WHITE PAPER

A New and Innovative Way to Develop Emotional Regulation Skills in Children

Sally Edwards, MA, MBA
Lifetime Credentialed Teacher, Author, Athlete, Fitness Expert



Heart Zones, Inc.

Heart Zones, Inc.,
2636 Fulton Avenue, Suite 100
Sacramento, California 95821
+1 (916) 481-7283

White Paper:
A New Way to Develop Emotional Regulation Skills in Children

Sally Edwards, MA, MBA, Lifetime Credentialed Teacher, Athlete, Author, Fitness Expert

Children and adolescent students struggle with managing their emotions. Schools are challenged with how to solve this problem. There is a new method to teach the skill of emotional regulation - the Chill Zone Game. If emotional regulation skills are learned, students can develop healthy resilience and mental health. The purpose of this White Paper is to demonstrate that using game design dynamics coupled with physiological heart rate data and emotional skill learning, students can be successful in acquiring a personalized and individualized emotional deregulation skill that leads to emotional strength.

Executive Summary

Pediatric emotional dysregulation presents a critical educational challenge for school counselors and behaviorist. Students lacking adaptive self-regulatory mechanisms exhibit disruptive externalizing behaviors such as physical aggression, verbal outbursts, and defiance, somatic withdrawal, anxiousness which can lead to panic.

To date, traditional school-based behavioral interventions often rely on passive psycho-education or reactive punitive measures. These measures often fail to provide the experiential, real-time skill acquisition, and emotional skill transferability needed to successfully navigate physiological stress within the classroom and school environment.

To address this systemic gap, the Chill Zone Game framework introduces a novel, bio-adaptive therapeutic intervention that integrates non-screen, play-based eustress with real-time cardiovascular biofeedback. Utilizing wearable heart rate monitor sensors, the protocol continuously monitors heart rate metrics during four different structured tabletop games. When playful competition or time pressure elevates a student's heart rate by 10% (or 7–10 beats per minute) above baseline—signaling sympathetic nervous system activation—gameplay pauses.

Guided by an educator or clinician, the student executes sequently each of six different evidence-based parasympathetic recovery modalities, such as resonance breathing, progressive muscle relaxation, or positive autobiographical memory retrieval, until baseline cardiovascular homeostasis is restored. The student determines which of these emotional recovery modalities is the most successful for returning to their baseline heart rate.

By establishing a closed-loop neuro-feedback mechanism, this intervention leverages hormone-driven reward loops to transform physiological down-regulation into an internalized, conditioned response. Operant conditioning within a low-threat, high-agency gaming context expands the child's window of tolerance, strengthens vagal tone, and restores executive functioning. Ultimately, this cost-effective, non-punitive intervention empowers children and adolescents to identify personalized somatic recovery strategies, facilitating far-transfer resilience and emotional stability across daily academic and social environments.

Introduction

Schools need to meet the challenges of all students. Demanding an urgent solution, one of those challenges is to provide social and emotional learning methods for dysregulated students. The impact of school closures from Covid pandemic coupled with the recent loss of federal funding to schools has lead to formidable challenges for school counselors and therapists. Many of todays children lack the behavioral, the social, the emotional skills that specifically address this critical challenge. The result is an increasing preponderance of students disturbing the classroom, poor academic performance, and emotional problems such as depression, anger, and anxiety. When student's nervous systems become overwhelmed, triggering inappropriate behavioral responses that significantly strain classroom management, deploying a learned skill can provide ways for student resilience.

The Problem Statement

One of the most serious problems facing school psychologists, counselors, and behavioral specialists is to provide support and skill training for physically and emotionally dysregulated students. These same students regularly skip school, cause classroom mayhem, face frequent disciplinary action for poor behavior that can lead to fights and punitive disciplinary action - suspensions and detentions. The problem occurs when teachers are confronted with a difficult situations that results in their student's inappropriate response due to the lack in students of proper skills. Here are a few examples:

- *Verbal Outbursts:* Impulsively shouting, making harsh accusations, interrupting from frustration or being overwhelmed.
- *Physical Aggression:* Hitting, throwing, knocking over desks, kicking and other "fight" responses as a response to perceived threats or stress.

- *Defiance:* Shouting "NO!", refusal to follow instructions, ripping up worksheets, damaging devices, avoiding tasks, crossing arms in refusal.
- *Withdrawal:* Refusing to speak, putting heads down on the desk, staring blankly, other physiological "freeze" responses.
- *Conflicts:* Blaming others, playground disputes, physical escalations, inability to take turns.
- *Meltdowns:* Anxiety, arousal, or panic attacks during classroom activities.

When these impulsively damaging behaviors occur it presents difficult challenges for teachers, counselors, administrators especially if classrooms are crowded as many of today's schools now resort to because of lack of funding. Traditional solutions include sending students to non-punitive"reset rooms", mobile crisis support teams, and training staff on a regulation-based framework such as Yale's Center for Emotional Intelligence RULER framework[1]. These are important ways to recalibrate student's emotions, teachers required to initiate a discreet way to get help, and other behavioral interventions to reduce or eliminate triggers from sensory overload or meltdowns.

There's an urgent need to provide methods to teach new skills that lead to healthy resilience. The problem is how to develop individual and personal skills for students to develop emotionally healthy responses. We recommend a simple yet impactful solution - a new way to teach students emotional resilience skills through learning how to deregulated and then repeatedly practicing that recovery method.

Background

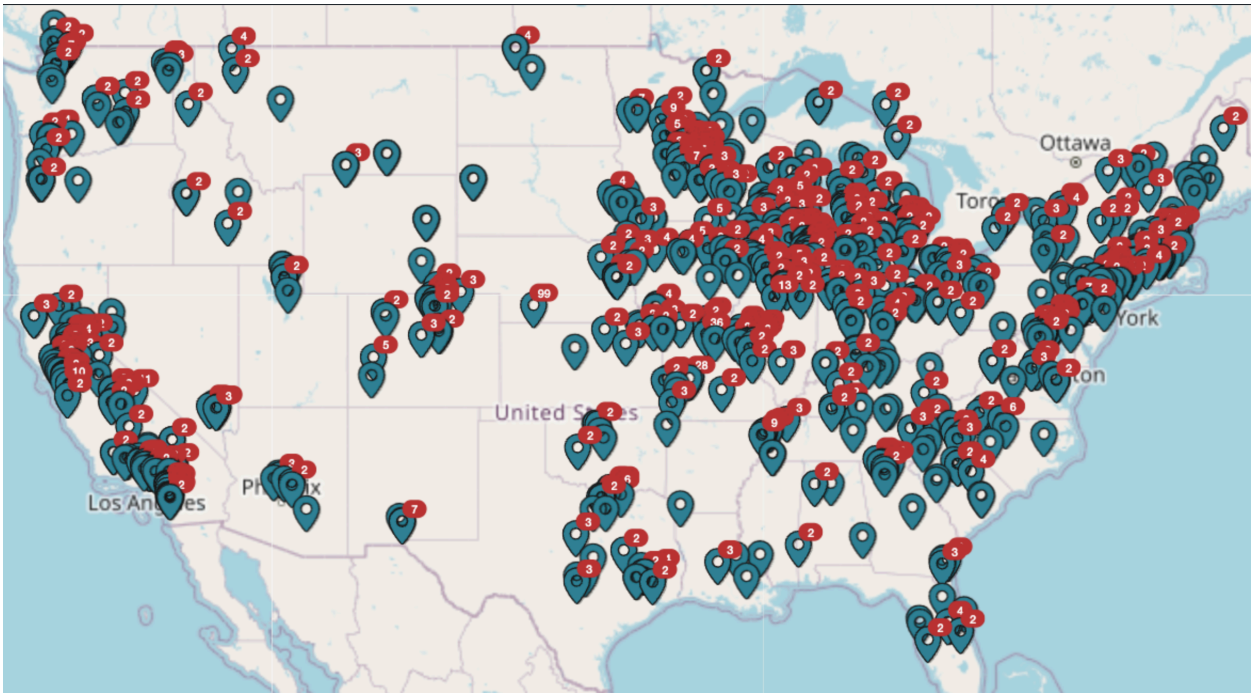
Heart Zones Inc. is a 30-year old Sacramento, California edtech company specializing in using wearable technology. Lead by a team of technologists, educators, athletes, and business professionals, fitness experts, the company's primary goal is to get America fit.[2] Given the current challenges for health seekers, physical activity enthusiasts, and emotional specialist, there needs to be new strategies, methods, and solutions to accomplish this goal of a healthy Americans.

Today, Heart Zones has over 2,500 licenses in schools across every U.S. state and 10 countries. As America's leading supplier of physical education technology, Heart Zones also provides curriculum, programs, workshops, and professional development to support teacher's success. The company holds the only US federal patent ever issued on cardiovascular measurement using the power of zone training method, especially heart rate zone training that it is the original developer with 40 years of experience.

---

[1] Marc A. Brackett, Sarah E. Rivers, Nicole A. Reyes, and Peter Salovey, "Enhancing Academic Performance and Social and Emotional Competence with the RULER Approach to Social and Emotional Learning," *Consulting Psychology Journal: Practice and Research* 64, no. 3 (2012): 218–240.

[2] Heart Zones, Inc is a 30-year old Edtech company: www.heartzones.com



The over 2,500 locations of Heart Zones Move Edtech Licensees in the USA and Canada

Market Context

The core product for Heart Zones is applying in schools wearable tech including heart rate monitors, activity trackers, smart watches, smart fitness equipment. The target audience currently is physical education and school counselors in the education sector: kindergarten-college. Heart Zones is the leading manufacturer of fitness solutions for teachers and counselors in the USA. The company successfully markets their solution using the following software-hardware platforms:

- *Heart Zones Move:* A live group application for up to 50+ students that collects data, displays it for engagement and motivation, saves the data, and shares it from participants using wearable devices.
- *Heart Zones Connect:* The web portal that saves the data in the cloud for classroom teachers.
- *Heart Zones Thrive:* A mobile app for smart devices for individual participants that connects their data to the companies portal - Heart Zones Connect.
- *Heart Zones Training:* Developed for health clubs and first responders, this mobile app uses smart watches connected to mobile phones through a cloud application to visually displays live data for participants in health clubs and for first responders.

TECHNOLOGICAL SOLUTION:

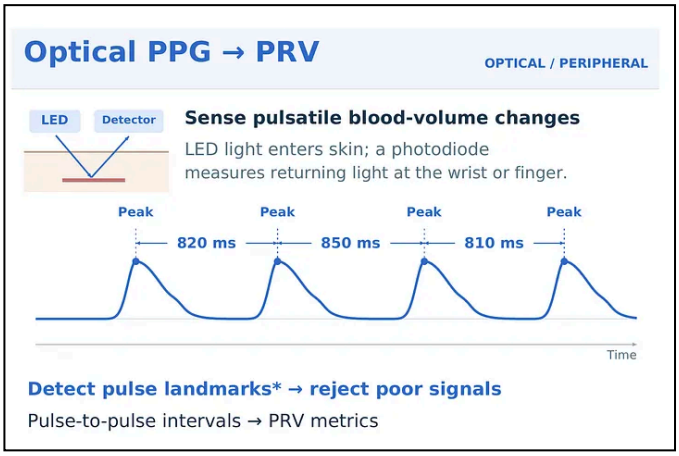
Using a heart rate monitor sensor wearable device, accurate heart rate data can be monitored, displayed, saved, stored, and shared. This comfortable armband uses a sensor known as a photoplethysmograph (PPG), to detect your heart rate.



A PPG heart rate armband from Heart Zones

The PPG optical sensors use light beams, hence the word photo in photoplethysmography, to measure the change in volume of blood caused by the hearts contractions. The hearts left ventricle is responsible for sending blood to the body (and working muscles). Each time the ventricle contracts it sends a "wave" of blood down the circulatory system and that wave is measured by PPG. Since the waves are caused by the hearts contraction heart rate can be monitored at a wide variety of locations on the body.

The PPG armband sensor broadcasts a signal to a transceiver that then transmits the heart rate data in beats-per-minute (BPM) to any device such as an Apple iPad, Macbook, Chromebook, or PC and most tablets with Heart Zones Move software application.[3].



Heart rate pulse waves used by PPG sensors to measure HRV (heart rate variability) assessments

The heart rate data is best visually displayed to the participants as they engage in a positively emotionally exciting game. However, it is the counselors decisions if this is helpful given the way they like to engage their students. Additionally, the receiving device, the PC or Chromebook, can also save, store locally or in the cloud, share the heart rate data for latter retrieval or to send as an email.

During game play, if the participants heart rate increases from a baseline heart rate number by 10% or about 7-10 BPM, the instructor has the physiological data needed to halt play triggering one of the six different recovery methods. When all players return to their baseline heart rate number play can resume. This activity is then repeated until the game concludes.

---

[3] https://www.heartzones.com/shop/move-starter-pack-510

PHYSIOLOGICAL SOLUTION

Determining physiological markers that are best for measuring different physiological conditions on the human body are varied. There are a number of these different biomarkers for physiological stress to be considered:

- Endocrine system: Release of different hormones one being cortisol measured in blood, saliva, urine, and hair.
- Inflammatory biomarkers: Release of different markers such as C-Reactive proteins in the blood stream.
- Cardiovascular markers: HRV (heart rate variability)[4], ambient heart rate, GSR (galvanic skin response), blood pressure
- Metabolic markers: Blood glucose and circulating lipid markers
- Other markers: Respiratory rate, peripheral skin temperature, and allostatic load Index (ALI)

The best physiological marker for the measurement of positive emotional arousal, eustressor, is the one which is both the easiest to measure as well as requires minimal non-invasive equipment. The physiological marker that meets those two requirements is the measurement of an individual's heart rate.

When a student is aroused from an emotional trigger such as fear, anxiety, depression, excitement, enjoyment, competition, laughter or other activating event or stressor, heart rate increases or decreases. This response is driven by the autonomic nervous system (ANS) or involuntary nervous system which is the control center for the regulation of heart rate.[5] The ANS does not require conscious thought but rather regulates two branches:

- Sympathetic nervous system branch: the fight or flight response increasing heart rate by increasing vagal nerve tone and
- Parasympathetic nervous system branch: the rest-and-digest response decreasing heart rate which is like a braking mechanism slowing heart rate and reducing vagal tone.

During the Chill Zone Game both branches of the ANS are engaged. When the participant has a positive activating event known as a eustressor[6] brought on by a constructive stimuli, heart rate increases and the sympathetic non-voluntary nervous

---

[4] The Big Holes in Wearable Heart Rate: https://erictopol.substack.com/p/the-big-holes-in-wearable-heart-rate?utm_source=gemini

[5] Hall, J. E., & Hall, M. E. (2021). Guyton and Hall Textbook of Medical Physiology (14th ed.). Elsevier.

[6] Selye, H. (1974). *Stress Without Distress*. J. B. Lippincott Company

system is involved. The opposite is true. When the participant practices a relaxing, calming, chill experience such as one of the six recovery modes such as box breathing, the parasympathetic system reduces the tone of the vagus nerve which lowers the heart rate.

The physiological solution is to learn the skill of emotional dysregulation[7]. Clinically, emotional dysregulation is the process of returning from hyperarousal or the overwhelm state which triggers the the ANS' sympathetic processes back to what is called the "window of tolerance'. Both executive function and emotional stability are then restored. The very essence of the Chill Zone Game is for the child to learn to initiate and regulate their emotional reaction and response in a manner consistent with the triggering incidents.

Emotional dysregulation is a frequent symptom of pediatric mental health diagnoses including but not limited to ADHD, Autism Spectrum Disorders, anger, aggression, anxiety, OCD, oppositional defiant, and depression[8]. As this state of emotional overwhelm refers to the inability to manage one's emotions when confronted with a arousal experience or a demanding task. Uncontrolled outburst often verbal or physical aggression are one of the ways emotional dysregulation appears. Left unresolved or untreated, consequences such as academic and social isolation occur often leading to further stress, more frequent behavioral challenges such as severe outbursts, and lack of social-emotional coping mechanisms.

One of the best ways to return to the window of tolerance is by the student learning and experiencing several different methods of parasympathetic regulations. Each student has their own best way to accomplish this as their preferred method for calming the heart, for emotional regulating their sympathetic response to a eustressor. The most effective approach is by measuring the changes in heart rate as the participant discovers the best way for them individually to recover from a stressful experience. When they do, students return to their chill zone using the mechanics of game engagement.

BIO-ADAPTIVE GAME SKILL DEVELOPMENT SOLUTION

---

[7] Eisenberg, N. Spinrad TL. Emotion-related regulation: sharpening the definition. *Child Dev.* (2004) 75:334–9. 10.1111/j.1467-8624.2004.00674.x

[8] Graziano, PA. Garcia A. Attention-deficit hyperactivity disorder and children's emotion dysregulation: a meta-analysis. *Clin Psychol Rev.* (2016) 46:106–123. 10.1016/j.cpr.2016.04.011

Play-based therapy and emotional skill acquisition using the Chill Zone emotional regulation skill discovery is a new innovation. When using biofeedback from individual emotional recovery methods with the power of heart rate data, individuals can learn their own method of recovering. That's because Chill Zone integrates three components in bio-adaptive play-based therapy.:

- Physiological sensing
- Biofeedback-drives learning
- Game mechanics driven by the internal nervous system (ANS)

How is this game-based experience transformational? It is a closed-loop design using the game engine (positive emotional charged games) with emotional skill regulation. Here's how the loop works:

- *Biofeedback:* Heart rate sensor (PPG) constantly measures and displays the participants heart rate (BPM)
- *Human Control:* Counselor monitors this response and controls the game action
- *Regulation:* Participants visualize their real-time feedback from visual heart rate display leads to mental recovery techniques to dysregulate.

In past social and emotional skill development, instructors or counselors would simply ask the players verbally to "calm down". In a bio-adaptive skill learning game, the specific emotional recovery methods are a key part of the core closed-loop.

Emotional Recovery Methods:

There are several well recognized methods to chill when emotional triggered. The foundation of those methods are as follow:

1. *Respiration Mechanics:* Somatic synchronization of breathing leads to resonance.[9] This activates the parasympathetic branch of the ANS. As vagal tone reduces, heart rate drops to calculated baseline threshold resulting in the reward - the game play resumes.
2. *Progressive Muscle Relaxation (PMR):* Using the recovery technique of systematic body scanning and PMR, a somatic intervention, results in increased proprioceptive awareness reducing neuromuscular tension. The player mentally identifies muscular tension by mentally sweeping their body from the top of the head to the feet and slowly returning back to the starting point. This muscle relaxation technique for recovery needs to be practiced as the player learns to calm any muscle tension (like trapezius tightness or thoracic contraction) which allows for the processing of

[9] Characteristics of resonance in heart rate variability stimulated by biofeedback. *Applied Psychophysiology and Biofeedback*, *31*(2), 129–142. https://doi.org/10.1007/s10484-006-9009-3

cognitive thought.[10]. The player actively interferes with the physical strain from neuromuscular feedback loop.

3. *Positive Autobiographical Memory Retrieval:* Sometimes known as a type of mental imagery called "Go to Your Happy Place." This is not thinking happy thoughts. Rather, it combines a sequence of autobiographical neural responses that reduces heart rate as follow: triggering hyperarousal event → sympathetic response→ "Go to Your Happy Place"→ reduced threat attention → increased parasympathetic influence → lower physiological arousal → lower heart rate. This method depends on the fact that the brain does not separate remembered memoiristic personal meaningful experience from imagined ones.[11]

Why Biofeedback Gaming Works - the Neuroscience of Skill Learning:

There are several mechanisms involved in emotional skill acquisition. The neuroscience is based on these psychological and neurological mechanisms:

- Goal-Directed Action: The Chill Zone game creates a deliberate emotional physiological shift which is a trainable skill rather than a passive physical reaction. When heart rate returns to baseline, the reward is play resumption. This reward releases dopamine, a brain neurotransmitter, which reinforces the neural pathway created by the recovery method.[12]
- *Muscle Memory:* Emotional recovery is not a book-learned theoretical concept. Rather, when stress levels his, the brain can learn to automatically deploy adaptive mechanism to down regulate as an instinctual response.[13]
- *Eustress Controlled Framing:* Using a playful context, games, the physiological framing of arousal is no longer seen as a type of threatening distress. Rather, the perception of the students is that of a positive manageable stress (eustress). When threat perception is reduced it expands the game player's "window of tolerance' when handling real-world stressors.[14]

---

[10] Lehrer, P. M., Woolfolk, R. L., & Sime, W. E. (Eds.). (2007). *Principles and Practice of Stress Management* (3rd ed.). The Guilford Press, pp. 78–84, 215–220.

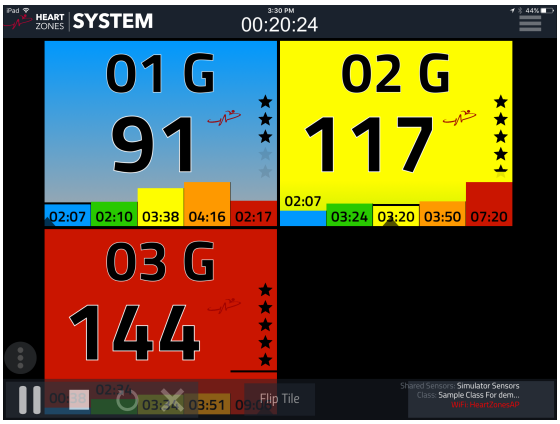
[11] Gadeikis, D., Bos, N., Schweizer, S., Murphy, F., & Dunn, B. (2017). Engaging in an experiential processing mode increases positive emotional response during recall of pleasant autobiographical memories. Behaviour Research and Therapy, 92, 68–76. See pp. 68–70, 72–74,

[12] Koepp, M. J., Gunn, R. N., Lawrence, A. D., Cunningham, V. J., Dagher, A., Jones, T., Brooks, D. J., Bench, C. J., & Grasby, P. M. (1998). Evidence for striatal dopamine release during a video game. *Nature*, 393(6682), 266–268 (pp. 266–267). https://doi.org/10.1038/30498

[13] Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation: A dual-process framework. *Cognition and Emotion*, 25(3), 400–412. https://doi.org/10.1080/02699931.2010.544160

[14] Jamieson, J. P., Nock, M. K., & Mendes, W. B. (2012). Mind over matter: Reappraising arousal improves cardiovascular and cognitive responses to stress. *Journal of Experimental Psychology: General*, 141(3), 417–422 (pp. 417–418). https://doi.org/10.1037/a0025719

The practical application of the Chill Zone game is it's skill-learning outcomes. As the player builds the emotional skill regulation of chilling the heartbeat (reducing heart rate), they develop a conditioned physiological response. The ultimate goal of biofeedback game-based skill acquisition is to use the grounding loops which are practiced when playing the Chill Zone game to achieve rapid physiological recovery.



Heart Zones Heart Rate "Big Board" Display Showing Heart Rate (bpm) and time in zones.

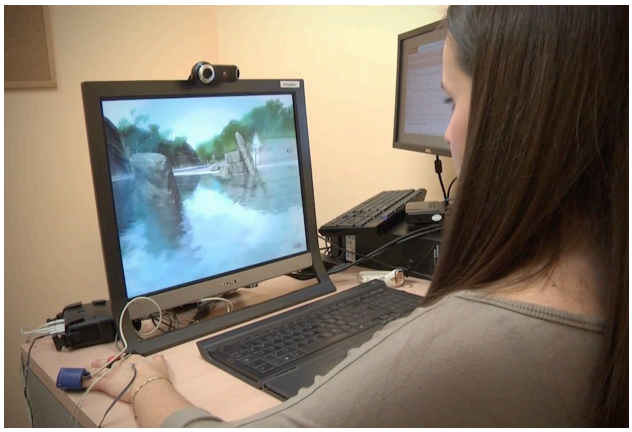
The Proposed Solution: The Chill Zone Game

Students love to play games. Most love experiential games. The Chill Zone is an immersive skill game for emotional regulation that uses the power and skill acquisition from a heart rate monitor and it's visual data. With the support of a counselor, a student wears a heart rate monitor, plays a short non-violent tabletop game that raises heart rate. These games create eustressor response increasing heart rate from one of several game mechanics: competition, laughter, time pressure, excitement, fun. Visually displayed heart rate allows the players, the student participant to connect their internal feelings with elevated emotional response seen as a heart rate number.

When any one of the participants heart rate number climbs 10 BPM (beats-per-minute) above baseline BPM, play stops and the participants practices sequentially each of the six different recovery methods to lower heart rate bak to baseline number. Once all participants heart rate return to baseline number, play resumes. During the recovery period, the students sequentially uses one of six different recovery methods. After each recovery method, the student completes a student worksheet on the success or how well that method resonated individually with them. Between rounds, the counselor teaches the recovery method for that round.

The central hypothesis is that if a student identifies their personal recovery method, they can rely on that when emotionally disturbed or aroused. When identified by the student, this recovery method must be practiced to the point that when triggered, the student can rely on this technique to de-regulate. This requires evidence based research.

To date, Heart Zones has conducted at five different school locations field tests using their equipment, Physical Education teachers, and students who were not identified as needing emotional and behavioral skill development. Though not conducted by school behaviorists or counselors, there were positive outcomes from both the teachers and the students that this emotional regulation[15] skill training was valuable to them. However, the limitation is that there is no evidence, yet, that this type of interventional and learning leads students to apply their personal emotional and social skill resilience in real situations.



PlayMancer relies on a closed-loop biofeedback architecture. Sensors continuously collect physiological metrics from the player, allowing the system to infer autonomic arousal and emotional stress.

Scientific Validation of Skill Acquisition through Gameplay

Schools have a financial, social, and moral incentive to manage challenging and disruptive student behaviors. Certain school mandates require that children be placed in the most positive classroom setting. Failure to place students in least restrictive settings leads to costly interventions such as 1-to-1 aides, unnecessary disciplinary actions, or eventually, an out of district placement for the student.

Recent studies on emotional regulation serious video games are showing positive results. The development of emotional regulation skills such as GameTeen, based on the game Whack-a-Mole, have been shown to facilitate emotional intelligence as well as reducing stress and anxiety. However, this game uses frustration and negative reinforcement to elicit emotional aggravation[16].

In 2009, the academic results from the award winning European Union, EU, video game Playmancer[17], were published. Playmancer uses four different physiological measurements: heart rate, heart rate variability (HRV), blood oxygen saturation (SpO2),

---

[15] Gross, J. J. (Ed.). (2015). *Handbook of Emotion Regulation* (2nd ed.). The Guilford Press.

[16] Rodriguez-Ortega, A., Rey, B., Alcañiz Raya, M. L., BAÑOS, R., Guixeres Provinciale, J., Wrzesien, M., ... & Parra Vargas, E. (2012). GameTeen: new tools for evaluating and training emotional regulation strategies.

[17] https://www.youtube.com/watch?v=osmo9EAClv8

and galvanic skin response (GSR).[18] The video game pioneered the use of real-time biofeedback in a virtual reality video game to treat psychological and impulse control disorders, eating disorders, maladaptive behavioral patterns, and gambling disorders in adults.

The video game RAGE Control (acronym for Regulate And Gain Emotional Control) modulates heart rate using a non-violent space theme. Loosely based on the arcade game, *Space Invaders*, players shoot down flying asteroids allowing friendly ones to avoid destruction. If this challenging inhibitory task up regulates heart rate, players lose the ability to shoot. Designed for children and adolescents, it trains players to down-regulate their heart rate which earns them the reward of being able to shoot down asteroids again which leads to learning the skill of emotional regulation.[19]

In 2020, the Boston-based company, Neuromotion, Inc. launched a biofeedback serious video game called *Mightier*. This tablet based platform features a library of over 25 puzzles, adventure, and action games for children aged 6-14 years. Players are connected to a heart rate armband which controls the dynamics of the game. When heart rate increases by 7 BPM from baseline, the game pauses or stops only resuming when the player down-regulates heart rate back toward baseline level. The game is deigned to held children and adolescent to acquire emotional regulation skills such as severe anger outburst, anxiety, ADHD, and Autism Spectrum Disorder (ASD). Neuromotion does not work with schools because their business model, revenue requiring annual subscriptions, and student equity requirements of the education channel.

15 Reasons Why The Chill Zone Game is Successful in Schools

The Chill Zone Game is both innovative, new, and unique. The game is unique from other social and emotional games and activities from other platforms in many ways. The differentiators that make the Chill Zone Game appealing to children and adolescents:

---

[18]

[19] Kahn, J. Ducharme, P. Rotenberg, A. Gonzalez-Heydrich, J.. "RAGE-Control": a game to build emotional strength. *Games Health J.* (2013) 2:53–7. 10.1089/g4h.2013.0007

1. **Availability of Games:** Not a video game but rather uses "off-the-shelf" skill and learning card and games.

2. **Not a Video Game:** Recommended skill games (2-person Perfection and timed-Jinga) and the card games (Spot It and Taco-Goat-Cheese-Pizza) provide non-screen time challenges.

3. **Cost to Schools:** The four skill and card games that are recommended cost less than $100 making this affordable for school budgets

4. **No Math or Reading:** All four games are without any reading or math involvement for those students who avoid or have learning challenges in language and math arts.

5. **Eustressor Games:** The games involve positive stress challenges such as excitement, competition, time-stressors avoiding all gameplay that is a distress such as violent games that use shooting weapons, destroying object, capturing the enemy, or games that elicit negative emotions such a anger or frustration.

6. **Complete Solution:** The six components to the game listed on page ?? Provide a complete solution for the experiential game play.

7. **Counselor Simplicity:** Given the counselor has access to the Heart Zones Move display and heart rate sensors, it takes less than 1-minute to launch the technology.

8. **Data Availability:** The heart rate date during game play is on display for the participants as well as saved for latter review and analysis.

9. **Cooperative Gameplay:** Multi-player or co-op mechanics where two players must interact are more engaging and motivating than single player particularly tablet games.

10. **Emotional Skill Acquisition:** The game is designed as an emotional recovery skill acquisition game which for the first time teaches students their own personal style or method of down-regulate.

11. **Fast Gameplay:** The speed of play is important to retain interest of players. This is driven by the games that they are already playing which are fast driving moves and actions. All four games can be further enhanced by adding a time component as in "Timed Jinga" which requires a player make a move within a 5 second time window.

12. **Non-Punitive:** In the games like Mightier, exceeding the target heart rate triggers a "Red Zone," which forcibly pauses play or degrades controls to mandate a breathing break. For children with low frustration tolerance (e.g., ADHD or ODD), halting their play right when they are excited or stressed feels like a punishment, often inducing meltdowns rather than calm.

13. **No Simple Mechanics:** Many serious games rely on simple mini-games (e.g., Whack-a-Mole, basic endless runners, first person shooters (FPS). Children accustomed to high-agency, social titles like Roblox or Minecraft exhaust simple arcade mechanics within weeks. The four games are fun, simple to learn, challenging, and not arcade based.

14. **Cooperative Gameplay:** Multi-player mechanics like the The Chill Zone Games, where two players must synchronize their calm states, reduce heart rate together, to accomplish a shared goal create social accountability and higher engagement.

15. **Sensor Agnostic:** Almost any wrist-armband sensor that elicits a standard Bluetooth (BLE) signal can be used: Apple Watch, Heart Zones Blink, Garmin watch, etc. all communicate a BLE signal.

Chill Zone Game Dynamics			
Game Name	**Type of Game**	**Eustressor**	**Emotional Response**
Spot It	Visual matching game	Time-pressure cognitive stress driven by visual overload and perceptual paralysis	Micro-frustration escalating into urgency. High arousal leading to a heart rate spike
Taco-Goat-Cheese-Pizza	Speed of reaction time game	Task switching with shock when a special action card appears. Hyper-alert physical restrain if wrong choice.	Rapid emotional swings in a continuous state of anticipatory excitement
Jinga	Fine motor skills Hand-eye coordination Spatial awareness Physical physics	Fine motor skills Hand-eye coordination Spatial awareness Physical physics	Anticipation and suspense
2-Person Perfection	A mechanical tabletop action game - specifically a timed dexterity game with two-person competitive person spatial matching game	Spatial disorientation and cognitive block forcing a geometric shape into matching slot	The panic of seeing an opponent move faster. Players enter narrow, intense focus, tuning out surroundings to concentrate entirely on the shapes and slots.

Scientific Validation of Heart Rate

Existing scientific literature demonstrates a strong link between using heart rate, a robust measurement of multiple underlying physiological conditions, to ANS control

over emotional regulation.[20] This robust set of literature though scant of using children and adolescents, demonstrates that high heart rate responses to stressors is often associated with behavior disorders such as aggression, maladaptive behavioral patterns, and frustration [21] [22]associated with behavior disorders such as aggression, maladaptive behavioral patterns, and frustration.[23] [24]

The Chill Game Challenges

Essential to the scientific success of the Chill Zone game is the need for compelling evidence for real world, generalizable change known as far-transfer effects.[25] If the identification of the skill of an individualized and personalized recovery can be achieved, will the student apply it in circumstances of their daily living?

Targeted Outcomes Post Participation in the Chill Zone Game

Improvements in children's emotional resilience can be measured. This is especially true if they acquire emotional regulation skills if the skills are individualized and personalized to them. These improvements can be measured in several ways such as:

1. Fewer students were removed from their classroom less often by their instructor.
2. Fewer teacher communications with parents about students negative behavior.

---

[20] Segerstrom, SC. Nes, LS. Heart rate variability reflects self-regulatory strength, effort, and fatigue. *Psychol Sci.* (2007) 18:275–81. 10.1111/j.1467-9280.2007.01888

[21] Boyce, WT. Quas, J. Alkon, A. Smider, NA. Essex, MJ. Kupfer, DJ.. Autonomic reactivity and psychopathology in middle childhood. *Br J Psychiatry.* (2001) 179:144–50. 10.1192/bjp.179.2.144

[22] .
Gatzke-Kopp, LM. Willner, CJ. Jetha, MK. Abenavoli, RM. DuPuis, D. Segalowitz, SJ. How does reactivity to frustrative non-reward increase risk for externalizing symptoms?. *Int J Psychophysiol.* (2015) 98:300–9. 10.1016/j.ijpsycho.2015.04.018

[23] Boyce, WT. Quas, J. Alkon, A. Smider, NA. Essex, MJ. Kupfer, DJ.. Autonomic reactivity and psychopathology in middle childhood. *Br J Psychiatry.* (2001) 179:144–50. 10.1192/bjp.179.2.144

[24] .
Gatzke-Kopp, LM. Willner, CJ. Jetha, MK. Abenavoli, RM. DuPuis, D. Segalowitz, SJ. How does reactivity to frustrative non-reward increase risk for externalizing symptoms?. *Int J Psychophysiol.* (2015) 98:300–9. 10.1016/j.ijpsycho.2015.04.018

[25] BulK, C. Kato, PM. Van der Oord, S. Danckaerts, M. Vreeke, LJ. Willems, A.et al. Behavioral outcome effects of serious gaming as an adjunct to treatment for children with attention-deficit/hyperactivity disorder: a randomized controlled trial. *J Med Internet Res.* (2016) 18:e5173. 10.2196/jmir.5173

3. Reduction in verbal abuse towards others.
4. Decrease in aggressive behaviors.
5. Decrease in inappropriate communication.
6. Success in deploying the new emotional skills acquisition from playing the Chill Zone Game

Students who learn the Chill Zone Game recovery skills should show positive and important behavioral gains that transfer to supporting their classroom experience, learning, and attendance. If successful, this new and innovative emotional regulation training can lead to positive gains for children

Conclusion & Next Steps

This white paper is a factual analysis of the problems, mechanisms, procedures, bio-responses, and neuroscience required to acquiring emotional resilience by using a new and novel biofeedback, play-based therapy game. This in-depth report educates the reader about the complex issues, specific and urgent solutions, and neuroscience involved in children playing the Chill Zone Game, an experiential skill acquisition game to develop emotional regulation.

For counselors, behavioralists, child psychologists, the Chill Zone game is a bio-adaptive solution for developing emotional regulation using learning-game dynamics from eustressor activities, heart rate monitor data feedback loops, and coaching from an adult instructor. This behavioral intervention leads to the development of emotional and social skill learning and resilience.

The purpose of this white paper is to demonstrate that acquired emotional regulation skills can effectively improve challenging children's behaviors that lead to lasting positive changes in students ability to navigate throughout their lifetime an emotionally healthy life. Using biofeedback wearables with engaging gameplay provides a scalable, effective solution for child development, mental wellness, and personalized emotional skill acquisition that transfers to activities of daily living.

Call to Action

There's an urgent need to find a variety of solutions for the mental health crisis for children and adolescents in the USA today. This White Paper is a call to action stressing this urgent need with its critical importance for school administrations to deploy a new

and innovative solution using gameplay therapy coupled with biofeedback connected to individualizing emotional recovery supports lifetime skill acquisition of healthy emotional responses to stressful situations. Here's how to get started:

- Requesting a demo from Heart Zones
- Do an online meeting with a Chill Zone Game school counselor
- Provide this White Paper to your school team
- Hold a meeting to discuss this solution with your team
- Meet with your school administration to get their support