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Doctoral Programme in Educational Psychology

Title: Brain Gym® – an academic critique

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Brain Gym® is part of the 'Educational Kinesiology' movement (often called Edu-K by its members), which believes that certain types of physical activity can support children's learning and development. In an article about his theories, the Brain Gym® creator Paul Dennison explained that educational kinesiologists believe that 'movement can create intelligence' (Dennison, 2009).

The Brain Gym® method involves teachers and students, or parents and their children, performing daily activity sessions together. The Brain Gym® manual describes 26 separate activities for children to perform, with each activity promoting its own benefits, such as improved concentration or better co-ordination (Dennison & Dennison, 1994). The activities are described clearly, with photographs to aid understanding. The variety of recommended activities includes 'hook ups', where you extend the arms forward, with palms facing outward. You then cross your straight arms at the wrist so that you can clasp your hands together, palm to palm, and with your fingers interlinked. Finally, you rotate your clasped hands back under your arms until they are next to your chest with your fingers facing upwards; you should then keep your eyes closed and breathe deeply. Hook ups are meant to help calm you down, to help you make a decision, and to help you focus (Dennison & Dennison, 1994). In addition, the Brain Gym® manual recommends other factors which can improve children's learning and performance, such as ensuring that they consume lots of water each day, especially before performing Brain Gym® exercises (Dennison & Dennison, 1994).

Brain Gym® is of interest to the Educational Psychologist (EP) community since the programme has been bought by numerous schools and Education Authorities around the UK as a means of supporting children's learning. Its popularity is perceived to be waning, but in my practice as a Trainee EP I have been asked by schools whether it is an appropriate intervention to improve whole class learning.

What are Brain Gym's® aims?

Brain Gym® explains that it uses a prescribed set of movements to support the development of brain function (Dennison & Dennison, 1994; Dennison, 2009). The Brain Gym® literature talks about the laterality of the brain, and the fact that movement in the left side of the body can activate the right hemisphere of the brain and vice-versa (Dennison, 1986). The hypothesis is that by coordinating the left and right hemispheres of the brain, improvements will be achieved in reading, writing, speaking, thinking and moving (Hyatt, 2007). Equally, Brain Gym® aims to support children's development through 'focusing', which coordinates the front and back of the brain, to help students' comprehension, and also to assist students who struggle with attention difficulties such as Attention Deficit Disorder (ADD) and Attention Deficit/Hyperactivity Disorder (ADHD). Brain Gym® then expands these ideas further, suggesting that certain movements can enhance the brain's function – for example, specific foot movements can 'switch-on' the part of the brain which processes language (Dennison, 1986).

The Brain Gym® literature seems unclear about the theoretical underpinnings of these ideas. However, Hyatt (2007), who has researched the Brain Gym® movement, cites three main philosophies which seem to underpin the Brain Gym® ideas: neurological repatterning, cerebral dominance and perceptual-motor training.

Neurological repatterning is founded on the idea that children develop in a linear manner, and that if children miss developmental stages as they grow-up (for example not crawling, but going from seated shuffling to walking), then their neurological development may be affected (Hyatt, 2007). As a consequence, many of the Brain Gym® activities aim to encourage people to mimic movements that might be carried-out by children in their first three years

(Shamberg, 2009), thus the movements can allow for the "organic unfoldment of inborn intelligence" (Shamberg, 2009, p. 10).

Cerebral dominance is a prevalent idea within 'popular neuroscience' (Howard-Jones et al., 2007), where one hemisphere of the brain is thought to dominate, and people who don't have a dominant side of the brain can have weaker cognitive abilities (Mayringer & Whimmer, 2004). For example, Crow, Crow, Done and Leask (1998) conducted a study where they found that hemispheric indecision in the brain could lead to lower cognitive skills. Thus Brain Gym® adheres to the idea that if one improves hemispheric decision through targeted exercises then you can improve cognitive function (Denison, 2009). Linked to cerebral dominance is cerebral modality – where certain hemispheres or parts of the brain are responsible for particular competencies. For example, through Functional Magnetic Resonance Imaging (fMRI), neuroscientists have discovered that a part of the brain called 'Broca's Area' is involved in language formation (Geake, 2008). Thus, a further belief of Brain Gym® is that if modal brain function can be enhanced through movement, then the skills which are governed by those specific modes of the brain can also be enhanced (Dennison & Dennison, 1994). Finally, perceptual motor training attributes learning problems to poor integration of visual, auditory and motor skills. Thus, if a child is taught the perceptual skill then their learning will improve as a result (Hyatt, 2007).

What is the evidence base?

The three theoretical ideas of Brain Gym® – neurological repatterning, cerebral dominance and perceptual-motor training – have varying levels of validity (Spaulding et al., 2010). Perceptual motor training was declared invalid in the late 1980s, and has appeared only very occasionally in the literature since (Kavale & Forness, 1987; Kavale & Mattson, 1983). The American Psychological Association (APA; 1999) investigated the claims of neurological repatterning, and found that there was no scientific evidence to support the claims that children's learning could be improved if they revisited stages of development they may have missed. The APA (1999) also added that studies purporting statistical significance in support of neurological repatterning had often not taken into account the effects of maturation and especially the fact that maturation occurs erratically in children with neurological impairments and learning difficulties.

Cerebral dominance can be linked to the neuroscientific concept of modality – the fact that certain parts of the brain do seem to be more involved in particular activities and emotions. However, unlike Brain Gym's® assertion that individual parts of the brain control different processes and movements, the reality is unknowably complex; for example, studies showing language processing to be left-lateralised in the brain are specifically carried-out on extremely right-handed subjects in order to show clear fMRI images, and even in these cases there is some activity in the right hemisphere (Blakemore & Frith, 2005; Geake, 2004; Geake, 2008; Hellige, 2000).

However, there is a lot of literature in support of Brain Gym®. For example, Donczik and Bocker (2009) consider how Brain Gym's® 'laterality repatterning' can increase the 'mental speed' of learning-disabled students. Donczik and Bocker (2009) used laterality repatterning as an intervention with an experimental and a control group of students, using the Zahlen-Verbindungs test (Ostwaldt, 1986) as a pre- and post-measure of cognitive speed, and claimed statistical significance of their results. In another study of Brain Gym's® methods, De los Santos (2002) found that it was an effective intervention to help improve the success of Hispanic students in higher education, and Cammisa (1994) found that after one year of Brain Gym® activities, 25 children with 'Learning Difficulties' scored higher on tests of perceptual-motor skills than they had done a year previously.

Yet, when one begins to look more closely at the literature in support of Brain Gym®, there are a number of issues which cause concern (Spaulding et al., 2010). The most notable problem with much of the research is that, rather than being published in peer reviewed journals, the papers have been published by Brain Gym's® own 'Brain Gym® Journal', which is now called the 'Brain Gym® Global Observer' (Brain Gym® International, 2011). The Brain Gym® website is explicit about this fact and explains that much of their research is qualitative and descriptive; as a consequence the website clarifies that the wider scientific community - which Brain Gym® says seeks research conducted experimentally with control groups and demonstrating statistical significance – does not tend to publish the research which has been previously conducted on Brain Gym® (Brain Gym® International, 2011). The website is honest about the fact that to conduct longitudinal scientific research is expensive, but that they would welcome any contributions from independent researchers who were interested in the area (Brain Gym® International, 2011).

The problem with this disclaimer is that much of what Brain Gym® has published in support of its method is claiming statistical significance and the use of experimental techniques such as control groups. For example, Khalsa, Morris and Sifft (1988) use statistics to evidence that doing Brain Gym® exercises improved children's performances on the 'stork stand test', and Khalsa and Sifft (1991) also claim quantitative evidence that adult students' response times to visual stimuli decreased after Brain Gym® interventions. Again, Donczik and Booker (2009), mentioned above, make quantitative claims of statistical significance and use both a control and an experimental group. Yet, Hyatt (2007) conducted a review of Brain Gym's® methods and its supporting research and found the research base to be entirely lacking in scientific rigour. For example, the Donczik and Booker (2009) study has only very weak statistical significance, and a control group whose base line measures were better than the experimental group's. Cammisa's (1994) year-long study fails to compensate for the impact of maturation, and De los Santos (2002) extrapolates research he has conducted with primary age children to be equally valid for students in higher education. Equally, Sifft and Khalsa's (1991) paper entirely neglects to use a control group who just do cardiovascular exercise instead of the Brain Gym® intervention.

Hyatt's (2007) investigations into the Brain Gym® movement result in him concluding that there is no evidence base for Brain Gym's® claimed neurological changes, nor for the fact that this is even how the brain functions. Geake (2008) is so concerned about the claims of Brain Gym® and other programmes declaring a foundation in neuroscience that he states:

"The evidential basis of these schemes does not lie in cognitive neuroscience, but rather with the various enthusiastic promoters; in fact, sometimes the scientific evidence flatly contradicts the brain-based claims." (Geake, 2008, p. 124)

Neuroscience and Education – a wider conversation

After conducting a study of 189 education professionals at education conferences, Pickering & Howard-Jones, (2007) concluded that educators want to use neuroscience in the classroom, and believe that neuroscience can support children to learn and develop. Indeed, neuroscience research has enhanced medical and psychological understanding of how the brain functions, and this has a great impact on education (Devonshire & Dommett, 2010; Goswami, 2006). However, Howard-Jones (2009) is a vocal member of the neuroeducation community who is concerned about the amount of 'brain-based' ideas that are being used in the classroom without teachers having sufficient education around the actual neuroscience. Howard-Jones (2009) feels that the consequence is that unscrupulous companies are able to bombard schools with marketing for interventions they claim to be founded in neuroscience, knowing that schools don't have the time or scientific knowledge to investigate these claims. It is felt that neuroscientific interventions are particularly easy for companies to sell to schools, since research containing neuroscientific words or brain scans are more satisfying to people, even if the actual neuroscience is nonsensical (Weisberg, Keil, Goodstein, Rawson & Gray, 2008). Brain Gym® is arguably an example of this phenomenon.

Geake (2008) explains that the neuroeducational community call ideas such as Brain Gym® ‘neuromythologies’ and are keen to debunk them. The Economic Research Council, jointly with the Teaching and Learning Research Panel, were so uneasy about the dissemination of incorrect neuroscience into schools that they commissioned a number of leading researchers in the areas of education and neuroscience to create a simple pamphlet for educators which could help to explain some of the neuroscientific myths often perpetuated in schools (Howard-Jones et al., 2007). Even the Guardian journalist Ben Goldacre (2009) has waded into the argument, pointing-out Brain Gym’s® questionable scientific claims. Goldacre (2009) notes that in the Brain Gym® manual it claims that the water content in processed food (such as soup) is non-existent – a worrying claim when the water content of food is unquestionably established (Goldacre, 2009). He adds to Howard-Jones’ call for people in education to become more critical consumers of pseudo-science.

The Educational Psychologist’s role:

The neuroeducation community are sympathetic to the difficulty faced by educators in establishing which neuroscience interventions are evidence-based and effective. Geake (2008) notes that some of the ‘neuromyths’ have come about from the dilution of scientific research into the wider community. Equally, as Howard-Jones (2009) observes, schools are subjected to professional and persuasive sales campaigns from various organisations that are keen to sell interventions into schools; Hyatt (2007) adds that ideas such as Brain Gym® are allowed to flourish because schools are under so much pressure for results.

However, the Educational Psychologist is in a unique position to assist schools in this area. EPs have a rare opportunity among most people working in education – they have the scientific understanding required to evaluate the validity of research, and they also have a platform from which they can communicate with members of the school community who are responsible for purchasing interventions and staff training. EPs therefore have a responsibility to have conversations with school staff about which interventions they are currently using, and to make themselves familiar with the evidence base supporting these interventions.

Some of these conversations may be complex, for example Geake (2008) raises the argument that many teachers feel things ‘work in the classroom’, thus they have no interest in whether or not the intervention has a scientific basis. Other arguments sometimes raised in support of interventions such as Brain Gym® concentrate on the idea that such interventions can foster a positive relationship between students and their teachers. Equally, with physical interventions such as Brain Gym®, there is an argument that cardiovascular exercise does appear to have a positive impact on brain function (Blakemore & Frith, 2005). However, although it is important for the EP to recognise these opinions, they also have a responsibility to make it clear that there are numerous activities which teachers and students can engage in to achieve these same aims; in addition, many of these alternative activities are free and don’t require educators to communicate unscientific notions about water consumption and brain function to impressionable children. Even though teachers may enjoy the interventions they use with their students, if they do not understand the evidence base behind them then this only serves to undermine their professionalism (Geake, 2008).

Fischer et al. (2007) make a final point that the onus is not all on educators to become more informed. Scientific research also needs to escape its ‘ivory tower’ and recognise that it should make itself understood in real-life settings. In the UK, the NeuroEducational research network (NEnet, www.neuroeducational.net) at the University of Bristol has played a key role in recent national efforts to develop collaboration between the fields of neuroscience and education (Howard-Jones, 2011). The website can be recommended by EPs to schools so that they can become more informed; it is also another tool to help support EPs act as an intermediary between the worlds of academic research and the classroom.

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