

Project On

“How Does Dance, Specifically Bharathanatyam
Affect Brain Development”

Submitted by

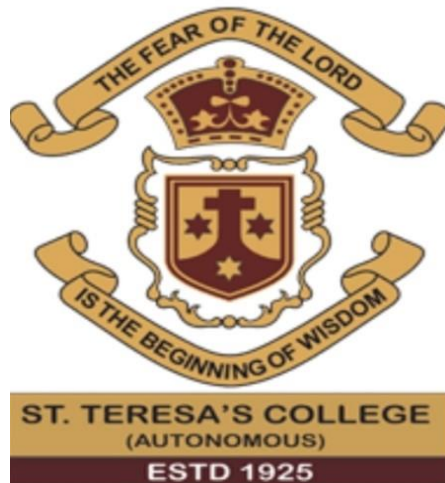
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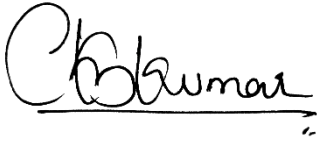


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CERTIFICATE

Certified that this is a confide record of final year project on “How Dose Dance, Specifically Bharathanatyam Affect Brain Development”. Submitted by Sreebhadra.G (SB19BHA009) and submitted in partial fulfilment of the requirement of award of B.A. Bharathanatyam this college.



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HOW DOES DANCE,
SPECIFICALLY
BHARATHANATYAM AFFECT
BRAIN DEVELOPMENT

ABSTRACT

The overall purpose of this project is to discern the relationship between dancing and the brain, in particular what impact Bharathanatyam has on brain structure and health. This project targets what areas are stimulated within the brain and what they mean for the dancer. It talks about the effect of visualizing movements on muscle memory and how it influences a dancer's performance. It also takes into account the way dance can be used as a therapeutic exercise, similar to yoga. One consequence of this, is the psychological effect practicing dance has on the mind of a dancer and what that means for treating health conditions. It defines what type of dance Bharathanatyam is and mentions in detail several aspects of the art form.

INTRODUCTION

Dance is a form of exercise, which has a natural impact on the body's physical health, however the way it affects the brain is a great deal more fascinating. It has the ability to stimulate various parts of the brain, and has even been shown to cause changes within brain structure over time. Deriving from this idea, arises the notion that dance can be used in a

clinical way to improve brain health. To either treat mentally ill patients or patients suffering from certain diseases that affect motor balance within their bodies.

Bharathanatyam is a particularly interesting example to use, as it is a form of Indian classical dance, which are known for their therapeutic attributes and peaceful countenance.

Although other dances and even other forms of exercise have also proven to have an effect within the brain, Bharathanatyam has been shown to be more unique and impressive.

PERSONAL EXPERIENCE

Bharathanatyam has been a monumental part of my life, as I first started learning the art form when I was six years old. I personally believe that my dancing has positively impacted my brain, due to subtle differences I have noticed in my own behavior and mannerisms. Due to the lengthy pieces of dance and the extensive amounts of theory I have learnt, I have discovered that my ability has improved dramatically. My long-term memory has also enhanced, which is useful for any content I need to learn for school.

Dancing has also allowed me to gain further strength in my body and improve my stamina, this has therefore helped me become physically fitter. Bharathanatyam has also helped me in releasing my emotions through dance, this is beneficial to me, as I can stop fixating on my worries and thoughts, and instead focus on carrying out the steps or the storyline within a dance piece. It has also helped me with my general coordination and spatial awareness, while improving my mental strength, convincing my body to push its limits, after persuading my mind.

This project's aim is to discover if there is any tangible evidence backed by science that can explain the effects dance has on the mind and body.

WHAT IS BHARATHANATYAM

Bharathanatyam is a classical South Indian dance that is considered to be the 'traditional dance of Tamils. This dance form has experienced changes in style and names throughout the two thousand years it has existed, however it was Bharatha Muni that first helped create the word 'Bharathanatyam.' Bharatha Muni was a creator of ancient Indian dance and music, he was even considered the 'father of

Indian theatrical art forms.’ He fashioned the word ‘Bharatha’ by fusing the first three syllables of the critical, key aspects involved in Bharathanatyam, which are: Bha-vam, Ra-gam and Ta-lam.

‘Bhavam corresponds to the expressional part of this art form, whereas Ragam represents the musical side and Thalam signifies the rhythmic aspects.’ The word Natyam links to the physical features of this dance form. In the past, Bharathanatyam was called differently, it is only within the last 50 years that it has embraced the name Bharathanatyam.

Bharathanatyam consists of three main divisions, which are called Nritham, Nrithyam, Natyam. Nritham is pure dance without any expression, Nrithyam is dancing with emotions and expressions and Natyam is a combination of the two, with the addition of music in the background. This art form is made up of the ‘three art forms of vocals, instruments and dance’ and contains nine forms of human expressions.

Yogharajah insists that ‘besides the dancer, the main part of this art form is the Carnatic music’ performed by the various instruments, including the mruthangam (Indian classical

drum), the vocalist, the Carnatic violin, and the veena (similar to sitar). The guru plays the natuvangam, in order to set the rhythm of the piece as is therefore referred to as the Nattuvanar.

This art form is very spiritual and teaches the dance ‘to strengthen their body, mind and soul.’ By learning this dance, the performer gets a sense of achievement and determination. Regular practice, creates and maintains a healthy and strong body and deters you from contracting any illnesses.’

PHYSICAL BENEFITS OF DANCE

In many ways Bharathanatyam can be considered an ‘artistic yoga’ as some of its movements are very similar to yogic poses and therefore the dance in turn achieves the same benefits as yoga accomplishes. It is also a strenuous dance form, which unsurprisingly brings physical advantages to a dancer. Bharathanatyam can improve a dancer’s balancing ability, as it contains many poses that require the dancer to maintain balance.

Dancing in general improves flexibility, due to the various steps and positions which stretch and loosens the muscles

within a performer's body. This results in less risk of injury and increases a dancer's range of motion.

Dance improves stamina and endurance due to the long hours of practice, this is important for dance as it is a strenuous activity and increased stamina extends the dancer's capability to perform. Endurance also helps to increase the supply of oxygen in the body, therefore strengthening the dancer's body.

Furthermore, dancing helps control weight, which is important for the overall health of dancer and can help prevent contraction of many diseases and conditions.

Dance involves all parts of the body, including the brain, therefore boosts blood circulation, which leads to a healthy heart. Dancing causes blood vessels to dilate, causing an increase in blood flow. Blood circulation is one of the most important bodily functions as it is responsible for supplying oxygen to the brain and other organs.

DANCE SCIENCE RESEARCH

Dance science research studies the link between dance

and various scientific fields e.g. ‘general medicine, sports science, somatics, body therapies, physical therapy, dance education, anatomy, physiology, kinesiology, biomechanics, movement analysis, psychology, and diet and nutrition.’ From this we can tell that dance must affect the brain in some way as it affects the body in such a significant way.

This research shows us that variances in ‘body structure can actual effect a dancer’s movement’s, therefore the way you perform a step is directly related to the way your body is structured. Certain injury patterns can be associated with particular dance form’, conveying that different types of dance target contrasting parts of the body, therefore placing strain on a variety of muscles. From this we can learn that according to your body structure, you are more prone to certain injuries.

This information means that a number of specific ‘rehabilitation techniques can return an injured dancer back to performing.’ These techniques link to the use of therapeutic exercises for the body which claims can ‘reduce stress, correct potentially harmful movement patterns and improve other dance skills.’ As well as impacting the body, such body

therapies can benefit the brain and cause further development. This research presents clear evidence that a dancer's ability to perform is affected by their own body structure and that there is a strong link between dance and scientific studies.

WHICH PARTS OF THE BRAIN ARE AFFECTED THROUGH DANCE

The motor cortex is an essential part of the brain, which is stimulated through dance, as it is the area of the brain responsible for our ability to learn and 'train new patterns of movement.' It is understandable that the motor cortex is impacted, as learning new movements and perfecting them through training is a key part to dance. At the same time, other 'cortical regions that interpret sensory information' are also stimulated. Therefore new patterns of movement cause unusual sensations in the brain resulting in a more advanced body consciousness. This advancement within the brain, can lead to a further developed brain.

The cerebellum's function is to 'facilitate coordination and refinement of motoric control' and is consequently responsible for a person's balance and posture. The cerebellum is stimulated by complex and unique movements

that can be associated with dance, specifically Bharathanatyam.

Another part of the brain affected is the hippocampus, which is activated by the 'habituation process', which is where each newly learned pattern is moved from the short-term memory to the long-term memory. A study, performed by the University of Hertfordshire, looked at how dance psychologically affects people with Parkinson's disease, by taking '120 people and asking half of them to do dancing three times a week for a year and the other half to do stretching'. They discovered that the dancing group hippocampus actually grew by 1% - 2% over the year therefore helping to improve memory. This shows that dance does affect the hippocampus and therefore improves your ability to memorize and recall information, a trait which is helpful for learning long, complicated dance routines or lengthy amounts of theory. The process of memorizing dance sequences, also improves the functioning ability of the hippocampus, due to the regular usage.

In addition, the pituitary gland, also known as the hypophysis is stimulated by the vigorous body movement. The

hypophysis is in control of ‘the secretion of several hormones, including endorphins, endocannabinoids, adrenaline, dopamine and serotonin.’ These hormones are constantly being formed and dispersed throughout the body. The energetic dance movements can be physically exertive on the body, resulting in the increase of released hormones such as adrenaline.

(Dr. Reinhold Keuler, 2016) claims that dopamine is the “happiness” hormone and that serotonin is the “mood” hormone, a release of these hormones would affect the mentality of the dancer, leading to a better performance.

A surprising revelation is that in the process of dancing, the frontal lobe shuts down. The frontal lobe is the ‘part of our brain responsible for thinking, therefore this implies that while dancing, other parts of our brain become more active resulting in the frontal lobe taking ‘a break.’ This is fascinating as indicates that when a dancer is purely dancing, they not directly thinking about the steps, but their body and their mind remembers instinctively for them. This suggest a unique insight into how the brain functions and such a

discovery can be used to psychologically treat medical patients.

Learning dance at a young age stimulates more neurotransmitter connections within the brain, implying that learning a form of dance alters the structure of your brain.

A consequence of improving the responsiveness of the brain, is improvements in a dancer's concentration and perseverance. This is advantageous as it advances a dancer's ability to train harder and for longer period of time. When the regions of the brain responsible for 'associative learning and imaginative faculties' are stimulated, there is a direct improvement of sensory awareness within a dancer. Further to these benefits, a dancer's spatial orientation and cognitive capacity similarly increases due to the changes and developments made within the brain.

A similar study is that of London's black cab drivers, whose widespread geographical knowledge of London's streets causes their brain's hippocampus to be larger than others. This is directly due to the fact that the hippocampus is the region of the brain where long-term memories are formed. This can be

linked to dance as a dancer's hippocampus is also enhanced due to the need to memorize and recall steps.

HOW DOES VISUALIZING MOVEMENTS IMPROVE MUSCLE MEMORY

Dancers can improve their capability of performing complex moves by 'marking' which is the process of walking through the steps slowly. Several findings published in Psychological Science suggest that 'marking may alleviate the conflict between the cognitive and physical aspects of dance practice.' Implying that marking allows the body and mind to instinctively learn steps so the dancer would not have to think about the steps while performing. This therefore allows dancers to memorize and repeat steps more gracefully.

Learning dance steps can be demanding, both physically and mentally so perfecting dance routines can place a strain on a dancer's body and mind. New research suggests that dance marking, 'loosely practicing a routine by going through the motions' can actually improve the quality of a dance performance as it 'reduces the mental strain needed to perfect

the movements.’ This is due to the fact that the brain has adapted and knows not to exert itself when the dancer is performing. This eventually leads to a dancer able to perform without consciously thinking about the steps.

The ways that marking is helpful to a dancer, is that often the dancer can remain in one place, while substituting hand gestures in place of physical movements. For example:-
“using a finger rotation to represent a turn while not actually turning the whole body.”

The researchers came to the conclusion that practicing the routine without marking, meant that the dancers could not memorise and join the steps as a sequence, therefore hindering their dance performance. Further inference that this type of marking and visualization can be used to maximize performance across other areas in life. “by reducing the demands on complex control of the body, marking may reduce the multi-layered cognitive load used.” Therefore marking is one method that can be used to enhance memory facilities within the brain. This enhancement leads to further development within the brain.

THE THERAPEUTIC VALUE OF INDIAN CLASSICAL DANCES

Dance can be considered an active form of non-competitive exercise, which has shown to improve physical health as well mental. Therefore it is not surprising that some form of dance can be used as therapy. 'Dance therapy is based on the idea that body and mind are co-relational.' Indian dances can be particularly therapeutic due to the fact that they embrace Indian philosophy, which itself encourages mental health along with body health.

Several powerful dance forms promote good health and body strength, for example:- 'the fast footwork of Kathak dance helps to release anger and tension.' The connotations we can make from this are that some dances can be used as a stress relieve as they cause you to focus your attention purely on the dance, meaning you forget about any issues that you have. Another example is Manipuri dancers, who tend to 'make rounded movements and avoid any jerks, sharp edges or straight lines', this gives Manipuri dancers a softer presence, proper body control and a relatively more peaceful mind.

All these physical movements, balancing postures, facial

expressions and muscle contractions and relaxations have a strong effect on therapeutic effect of dance in the human body. Hence why Indian dance therapists try to incorporate different dance movements within their therapeutic sessions. The histories of several Indian classical dance suggest that said dances were ‘aimed at the betterment of health of dancers.’ To an extent, they can even be compared with yoga as a form of physical and mental exercise.

Overall, the Indian classical dance styles can be grouped into seven major types, named:

- **KATHAK** — ‘Originated from northern India’ the technique of Kathak today is characterized by fast rhythmic footwork.
- **BHARATHANATYAM** — ‘Most celebrated art form in the southern Indian state of Tamil Nadu.’ There is a mythical background often associated with Bharathanatyam claims that Lord Brahma ‘bestowed this esteemed dance on Bharatha Muni’ who then taught it to Lord Shiva, who then passed on the knowledge to his wife, Parvathi, where she taught the art form to other

women and ‘in this manner, this art was traditionally handed down.’

- **MANIPURI** – This dance comes from the region of ‘Manipuri, the north-eastern state of India.’
- **KATHAKALI** – ‘Originated from Kerala’ is traditionally performed by males and involves physical movements.
- **ODISSI** – ‘Originates from the state of Orissa, in Eastern India.’
- **KUCHIPUDI** – This dance come from Andhra Pradesh.
- **MOHINIYATTAM** – ‘Traditional South Indian dance from Kerala’ with the main theme of the dance being ‘love and devotion to God.’

Out of these seven types, Bharathanatyam is still considered to be the ‘most sublime.’ Within this dance form, the dancers use hand and eye movements to express various emotions, which in turn allow them to express their inner feelings. This

sort of expression is beneficial to mental health as it causes the mind to be at peace. Hence why many use the practice of Indian classical dance for ‘emotional wellbeing and psychotherapy.’

HOW DOES DANCE THERAPY AFFECT BODY HEALTH AND THE PSYCHIATRIC POPULATION

Dancing is considered to be ‘one of the earliest forms of therapeutic practice and experience known to humanity.’ The combination of music and movement is enhanced by the expression of feelings. ‘Dance therapy is the psychotherapeutic use of movement and dance through which the individual participates creatively in a process that furthers his cognitive, emotional, physical and social integration.’

There is a growing interest in how dance can benefit brain functions, particularly in the elderly, as they are more susceptible to illness. Although the link between ‘exercise and healthy cognitive function’, is unclear, it is still an area of great interest to scientists and researchers. However dance is not purely fitness, it also involves a combination of other

advantageous features, including ‘social interaction, musical stimulation and cognitive reasoning.’

In one experiment, an elderly group of 35 took part in a dance programme over the span of six months. At the end, they displayed a ‘range of cognitive improvements, including improved working memory and reaction times.’ Interestingly, the cardiorespiratory levels within the group did not change, suggesting that although dance can improve brain functions, it is not as helpful to the rest of the body’s internal processes.

In another study, 400 older adults were tracked over a number of years and it was discovered that ‘dancing was the only physical ability linked with lower risk of dementia.’ Further inference suggests that the physical exercise attribute within dance is not alone in protecting the ‘cognitive and perceptual’ capacities of a dance.

Therefore researchers have also explored the therapeutic effects of dance for treating clinical conditions. ‘The findings of several small-scale studies indicate that dancing may be beneficial for people with certain neurodegenerative disorders, like dementia.’ It is suggested that weekly dancing

sessions can improve visual functions and ‘planning ability’ for dementia patients.

One of these studies was presented in the New England Journal of Medicine in 2003 by researchers at the Albert Einstein College of Medicine. They came to the conclusion that dance can improve brain health through investigating the ‘effect leisure activities had on the risk of dementia in the elderly.’ They tried eleven different types of physical activities, but discovered that only dance ‘lowered participants’ risk of dementia.’ This is due to the fact that dance involves both mental strength and social interaction, therefore ‘this type of stimulation can help reduce the risk of dementia.’

Dance therapy has also been able to help people with mental illness. This is particularly shown in one study involving psychiatric ward patients, where it was revealed that ‘just 30 minutes of dancing to lively music was sufficient to reduce their symptoms of depression and improve vitality.’

The most fascinating idea that this study unearthed, was that when the same group of researchers involved a second group of patients who only ‘listened to the same music, without

dancing’, was that they did not benefit as much from the experience as the dancing patients did. Therefor providing connotations that ‘music alone wasn’t enough.’

Alexia Margariti and Nicolas- Tiberio Economou’s paper refers to the application of ‘primitive expression therapy’ which is a form of dance therapy that was created by Katherine Dunham, a dancer, choreographer and educator in the fifties. This study observed the positive changes in patient ‘psychological behavior as well as physiological state’ when they applied PE therapy to psychiatric patients. According to this concept, we can understand that PE therapy can be used to assess psychological behavior as well as the ‘neurophysiological changes’ in the psychiatric patients undergoing treatment.

Has such beneficial effects on the brain that it is now being used to treat people with Parkinson’s disease.’ Over ‘one million people in this country are living with Parkinson’s disease’ and according to the Parkinson’s Disease Foundation, ‘each year another 60,000 are diagnosed.’ Parkinson’s disease is a ‘progressive neurological movement disorder’ is affected. As the disease progresses, increasing

number of these cells die, therefore reducing the amount of dopamine within the brain.

According to the foundation, ‘the primary motor symptoms of Parkinson’s disease include bradykinesia (slowed movement), stiffness of the limbs, tremors and impaired balance and coordination.’ Therefore it can be considered that dance may lessen these symptoms, however this is not completely scientifically proven and for the moment is merely ‘observational research’. The University of Hertfordshire conducted a study looking at ‘what happens psychologically to people with Parkinson’s disease’ and looked particularly at the physical, cognitive and emotional issues. They came to the conclusion that there are ‘three elements in dancing that are vital to improving health and distinguishes dance from other forms of exercise’. These elements are social interaction, the physical aspect and cognitive learning.

WHAT EFFECT DOES MUSIC HAVE ON THE BRAIN

Music is a critical aspect within dance, and is already known for having a unique effect on the brain. Therefore it is not a far-fetched idea to believe that dance also has an effect

on the brain. There is no question that music has a very stimulating effect on physical activity, and I think that applies to dance, as well.

Inside a 2008 article within Scientific American magazine, a Columbia University neuroscientist stated ‘that synchronizing music and movement constitutes a pleasure double play.’ Therefore implying that the musical aspect of dance stimulates the brain neurologically, while the movement aspect ‘activates the brain’s sensory and motor circuits.’

According to experts, ‘music can stimulate multiple regions within the brain, particularly the hippocampus’, which is the part of the brain that manages long-term memory. So by listening to the same music repeatedly, the feelings and emotions associated with each piece of music are revived within the hippocampus.

Piano music can be used to improve spatial reasoning skills, which can be defined as ‘the ability to reason depiction, measurement, navigation and shape accurately.’ In other words, it is the ability to understand shapes and dimensions, which can also be linked towards dance.

Music has also been shown to reduce stress and anxiety levels, as shown in a study published in ‘Trends in Cognitive Sciences.’ The study conveys that the patients that listened to music, experienced lower levels of cortisol, compared to patients who took anti-anxiety drugs. Knowledge gained from research suggests that calming sounds.

As music and dance have been shown to help within therapy, it is not surprising that music can be thought to provide benefits to brain damaged patients. There is one such program called “Melodic Intonation”, where the patient is encouraged to sing, until they can manage to talk once again. This is a result of music appealing to the ‘damaged part of the brain associated with language.’

HOW DOES OTHER FORMS OF DANCE AND EXERCISE AFFECT THE BODY AND THE BRAIN

A study presented by researchers from imperial College London, claimed that ballet dancers had ‘specific differences in brain structure’ which prevented dizziness when they

performed pirouettes. To obtain evidence for this idea, the researchers gathered a 'group of 29 female ballet dancers and a group of 20 female rowers', who were of similar age and fitness levels as the dancers. In the experiment, both groups were subjected to spin around on a chair in a darkened room. They were told to turn a handle in time with how quickly they felt like they were still spinning after the chair had stopped. The researchers at imperial also 'measured eye reflexes triggered by input from the vestibular organs.' In order to understand how these exercises effected the brain, the researchers also examined the dancers and rowers.'

Dance is not only form of exercise that impacts the brain, often other ways of keeping fit such as yoga and self -defence are also beneficial. A hospital is interested in helping chronically ill patients by using unconventional methods. Tai chi is a type of Chinese martial art that was originally used for self - defence, however now it is more commonly used as a fitness exercise. Tai chi can be in some ways similar to dance, 'tai chi to be a more ritualized, structured form of dance.'

Within the 2021 edition of New England Journal of Medicine, a study was published by a scientist from the Oregon

Research Institute, containing research that discovered that tai chi ‘helped improve balance and prevented falls among people with mild to moderate Parkinson’s disease.’ This conclusion was brought about through an experiment using results from a group of patients suffering from the disease, who practiced weight training or stretching for the same length of time instead. Overall, the patients who did tai chi, became physically strong.

HOW IS BHARATHANATYAM UNIQUE TO OTHER DANCERS

Bharathanatyam involves several aspects to dance, including the physical steps, the intricate movements and the facial expressions. While some dances, like ballet or ballroom, mainly focus on the physical aspect of the art form, Bharathanatyam is divided into three main types of dance, as previously mentioned; Nritham, Nrithiyam and Natyam. Therefore Bharathanatyam contains pieces which are only made up of steps, pieces which are purely expression and also pieces which are a combination of the two. The intricate movements that are performed within Bharathanatyam are similar to contemporary dance, but are executed more gently by the dancer.

Bharathanatyam also passes on 'transferable skills', which encourage students to withstand high amounts of pressure and be able to present to large crowds. These abilities can be beneficial for students working towards higher education and professional careers.

What really makes Bharathanatyam stand out, is its use of facial expressions, as this art form places emphasis on portraying your passion towards the audience. Within Bharathanatyam there is 'nine human emotions, which are love, anger, fear, disgust, surprise, compassion, bravery, laughter and peace.' These emotions can be portrayed through head, neck and eye movements, along with various hand gestures. For example:- when you express these emotions as a dancer, you try to psychologically experience the emotion and in turn push out your real emotions.' Backs up the point using a typical story of Rama and Sita, where the dancer has to display tangible emotion to be able to accurately portray Rama's love for Sita.

However physical movements are also an important feature for Bharathanatyam, as they make it distinctive from softer

types of dances. Further to this idea, it can be said that Bharathanatyam is ‘similar to karate, in terms of its hard, forceful steps.’

Bharathanatyam combines four main aspects of expression, portrayed through vibrant costumes, intricate hand and leg movements, expression through music and ‘the last expression is the expression through your inner soul, your spirituality.’ These qualities combined creates a unique art form that stands out from other dance styles.

CONCLUSION

It is clear that dance has a significant impact on the brain and the two are undoubtedly interlinked. Dance has always shown physical benefits on the body, however more recent research appears to show the mental benefits for partaking in this art form. Dance has been shown to stimulate various regions of the brain, which has an essential effect on how dancer’s perform and how they function in everyday life. Research has shown that visualizing movements can improved muscle memory within the brain and the frontal lobe shuts down when dancing. Further research has depicted how dance can be used as a therapeutic method to improve

brain health. Therefore benefiting mentally ill patients and patients suffering from illnesses that effect motor control.

Many forms of exercise have an influence on the brain however, dance is more advantageous as it embraces aspects of music, physical exercise and mental health.

Bharathanatyam is good example of a dance form that has a unique impact on the brain, as it embraces the idea of mental fitness through storytelling and facial expressions, while also including a vigorous physical element. This affects more areas of the brain and in turn results in additional brain development.

