (206) XXX-XXXX
Steve Curtis, Ph.D., NCSP, MP, (206) XXX-XXXX
Elise Murowchick, Ph.D., (206) XXX-XXXX

Researchers’ statement
We are asking you and your child to be in a research study. The study’s information will be used in the production of a doctoral dissertation for the primary researcher. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called “informed consent.” We will give you a copy of this form for your records.

PURPOSE OF THE STUDY
Anger in adolescence expresses in many different ways, and can lead to difficulties in academics, employment and social situations. The intent of this study is to examine a new inexpensive and effective form of therapy to be used in helping teenagers control their anger and frustration.

STUDY PROCEDURES
The study process is designed to obtain information about the experience of your adolescent, yourself, and your child’s teacher.

Adolescent participation:
Your child will complete a standard behavioral assessment that is used by psychologists to determine treatment recommendations. The assessment includes a clinical interview to learn more about your child’s unique life. Then a checklist of questions about his or her typical behaviors and feelings of frustration and anger is completed. The assessment will take approximately 1 hour and can be completed at home or in a meeting with the researcher, depending on your preference.

After completing the assessment, for two weeks your child will wear a Mio Fuse wristwatch during the school day that monitors his or her heart rate while in school. He or she will record the heart rate indicated on the watch every half hour and mark current feelings of happiness or frustration. This will occur during the school day and will not interfere with your child’s education.

On the third week there will be nothing for your child to do except complete a questionnaire 15-minute questionnaire about feelings of frustration.
The two-week heart rate monitoring and feelings recording process will occur two more times. Upon completion of the third two-week heart rate monitoring process a 15-minute questionnaire is completed about feelings of frustration and anger. Then your child will have the opportunity to spend 15 to 20 minutes describing what it was like to participate in the study.

Your participation:

A 20 to 30 minute initial interview can be completed at home to get some background information about your child. You will complete a questionnaire about information regarding your child’s general and specific behaviors based on what you observe from the unique perspective of the parent. At the end of the study, you are asked to complete an interview with the researcher, taking approximately 15 to 30 minutes to describe what you observed for changes during the study and what you would recommend.

You and your child can opt to not answer any questions or can choose to break from participation at any time.

RISKS, STRESS, OR DISCOMFORT

Unforeseen complications can arise at any time. If at any time you or your child feels unnecessary stress or discomfort caused by the study, you should contact the researcher at (603) XXX-XXXX so that accommodations can be made, or you can take a break, or opt out of a part of the study.

BENEFITS OF THE STUDY

The anticipated benefits from this research will be to begin a foundation of research into the use of recently developed technology that could improve the lives of adolescents, parents, and teachers living with the effects of explosive uncontrolled anger outbursts. It would provide therapists an inexpensive and easy to implement technology-based therapy. Additionally, this study should lead to many other substantial research studies.

CONFIDENTIALITY OF RESEARCH INFORMATION

All data collected is confidential. Personal identifying information security is very important to us, and you and your child’s personal identifying information will be handled securely and privately. Audio recordings will be made of all end-of-study interviews to accurately capture the information we talk about. All identifying information and recordings will be locked in an encrypted computer that only the primary researcher has access to. You and your child’s identifying information will be hidden and only be identified by a generic non-identifying name or sequence of numbers.

University staff sometimes reviews studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records may be examined. The reviewers will protect your privacy. The study records cannot be used to put you at legal risk of harm.

Parent or Guardian’s statement

This study has been explained to me. I volunteer to take part, and allow my child to take part, in this research. I have had a chance to ask questions. If I have questions later about the research,
or if participating in this study has harmed my child, or me, I can contact one of the researchers listed on the first page of this consent form. I will receive a copy of this consent form.

Printed name of my child

Printed name of parent

Parent/Guardian signature for consent to participate  Date

Parent/Guardian signature for consent for my child to participate  Date

Parent/Guardian signature for consent to audio recording of the interview  Date

Printed name of researcher  Signature of researcher  Date

Parent notes and comments:

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________
Appendix D

Homeroom Teacher Informed Consent Form
CONSENT TO RESEARCH
Antioch University Seattle
TEACHER CONSENT FORM

Researchers:
Jedidiah Savard, Psy.D. Student, (603) XXX-XXXX
Mark Russell, Ph.D., ABPP, ABCCAP, (206) XXX-XXXX
Steve Curtis, Ph.D., NCSP, MP, (206) XXX-XXXX
Elise Murowchick, Ph.D., (206) XXX-XXXX

Researchers’ statement
We are asking you to be in a research study. The study’s information will be used in the production of a doctoral dissertation for the primary researcher. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called “informed consent.” We will give you a copy of this form for your records.

PURPOSE OF THE STUDY
Anger in adolescence expresses in many different ways, and can lead to difficulties in academics, employment, and social situations. The intent of this study is to examine a new inexpensive and effective form of behavioral therapy to be used in helping teenagers control their anger and frustration.

STUDY PROCEDURES
The study process is designed to obtain information about the experience of your student, his or her parents or guardians, and yourself while implementing the therapy.

Your participation:
You will be asked to complete a questionnaire about information regarding your student’s general and specific behaviors based on what you observe from the unique perspective of the homeroom teacher. At the end of the study, you are asked to complete another behavioral questionnaire and participate in an interview with the researcher, taking approximately 15 to 30 minutes describing what you observed for changes during the study and what you would recommend.

You can opt to not answer any questions or can choose to break from participation at any time.

RISKS, STRESS, OR DISCOMFORT
Unforeseen complications can arise at any time. If at any time you feel unnecessary stress or discomfort caused by the study, you should contact the researcher at (603) XXX-XXXX so that accommodations can be made, or you can take a break, or opt out of a part of the study.
BENEFITS OF THE STUDY

The anticipated benefits from this research will be to begin a foundation of research into the use of recently developed technology that could improve the lives of adolescents, parents, and teachers living with the effects of explosive uncontrolled anger outbursts. It would provide therapists an inexpensive and easy to implement technology-based therapy. Additionally, this study will begin a new foundation of research that will lead to many other research studies.

CONFIDENTIALITY OF RESEARCH INFORMATION

All data collected is confidential. Personal identifying information security is very important to us, and your personal identifying information will be handled securely and privately. Audio recordings will be made of all studies completion interviews to accurately capture the information we talk about. All identifying information and recordings will be locked in an encrypted computer that only the primary researcher has access to. Your identifying information will be hidden and only be identified by a generic non-identifying name or sequence of numbers.

University staff sometimes reviews studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records may be examined. The reviewers will protect your privacy. The study records will not be used to put you at legal risk of harm.

Teacher’s statement

This study has been explained to me. I volunteer to take part in this research and to have my post-study interview audio recorded. I have had a chance to ask questions. If I have questions later about the research, or if I have been harmed by participating in this study, I can contact one of the researchers listed on the first page of this consent form. I will receive a copy of this consent form.

Printed name of teacher

_________________________________  ______________________
Teacher’s signature for consent to participate                    Date

_________________________________  ______________________
Teacher’s signature for consent to audio recording of the interview    Date

Printed name of researcher  Signature of researcher  Date
Appendix E

Principal Informed Consent Form
Researchers:
Jedidiah Savard, Psy.D. Student, (603) XXX-XXXX
Mark Russell, Ph.D., ABPP, ABCCAP, (206) XXX-XXXX
Steve Curtis, Ph.D., NCSP, MP, (206) XXX-XXXX
Elise Murowchick, Ph.D., (206) XXX-XXXX

Researchers’ statement
We are asking the New Horizon School to permit a research study that would include one to five students, the students’ parents, and their homeroom teacher(s). The study’s information will be used in the production of a doctoral dissertation for the primary researcher. The purpose of this consent form is to give you the information you will need to help you decide whether to permit the study or not. Please read the form carefully. You may ask questions about the purpose of the research, the possible risks and benefits, rights of participants, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called “informed consent.” We will give you a copy of this form for your records.

PURPOSE OF THE STUDY
Anger in adolescence expresses in many different ways, and can lead to difficulties in academics, employment and social situations. The intent of this study is to examine a new inexpensive and effective form of therapy to be used in helping teenagers control their anger and frustration.

STUDY PROCEDURES
The study process is designed to obtain information about the experience of an adolescent, the adolescent parent or guardian, and the child's homeroom teacher.

Adolescent participation:
The child will complete a standard psychological behavioral assessment that is used by psychologists to determine treatment recommendations. The assessment includes a clinical interview to learn more about the adolescents’ unique life. Then a standardized checklist of questions is completed about his or her typical behaviors and feelings of frustration and anger. The assessment will take approximately one hour and can be completed in multiple sessions or all at once depending on availability, parent, and school preference.

After completing the assessment, for two weeks the child will wear a Mio Fuse wristwatch that monitors his or her heart rate while in school. He or she will record the heart rate indicated on the watch every half hour and mark if feeling happy or frustrated. This will
occur during the school day and should not interfere with the child’s education.

On the third week there will be nothing to do except complete a questionnaire about feelings of frustration and anger. This questionnaire will take approximately 15 minutes and can be completed at school anytime during the day.

The two-week heart rate monitoring and feelings recording process will occur two more times. Upon completion of the third two-week heart rate monitoring process a 15-minute questionnaire is completed about feelings of frustration and anger. Then the child will have the opportunity to spend 15 to 20 minutes describing what it was like to participate in the study.

**Parent and homeroom teacher participation:**

Parents and the adolescents’ homeroom teacher will complete a questionnaire about information regarding the adolescents’ general and specific behaviors based on what they observe from the unique perspective of the parent and teacher. At the end of the study, they are asked to complete an interview with the researcher, taking approximately 15 to 30 minutes to describe what they observed for changes during the study and what they recommend.

The parent, child, and/or homeroom teacher can opt to not answer any questions or can choose to break from participation at any time.

**RISKS, STRESS, OR DISCOMFORT**

Unforeseen complications can arise at any time. If at any time a participant, parent, teacher, or the school feels unnecessary stress or discomfort is being caused by the study, the primary researcher can be contacted at (603) XXX-XXXX so that accommodations can be made, or a break can be taken, or an individual can opt out of a part of the study.

**BENEFITS OF THE STUDY**

The anticipated benefits from this research will be to begin a foundation of research into the use of recently developed technology that could improve the lives of adolescents, parents, and teachers living with the effects of explosive uncontrolled anger outbursts. It would provide therapists and school psychologists and counselors an inexpensive and easy to implement technology-based therapy. Additionally, this study will begin a new foundation of research that will lead to many other research studies.

**CONFIDENTIALITY OF RESEARCH INFORMATION**

All data collected is confidential. Personal identifying information security is very important to us, and all participant personal identifying information will be handled securely and privately. Audio recordings will be made of all studies completion interviews to accurately capture the information we talk about. All identifying information and recordings will be locked in an encrypted computer that only the primary researcher has access to. All identifying information will be hidden and only be identified by a generic non-identifying name or sequence of numbers.

University staff sometimes reviews studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, the records may be examined. The
reviewers will protect all participants’ privacy. The study records will not be used to put anyone at legal risk of harm.

**New Horizon School’s Principal statement**

This study has been explained. The school permits the researchers to identify and contact student’s, the student’s parents or guardians, and the student’s homeroom teacher. The school knows that each of these participants will have the opportunity to consent individually and to participate or decline participation. The school acknowledges that one to five students may participate in the study as outlined above. The school will be notified in writing of any alterations to the study prior to implementation if the need arises. The school has had a chance to ask questions, and if questions arise later about the research, or if any concerns arise about the research, the school can contact one of the researchers listed on the first page of this consent form. The school will receive a copy of this consent form.

<table>
<thead>
<tr>
<th>Printed name of school principal</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>School principal signature of consent</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Printed name of researcher</th>
<th>Signature of researcher</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

Adolescent Informed Assent Form
Researchers:

Jedidiah Savard, Psy.D. Student, (603) XXX-XXXX
Mark Russell, Ph.D., ABPP, ABCCAP, (206) XXX-XXXX
Steve Curtis, Ph.D., NCSP, MP, (206) XXX-XXXX
Elise Murowchick, Ph.D., (206) XXX-XXXX

Researcher’s statement:

My name is Jed Savard.

I am asking you to be in a research study because I am trying to learn more about how to help children feel less angry and frustrated.

If you agree to be in this study you will participate in some tests and answer some questions.

At first you will answer some questions about yourself.

Then you will wear a special watch each day during school for two weeks. The watch can tell how fast your heart is beating. You will be able to check how fast your heartbeats, and then you can write down the speed of your heartbeat, and write down if you are feeling happy or mad.

Then you will not wear the watch for a week and answer some questions about how you are feeling.

You will wear the watch for two more weeks, then another week off, and two more weeks again.

Then you will answer some questions at the end and you will be able to tell me all about how you liked or didn’t like using the heart beat watch. I will record our conversation, and will not allow anyone else to listen to the recording.

No part of this study can hurt you. If there is a problem, you can stop at any time and you can tell me, or your parents or teachers that you have a concern.

The process is designed to help you have better control over your angry feelings. It should help you to better know when you are about to get angry so that you can do something to stop from getting into trouble.
Please talk this over with your parents before you decide whether or not to do this. We will also ask your parents if it is okay for you to be in this study. But even if your parents say “yes” you can still decide not to do this.

If you don’t want to be in the study, you don’t have to participate. Remember, being in this study is up to you and no one will be upset if you don’t want to participate or even if you change your mind later and want to stop.

You can ask any questions about the study. If you have a question later you can call me at (603) XXX-XXXX or ask me next time you see me.

Signing your name at the bottom means that you agree to be in this study. Your doctors will continue to treat you whether or not you participate in this study. You and your parents will be given a copy of this form after you have signed it.

Your statement:

This research has been explained to me. I agree to take part in this study. I have had a chance to ask questions. If I have more questions, I can ask the doctor or researcher.

Your name is:

________________________________________

________________________________________

Your signature to participate in the study

Date

Your signature to have your interview audio recorded

Date

Researcher’s signature

Date
Appendix G

Participant Collected Demographic Information
Participant Collected Demographic Information

Adolescent Participant

1. Name
2. Date of Birth/Age
3. Grade in Education
4. Sex
5. Identifying Gender
6. Medical and/or Psychological Diagnoses

Parent or Guardian

1. Name
2. Contact phone number and mailing address
3. Relationship to the Adolescent
4. Family Psychological/Behavioral History Diagnoses

Homeroom Teacher

1. Name
2. Contact phone number and mailing address
Appendix H

Initial Parent or Guardian Clinical Structured Interview
Initial Parent or Guardian Interview  

Adolescent Participant Name ________________________________________________

Adolescent Participant Study ID# __________________

Parent or Guardian Participant Name _________________________________________

Relationship to the Adolescent Participant______________________________

Parent or Guardian Participant Study ID# __________________

Homeroom Teacher Name _________________________________________________

Homeroom Teacher Study ID# __________________

Parent or Guardian Contact Phone #________________________________________

Mailing Address __________________________________________________________

Apt.#________________________City________________________State__________Zip________

Adolescent DOB_______________________ Age____________________________

Sex________________________Identifying Gender____________________________

Grade______________________________

Relevant Medical Diagnoses________________________________________________

Relevant Psychological Diagnoses___________________________________________

Is your child currently on medications?   Yes   No

If so, what medications?

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________
Adolescent Relevant Developmental History (Pregnancy, Birth, Milestones [e.g., walking, talking]

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Adolescent Relevant Academic History

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Adolescent Relevant Behavioral History

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Behavioral history continued

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What psychological or behavioral interventions have been tried for anger and aggression?

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What consequences have resulted from anger and aggression?

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______________________________________________________________________________

Number of Siblings ____________________________
Ages and M or F __________________________________
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<th>Check all that apply</th>
<th>Participant</th>
<th>Father</th>
<th>Mother</th>
<th>Brother(s)</th>
<th>Sister(s)</th>
</tr>
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<tr>
<td>Learning Difficulties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention Difficulties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Hyperactive Difficulties</td>
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<td></td>
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<tr>
<td>Social Difficulties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Areas of Giftedness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hx of Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hx of Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hx of Suicidality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance Abuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Criminal Legal Hx</td>
<td></td>
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</table>

Additional Relevant Information

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Appendix I

Standardized Objective Assessments Used in this Study

Pretreatment, In-treatment, and Post-treatment
<table>
<thead>
<tr>
<th>Assessment</th>
<th>Available sample protocol or report</th>
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<tbody>
<tr>
<td>Achenbach Direct Observation Form</td>
<td><a href="http://www.aseba.org/forms/dof.pdf">http://www.aseba.org/forms/dof.pdf</a></td>
</tr>
<tr>
<td>Achenbach Teacher’s Report Form for Ages 6-18</td>
<td><a href="http://www.aseba.org/forms/trf.pdf">http://www.aseba.org/forms/trf.pdf</a></td>
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</table>
Appendix J

In-treatment Adolescent Self-Monitoring Measurement
## Participant Daily Heart Rate Monitoring Form

<table>
<thead>
<tr>
<th>Time</th>
<th>Heart Rate</th>
<th>Feeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>8:30am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>9:00am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>9:30am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>10:00am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>10:30am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>11:00am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>11:30am</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>12:00pm</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>12:30pm</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
<tr>
<td>1:00 pm</td>
<td>_________</td>
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<tr>
<td>1:30pm</td>
<td>_________</td>
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<td>2:00pm</td>
<td>_________</td>
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<tr>
<td>2:30pm</td>
<td>_________</td>
<td><img src="image" alt="Angry" /> <img src="image" alt="Happy" /></td>
</tr>
</tbody>
</table>

How I am feeling today:

________________________________________________________________________________________________________
________________________________________________________________________________________________________
________________________________________________________________________________________________________
________________________________________________________________________________________________________
________________________________________________________________________________________________________

Instructions: Check your device at the beginning and middle of each hour. Write down the heart rate number next to the time you checked. Circle the angry face if you are feeling angry or mad. Circle the happy face if you are feeling happy or glad. Please circle one or the other.
Appendix K

Heart Rate Monitoring Device Description
**Heart Rate Monitoring Device Description**

The Mio Fuse Heart Rate Monitoring and Activity Tracker is a trademark product of Mio Global (Physical Enterprises Inc.). It uses infragreen technology invented by Mio Global founder Liz Dickenson to detect heart rate based on blood flow in the capillaries of the wearer’s skin (Wauters, 2013). The Fuse is a wrist worn device that will capture EKG-accurate heart rate data, …tracks steps, pace, distance and calories to provide a complete assessment of your daily effort, [has] customizable display and configurable heart rate zones, connects to fitness apps with Bluetooth Smart (4.0). …stores activity data and wirelessly syncs to the Mio GO app, [and is] water resistant to 30m (3ATM). (Mio Global, 2015)

The Mio Fuse also has colored indicators and a vibration feature that alerts the wearer to heart rate elevations that have entered a predetermined zone (Mio Global, 2015). The vibration and color indicators can be activated and used simultaneously or independently. Each has up to five zones that can be set for activation. The large digital display is easy for children to read, and comes in crimson red, cobalt, or aqua green.

*Figure 27.* Picture of the Mio Fuse Illustrating a Displayed Heart Rate of 100 BPM.
Appendix L

Description of New Horizon Pre-Internship,

Clinical Psychology Clinical Pre-Internship Brochure
Clinical Pre-internship

**Doctoral Student:** Jedidiah S. Savard

**Email:** jsavard@new-horizon-school.org

**Site Description**

New Horizon School is a private school providing special education and supportive services to 4th through 12th grade students living with autistic, attention, behavioral, and other neurological disorders. Optional post-graduate one and two year transitioning education is provided to students who need additional assistance upon graduation. The students attend full-time classes in general academic curriculums as defined by the state of Washington, and participate in extra-curricular courses and activities such as fishing, fencing, archery, weight training, cross country running, culinary arts, digital coding, student government, advanced gaming strategies, and provide visitor campus tours. The supportive atmosphere has a small class size of generally six to ten students.

**Duration:** April 2015 – July 2016

**Institutional Support**

The New Horizon School faculty and staff provide administrative, clerical, and supervisory support. Licensed psychologists provide group and individual clinical supervision on-site and at Antioch University Seattle.

**Stipend**

There is no stipend or other form of payment for time and services.
Supervision and other Professional Interactions

Steven E. Curtis, Ph.D., NCSP – Primary individual/group supervisor & didactic trainer

Cheryl R. Azlin, Psy.D. – Individual supervision & didactic training

Arthur Lewy, Ph.D. – Individual supervisor

Marla Veliz, MA - School Principal

Range of Activities

Pre-interns provide individual therapeutic services to children and adolescents on a weekly and bi-weekly basis. Crisis intervention and counseling is provided daily as the need arises. Classroom interventions and psycho-educations are delivered on a rotating schedule intent on prevention. Interventions are consistent with evidence-based practices empirically researched and designed for children and adolescents.

A pre-intern can conduct bi-annual achievement assessments to track students’ academic achievement. Assessment and reevaluation of disorders and range-of-abilities are provided upon request from parents or in accordance with requirements for individual education plan (IEP) and special education services.

Staff meetings, Seminars, and Didactic Training Opportunities

- Weekly didactic training is attended that is directly focused on working with children and adolescents in an academic and therapeutic focus and setting.

- Weekly and intermittent meetings and consultations with school faculty and staff.

- Professional seminars attended at Antioch University Seattle, University of Washington, Washington State Psychological Association, and Western State Hospital.
Appendix M

Child and Adolescent Assessment and Therapy Course Syllabus
Psy.D. Course Syllabus

<table>
<thead>
<tr>
<th>Course:</th>
<th>PSYC778: Child &amp; Adolescent Assessment &amp; Therapy II</th>
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<tbody>
<tr>
<td>Credits:</td>
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</tr>
<tr>
<td>Quarter:</td>
<td>Spring 2015</td>
</tr>
<tr>
<td>Prerequisites:</td>
<td>PSYC777: Child &amp; Adolescent Assessment &amp; Therapy I</td>
</tr>
<tr>
<td>Instructor:</td>
<td>Steve Curtis, Ph.D., NCSP, MSCP</td>
</tr>
<tr>
<td>Office Hours:</td>
<td>By appointment</td>
</tr>
<tr>
<td>Contact Information:</td>
<td><a href="mailto:scurtis@antioch.edu">scurtis@antioch.edu</a></td>
</tr>
<tr>
<td>Course Liaison:</td>
<td>Mark Russell, Ph.D., ABPP, ABCCAP <a href="mailto:mruvell@antioch.edu">mruvell@antioch.edu</a></td>
</tr>
<tr>
<td>Class Time:</td>
<td>Fridays 1-4 pm</td>
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**Course Description**

The third course in the AUS Child Clinical Psychology concentration. An advanced seminar in child and adolescent assessment and psychotherapy continuing the exploration and implementation of evidence-based child, adolescent, and family treatments as well as current trends and issues related to the practice of child clinical psychology. **Prerequisite:** PSYC772: Child & Adolescent Assessment; PSYC777: Child & Adolescent Assessment & Therapy I.

**Expanded Course Description**

This course will build upon the previous courses. We will learn more in-depth material in the field by spending much time understanding the principles of applied behavior analysis (ABA), functional behavioral assessment (FBA), and behavior intervention planning/implementation (BIP). We will also learn more about children with autism, ADHD, sensory processing issues, and other behavior challenges. These course goals and teachings are meant to help “round-out” your learning and experiences as you complete your doctoral clinical psychology child-track training. Included in the course will be required readings, class discussions, chapter outlines, completion of a behavior-change project, and an agency paper.

**Assignment and Competency List**

Behavior-Change Project
- Competency VII: Interventions, Benchmark 3
- Competency VIII: Research & Evaluation, Benchmark 3

**Learning Objectives**

To have knowledge of multiple types of theoretical perspectives and therapies for working with a diverse group of children and adolescents.
To understand the application of applied behavior analysis, functional assessment, and behavior intervention development.
To have the capacity to design a comprehensive treatment plan and evaluate outcomes based on diagnosis, assessment, other information regarding etiology, and background.
To increase the knowledge base of individuals with autism, sensory processing difficulties, ADHD, and children with other challenging behaviors.
To learn proactive ways to help kids be successful.

**Behavior-Change Project:** Students will be required to complete a behavior-change project. The subject can either be himself or herself, another adult, or a child. Students are to select a behavior of concern, conduct an FBA surrounding that behavior, produce a small written report with target behaviors listed, collect initial baseline data, collect treatment data, and summarize the findings. The format of this report will be provided in class.

*If completed to instructor satisfaction, this assignment will fill this/these competency(-ies)/benchmark(s):*

**COMPETENCY VII: Interventions**
**BENCHMARK 3:** Formulates and conceptualizes cases and plans interventions utilizing at least one theoretical orientation. For example, formulates diagnoses; selects appropriate interventions for different problems and populations; writes case conceptualizations and treatment plans based on EBP; expands confidence in interventions as rules become guidelines; broadens selection of interventions and their planning.

**COMPETENCY VIII: Research & Evaluation**
**BENCHMARK 3:** Demonstrates understanding of research methods and techniques of data analysis. For example, critically reviews psychological research; contributes to research and scholarly activity, which may include presentation at conferences; participates in research teams; submits manuscript for publication.
Appendix N

FBA/BIP Assignment Leading to this Study
FUNCTIONAL BEHAVIORAL ASSESSMENT

Name: Han Solo  
School: New Horizon School  
Birthdate: December 25, 0001  
Grade: 6th  
Age: 13  
Report Date: 5/31/2015

PURPOSE:

Han was referred for a functional behavioral assessment because of his persistent and uncontrollable anger outbursts in the classroom. The information provided is intended to be used in developing a complete plan for Han to manage his own behavior.

PROCEDURES:

Interview with Han’s mother (4/29/15 & 5/12/15)
Interview with Han’s teachers (4/29/15)
Classroom observation at New Horizon School (5/04/15 & 5/12/15)
Clinical interview with Han (5/04/15 & 5/12/15)

BACKGROUND:

Han is a 13 year old male student at New Horizon School in Renton, Washington. He has an extensive history of challenging and destructive behavior. His mother and teachers report his anger to be associated with lowered self-efficacy primarily with negative feelings towards an inability to complete tasks. The excessive anger outbursts result in aggressive verbal and physical presentations that appear to be unprovoked and no discernable forewarning is identified.

Han has been formally diagnosed with Autism Spectrum Disorder (ASD), Attention-Deficit Hyperactivity Disorder (ADHD), and Pediatric Autoimmune Neuropsychiatric Disorder Associated with Streptococcal infections (PANDAS). He attended public schools in the Bellevue, WA school district from Kindergarten through 5th grade. The persistent behavioral and academic challenges he faced led Han’s mother to place him in a private school specializing in working with children and adolescents with similar disorders.

He demonstrates and reports no other major medical concerns. His current medications are Ritalin for ADHD management and Celexa to manage his moods. His mother is a Registered Nurse and closely manages his daily diet.

ASSESSMENT RESULTS:

Observations:

Han was observed in three classrooms during first period, fourth period before lunch, and seventh period prior to the end of the day. Additionally, he was observed during his lunch break on two separate days. There were no significant outbursts or angry fits that occurred during the observations and interviews.
Han demonstrated significant frustration during different tasks and at different parts of his day. He pulled his head down between his legs, slapped his head several times, and expressed his anxiety for performing a task. He repeatedly said, “I can’t do this” or “I’m really not able to do this”. Immediate attention and redirection from a teacher was helpful and encouraging. At times he needed to be told that he was capable and reminded of his potential based on past experiences of successful achievement.

**SUMMARY:**

The following determinations were made based on parent, teacher, and subject interviews and classroom/lunchroom observations.

Han is a sensitive young man who is an exceptional student with capabilities for accomplishing high achievements in his education. He has difficulty in managing his fluctuating level of self-efficacy and allows thoughts of failure to overcome him. These thoughts can lead to anger, self-harm, and possibly destruction of property. Redirection from teachers and other staff prior to his angry feelings taking over can lead to de-escalation. The teachers and his mother report no warning signs from Han, and often are unable to identify his anger onset until it has reached a significant level beyond de-escalation. Han reports having feelings of his temperature rising in his body, his mind racing, and his body wanting to explode with energy when he gets frustrated and angry. He also has a hard time believing that he is capable and downplays his achievements.

These observation statements will be used to develop a behavioral intervention plan on the next page.

_________________________________________  ______________________________________
Jed Savard, Psy.D. Graduate Student             Date

_________________________________________  ______________________________________
Steve Curtis, Ph.D., NCSP Child Clinical Psychologist Date
BEHAVIORAL INTERVENTION PLAN

Name: Han Solo  
School: New Horizon School
Birth Date: December 25, 0001  
Grade: 6th
Age: 13  
Report Date: 5/15/2015

TARGET BEHAVIORS:

With Han, the following target behaviors will be the focus for intervention.

1. Increase Han’s awareness of the elevating anxiety and anger.
2. Increase the teacher’s and school faculty’s awareness of the elevating anxiety and anger.
3. Improve Han’s ability to self-sooth and lower his anger/anxiety.
4. Improve the teacher’s and school faculty’s methods of de-escalating Han’s anger/anxiety.

INTERVENTIONS:

1. **Provide Han with a heart rate monitoring device.** Fitbit, Garmin, Mio, and other manufacturers are now offering a heart rate monitoring watch. This will provide Han with real-time awareness of his elevated heart rate preceding anxiety and explosive tendencies.

2. **Monitor daily/weekly heart rate fluctuation results.** The device will provide readout of his heart rate and coinciding anxiety and anger fluctuations during the week. Make adjustments to his routine when consistent anxiety and anger is detected during daily/weekly activities.

3. **Teach Han to self-monitor.** Provide Han with remedial tracking and teaching on how to use the device to monitor his anxiety daily until he is actively using it properly on his own. He will use a heart rate tracking sheet to begin keeping track of his heart rate on his own and instill active awareness and tracking.

4. **Teach Han to self-sooth.** Provide Han with methods of managing and soothing himself during times of stress and anxiety. Weekly therapy sessions should partially focus on methods for managing breathing and thoughts that intensify his anxiety and frustration.

5. **Build self-esteem.** Provide Han with therapeutic training on improving his internal self-esteem. He is demonstrating limited and diminished feelings of self-worth. Improving these feelings through active therapeutic work on self-worth should improve self-esteem.

6. **Build self-efficacy.** Provide Han with therapeutic training on improving his self-efficacy, specifically in his academic work. He demonstrates a belief that he is a
failure or will fail. Evidence to the contrary in his classes is shunned to reinforce his belief in his inevitable failure. Active work on addressing these beliefs and improving his self-efficacy will improve his academic experience and diminish his anxiety and explosive tendencies at school.

**MONITORING PLAN:**

Han will use the attached Daily Heart Rate Monitoring Form each academic day to track his heart rate. His teachers will use the attached Teacher Daily Behavior Report Form to track his behavior and academic progress.

Han’s mother will collect the Teacher Daily Behavior Report Forms and Daily Heart Rate Monitoring Forms. She will use these to track his progress with the Daily Parental Tracking of Heart Rate & Anxiety Report form.

**GOALS:**

Han’s negative thinking will lessen and he will spend more time actively participating in school related activities. Consequently his grades will improve and he will successfully progress to the next grade level.

Han’s anxiety and explosive outburst will lessen and he will be able to remain in the classroom for the entire school day without a need or requirement to leave.

The continuous daily monitoring will improve parental and teacher awareness of Han’s functioning and improvement. It will also allow Han to improve his self-efficacy by being aware of his feelings more and taking responsibility for improved management.

_________________________________________  __________________________________________
                        Jed Savard, Psy.D. Graduate Student                  Date

_________________________________________  __________________________________________
                        Steve Curtis, Ph.D., NCSP Child Clinical Psychologist Supervising Clinician                  Date
# Participant Daily Heart Rate Monitoring Form

**Date: __________________**

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Han’s Notes about how you are feeling during the day:

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# Teacher Daily Report Form

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<th>Distracted</th>
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Teacher notes:

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Instructions: Upon each half-hour interval, please circle (Y)es or (N)os based on your observation of Han’s expression of anxiety/anger at that time. Additionally, please indicate in the same manner if he is remaining focused on his tasks and/or is distracted at that time. This form should be sent home with Han daily for his mother to collect.
### Daily Parental Tracking of Heart Rate & Anxiety Report

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Appendix O

Request for Support in Acquiring Devices
Dissertation Study Help

1 message

Jedidiah Savard <jsavard@antioch.edu>  
Tue, Jan 19, 2016 at 9:41 PM

Hello Ms. Dickinson,

My name is Jed Savard. I am a third year clinical psychology doctoral student at Antioch University Seattle in Seattle, WA. After seven months of work and preparation of my prospectus and proposal I am nearing the beginning phase of my dissertation study. The study will employ five Mio Fuse heart rate monitors to study the effectiveness of using them for therapeutic reduction of anger and aggression in adolescents.

I chose the Mio Fuse for my dissertation because of its large display of the monitored heart rate and its available color indicator and vibration settings for heart rate intervals. I believe your devices will be effective tools for the therapy I designed to reduce anger and aggression in adolescents. Due to the limits in my finances I am seeking an alternative method of obtaining the devices for the study.

Would you consider supplying five Mio Fuse devices for my dissertation study?

I am sure you will have many questions and I am happy to answer them to your satisfaction. I can be reached by phone at [redacted] or by email at jsavard@antioch.edu. My dissertation committee chair is professor Dr. Mark Russell who can be reached at [redacted]. He is currently on leave from teaching through April but regularly checks his emails and responds.

Thank you for your time and consideration,

Jed Savard
Appendix P

Mio Global Donation of Mio Fuse Devices Agreement
Note: The generous people at Mio Global honored the request and donated 5 Mio Fuse devices as shown below. Picture was taken the day of arrival 01/27/16. Mio Global was provided with a full copy of the dissertation proposal and will be provided with the study completion data, results, final analysis and the dissertation document as a whole.
Appendix Q

Parent or Guardian Initial Brochure
Researchers Information

Jed Savard is an advanced pre-interning doctoral student in the Psy.D. Clinical Psychology program at Antioch University Seattle. He has completed more than 300 college credits focused on the field of Psychology. His primary research, assessment, and therapeutic focuses are in child, adolescent, and emerging adult psychological and behavioral development. He has a Bachelors of Science in Psychology from Baker College, completed Masters courses and training in School Psychology at Plymouth State University, and a Masters in Clinical Psychology from Antioch University. Jed has completed several years of training in adolescent judicial advocacy, adult recovery, clinical therapy and assessment, and school psychology and counseling. He is a school counselor and board member at New Horizon School and the Vice President of the Washington State Psychological Association of Graduate Students.

Dissertation Committee Supervisors:
Mark Russell, Ph.D., ABPP, ABCCNP
Steve Curtis, Ph.D., NCSP, MSCP
Ellie Murrowchick, Ph.D.

Parents and Guardians

Introduction

Your child has been selected as a potential participant in a new study. With your permission your child will participate in a study that will take place at New Horizon School and will not interfere with the regular education of participants. The intent of the study is to evaluate the use of daily heart rate monitoring in the reduction of angry and aggressive feelings and behaviors.

The study evaluates a new behavioral therapy designed by clinical psychology doctoral student Jed Savard. The study serves as his doctoral dissertation and is approved and supervised by three licensed psychologists, the Antioch University Seattle Internal Review Board, and New Horizon School principle Marla Veliz. This brochure and the enclosed documents should provide you with the information you need to make an informed decision about providing participation consent.

Please contact Jed directly at [email protected] or jsavard@antioch.edu for any additional information you require.
What is the study?
Using the latest in heart rate monitoring technology, each participant will learn to identify his or her own heart rate elevations that occur prior to overwhelming feelings of anger or aggression. When the participant begins to feel anger, frustration, or aggressive feelings they will use a strategy taught to them to reduce their undesirable feelings.

What is the heart rate monitor used in this study?
Each participant throughout the day will wear the Mio Fuse wrist worn device. The Mio Fuse displays participants’ heart rate.

What is the parent’s part?
Parents have a unique perspective that is invaluable in observing and learning about adolescents. Parents are also responsible for making good decisions for their children.

Upon providing informed consent for you and your child to participate you will have two parts in the study:

1. Participate in a short interview with the researcher at the beginning and at the end of the study.
2. Fill out a short questionnaire four times throughout the study to record your observations.

The interview at the beginning of the study is to learn more about your child. The enclosed Initial Parent or Guardian Interview form contains the primary information for this interview. A short over-the-phone or in person interview will be conducted to answer any of your additional questions and to answer any of the researchers questions that may arise from you and your child’s unique circumstances. The level of disclosure is up to you and will not be used to disqualify your child from participating.

At the beginning of the study and three times throughout the study you will be asked to complete the enclosed Child Behavior Checklist.

Then at the end of the study you will meet with the researcher for a short formal interview to evaluate your observations and perspective in how effective the therapy intervention was for your child.

What are the benefits and risks?
There were no foreseen risks and there are no intended risks to you or your child. This study intends to improve the lives of adolescents and consequently improve the lives of their families and their education and peer experiences. The goal is to give each participant an improved sense of himself or herself, to know their own internal feelings, and to increase and improve maturity. The therapy intends to benefit the participant in becoming a more well-rounded and productive citizen. Additionally, it will improve participants’ self-esteem, self-efficacy, peer relationships, teacher and parent interactions, and ready them for future education and employment. This therapeutic opportunity intends to improve your child’s life in many ways.

Thank You Very Much!

Liz Dickinson, the owner and CEO of Mio has donated the devices for this study and no monetary costs will be required by parents or guardians.
Appendix R

Permissions
Table 3 Copyright License

**ELSEVIER LICENSE**
**TERMS AND CONDITIONS**

Feb 13, 2016

This is a License Agreement between Jedidiah S Savard ("You") and Elsevier ("Elsevier") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Elsevier, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

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I am seeking permission to adapt Table 1 of your dissertation found in your appendix for use in my own dissertation titled "Reducing Adolescent Anger and Aggression with Biofeedback: A mixed methods multiple case study. I have attached a copy of my adapted table for you to review.

Thank you for your time,

Jed Savard

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Jedidiah S. Savard, Psy.D. Student
Antioch University Seattle, Applied Clinical Psychology Dept.
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