THE SCIENCE BEHIND GYMZOONASIUM

THE PROBLEM

Exercise and physical activity are vital for the physical, mental, and social well-being of all people [40]. Unfortunately, the 2018 Report Card on Physical Activity for Children and Young People scored the overall physical activity level of Australian children as a D-minus [1]. Less than 23% of Australian children aged 5-14 are moving their bodies for the recommended 60 minutes per day [5].

Increasing pressures to improve academic scores often lead to additional instructional time for subjects such as mathematics and language, at the cost of time for being physically active [50]. The result of this is that opportunities for physical activity at school are regularly decreasing. From a progressively younger age the focus is on 'sitting still' and 'paying attention', with primary children now spending 70% of class time sitting – the importance of active play and the needs of the 'whole child' are ignored [4, 36].

Children's physical activity and fitness levels are linked with their executive function and academic achievement [22]. Inactivity negatively impacts brain health and executive control, including working memory, the ability to resist distractions, and the abilities to maintain focus and multi-task [27, 26]. In a classroom context, this often impacts on teachers and students in the form of disruptive behaviour, fidgeting, impulsivity, and distraction [48].

Classroom teachers often have a lack of training in physical education and thus lack the confidence to incorporate physical education for their class [60]. Schools have a responsibility to provide physical activity, both outside and inside the classroom—the importance of teachers being supported to implement effective daily physical activity is of critical importance [43, 63].

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

The opportunity for classroom-based physical activity

From a physical perspective, regular physical activity supports children's brain development, bone strength, muscle control, balance and coordination, healthy weight, [21, 23]. In terms of cognitive and mental health, exercise helps regulate sleep patterns, depression and anxiety, concentration, self-esteem, body image, social skills, relationships, resilience, and confidence [21, 23, 34, 49].

Physical activity and physical literacy are linked with enhanced resilience in children [34]. Physical literacy is the competence to perform movement skills and the knowledge, motivation, confidence, and understanding to value and take responsibility for engagement in physical activity across the lifespan. Physical literacy is said to be the basis for sustaining the health of individuals.

Children who engage in high levels of physical activity are at a reduced risk of cardiovascular disease, obesity, Type II Diabetes, cancer, and other chronic illness [41]. They are also more likely to maintain a healthy, active lifestyle into adulthood [23].

Schools are the most strategic and practical place for students to learn about and practice being physically active [14]. Classroom physical activity is needed in addition to PE classes and recess [14]. With very little changes to routine, students can be gifted 20-60 minutes of physical activity throughout their classroom time.

The more physically active schoolchildren are, the better they do academically [50]. Academic performance is found to be maintained or increased when normal academic classes are reduced and replaced by an increase in exercise, physical activity, or physical education [19, 28, 47, 51]. In fact, the average academic achievement of children who had access to additional physical activities is significantly higher than those who did not [3, 9].

There is a huge potential up-side for schools that commit to breaking up and reducing the time children spend sitting at school and increasing their physical activity levels [4]. It's beneficial to break up long periods of sitting with active "brain breaks" as often as possible. Physically active brain breaks are very beneficial for students' emotional regulation, attentiveness, focus, stress levels, cognitive/mental functioning, memory, and learning capacity [4, 14, 22].

Physical activity has an immediately positive impact on an individual's cognitive functioning both in the short- and long-term [7]. Regular moderate-to-vigorous physical activity is associated with many cognitive benefits: improved brain processing speed, working memory, planning and problem-solving, attention,

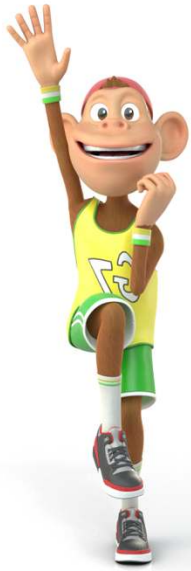
© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

anxiety and impulsivity. Brain function and working memory may be heightened immediately after exercise [23].

Specifically, classroom physical activity improves students' concentration and ability to stay on-task; cognitive function (brain processing speed, working memory, planning and problem solving); behaviour, fidgeting and impulsivity; motivation, engagement, enjoyment of learning; academic performance in the form of test scores; and mental health in the form of anxiety, stress, depression and self esteem [14, 58]. Classroom-based physical activity interventions may provide a practical, low-cost, and effective strategy to increase academic-related outcomes [58].

Research also supports the value of physical literacy development in schools as part of a holistic approach that supports students' wellbeing and future health [34]. Longitudinal research has found that daily physical education during primary school has significant long-term positive effects on women's exercise habits in adulthood and positive health outcomes for both men and women [56].

WHY GYMZOONASIUM?



Many teachers lack the training, experience, confidence, or personal values pertaining to the importance of physical activity, and time to plan and implement a daily physical activity program.

GymZOOnasium develops teachers' skills and capabilities to facilitate classroom physical activity through the use of evidence-designed sessions, with an incredibly low time-commitment needed to familiarise with the program.

When you use GymZOOnasium you can have confidence that you are implementing a program purpose-built for your class' needs and based on scientific evidence in…

SESSION DESIGN

When encouraging children to participate in exercise, it's important to find something they enjoy [23[. Children have been found to be receptive to additional daily physical activity at school, especially when it offers high time-on-task, is fun, and reflects their interests [37]. Children are more likely to participate in physical activity when they have developed feelings of confidence, enjoyment, and self-efficacy towards sport and physical activity [61].

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

Intensity, Duration and Frequency

Several studies have investigated the optimal dose of active brain breaks, by manipulating their intensity, duration and frequency [58].

Regular moderate-to-vigorous physical activity is associated with many cognitive benefits: improved brain processing speed, working memory, planning and problem-solving, attention, anxiety and impulsivity [23]. Moderate intensity movement breaks have been found to produce the greatest improvement in selective attention, while participation in vigorous physical activity may further enhance learning [16, 19, 29, 33].

Classroom physical activity at an optimum 10-minute mark has been shown to produce the greatest improvements in on-task classroom behaviour and math scores [30, 31]. Using these active brain breaks twice per day has shown significantly better selective attention scores for children, compared to only once per day [2].

Aerobic Exercise

Aerobic exercise in bouts as short as 10 minutes improves impulsivity, mood, unproductive and disruptive behaviour, attention span, work performance, on-task behaviour, aggressive behaviour, stereotyped and self-injurious behaviour, executive control and function, and purposeless wandering [7, 10, 15, 44, 48, 55].

Gross Motor Skills

Children with less-developed motor abilities engage less in physical activities, which can have life-long impacts on their physical and mental health [46].

Developing gross motor capacity within children not only improves their cognitive function, physical, and psychosocial development, it also improves their academic abilities in language, reading, and mathematics [46, 53, 59]. On top of this, motor development is critical to the overall development of children with ASD [36].

Fine Motor Skills

Development of fine motor skills is linked to self-care abilities in children, as well as aspects of language, literacy, reading and math achievement, cognitive development, emergent writing, and handwriting proficiency (which in turn is linked to later academic achievement) [12, 13, 26, 32, 45, 54, 64].

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

Strength

Strength training can improve coordination, strength, resilience, mental health, self-esteem, sports performance and injury risk; and set children up for a lifetime of health success [23].

Regulation

Children naturally have limited attention spans and require help in learning how to self-regulate their moods [35]. Studies have shown that movement and music help students learn these important skills and be able to manage their brain and body physically, mentally, and emotionally even from a single bout, making such sessions a valuable in-class strategy for self-regulation [18, 35, 57, 62].

Activities rich in vestibular, tactile, and proprioceptive input (to address students' sensory processing needs) are effective in reducing self-stimulating and self-injurious behaviours and increasing students' function and participation [52]. Results support the effectiveness of using exercise as a proactive strategy for reducing disruptive behaviours in the classroom [6].

Coordination

Coordination exercise helps with developing attention, working memory, verbal learning, and memory skills, and directly correlates with children's academic achievement and cognitive function [11, 24].

Bilateral coordination activities are effective for improving children's focus and performance in the classroom, with 10min of bilateral coordination exercises producing more improvement in students' concentration and attention than a normal physical education lesson of the same duration [11, 17].

Crossing the Midline

Crossing the midline movements can help strengthen a connection between students' mind and body, which results in a more productive and successful school day [42].

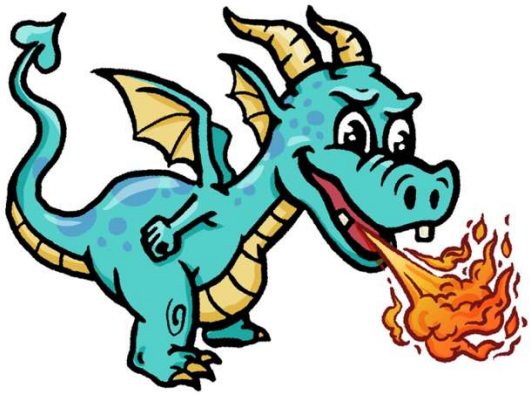
When the ability to cross the midline is not fully developed early on, students will have a hard time with specific activities in the classroom such as reading or tracking items across their body, and can lead to them compensating with disruptive classroom behaviours [38].

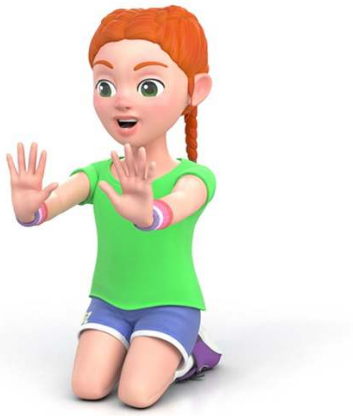
© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

Oftentimes parents and teachers are quick to diagnose a student and look for prescription medications to help solve problems that look like ADHD, which could potentially be fixed through crossing the midline movements in and outside of the classroom [8].

Meditation and Breathing

Activities that include meditation and breathing exercises, such as yoga, show positive effects on attention, planning, and emotional control of school children [25, 39].





GymZOOnasium has been designed through the expertise of Occupational Therapists, Physiotherapists, Exercise Physiologists, Yoga Instructors, Teachers, Parents, and children. Using the latest in scientific research and recommendations, our sessions are acutely aligned to give students the best possible outcomes, and teachers the easiest possible implementation.

Experience GymZOOnasium today: www.gymzoonasium.com.au

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

References

1. Active Healthy Kids Australia (2018). Muscular Fitness: It's Time for a Jump Start. The 2018 Active Healthy Kids Australia Report Card on Physical Activity for Children and Young People. Adelaide, South Australia: Active Healthy Kids Australia.
2. Altenburg TM, Chinapaw MJM, Singh AS. (2016). Effects of one versus two bouts of moderate intensity physical activity on selective attention during a school morning in Dutch primary schoolchildren: a randomized controlled trial. Journal of Science & Medicine in Sport. 19(10):820–4. DOI: 10.1016/j.jsams.2015.12.003
3. Ardoy DN, Fernández-Rodríguez JM, Jiménez-Pavón D, Castillo R, Ruiz JR, Ortega FB. A physical education trial improves adolescents' cognitive performance and academic achievement: the EDUFIT study. Scand J Med Sci Sports. 2014 Feb;24(1):e52-61. doi: 10.1111/sms.12093. Epub 2013 Jul 5. PMID: 23826633.
4. Ash C. Routen, Anna E. Chalkley & Lauren B. Sherar (2017). Getting a GRIP (getting research into practice) on movement integration in the school classroom, Physical Therapy Reviews, 22:3-4, 139-146, DOI: 10.1080/10833196.2017.1306900
5. Australian Institute of Health and Welfare (2020). Australia's children. Cat. No. CWS 69. Canberra: AIHW.
6. Basile, V. C., Motta, R. W., & Allison, D. B. (1995). Antecedent exercise as a treatment for disruptive behavior: Testing hypothesized mechanisms of action. Behavioral Interventions, 10(3), 119–140. https://doi.org/10.1002/bin.2360100302
7. Best, J. R. (2010). Effects of physical activity on childrens' executive function: Contributions of experimental research on aerobic exercise. *Developmental Review*, 30(4), 331-351. DOI: 10.1016/j.dr.2010.08.001
8. Biles, D. L. (2014) *A step ahead: Movement activities to help develop children's ability to learn.* Morrisville, NC: Lulu Publishing Services.
9. Bouchard, C., Shephard, R. J., & Stephens, T. (Eds.). (1994). *Physical activity, fitness, and health: International proceedings and consensus statement.* Human Kinetics Publishers.
10. Bowling, A., Haneuse, S., Miller, D., Slavet, J., & Davison, K. (2016). Duration Of Aerobic Exercise And Effects On Self-Regulation Among Children With Behavioral Health Disorders. Medicine & Science In Sports & Exercise, 48, 639. doi: 10.1249/01.mss.0000486915.23995.1e
11. Budde, H., Voelcker-Rehage, C., Pietraßyk-Kendziorra, S., Ribeiro, P., & Tidow, G. (2008). Acute coordinative exercise improves attentional performance in adolescents. *Neuroscience letters*, *441*(2), 219-223. DOI: 10.1016/j.neulet.2008.06.024
12. Cadoret, G., Bigras, N., Duval, S., Lemay, L., Tremblay, T., & Lemire, J. (2018). The mediating role of cognitive ability on the relationship between motor proficiency and early academic achievement in children. Human Movement Science, 57(November 2017), 149–157.
13. Carvell, N.R. 2006. Language Enrichment Activities Program (LEAP), vol. 1. Dallas, TX: Southern Methodist University.

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

14. Centers for Disease Control and Prevention (2018). Strategies for Classroom Physical Activity in Schools. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services.

15. Chen, A.-G., Yan, J., Yin, H.-C., Pan, C.-Y., & Chang, Y.-K. (2014). Effects of acute aerobic exercise on multiple aspects of executive function in preadolescent children. *Psychology of Sport and Exercise, 15*(6), 627-636. DOI: 10.1016/j.psychsport.2014.06.004

16. Coe, D. P., Pivarnik, J. M., Womack, C. J., Reeves, M. J., & Malina, R. M. (2006). Effect of physical education and activity levels on academic achievement in children. *Medicine and Science in Sports and Exercise, 38*(8), 1515. DOI: 10.1249/01.mss.0000227537.13175.1b

17. Da Silva Pacheco, S. C., Gabbard, C., Ries, L. G. K., & Bobbio, T. G. (2016). Interlimb coordination and academic performance in elementary school children. *Pediatrics international*, *58*(10), 967-973. DOI: 10.1111/ped.12972

18. Davis CL, Tomporowski PD, McDowell JE, Austin BP, Miller PH, Yanasak NE, et al. Exercise improves executive function and achievement and alters brain activation in overweight children: A randomized, controlled trial. Health Psychol. 2011;30: 91–98. Pmid:21299297

19. de Greeff, J. W., Hartman, E., Mullender-Wijnsma, M. J., Bosker, R. J., Doolaard, S., & Visscher, C. (2014). Physical fitness and academic performance in primary school children with and without a social disadvantage. *Health education research, 29*(5), 853. DOI: 10.1093/her/cyu043

20. Dexter T. Relationships between sport knowledge, sport performance and academic ability: Empirical evidence from GCSE Physical Education. Journal of Sports Sciences 1999;17(4):283-295. DOI: 10.1080/026404199366000

21. DoH (Department of Health) (2009). Get up & grow: healthy eating and physical activity for early childhood—directors/coordinators book. Canberra: DoH.

22. Donnelly JE, Hillman CH, Castelli D, Etnier JL, Lee S, Tomporowski P, et al. Physical activity, fitness, cognitive function, and academic achievement in children: a systematic review. Med Sci Sports Exerc. 2016 Jun;48(6):1197–222. DOI: 10.1249/MSS.0000000000000901

23. Exercise and Sport Science Australia. (2020). Exercise For Kids.

24. *Fernandes VR, Ribeiro MLS, Melo T, de Tarso Maciel-Pinheiro P, Guimarães TT, Araújo NB, Ribeiro S and Deslandes AC (2016) Motor Coordination Correlates with Academic Achievement and Cognitive Function in Children. Front. Psychol. 7:318.*

25. Flook, L., Smalley, S., and Kitil, M. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *J. Appl. Sch. Psychol.* 26, 70–95. DOI: 10.1080/15377900903379125

26. Grissmer, D., Grimm, K. J., Aiyer, S. M., Murrah, W. M., and Steele, J. S. (2010). Fine motor skills and early comprehension of the world: two new school readiness indicators. *Dev. Psychol.* 46, 1008–1017. DOI: 10.1037/a0020104

27. Hillman, C. H., Pontifex, M. B., Castelli, D. M., Khan, N. A., Raine, L. B., Scudder, M. R., . . . Kamijo, K. (2014). Effects of the FITKids Randomized Controlled Trial on Executive Control and Brain Function. *Pediatrics, 134*(4), e1063-1071. http:// dx.doi.org/10.1542/peds.2013-3219

28. Hollar, D., Messiah, S. E., Lopez-Mitnik, G., Hollar, T. L., Almon, M., & Agatston, A. S. (2010). Effect of a two-year obesity prevention intervention on percentile changes in body mass index

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

and academic performance in low-income elementary school children. *American Journal of Public Health, 100*(4), 646. DOI: 10.2105/AJPH.2009.165746

29. Howie, E. K., & Pate, R. R. (2012). Physical activity and academic achievement in children: A historical perspective. *Journal of Sport and Health Science, 1*(3), 160-169. DOI: 10.1016/j.jshs.2012.09.003
30. Howie EK, Beets MW, Pate RR. Acute classroom exercise breaks improve on-task behavior in 4th and 5th grade students: a dose–response. Ment Health and Phys Act. 2014;7(2):65–71. DOI: 10.1016/j.mhpa.2014.05.002
31. Howie EK, Schatz J, Pate RR. Acute effects of classroom exercise breaks on executive function and math performance: a dose-response study. Res Q Exerc Sport. 2015;86(3):217–24.
32. Huffman, J. M., & Fortenberry, C. (2011). Helping preschoolers prepare for writing: Developing fine motor skills, Young Children, 66(5), 100-103.
33. Janssen M, Chinapaw MJM, Rauh SP, Toussaint HM, van Mechelen W, Verhagen EALM. A short physical activity break from cognitive tasks increases selective attention in primary school children aged 10–11. Ment Health and Phys Act. 2014;7(3):129–34.
34. Jefferies P, Ungar M, Aubertin P and Kriellaars D (2019) Physical Literacy and Resilience in Children and Youth. *Front. Public Health* 7:346. DOI: 10.3389/fpubh.2019.00346
35. Lengel, T., & Kuczala, M. (Eds.). (2010). *The kinesthetic classroom: Teaching and learning through movement*. Corwin Press.
36. Lloyd, M., Macdonald, M., & Lord, C. (2013). Motor skills of toddlers with autism spectrum disorders. Autism, 17(2), 133–146. DOI: 10.1177/1362361311402230
37. Macdonald, D., Abbott, R., lisahunter, Hay, P., & McCuaig, L. (2014). Physical activity – academic achievement: Student and teacher perspectives on the 'new' nexus. *Physical Education and Sport Pedagogy, 19*(4), 436-449. DOI: 10.1080/17408989.2013.769510
38. Mackinder, L. (2010). How the Body Midlines Affect the Learning of Mathematics. *LILIPOH, 15*(60), 45-51.
39. Manjunath, N. K., and Telles, S. (2001). Improved performance in the tower of London test following yoga. *Indian J. Physiol. Pharmacol*. 45, 351–354.
40. Martin, K. (2010). Brain boost: Sport and physical activity enhance children's learning.
41. Martin, R., & Murtagh, E. M. (2015). An intervention to improve the physical activity levels of children: Design and rationale of the 'Active Classrooms' cluster randomised controlled trial. Contemporary Clinical Trials, 41, 180–191. https://doi.org/10.1016/j.cct.2015.01.019
42. McClelland, E., Pitt, A., & Stein, J. (2015). Enhanced academic performance using a novel classroom physical activity intervention to increase awareness, attention and self-control: putting embodied cognition into practice. *Improving Schools*, *18*(1), 83-100. DOI: 10.1177/1365480214562125
43. National Heart Foundation. (2014). Is Sport Enough? 2014 Report Card on Physical Activity for Children and Young People.
44. Niemann, C., Wegner, M., Voelcker-Rehage, C., Holzweg, M., Arafat, A. M., & Budde, H. (2013). Influence of acute and chronic physical activity on cognitive performance and saliva testosterone

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

in preadolescent school children. *Mental Health and Physical Activity, 6*(3), 197-204. DOI: 10.1016/j.mhpa.2013.08.002

45. Oberer, N., Gashaj, V., & Roebers, C. M. (2017). Motor skills in kindergarten: Internal structure, cognitive correlates and relationships to background variables. Human Movement Science, 52, 170–180.

46. Pick et al (2010). Rationale, design and methods for a randomised and controlled trial to evaluate "Animal Fun" - a program designed to enhance physical and mental health in young children. BMC Pediatrics 10:78.

47. Rasmussen, M., & Laumann, K. (2012). The academic and psychological benefits of exercise in healthy children and adolescents. European Journal of Psychology of Education, 28(3), 945-962. DOI: 10.1007/s10212-012-0148-z

48. Rosenthal-Malek, A., & Mitchell, S. (1997). Brief report: the effects of exercise on the self-stimulatory behaviors and positive responding of adolescents with autism. Journal of Autism and Developmental Disorders, 27(2), 193–202. DOI: 10.1023/a:1025848009248

49. Sibley BA, Etnier JL. The relationship between physical activity and cognition in children: a meta-analysis. Pediatr Exerc Sci. 2003;15:243–56. DOI:10.1515/ijsl.2000.143.183

50. Singh A, Uijtdewilligen L, Twisk JWR, van Mechelen W, Chinapaw MJM. (2012). Physical Activity and Performance at School: A Systematic Review of the Literature Including a Methodological Quality Assessment. Arch Pediatr Adolesc Med. 2012;166(1):49–55. DOI: 10.1001/archpediatrics.2011.716

51. Shephard RJ, Lavallee H, Volle M, La Barre R, & C, B. (1994). Academic skills and required physical education: The Trois Rivieres Experience. *Canadian Association for Health, Physical Education, and Recreation Research Supplements, 1*(1), 1-12.

52. Smith, S., Press, B., Koenig, K., & Kinnealey, M. (2005). Effects of Sensory Integration Intervention on Self-Stimulating and Self-Injurious Behaviors. *American Journal of Occupational Therapy*, *59*(4), 418-425. DOI: 10.5014/ajot.59.4.418

53. Straker, L.M., Campbell, A.C., Jensen, L.M. *et al.* Rationale, design and methods for a randomised and controlled trial of the impact of virtual reality games on motor competence, physical activity, and mental health in children with developmental coordination disorder. *BMC Public Health* 11, 654 (2011). DOI: 10.1186/1471-2458-11-654

54. Suggate, S., Pufke, E., & Stoeger, H. (2018). Do fine motor skills contribute to early reading development? Journal of Research in Reading, 41(1), 1–19.

55. Tine, M. T., & Butler, A. G. (2012). Acute aerobic exercise impacts selective attention: An exceptional boost in lower-income children. *Educational Psychology, 32*(7), 821-834. doi: 10.1080/01443410.2012.723612

56. Trudeau, Francois; Laurencelle, Louis, Tremblay, Janie, Rajic, Mirjana, Shephard, Roy. Daily primary school physical education: effects on physical activity during adult life, Medicine & Science in Sports & Exercise: January 1999 - Volume 31 - Issue 1 - p 111-117. DOI:10.1097/00005768-199901000-00018

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.

57. Vasilopoulos F, Ellefson MR (2021) Investigation of the associations between physical activity, self-regulation and educational outcomes in childhood. PLoS ONE 16(5): e0250984. DOI: 10.1371/journal.pone.0250984

58. Watson, A., Timperio, A., Brown, H. *Best, K, Hesketh, K.* Effect of classroom-based physical activity interventions on academic and physical activity outcomes: a systematic review and meta-analysis. *Int J Behav Nutr Phys Act* 14, 114 (2017). DOI: 10.1186/s12966-017-0569-9

59. Westendorp, M., Hartman, E., Houwen, S., Smith, J., & Visscher, C. (2011). The relationship between gross motor skills and academic achievement in children with learning disabilities. *Research in Developmental Disabilities*, *32*(6), 2773–2779. DOI: 10.1016/j.ridd.2011.05.032

60. Williams, N., Wilson-Gahan, S. The implementation of the Smart Moves daily physical activity program in Queensland state primary schools. ACHPER. 2013.

61. Wing, E. K., Bélanger, M., & Brunet, J. (2016). Linking parental influences and youth participation in physical activity in- and out-of-school: The mediating role of self-efficacy and enjoyment. *American Journal of Health Behavior, 40*(1), 31–37. DOI: 10.5993/AJHB.40.1.4

62. Yeung RR. The acute effects of exercise on mood state. J Psychosom Res. 1996; 40(2):123-141.

63. Young, D., Felton, G., Grieser, M., Elder, J., Johnson, C., Lee, J., & Kubik, M. (2007). Policies and opportunities for physical activity in middle school environments. Journal of School Health, 77, 41–47. DOI: 10.1111/j.1746-1561.2007.00161.x

64. Wang, M. V., Lekhal, R., Aarø, L. E., & Schjølberg, S. (2014). Co-occurring development of early childhood communication and motor skills: Results from a population-based longitudinal study. Child: Care, Health and Development, 40(1), 77–84.

© Complete Performance Solutions Pty Ltd 2022. All rights reserved.