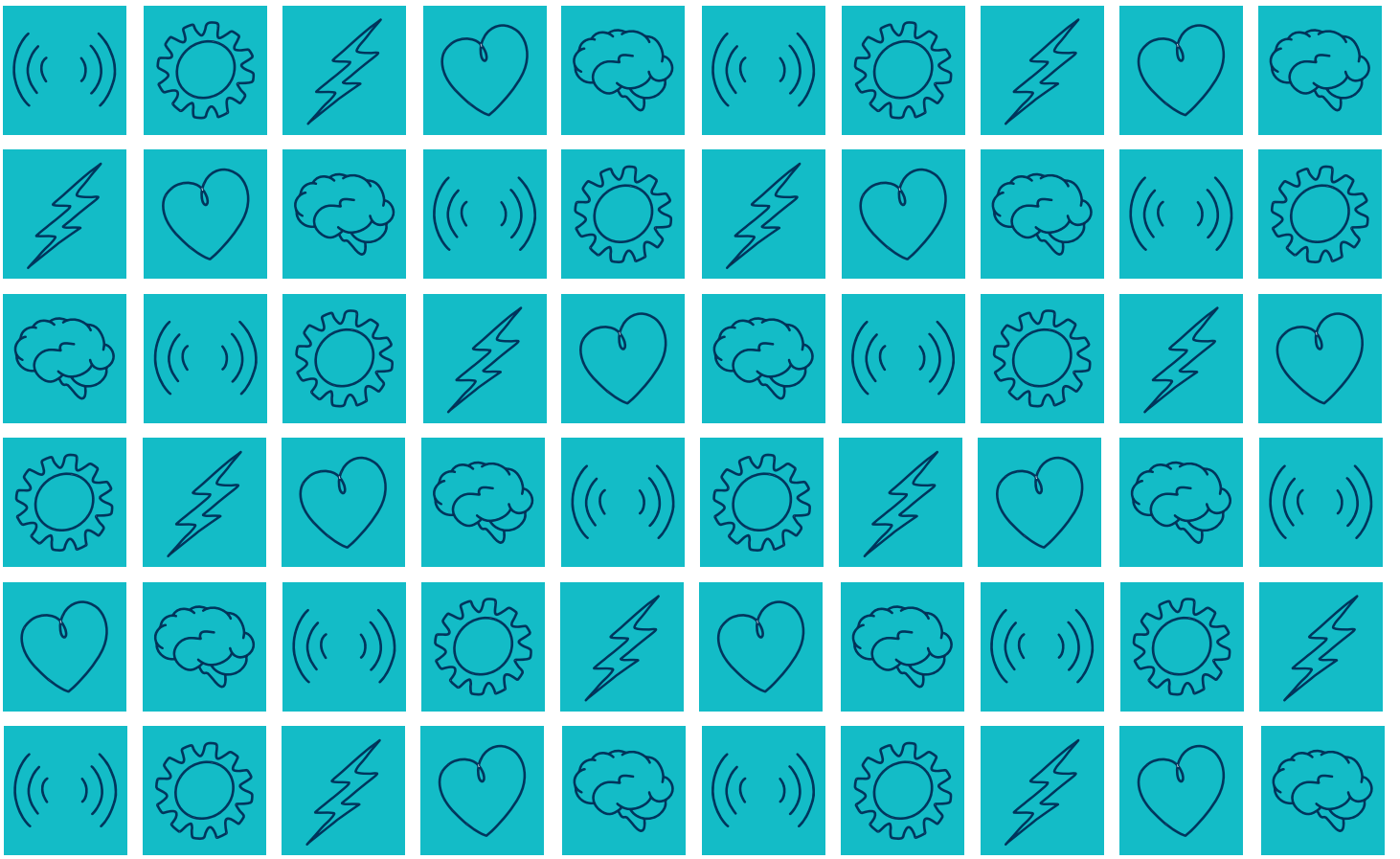

BUILDING AND OPTIMIZING BRAIN HEALTH AND CONNECTIVITY

Brain Balance™: An Integrative Approach to Improving Attention, Behavior, and Cognition

RESEARCH AND RESULTS

Brain Balance®

EXECUTIVE SUMMARY

At Brain Balance, we're dedicated to grounding our program in a solid foundation of evidence. Drawing on decades of external research exploring brain development and neuroplasticity—the brain's remarkable capacity for change—we've crafted our program to focus on what drives improvements in the areas of behavior, social and academic success.

A mounting body of evidence supports the efficacy of the Brain Balance program. Our published research underscores significant improvements as reported by parents, clinicians, and teachers, spanning crucial domains such as focus and attention, ADHD symptoms, cognitive skills, and mental well-being.

This document provides a comprehensive review of collateral research across diverse brain health domains that has shaped our approach, alongside the primary research we've conducted to better understand the profound impact of our program.

A GROWING EVIDENCE BASE SUPPORTING THE IMPACT OF BRAIN BALANCE:

Improvements Reported by Parents, Clinicians and Teachers

- Focus & Attention
- ADHD Symptoms
- Cognitive Skills
- Mental Well-Being

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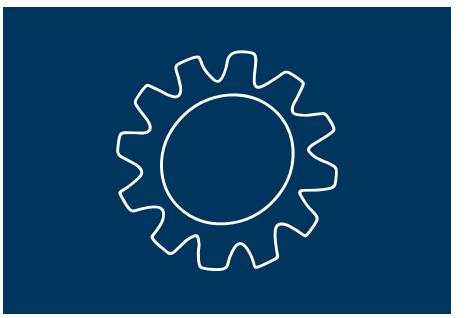
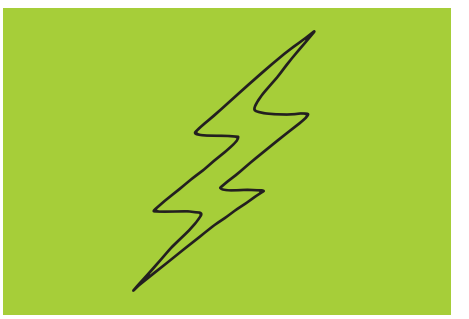




IT'S ALL ABOUT THE BRAIN

How we experience life—physically, emotionally, and socially—depends on our brain health, connectivity, and development. It's common for developmental immaturities or weakened brain pathways to manifest as skill gaps, challenging behaviors, or even disorders that hold people back from reaching their full potential in school, work, and life.

Healthy brain development occurs as a specific chain of events as a result of a typical developmental trajectory. Key domains of brain and body function, as well as communication between both hemispheres of the brain, build and integrate as we grow and develop from infancy onward. Developmental complications occur when the normal trajectory of development is disrupted. But the principles of neuroplasticity—the brain's ability to change and adapt from experience—demonstrate that individuals can actively shape their brain's capabilities and optimize cognitive function throughout life.[1]

This is the foundational premise of Brain Balance, a drug-free, nonmedical integrative program designed to optimize brain health and functions by strengthening weakened pathways and building stronger connections in the brain.

> Brain health is "the state of brain functioning across sensory, motor, social-emotional, behavioral, and cognitive domains, allowing a person to realize their full potential over the life course, irrespective of the presence or absence of disorders."[2]
>
> *—World Health Organization*

THE BRAIN BALANCE APPROACH

Better brain health and connectivity benefits everyone, regardless of age, but it is especially critical for children who are going through rapid brain growth phases and young adults as they grow and experience the world around them.

When development goes off track, individuals can struggle with skill gaps, behavioral issues, and disorders such as ADHD, sensory processing, autism spectrum, and learning disabilities. Regardless of the individual having a diagnosis, struggles can present in attention, executive functions, social interactions, and stress and mood regulation. These challenges are a result of underconnectivity, or weakened pathways, in key brain functions or regions.

The Brain Balance program is designed to help individuals build healthier brains and meaningfully address issues by stimulating the growth of new neural connections and strengthening existing connections. The scientific research that guides the Brain Balance program includes research on neuroplasticity, the drivers of brain health and development, the five domains of brain health, and indicators of developmental immaturities. This proprietary program is a multimodal, integrative approach tailored to the unique needs of individuals.

An Integrative Program to Build and Maintain Brain Health and Connectivity

Research has found an interrelationship between the five domains of development. In other words, each domain depends on the proper functioning of the other domains. Improvements in one domain can influence others. What makes the Brain Balance program unique is that our work focuses on the optimal functioning of each domain simultaneously and how they work together, as well as foundational development exercises (including primitive-reflex integration) that support brain health in each domain and the importance of healthy nutrition in optimizing brain health.

The separate domains must work cohesively, like a finely tuned orchestra, to perform everyday tasks that rely on multiple systems functioning together. This interdependency supports our high-level brain functions, such as sustained focus, memory, mood, decision-making, and impulse control. For example, a child sitting in the classroom must process auditory and visual information while paying attention, taking notes, and retaining information. This requires the successful integration of different systems working in sync. To improve overall brain connectivity, the Brain Balance program improves brain functions by engaging multiple brain networks simultaneously and focusing on areas of underconnectivity.

The information provided here is designed to share the growing evidence of the program's successful outcomes and to provide insight into the collateral research that informs key aspects of the program.

To improve overall brain function, the Brain Balance program improves brain connectivity by engaging multiple brain networks simultaneously.

THE FIVE DOMAINS OF BRAIN HEALTH

The five primary domains of brain health work together to influence a range of executive functions, processing, and behaviors. This interdependency supports high-level areas such as sustained focus, memory, mood, decision-making, learning, and impulse control.

Encompasses:

- Visual processing
- Auditory processing
- Tactile
- Olfactory
- Taste

Encompasses:

- Gross-motor coordination
- Fine-motor coordination
- Balance
- Body awareness and control
- Rhythm and timing

Encompasses:

- Emotional regulation
- Impulse control
- Decision making
- Appropriate response to environment
- Coping skills
- Resilience

Encompasses:

- Regulation of stress and emotional response
- Age-appropriate social interactions
- Non-verbal social cues
- Awareness of self/others
- Empathy

Encompasses:

- Attention
- Memory
- Comprehension
- Logic and reasoning
- Academics/ learning
- Executive functioning

Supporting the Five Domains

FOUNDATIONAL DEVELOPMENT EXERCISES
(Drives development across all domains)

NUTRITION
(Drives development across all domains)

SENSORY DOMAIN

What It Encompasses

The sensory domain refers to aspects of perception and processing of sensory information from the environment. It involves the five main senses: vision (visual processing), hearing (auditory processing), touch (tactile), taste (gustatory), and smell (olfactory). How the brain processes and interprets sensory input plays a crucial role in how we learn and interact with the world. Brain health is closely linked to optimal sensory domain functioning.

Individuals who experience sensory-processing dysregulation can experience heightened challenges with attention, anxiety, and emotional regulation. They can also struggle to keep up in the classroom and become frustrated with sensory experiences such as noisy environments, certain foods, or even the clothing they wear.

How the Brain Balance Program Strengthens the Sensory Domain

The Brain Balance program engages many sensory systems simultaneously through repetitive, layered stimulation that progressively intensifies over the course of the sessions. The layered sensory stimulation occurs while participants are engaged in additional specialized exercises to activate several brain systems simultaneously.

Example exercises

Brain Balance participants wear a series of specialized sensory gear that includes a progression of glasses to provide color and light stimulation; tactile devices to deliver varied vibration; specific organic essential oils to provide olfactory stimulation; and layered auditory stimulation using a metronome, music, and other auditory-processing inputs. The gear is targeted to activate the underdeveloped area or side of the brain through a multimodal approach. With the specialized sensory gear, participants complete exercises to directly engage the perception and processing of auditory and visual information. (Brain Balance participants do not engage in taste. However, changes in picky eating often occur with the maturation of other senses such as smell and tactile.)

Collateral Research that Supports the Program

Behavioral Neuroscience, 2015

"Environmental Enrichment as a Therapy for Autism: A Clinical Trial Replication and Extension"[3]

A randomized controlled trial explored sensory or sensory-motor enrichment as a therapy for children with autism spectrum disorder (ASD). Children ages three to six with ASD were randomly assigned to groups that received either daily sensory-motor enrichment along with their standard treatment or standard treatment alone. The children in the enrichment group participated in exercises that activated different combinations of senses, including olfactory, tactile, thermal, auditory, visual, and motor systems. After six months, the enrichment group showed reduced sensory issues and autism severity and improved cognitive and receptive language skills compared to the control group. Children who engaged in only some of the sensory exercises experienced similar benefits to those who did all of them. This suggests that sensorimotor enrichment could be a beneficial treatment for various ASD symptoms.

Human Movement Science, 2004

"Sensory-Motor Deficits in Children with Developmental Coordination Disorder, Attention Deficit Hyperactivity Disorder and Autistic Disorder"[4]

This review article discusses research findings that implicate poor sensory-motor integration as a cause of motor problems in developmental disorders such as developmental coordination disorder (DCD), ADHD, and ASD. The researchers suggest that sensory and motor deficits in children with DCD and ASD may provide insight into some of the social difficulties found in these groups.

Cognitive Neurodynamics, 2018

"An Oscillatory Neural Network Model That Demonstrates the Benefits of Multisensory Learning"[5]

This study uses a computational-modeling approach to investigate the mechanisms underlying multisensory processing. The results showed that the use of multisensory channels accelerates learning and recall by up to 80 percent. These findings are consistent with other recently published results in cognitive science showing that multisensory integration produces greater and more-efficient learning.

Current Biology, 2006

"Sound Facilitates Visual Learning"[6]

Numerous studies have shown that practice can improve performance on low-level visual perceptual tasks. However, such learning is characteristically slow, requiring many days of training. This study shows that multisensory audiovisual training facilitates visual learning and results in significantly faster learning than single-sensory visual training. These results show that multisensory interactions can be exploited to yield more-efficient learning of sensory information and suggest that multisensory training programs would be the most effective for acquiring new skills.

MOTOR DOMAIN

What It Encompasses

The motor domain refers to the physical abilities and coordinated movements of an individual. It encompasses both gross-motor skills, which involve large muscle groups and whole-body movements, and fine motor skills, which involve smaller muscle groups such as those in the hands and eyes.

The visual system is also dependent on motor coordination for the speed, accuracy, and endurance of eye movements. The visual-motor system is critical to the ability to read, take notes in class, and maintain eye contact with a person or target.

The motor domain is a foundational building block for future development. Daily activities are dependent on the success of this domain for learning, body coordination, sports, and overall physical functioning. Brain health and development play a significant role in shaping gross, fine, and visual-motor skills throughout a person's life. Motor skills are crucial for daily activities, learning, coordination, sports, and overall physical functioning. Brain health and development play a significant role in shaping motor skills throughout a person's life.

Individuals with motor domain challenges may experience a range of challenges, from clumsiness to productivity issues at school or work. Motor domain issues can lead to a reduced ability to sustain attention and affect one's willingness to participate in learning vocational, leisure, or play activities.

How the Brain Balance Program Strengthens the Motor Domain

Optimizing motor development is directly addressed throughout the Brain Balance program, including exercises to enhance core postural muscles, gross-motor coordination, and fine-motor coordination in the hands and visual-motor system. These exercises are combined with multimodal activities to engage multiple brain systems simultaneously.

Example exercises

Activities consisting of whole-body movements that incorporate rhythm and timing engage multiple brain networks simultaneously and work to improve control and awareness. Exercises to improve the visual-motor system include speed, accuracy, and coordination of precise eye movements. Additionally, the program incorporates progressively challenging activities to drive balance and awareness of body position and movement, which activate the body's vestibular and proprioceptive systems.

Collateral Research that Supports the Program

Child Development, 2000

"Close Interrelation of Motor Development and Cognitive Development and of the Cerebellum and Prefrontal Cortex"[7]

This article reviews research that explains on a neurobiological level why motor and cognitive development may be fundamentally interrelated. Evidence from neuroimaging, neuroanatomical, and behavioral studies shows this interrelationship is underpinned by a close interaction between the prefrontal cortex (a brain region that plays a critical role in cognitive functioning) and the cerebellum (a key brain region that regulates motor functioning including movement, balance, and coordination).

International Journal of Environmental Research and Public Health, 2018

"Relationships between Motor Proficiency and Academic Performance in Mathematics and Reading in School-Aged Children and Adolescents: A Systematic Review"[8]

This review article evaluated 55 published studies on the associations between motor proficiency and academic performance in math and reading in typically developing school-age children and adolescents. Significant positive associations were evident between academic performance and components of gross-motor proficiency, including coordination and agility. Studies also suggest that motor-skill interventions in primary-school settings may have a positive impact on academic performance in math, reading, or both.

Neuropsychiatric Disease and Treatment, 2017

"Dynamic Balance in Children with Attention-Deficit Hyperactivity Disorder and Its Relationship with Cognitive Functions and Cerebellum"[9]

Developing the ability to maintain balance under dynamic conditions is important in ordinary life because it enables people to perform activities while moving. The researchers found that seven- to 11-year-old children with ADHD and no other neurological conditions had poorer performance on dynamic balancing tasks compared to children in typically developing control groups, and these deficits in dynamic balance were associated with inconsistencies in reaction times. The findings of this study show that poor dynamic balance control is associated with attentional deficits in school-age children.

Journal of Autism and Developmental Disorders, 2010

"Motor Coordination in Autism Spectrum Disorders: A Synthesis and Meta-Analysis"[10]

This review article analyzed the results of 83 studies on motor coordination, gait, arm movements, or postural stability deficits in children with ASD. The results showed substantial motor-coordination deficits in the ASD groups across a wide range of behaviors. These studies suggest that impaired motor coordination is a cardinal feature of ASD and that interventions for this population should target motor coordination.

Frontiers in Psychology, 2022

"Cognitive, Perceptual, and Motor Profiles of School-Aged Children with Developmental Coordination Disorder"[11]

This study profiled the subtypes of DCD, which is a disorder characterized by below-age-appropriate gross- and/or fine-motor skills that interfere with daily life. This disorder includes additional impairments in visual perception, cognitive profiles, and executive functions but has been found to present in various combinations and severities. This study identified the groupings of challenges presenting with DCD. While children presented with five different combinations and severities of additional challenges including visual perception, cognitive profiles, and executive functions, deficits in executive functions were present in all five subtypes of DCD identified.

Journal of Experimental Child Psychology, 2019

"Sustained Visual Attention Is More Than Seeing"[12]

This study found that sustained visual attention is tied to sensory-motor coordination and is considered a top-down internal control mechanism. This is important, because many aspects of learning depend on the ability to select a target and sustain attention on it.

BEHAVIORAL DOMAIN

What It Encompasses

A healthy and well-connected brain has a substantial influence on behavior: it supports emotional regulation, impulse control, decision-making, and appropriate responses to the environment, contributing to positive and adaptive behaviors. Maintaining brain health through development, lifestyle, cognitive stimulation, social engagement, and emotional well-being is crucial for promoting positive behaviors and overall well-being.

To understand how development affects behavior over time, consider a two-year-old who lacks the ability to maintain attention, stay in place, keep their hands and feet to themselves, and control their actions when upset. Over time, as that two-year-old matures, those skills and abilities should also mature. When aspects of development or brain health are immature, children or adults can have less control over their actions and reactions.

Individuals with issues in the behavioral domain can experience challenges in handling frustrations or developing healthy coping strategies, self-control, impulsivity, and hyperactivity. Some or all of these challenges can affect behavioral regulation that in turn influences attention, learning, socialization, and relationships, and can result in feelings of frustration and shame.

How the Brain Balance Program Strengthens the Behavioral Domain

The Brain Balance program supports improvements in the behavioral domain by strengthening the prefrontal cortex as well as maturing the foundational development that improves the accuracy, endurance, and control of actions and reactions to the environment. Progress requires the brain to accurately process information and relay it to the prefrontal cortex, the part of the brain that controls impulses, actions, emotional control, decision making, and reasoning. The necessary self-control and regulation that influence and control our behaviors are directly tied to the maturity of these domains and their connectivity to the prefrontal cortex.

Example exercises

All aspects of the Brain Balance program are designed to increase the foundational abilities that support the behavioral domain. Our approach doesn't involve practicing specific situations and scenarios. Instead, the emphasis is on exercising and strengthening the neural pathways that process and react to information through a multimodal approach to improve endurance to help maintain behavioral control. By improving the accuracy and endurance of these systems, individuals can better control their reactions to stress, change, frustration, and social cues and interactions. The Brain Balance program indirectly works to support behavioral regulation by improving the foundational aspects of developmental-reflex integration, core muscles, sensory input, balance, coordination, and rhythm and timing, as well as visual-motor coordination and perception and auditory processing.

Collateral Research that Supports the Program

Overall, early immaturity in motor development and sensory processing is strongly correlated with a higher likelihood of developmental conditions that can shape behavior.

PLoS ONE, 2019

"Relations between Gross Motor Skills and Executive Functions, Controlling for the Role of Information Processing and Lapses of Attention in 8-10 Year Old Children"[13]

This study investigated the relationship between gross-motor skills and aspects of executive function in eight- to 10-year-old children, as well as how information processing and attention lapses relate to gross-motor skills and executive function. Gross-motor skills were linked to working memory and response inhibition but not to interference control. Lapses of attention predicted all executive functions. After accounting for attention and information processing, gross-motor skills were only related to visuospatial working memory and response inhibition. The results suggest a relationship between gross-motor skills and executive functions.

Frontiers in Pediatrics, 2020

"Assessment of Sensory Processing and Executive Functions at the School: Development, Reliability, and Validity of EPYFEI-Escolar"[14]

This study sought to determine the psychometric properties of the Assessment of Sensory Processing and Executive Functions at the School (EPYFEI-Escolar), a questionnaire meant to assess how sensory processing and executive functioning work in school participation. The results show high reliability of the questionnaire and the factors it comprised and support the potential value of the EPYFEI-Escolar to identify children's academic requirements and challenges. Furthermore, this tool can aid in designing customized intervention programs based on individual student needs.

Frontiers in Human Neuroscience 16, 2022

"Relationship between Gross Motor Skills and Inhibitory Control in Preschool Children: A Pilot Study"[15]

This study examined the development of gross-motor skills and inhibitory control in preschool children. Inhibitory control comprises processes that affect an individual's ability to plan, focus attention, remember, and juggle multiple tasks. Inhibitory control is key to executive functioning in young children because it works to suppress impulses and inappropriate behaviors and ignore distractions when working toward achieving a goal. For the purpose of this study, gross-motor skills were assessed by measuring locomotor and object control skills. Inhibitory control was measured using the Fish Flanker task for accuracy and reaction time. A significant negative correlation was found between motor skills and inhibitory control: a lower score on motor skills correlated with lower accuracy and reaction time on the inhibitory control task.

SOCIAL-EMOTIONAL DOMAIN

What It Encompasses

The social–emotional domain encompasses the process of developing the self-awareness, self-control, and interpersonal skills that are vital for school, work, and life success. This domain is dependent on the interplay between social interactions and emotional regulation. It involves the ability to understand and manage one's stress and emotions, develop positive relationships, show empathy and compassion toward others, and navigate social situations effectively. Social-emotional abilities form as a result of healthy development, which begins with the maturation of all aspects of sensory processing, as well as a healthy balance between the sympathetic and parasympathetic nervous system. Brain health plays a critical role in shaping social-emotional functioning because various brain regions and neural networks are involved in processing emotions, recognizing social cues, and forming social connections.

Complications in the social-emotional domain can make it harder to control reactions to stress and frustration. The effects can also be seen in social interactions and issues controlling appropriate responses to mood and emotions, which can make it more challenging or stressful for an individual to interact and form connections with peers and family members.

How the Brain Balance Program Strengthens the Social-Emotional Domain

The Brain Balance program supports foundational development in this domain by engaging brain regions responsible for body and self-awareness, as well as regions in the brain that contribute to social and emotional regulation. The goal is to improve how the brain takes in, processes, and responds to information. The accuracy and coordination of the social-emotional domain affect one's ability to read social cues, develop empathy, and engage an in age-appropriate manner with peers. Improving and integrating the five domains of brain health contributes to better sensory processing, stronger self-awareness, and improved accuracy and endurance of information processing. With enhanced connectivity among brain regions and greater accuracy in relaying information to higher-brain regions, individuals can experience improvements in awareness, control, stress management, and emotional responses.

Example exercises

All aspects of the Brain Balance program work to increase the foundational abilities that support the development of social-emotional regulation. Rather than practicing specific situations and scenarios, our program consists of exercises that strengthen the neural pathways responsible for processing and reacting to information. Greater maturity in development leads to improved control. Increasing the accuracy and endurance of these systems can lead to improved reactions to stress, change, frustration, and social cues and interactions. The Brain Balance program works indirectly to drive social-emotional regulation by improving the foundational aspects of developmental reflex integration, core muscles, sensory input, balance, coordination, and rhythm and timing, as well as visual-motor coordination and perception and auditory processing.

Collateral Research that Supports the Program

PLoS ONE, 2014

"Autism and Sensory Processing Disorders: Shared White Matter Disruption in Sensory Pathways but Divergent Connectivity in Social-Emotional Pathways"[16]

The majority of children with ASD demonstrate hyper- or hyporeactivity to sensory input. This study investigated the structural connectivity of specific white matter tracts in the brains of boys with ASD and boys with sensory processing disorder (SPD) relative to typically developing children ages eight to 12. The results showed that both groups of boys with ASD or SPD demonstrated decreased connectivity relative to controls in parieto-occipital tracts, which are involved in sensory perception and multisensory integration. However, relative to controls, the ASD group alone showed impaired connectivity in temporal tracts thought to be involved in social-emotional processing. These findings help elucidate the roles of specific brain circuits in neurodevelopmental disorders.

Journal of Abnormal Child Psychology, 2009

"Sensory Over-Responsivity in Elementary School: Prevalence and Social-Emotional Correlates"[17]

This study followed the development of 925 kids from infancy through seven to 11 years of age to better understand the correlation between kids who experience sensory over-responsivity (SOR) with auditory and tactile stimuli with social-emotional problems. The study found that kids who experienced SOR had a higher frequency of co-occurring internalizing (depression, withdrawal), externalizing (aggression, impulsivity), and problems with dysregulation. These kids were also found to have lower levels of socially adaptable behaviors. The study concluded that early identification of sensory over-responsiveness is needed to minimize the effect of school-age children's social-emotional status and adaptable behaviors.

Child Development, 2023

"The State of Evidence for Social and Emotional Learning: A Contemporary Meta-analysis of Universal School-Based SEL Interventions"[18]

Results endorsed that compared to control conditions, students who participate in universal school-based (USB) social and emotional learning (SEL) interventions experienced significantly improved skills, attitudes, behaviors, school climate and safety, peer relationships, school functioning, and academic achievement.

COGNITIVE DOMAIN

What It Encompasses

The cognitive domain refers to the mental processes and abilities involved in acquiring, processing, and using information. Cognitive abilities are critical to learning, both academically and socially. The domain encompasses various aspects of thinking, reasoning, memory, attention, problem-solving, language, and decision-making. Our cognitive abilities directly support executive-functioning skills. Success in school, work, and everyday life depends on our cognitive abilities.

Individuals with cognitive challenges may experience issues with attention, memory, reasoning and judgment, auditory and visual processing, and planning and completing tasks. These challenges can lead to increased stress and anxiety; negative experiences; frustration with aspects of learning, school, or work; struggles to follow and execute directions; and feelings of self-doubt. Brain health plays a crucial role in supporting optimal cognitive function.

How the Brain Balance Program Strengthens the Cognitive Domain

Cognitive abilities form as a result of healthy development, which begins with motor coordination, sensory perception, rhythm and timing, and perceptual abilities. The Brain Balance program supports foundational development and then works to engage and strengthen the core elements of cognition, including attention, memory, auditory and visual processing, logic and reasoning, and reading and comprehension.

Example exercises

All aspects of the Brain Balance program aim to increase the abilities that support cognition, both directly and indirectly. Healthy development enables cognition, which is necessary for learning. Participants engage in proprietary activities to directly improve cognition by completing tasks for working memory, sustained attention, visual attention, auditory and visual processing, logic, and comprehension.

Collateral Research that Supports the Program

Journal of Clinical Child & Adolescent Psychology, 2018

"Future Directions for Examination of Brain Networks in Neurodevelopmental Disorders"[19]

Research over decades indicates the brain can operate as a series of interconnected networks. This review examines how these networks differ in typical versus atypical neurological development. Main findings reveal the progression of brain network integration, segregation during normal growth, and deviations in these networks in neurodevelopmental disorders. Autism and ADHD have been extensively studied with neuroimaging, while significant insights have also been gained into network abnormalities in conditions such as schizophrenia, anxiety, and depression during adolescence. The article discusses future directions that would ideally take new developments from cognitive neuroscience and neuroimaging fields and translate them to relevant clinical populations.

Brain Imaging and Behavior, 2019

"Neural Correlates of Cognitive Control Deficits in Children with Reading Disorder"[20]

Children with reading disorder (RD) have been known to show deficits in cognitive control. This study assessed neural activity during the resolution of cognitive conflict on the Simon Spatial Incompatibility task and patterns of resting-state functional connectivity from task control regions in children with RD compared to their typically developing peers. Relative to typically developing children, those with RD showed reduced functional connectivity from cingulo-opercular seeds to left hemisphere fronto-parietal and temporo-parietal reading-related regions, perhaps reflecting reduced organization of task-control circuits and reduced integration with reading-related regions. In addition, children with RD showed reduced functional connectivity between fronto-parietal and default-mode network regions. These findings suggest that altered functioning and connectivity of control circuits in the brain may contribute to cognitive control deficits in children with RD.

Neuropsychology Review, 2014

"Strengthening Connections: Functional Connectivity and Brain Plasticity"[21]

This review article discusses research on the effects of practice and training on intrinsic functional connectivity in the brain. Studies have shown that practice on a range of perceptual, motor, and cognitive tasks changes functional connectivity. For example, one study the article discusses, Taubert et al. (2011), compared participants who trained on a dynamic balance task once per week for six weeks with a control group of students who did not practice the balancing task. They found that the trained group exhibited increased "global connectedness" in the bilateral supplementary motor area (SMA), preSMA, and ventral premotor cortex—an increase that was absent in the control group. Increased intrinsic functional connectivity with parietal and frontal areas was also observed. These findings underscore the value of training in increasing functional connectivity in the brain.

Supporting the Five Domains of Brain Health

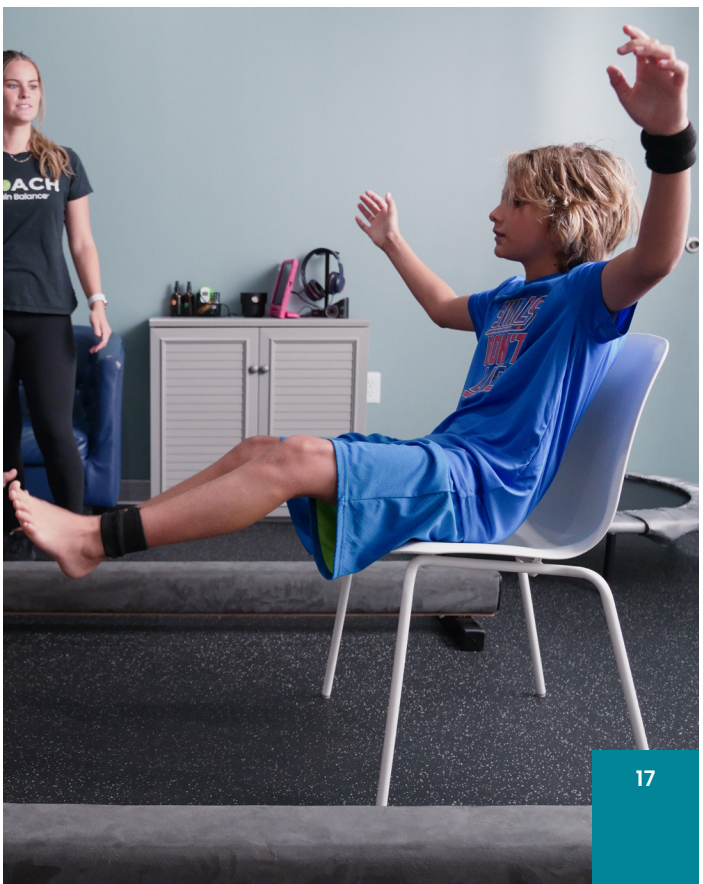
FOUNDATIONAL DEVELOPMENT EXERCISES

What They Encompass

Early development, which includes primitive reflexes, helps lay the foundation for healthy brain development in the five domains of brain health. Primitive, or developmental, reflexes are natural during infancy but are typically integrated and suppressed over time to allow for normal voluntary motor activity development. Persistent, or non-integrated, primitive reflexes beyond one year of age can create disruptions in typical brain development by not allowing strong signals to reach higher brain regions. A disruption in the integration of primitive reflexes has the potential to impact all brain health domains.

How the Brain Balance Program Incorporates Foundational Development Exercises

Repetition of exercises specific to each non-integrated primitive reflex, which engages sensory stimulation and a motor response, can help improve the integration of these reflexes. When the brain integrates, or outgrows, each of these reflexes, an individual is capable of a higher degree of body awareness, control, and coordination. By combining primitive-reflex integration exercises with multimodal sensory stimulation, and additional exercises to engage higher-level brain networks, the Brain Balance program drives significant improvement in brain development.



Collateral Research that Supports the Program

Journal of Neurology, Neurosurgery & Psychiatry, 2003

"The Grasp and Other Primitive Reflexes"[22]

This review article discusses research on various primitive reflexes, which are reflexive behavioral-motor responses that typically emerge during early development and are suppressed during later stages of development to allow for the normal emergence of voluntary motor activity.

Dyslexia, 2004

"Prevalence of Persistent Primary Reflexes and Motor Problems in Children with Reading Difficulties"[23]

Studies have shown that some children with reading difficulties have underlying developmental delays that may be related to the persistence of primitive reflexes. This study investigated the prevalence of persistent primitive reflexes in a typically developing primary-school population (ages nine to 10). The results showed that retention of the asymmetric tonic neck reflex was found in higher levels in children with lower reading abilities compared to those with higher reading abilities. The study also found that there was a significant difference in motor abilities between the lowest- and highest-level reading groups. These findings highlight the persistence of primitive reflexes in children with reading difficulties and provide further evidence of the association between movement difficulties and reading in young children.

Archives of Medical Science, 2018

"Persistence of Primitive Reflexes and Associated Motor Problems in Healthy Preschool Children"[24]

This study examined the occurrence of primitive reflexes in typically developing children ages four to six and analyzed the effect of retained primitive reflexes on psychomotor development. The results showed that retention of primitive reflexes negatively affects psychomotor skills and that the greater the intensity of the retained reflex, the lower the motor efficiency. The researchers recommend routine primitive-reflex testing in children as well as therapies to facilitate normal reflex integration.

Perceptual and Motor Skills, 2009

"Sensorimotor Therapy: Using Stereotypic Movements and Vestibular Stimulation to Increase Sensorimotor Proficiency of Children with Attentional and Motor Difficulties"[25]

This study examined whether children with attentional and motor difficulties would benefit from sensorimotor therapy by using a training program that includes primitive-reflex integration along with vestibular stimulation, auditory perceptual stimulation, and gross-motor movements. The results showed significant improvement of sensorimotor skills among all three age groups examined: a younger group (seven years old or younger), a middle group (eight to 10 years old), and an older group (11 years or older). These finding suggest that a comprehensive training program that includes primitive-reflex integration may benefit typically developing children with sensorimotor difficulties and may complement regular treatment of DCD, learning disabilities, or ADHD.

NUTRITION

What It Encompasses

The connection between nutrition and brain health is profound because the brain relies on a steady supply of nutrients to function optimally. The food we consume provides the building blocks for brain cells, supports various physiological processes, and influences cognitive function and emotional well-being. Proper nutrition is essential for brain development, cognitive performance, memory, mood regulation, and overall brain health throughout life. Additionally, the connection between the gut and the brain, referred to as the gut–brain axis, is critical because it can affect communication between the gut and the brain that affects inflammation, digestion, energy production, the immune system, and more.

How the Brain Balance Program Incorporates Nutrition

A critical component of the overall Brain Balance program, the Balance 360 nutrition program consists of personalized recommendations and guidance so each participant can work to improve the nutrition that supports brain health. The program consists of materials on a web portal that features videos and recipes as well as personalized nutrition sessions with a nutrition coach to work directly in supporting each participant's nutrition journey. While general goals for healthy eating apply to all individuals, participants have their own unique starting points. The goal of the Balance 360 nutrition program is to provide all the necessary building blocks to support the brain and body and reduce systemic inflammation, which can interfere with healthy brain function.

Collateral Research that Supports the Program

Journal of Affective Disorders, 2019

"Dietary Patterns and Attention Deficit/Hyperactivity Disorder (ADHD): A Systematic Review and Meta-Analysis"[26]

This review and meta-analysis examines the current research to determine the extent to which diet may affect ADHD. Based on the results of 14 observational studies, researchers concluded that a healthy diet—characterized by frequent consumption of fruits and vegetables—is protective against ADHD, whereas an unhealthy diet—characterized by frequent consumption of saturated fat and refined sugar—can increase the risk of ADHD. This suggests that proper diet can reduce the chances of an individual developing hyperactivity.

California Office of Environmental Health Hazard Assessment, 2021

"Potential Neurobehavioral Effects of Synthetic Food Dyes in Children"[27]

This state report investigates the effect that FDA-approved food dyes may have on behavior and brain functioning in children. The research involved suggests that synthetic food dyes can lead to negative neurobehavioral effects in children, with varying degrees of sensitivity among different individuals. While certain food additives are approved by the FDA, they may still have adverse effects on children's behavior. The risk of adverse neurobehavioral reactions can be mitigated in part by avoiding synthetic food dyes.

Advances in Nutrition, 2021

"Diet and the Microbiota–Gut–Brain Axis: Sowing the Seeds of Good Mental Health"[28]

While experts have a general understanding of how diet affects the gut microbiome, new research is uncovering ways in which gut microorganisms can influence the brain. This review article examines new studies in the relationship between diet and brain functioning. Research in this field is still emerging, but results so far have shown a promising relationship between the gut and the brain and how diet can be used to improve brain health.

Food & Nutrition Magazine, 2019

"Stopping the Leak: Leaky Gut, Leaky Brain and Beyond"[29]

This article explores a growing body of research that points to a relationship between the intestinal microbiome and the central nervous system (CNS). Gut bacteria may play a role in certain central-nervous-system conditions, and inflammation has been shown to adversely affect the blood–brain barrier. A low-inflammatory diet could play an important role in reducing the chances and severity of certain CNS issues.

Nutrients, 2019

"From Probiotics to Psychobiotics: Live Beneficial Bacteria Which Act on the Brain-Gut Axis"[30]

This review article analyzes the relationship between probiotics, psychobiotics, and cognitive and behavioral processes. The current research suggests that while probiotic bacteria are mostly concentrated in the intestines after ingestion, they may also produce substances that act on the brain. Though this is still a new field, there are many promising results that indicate psychobiotic bacteria may be usable in the treatment of nervous system conditions.

BRAIN BALANCE OUTCOMES: Research and Studies

What differentiates Brain Balance from other programs is, rather than focusing on symptoms alone, our research-backed, integrative approach engages multiple brain systems simultaneously. This causes these systems to "fire and wire together," according to Donald Hebb, a pioneer in neuroplasticity. **Our published research demonstrates that our program leads to consistent and significant outcomes in the areas of decreased hyperactivity, impulsivity, and negative behaviors; and improved attention, cognition, social-emotional functioning, and motor development.** Recent research on the Brain Balance program includes the following:

Harvard University & McLean Hospital Psychiatry Research, 2023

"Open Assessment of the Therapeutic and Rate-Dependent Effects of Brain Balance Center® and Interactive Metronome® Exercises on Children with Attention Deficit Hyperactivity Disorder"[31]

This control-group study reveals that participants in the Brain Balance program saw a reduction in symptoms of attention deficit hyperactivity disorder (ADHD). The study compared an "active" group of eight- to 14-year-olds who met the diagnostic criteria for ADHD with a "control" group of typically developing children. Participants in the "active" group completed 15 weeks of a Brain Balance home program. Ratings from parents of Brain Balance participants showed a marked reduction in ADHD symptoms with substantial improvement in all domains, most notably inattention. Clinician ratings also demonstrated changes in total ADHD scores as well as in the subscales of inattention and hyperactivity. The significance of this study is that it indicates a substantial reduction in the symptoms of ADHD in a nondrug intervention. While ADHD has been shown to be highly responsive to medication, the benefits can wax and wane between dosages, vary from person to person, and do not persist over time without continued usage. Thus, there is a pressing need to identify treatment options that work to foster corrective neurobiological changes, which could provide enduring benefits.

Participants in the Brain Balance program saw a reduction in symptoms of ADHD.

—Harvard University & McLeanHospital Psychiatry Research, 2023

Frontiers in Psychology, 2023

"Reliable Change in Developmental Outcomes of Brain Balance® Participants Stratified by Baseline Severity"[32]

This study evaluated the effectiveness of the Brain Balance program as a multimodal nonpharmacological approach to addressing cognitive, attentional, and emotional issues in 4,041 students ages four to 18 who completed three months of the program. Based on parent surveys, the research found significant improvements in emotionality, reading and writing skills, academic engagement, behavior, coordination, and social communication among children who participated in the program. The size of change in all domains was categorized as a large to very large effect. In additional assessments of primitive reflexes and sensory-motor activity, students demonstrated significantly diminished primitive reflexes from pre- to post-participation and significant improvements in sensory-motor skills, including fine-motor skills, gait and aerobic ability, proprioception, rhythm and timing, and eye-gaze stability.

Overall, these results demonstrate improvements in primitive-reflex integration and sensory-motor skills, as well as statistically significant reliable change in emotionality, reading and writing, behavior, academic engagement, motor skills, and social communication in Brain Balance participants from pre- to post-program, with the probability and degree of change increasing as participants' baseline severity increases.

The findings in this study highlight the efficacy of multimodal nonpharmacological programs like Brain Balance® in assisting with childhood development.

Current Psychology, 2023

"Measurement Properties of the Brain Balance® Multidomain Developmental Survey: Validated Factor Structure, Internal Reliability, and Measurement Invariance"[33]

The purpose of this study was to refine and validate a comprehensive developmental survey tool utilized by the Brain Balance program to provide insight into multiple aspects of a child's development. Research has demonstrated a close interplay between various domains of development, including sensory, motor, cognitive, and emotional functioning in children, yet no survey tool existed that provided input into multiple domains. While many validated survey tools exist, they focus on one domain or diagnostic concern such as sensory processing, ADHD, anxiety, motor development, or autism. This focused scope provides information on the area of concern but does not indicate whether other aspects of development or life also demonstrate an effect. A deficit in one domain often results in deficits across multiple domains, creating a need for a single survey tool to provide a broader understanding of the whole child. An exploratory factor analysis was completed on Brain Balance pre- and post-program surveys submitted by parents of 47,571 students. The analysis suggested six key factor structures: negative emotionality, reading and writing difficulties, hyperactive-disruptive, academic disengagement, motor and coordination problems, and social-communication problems.

This study supports the necessity of holistically identifying and monitoring development in these domains to support healthy development.

Brain Balance participants demonstrated significantly improved scores across the VADRS scale compared with their control-group counterparts.

—Journal for the Study of Education and Development, 2023

Journal for the Study of Education and Development, 2023

"The Brain Balance® Programme Improves Attention and Classroom Behaviour in Students with Attentional and Developmental Challenges in a School Setting"[34]

This initial control group study examined the efficacy of delivering the Brain Balance program on-site at a school. Studies have examined the efficacy of completing the program from home or in centers. These studies provide evidence of fostering measurable change in key domains of development including motor, attention, behaviors, cognition, and social-emotional regulation, all of which are areas that can affect a student's learning and classroom experience. The study included 15 active and 11 control group participants ages five to 15 years who participated in the Brain Balance program at school. Pre- and post-program measurements included the Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS); measures of sensory-motor development including the integration of primitive (developmental) reflexes, auditory processing, fine-motor skills, gross-motor coordination, proprioception (body awareness), rhythm and timing, and gaze stability; and the Cambridge Brain Sciences cognitive assessment.

Post-program scores indicated that the active group saw significant improvement in the diminishment of primitive reflexes and scored significantly higher across all sensory-motor tasks compared to the control group in auditory processing, gross-motor coordination, fine-motor coordination, rhythm and timing, proprioception, and gaze stability. The Brain Balance participants demonstrated significantly improved scores across all five subtypes of the VADRS scale, including inattention, hyperactivity and impulsivity, combined subtype, oppositional defiant and conduct disorders, and anxiety or depression symptoms compared with their control-group counterparts. The most significant changes were noted in the inattentive, hyperactivity and impulsivity, and combined subtypes. While improvements were noted in response time and accuracy on the tests of cognition, this aspect of the study was considered underpowered. Future follow-up studies will include a larger number of participants.

This was the first study to analyze the efficacy of delivering the program within a school setting. Providing the Brain Balance program in a school setting could provide an additional evidence-based intervention option to support the development of students' learning and developmental outcomes. This study contributes to the growing body of evidence demonstrating improvements in sensory-motor development and cognition from the perspectives of clinicians, parents, and now teachers, as well as validated measures of cognition and attention.

Humanities and Social Sciences Communications, 2022

"Reliable Change in Parent-Rated Scores on the Brown Attention-Deficit Disorder Scales® from Pre- to Post-Participation in the Brain Balance® Program"[35]

This study investigated the effect of three months of participation in the Brain Balance program on attentional issues in children and adolescents. The study used the scientifically validated Brown Attention-Deficit Disorder Scales (BADDS), administered as a parental questionnaire before and after program participation, to measure changes in symptoms related to ADHD for 71 students ages four to 17. A Wilcoxon test indicated that scores differed significantly between pre- and post-program, with an average significant decline of seven T-score points. The probability of showing improvement from pre- to post-program was 81 percent, with the likelihood of demonstrating statistically significant change increasing with the severity of the pre-program score.

This study provides evidence of significant reliable improvements in attentional functioning over time in children and adolescents with baseline attentional issues affecting both attentional and behavioral abilities. The percentage of program participants experiencing reliable change is in some cases higher than that reported for some previously studied interventions.

This study provides evidence of significant reliable improvements in attentional functioning over time in children and adolescents.

—Humanities and Social Sciences Communications, 2022

Journal of Advances in Medicine and Medical Research, 2021

"Effect of the Brain Balance Program® on Cognitive Performance in Children and Adolescents with Developmental and Attentional Issues"[36]

A child's cognitive functioning is a reflection of his or her ability to perform higher-level mental processes that engage specific mechanisms associated with attention, learning, memory, and reasoning. These cognitive functions allow children to interact with their environment in a goal-directed manner and shift their behavior in response to changing environmental demands. Cognition is known to be negatively affected in both ADHD and subthreshold ADHD, for which challenges with attention exist but do not meet the criteria for the diagnosis. This study aimed to improve aspects of cognition in students who presented with developmental or attentional concerns per parent reporting. The study included 598 students broken into four groups:

- An active group for ages four to six
- An active group for ages seven to 18
- A control group for ages four to six
- A control group for ages seven to 18

The control groups completed less than one month of the Brain Balance program, while the active groups completed three months of the program.

The study used the scientifically validated Cambridge Brain Sciences Cognitive Assessment to measure cognitive abilities pre- and post-program. The results of this study show that children who completed three months of the Brain Balance program displayed significant improvements in cognition, particularly in memory, reasoning, verbal ability, and concentration. There are also significant improvements in cognitive performance for participants who completed three months of the program compared to those who completed an average of just 27 days. Some significant improvements were also seen in the control group of children who completed an average of just 27 days of the Brain Balance program. Among ages four to six, those improvements were in tasks that measured attention and concentration. Participants aged seven and older improved in planning and executive function.

The findings of this study point to the potential of nonpharmacologic training programs, such as the Brain Balance program, in significantly improving aspects of cognitive performance in children and adolescents with developmental and attentional issues.

Journal of Mental Health and Clinical Psychology, 2020

"A Retrospective Review of Parent-Reported Anxiety and Emotional Functioning in Children with Developmental Challenges after Participation in the Brain Balance® Program"[37]

This study suggests that the Brain Balance program is an effective nondrug option for reducing and improving emotional and developmental challenges associated with anxiety, ADHD, or autism. The study focused on children who were at or below developmental milestones and evaluated parent-reported changes in their behavior after completing five to six months of the Brain Balance program. The categories surveyed included symptoms of anxiety, depression, behavioral and emotional regulation, and social-emotional concerns. A retrospective review was performed on four years of archived survey responses from parents of enrolled students ages four to 17 (70.8 percent male and 29.2 percent female) before and after program participation of five to six months. The median change of reduction in symptoms was reported in the following categories:

- Anxiety
  - "may experience panic attacks" (495 students): 60.0 percent reduction
  - "worries a lot" (1,110 students): 40.0 percent reduction
- Depression
  - "seems depressed" (428 students): 60.0 percent reduction
  - "often appears unhappy" (630 students): 50.0 percent reduction
  - "pessimistic or negative" (711 students): 42.9 percent reduction
- Behavioral
  - "obsessive thoughts/behaviors" (889 students): 36.7 percent reduction
- Social-emotional
  - "withdraws socially" (689 students): 50.0 percent reduction
  - "does not seem to be in touch with his/her feelings" (547 students): 60.0 percent reduction
- Emotional regulation
  - "difficulty suppressing/controlling emotions" (1,261 students): 33.3 percent reduction
  - "does not demonstrate a lot of emotion" (522 students): 50.0 percent reduction
  - "difficulty expressing emotion" (774 students): 42.9 percent reduction

Scan or click the QR code for a deeper take on Brain Balance's Research and Studies.

ENDNOTES

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