ZING PERFORMANCE

Introduction to The Science

Used by Zing Performance for:

- Enhancing Learning
- Key Skill Development
- Precision Sporting Skills

THE SCIENCE EXPLAINED

Introduction

Enhancing human performance is crucial for many categories of people. For those who struggle with learning issues…

…and those with limited behavioural, social or other skills

….for athletes wishing to be the very best in their sport

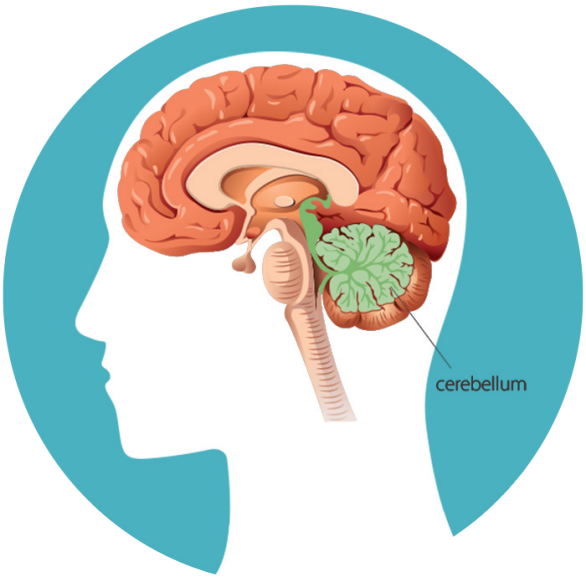
…for the elderly with declining memory, balance and consequently confidence.

The company's team of scientists, educators and business leaders worked for many years to develop and test a program that enhances brain function, based on cutting-edge research from some of the world's top universities. Zing Performance is the result and the company has developed several programs for children, athletes, women and men.

Zing Performance is engaged in ongoing research and development, and users will benefit from our dedication to the continual improvement of the Zing programs.

Our research has focused largely on the Cerebellum. Breakthrough papers from Prof Jeremy Schmahmann of Harvard Medical School in the early 1990's changed the world's perception of this part of the brain.

Only 10 % of the volume of the brain but harbouring 75% of all the brain cells, its importance became clearer. Likewise the possibilities became apparent if the effectiveness of the cerebellum could be enhanced then the functions, skills and processes could potentially improve to. And this has been and is the focus of Zing Performance.



The Cerebellum

Can the Cerebellum be **Developed Further?**

Human babies are born with little development present. This is quite unlike other mammals who are walking and feeding within minutes of birth. So, how does the Cerebellum develop? Many theories exist, but what is proven is that specific types of physical exercise play an important role. Also clear is that stimulation from the vestibular system "readies" the Cerebellum – creating a form of plasticity. When a baby is crawling, tumbling and trying to walk there is a combination of both vestibular and cerebellar stimulation, and it happens at the very time that rapid development of skills occurs.

U.S Government Paper

Our research has benefited greatly from this wealth of knowledge and sought to take it further. Our belief is that each brain is unique and has reached different stages of development. We have therefore focused our efforts on creating personalized programs for these 'different brains'. Whilst a one-size-fits-all approach is effective with some, it often fails those that need it most, and probably does not bring out all of the latent potential in any. We concluded that a fully customized program would take this exciting possibility further.

Furthermore, when the brain has responded to a certain type of exercise with a specific level of challenge (or 'difficulty') it should have 'developed' accordingly. It is then ready for the next stage of growth which can be achieved with increasing levels of stimulation or difficulty. In practice, the Zing program assesses the development and intelligently increases the stimulation so the brain continues to progress in its development until it appears optimized.

There is a large body of evidence supporting how exercise improves performance. So much so that the U.S. Department of Health and Human Services produced a booklet for schools summarizing the impact of exercise on academic performance, including indicators of cognitive skills and attitudes, academic behaviours, and academic achievement. It summarizes 50 well researched published papers in a form that schools can use (see https://www.cdc.gov/healthyyouth/health_and_ academics/pdf/pa-pe_paper.pdf "The Association Between School-Based Physical Activity, Including Physical Education, and Academic Performance").

Cerebellar Development Aids Executive Function

The Zing programs not only help develop your ability to learn new skills quicker but when the cerebellum is fully functional a person's executive functions will increase. This is, in fact, an indirect consequence. The reason is when fundamental skills are incompletely developed by the Cerebellum they cannot be completely processed in the cortex. Some of the processing must be carried out in the Cerebrum (the thinking brain) as there is an element of "thinking about" performing that skill as it hasn't been fully automated.

The thinking brain is where we make decisions, organise, remember lists etc – it is a busy place. But an under developed Cerebellum means it gets filled with processes that really need not be there. But the thinking brain is in the same part of the brain as the control of the executive functions and when it is in "overload" not only do you experience loss of emotional control it impairs the "executive" from doing its job properly.

Executive functions include attention, working memory and cognitive flexibility. Improving this area will have a knock-on effect to other aspects of a person's life including social skills, productivity and depression.

Cerebellar Development Aids Executive Function

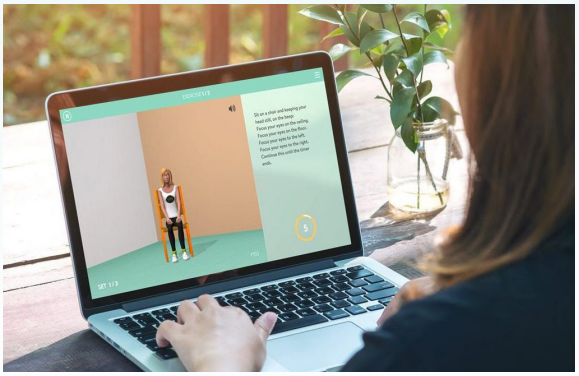
Many studies have been done on the impact of executive functions but below is a table from Diamond (2013) which summarizes it effects:

Aspects Of Life	The ways in which executive functions (efs) are important to that aspect of life	Peer Reviewed Research
Mental Health	EFs are impaired in many mental disorders, including:	
	• Addictions • Attention deficit hyperactivity disorder (ADHD) • Conduct disorder • Depression • Obsessive compulsive disorder (OCD) • Schizophrenia	• Baler and Volkow (2006) • Diamond (2005), Lui and Tannock (2007) • Fairchild et al. (2009) • Taylor-Tavares et al. (2007) • Penadès et al. (2007) • Barch (2005)
Physical Health	Poorer EFs are associated with obesity, overeating, substance abuse, and poor treatment adherence	• Cresioni et al. (2011), • Miller et al. (2011), • Riggs et al. (2010)
Quality of life	People with better EFs enjoy a better quality of life	• Brown and Landgraf (2010), • Davis et al. (2010)
School readiness	EFs are more important for school readiness than are IQ or entry-level reading or math	• Blair and Razza (2007), • Morrison et al. (2010)
School success	EFs predict both math and reading competence throughout the school years	• Borella et al. (2010), • Duncan et al.(2007), • Gathercole et al. (2004)
Job success	Poor EFs lead to poor productivity and difficulty finding and keeping a job	• Bailey (2007)
Marital harmony	A partner with poor EFs can be more difficult to get along with, less dependable, and/or more likely to act on impulse	• Eakin et al.(2004)
Public Saftety	Poor EFs lead to social problems (including crime, reckless behavior, violence, and emotional outbursts)	• Broidy et al. (2003), • Denson et al. (2011)

Source: Diamond (2013)

The Zing Performance Program
The Key To Lasting Improvements

The Cerebellum "comes alive" when the vestibular is stimulated. The secret to developing the Cerebellum is to use physical exercises that create appropriate vestibular stimulation whilst simultaneously carrying out a coordinative exercise.



This enhances plasticity. Sounds easy? Sadly not so easy – every brain is unique so requires a personalised program. Every brain develops at a different pace – so the program must adjust accordingly if it's to maximise the development and thus realise the potential.

This is what the Zing team has spent many years perfecting. Now it uses Artificial Intelligence (A.I) to continue the fine tuning and optimise the speed of development. Happily, after working with many 1000's of clients – children, adults and athletes we have a safe and proven system.

Taking only 10 minutes twice a day the program achieve life changing results in under 12 months for many. Those with more complex issues can take longer to achieve optimum changes. And, of course, when the Cerebellum develops the results last – unlike the memory functions of the Hippocampus which can be more temporary.

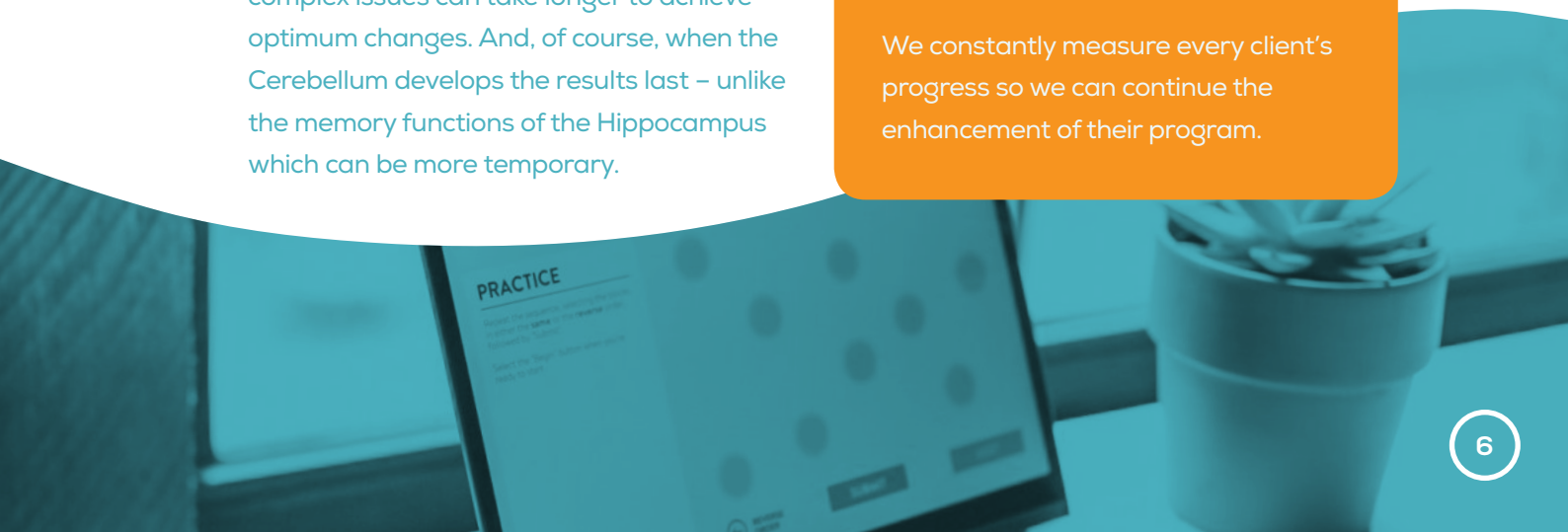
What's Happening in the Brain?

What "fires together wires together". Zing carefully creates the appropriate "challenges" to cause connections to "fire together". Do this frequently enough and new connections are made.

New Connections = New Skills = More Intelligence

The nature of the personalised Zing programs is that for each user they are receiving the correct type and level of stimulation for the correct amount of time – and this is adjusted everyday throughout the program.

We constantly measure every client's progress so we can continue the enhancement of their program.



Measuring Client Progress

For every Zing user performance data is collected as follows;

Cognitive Skills (Objective)

	Kids (7-11yrs)	Teen (12-17yrs)	Adult	Sport
Visual Working Memory	✓	✓	✓	✓
Auditory Working Memory	✓	✓	✓	✓
Concentration	✓	✓	✓	✓
Memory Recall	✓	✓	✓	✓
Reading	✓	✓		
Response Time			✓	✓

Real-Life Feedback (Subjective)

	Kids (7-11yrs)	Teen (12-17yrs)	Adult	Sport
Organizational Skills	✓	✓		
Learning	✓	✓		
Decision Making			✓	✓
Controlling Emotions	✓	✓	✓	✓
Communication Skills			✓	
Balance & Coordination	✓	✓		
Skill Performance				✓
Productivity			✓	

Research Evidence

There are numerous research papers published on coordinative exercise developing brain function, however we have selected two easy to understand studies and provided the summaries below. The first study uses elderly participants, being able to show an increase in cognitive function in this declining generation indicates that an improvement could be made in the general population.

1 Effectiveness of coordination exercise in improving cognitive function in older adults: a prospective study

Timothy CY. Kwok, KC Lam, PS Wong, WW Chau, Kenneth SL. Yuen, KT Ting, Elite WK. Chung, Jessie CY. Li, Florence KY. Ho. (September 2011)

40 participants (3 males, 37 females) mean age of 79yrs.

Methods

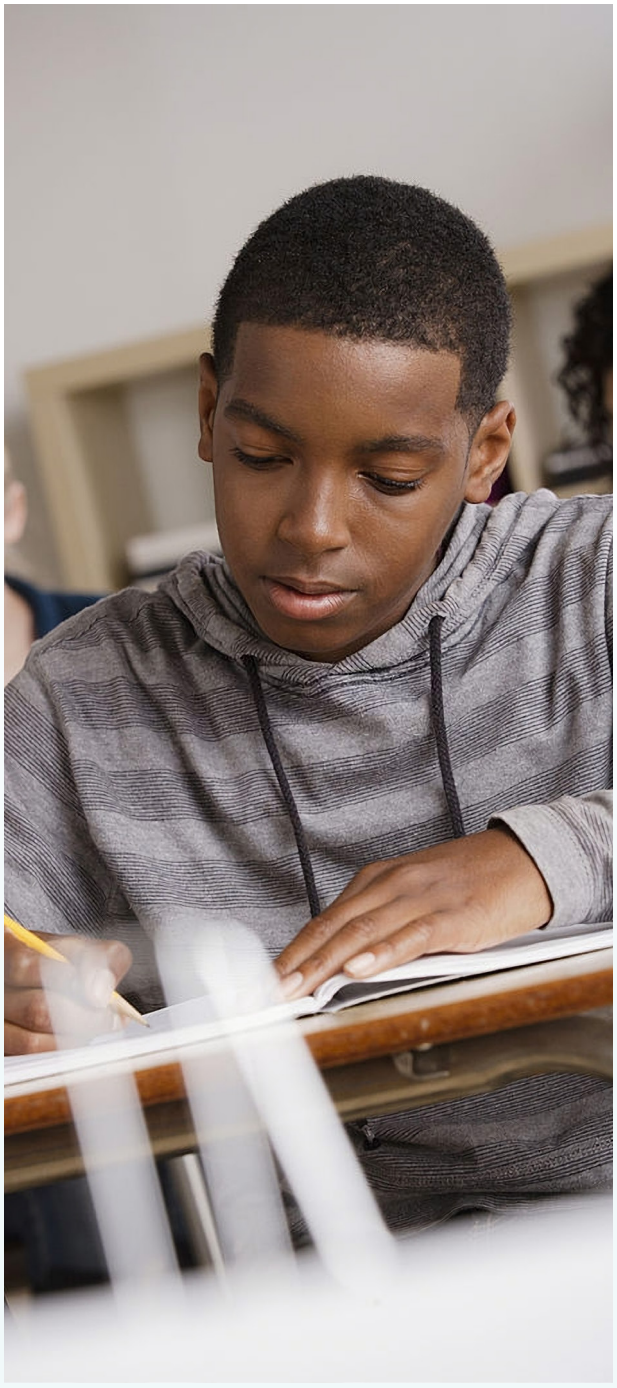
Participants from two centers for the elderly were allocated to practice either an 8-week coordination training (CT) program or an 8-week towel exercise (TE) program. The Chinese Dementia Rating Scale (CDRS) was used to measure cognitive functioning of participants among other physical measurements. These assessments were administered before and after the program.

Results

The dementia rating scale scores (CDRS) of the coordination training (CT) group improved significantly from 114.8 at pre-test to 119.3 after training. The scores of the towel exercise (TE) group also improved from 114.9 at pre-test to 116.9 after training.

Research Evidence

2 Acute coordinative exercise improves attentional performance in adolescents.
Henning Budde, Claudia Voelcker-Rehageb, Sascha Pietraßyk-Kendziorraa, Pedro Ribeiroc, Gunter Tidowa (June 2008)



Healthy adolescents aged 13-16yrs old from an elite performance school; 99 (80 male and 19 female) mean age of 14.98yrs.

Methods

The group was split into 2 sub-groups. A group of 52 (44 male, 8 female – referenced as the 'NSL' group in the results) who performed normal physical education classes of medium intensity exercise without any specific coordinative requests, and a group of 47 (36 male, 11 female – referenced as the 'CE' group in the results) who performed coordinative exercises which were selected from special coordinative training forms for soccer.

The Neuropsychological performance of students were assessed in areas of attention and concentration through an assessment called the d2-test.

Results

The results indicate that the group which undertook the coordinative exercises (CE) displayed greater improvements in the controlled attention and concentration tests over the group which undertook regular physical exercise.

Since the heart rate was the same in both groups, this supports that the coordinative character of the exercise is responsible for the significant difference between the two groups.

Peer-Reviewed Research

Bailey (2007)
Bailey, C.E. (2007) Cognitive accuracy and intelligent executive function in the brain and in business. Annals of the New York Academy of science, 1118, 112-41.

Baler and Volkow (2006)
Baler, R.D. and Volkow, N.D. (2006) Drug addiction: the neurology of disrupted self-control. Trends Mol. Med, 12, 559-66.

Barch (2005)
Barch, D.M. (2005) The cognitive neuroscience of schizophrenia. Annual Review Psychology, 1, 321-53.

Barton and Venditti, 2014
Barton, B.A. and Venditti, C. (2014) Rapid evolution of the cerebellum in humans and other great apes. Current Biology, 24 (20), 2440-2444.

Bellebaum et al. 2012
Bellebaum, C., Daum, I. and Suchan, B. (2012) Mechanisms of cerebellar contributions to cognition in humans. Cognitive science, 3 (2), 171-184.

Ben-Soussan et al. 2015
Ben-Soussan, T.D., Piervincenzi, C., Venditti, S., Verdone, L., Caserta, M. and Carducci, F. (2015) Increased cerebellar volume and BDNF level following quadrato motor training. Synapse, 69 (1), 1-6.

Blair and Razza (2007)
Blair, C., and Razza, R.P. (2007) Relating effortful control, executive function, and false-belief understanding to emerging math and literacy ability in kindergarten. Child development, 78, 647-63.

Borella et al. (2010)
Borella, E., Carretti, B., and Pelgrina, S. (2010) The specific role of inhibition in reading comprehension in good and poor comprehenders. Journal of learning disabilities, 43, 541-52.

Broidy et al. (2003)
Broidy, L.M., Nagin, D.S., Tremblay, R.E., Brame, B., Dodge, K.A., and Fergusson, D.E. (2003) Developmental trajectories of childhood disruptive behaviour and adolescent delinquency: a six-site cross-national study. Developmental Psychology, 30, 222-45.

Brown and Landgraf (2010)
Brown, T.E., and Landgraf, J.M. (2010) Improvements in executive function correlate with enhanced performance and functioning and health-related quality of life: evidence from 2 large, double-blind, randomized, placebo-controlled trials in ADHD. Postgrad. Med. , 122, 42-51.

Budde et al. 2008
Budde, H., Voelcker-Rehage, C., Pietrabyk-Kendziorra, S., Ribeiro, P. and Tidow, G. (2008) Acute coordinative exercise improves attentional performance in adolescents. Neuroscience Letters, 441 (2), 219-23.

Burciu et al. 2013
Burciu, R.C., Fritsche, N., Granert, O., Schmitz, L., Sponemann, N., Konczak, J., Theysohn, N., Gerwig, M., van Eimeren, T. and Tinmann, D. (2013) Brain changes associated with postural training in patients with cerebellar degeneration: a voxel-based morphometry study. The journal of neuroscience, 33 (10), 4696-604.

Crescioni et al. (2011)
Crescioni, A.W., Ehrlinger, J., Alquist, J.L., Conlon, K.E., Baumeister, R.,F., Schatschneider, C., and Dutton, G, R. (2011) High trait self-control predicts positive health behaviours and success in weight loss. Journal of health psychology, 16 (5), 750-9.

D'Angelo and Casali, 2013
D'Angelo, E. and Casali, S. (2013) Seeking a unified framework for cerebellar function and dysfunction from circuit operations to cognition. Frontiers in Neural Circuits, 6 (116).

Davis et al. (2010)
Davis, J.C., Tomporowski, P.O.D., McDowell, J.E., Austin, B.P., Miller, P.H., Yanasak, N.E., Allison, J.D., and Naglieri, J.A. (2011) Exercise improves executive function and achievement and alters brain activation in overweight children: a randomized, controlled trial. Health psychology, 30 (1), 91-8.

Denson et al. (2011)
Denson, T.F., Pederson, W.C., Friese, M., Hahm, A., and Roberts, L. (2011) Understanding impulsive aggression: Angry rumination and reduced self-control capacity are mechanisms underlying the provocation-aggression relationship. Personality and Social Psychology Bulletin, 37 (6), 850-862.

Peer-Reviewed Research

Diamond (2005)
Diamond, A. (2005) Attention-deficit disorder (attention-deficit / hyperactivity disorder without hyperactivity): a neurobiologically and behaviourally distinct disorder from attention-deficit / hyperactivity disorder (with hyperactivity). Dev. Psychology, 17, 807-25.

Diamond (2013)
Diamond, A. (2013) Executive Functions. Annual Review of Psychology, 64 (64), 135-168.

Duncan et al. (2007)
Duncan, G.J., Dowsett, C.J., Claessens, A., Magnuson, K., Huston, A.C., Klebanov, P., Pagani, L.S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., and Duckworth, K. (2007) School readiness and later achievement. Developmental psychology, 43 (6), 1428-1446.

Eakin et al.(2004)
Eakin, L., Minde, K., Hechtman, L., Ochs. E., Krane, E., Bouffard, R., Greenfield, B., and Looper, K. (2004) The marital and family functioning of adults with ADHD and their spouses. Journal of attention disorders, 8, 1-10.

Fairchild et al. (2009)
Fairchild, G., van Goozen, S.H., Strollery, S.J., Aitken, M.R., Savage, J., Moore.S.C. and Goodyer, I.M. (2009) Decision making and executive function in male adolescents with early-onset or adolescence-onset conduct disorder and control subjects. Biol. Psychiatry, 66(2), 162-168.

Gathercole et al. (2004)
Gathercole, S.E., Pickering, S.J., Knight, C., and Stegmann, Z. (2004) Working memory skills and educational attainment: evidence from National Curriculum assessments at 7 and 14 years of age. Applied cognitive psychology. 18, 1-16.

Hogan et al., 2011
Hogan, M.J., Staff, R.T., Bunting, B.P., Murray, A.D., Ahearn, T.S., Deary, I.J. and Whalley, (2011). Cerebellar brain volume accounts for variance in cognitive performance in older adults. Cortex, 47 (4), 441-450.

Koziol et al., 2014
Koziol, L.F., Budduig, D., Andreasen, N., D'Arrigo, S., Bulgheroni, S., Imamizu, H., Ito, M., Manto, M., Marvel, C., Parker, K., Pezzulo, G., Rammani, N., Riva, D., Schmahmann, J., Vandervert, L. and Yamazaki, T. (2014) The cerebellum's role in movement and cognition. Cerebellum, 13 (1), 151-177.

Kwok et al. 2011
Kwok, T.C., Lam, K.C., Wong, P.S., Chau, W, W., Yuen, K.S., Ting, K.T., Chung, E.W., Li, J.C. and Ho, F.K. (2011) Effectiveness of coordination exercise in improving cognitive function in older adults: a prospective study. Clinical interventions in aging, 6, 261-267.

Lui and Tannock (2007)
Lui, M. and Tannock, R. (2007. Working memory and inattentive behaviour in a community sample of children. Behav. Brain Funct, 3-12.

Miller et al. (2011)
Miller, H.V., Barnes, J.C., and Beaver, K.M. (2011) Self-control and health outcomes in a nationally representative sample. Annual journal of health behaviour, 35, 15-27.

Morrison et al. (2010)
Morrison, F. J., Ponitz, C. C., and McClelland, M. M. (2009). Self-regulation and academic achievement in the transition to school. In S. Calkins & M. Bell (Eds.), Child development at the intersection of emotion and cognition (pp. 203–224). Washington, DC: American Psychological Association.

Penades et al. (2007)
Penades, R., Catalan, R., Rubia, K., Andres, S., Salamero, M., and Gasto, C. (2007) Impaired response inhibition in obsessive compulsive disorder. Eur. Psychiatry. 22, 404-10.

Riggs et al. (2010)
Riggs, N.R., Spruijt-Metz, D., Sakuma, K.K., Chou, C.P., and Pentz, M.A. (2010) Executive cognitive function and food intake in children. Journal of nutritional edu. Behaviour, 42, 398-403.

Taylor-Tavares et al. (2007)
Taylor-Tavares, J.V., Clark, L., Cannon, D.M., Erickson, K., Drevets, W.C., and Sahakian. B. J. Distinct profiles of neurocognitive function in unmedicated unipolar depression and biopolar II depression. Biological Psychiatry, 62(8), 917-24.

Wang, Kloth and Badura, 2014
Wang, S.S., Kloth, A.D., and Badura, A. (2014) The cerebellum, sensitive periods, and autism. Neuron, 83 (3), 518-32.

ZING
PERFORMANCE

www.zingperformance.com