**Movement Breaks**

\*This is an informal (and minimally organized) document with references and links to the information that guided the recommended frequency of “brain breaks” used in our study. The results of this study were presented at the 2017 AOTA Conference and our paper was recently submitted for publication in the International Journal of Special Education. This is being shared now per request. A more formal document will available in the near future.

<http://new.ocde.us/HealthySchools/Documents/ClassroomPA-Breaksgonoodle-white-paper.pdf?Mobile=1&Source=%2FHealthySchools%2F%5Flayouts%2Fmobile%2Fview%2Easpx%3FList%3D25fc57ff%252D3ba1%252D4e1f%252Dab0c%252D61ec27e2bfb1%26View%3De39fca25%252Df66f%252D495f%252Db15e%252D922291dc225d%26CurrentPage%3D1>

White paper by GoNoodle on the effects of brain breaks.

<https://www.sciencedirect.com/science/article/pii/S0091743515002583?via%3Dihub>

Summary of 2015 research showing activity breaks increase students’ classroom behavior.

<http://thoughtmedicine.com/2010/05/spark-the-revolutionary-new-science-of-exercise-and-the-brain-by-john-j-ratey-md-book-review/>

Article about brain and exercise. Recommends a total of 45-60 minutes per day at 55-65% of maximum heart rate.

<https://www.edutopia.org/article/research-tested-benefits-breaks>

Overview article on the benefits of brain breaks.

<https://www.sciencedirect.com/science/article/pii/S0959475216300275#>!

Shows on-task behavior declined as instructional duration increased from 10 to 30 min.

<https://www.sciencedirect.com/science/article/abs/pii/S1755296614000295>

10 minutes of classroom exercise breaks improved on-task behavior in 4th and 5th grade students.

<https://www.fatherly.com/health-science/elementary-school-distractions-attention-spans/>

Article about 2016 research on off-task behavior in elementary school children. Shows decline after 10 minutes. Also mentions a study showing heavily decorated classrooms hinder learning.

<http://www.laurenqhill.com/understanding-the-of-attention-spans-of-elementary-aged-students/>

Article about attention span of elementary students with nice graphic showing expected length of focus by age.

<http://www.speechtherapycentres.com/children-and-age-appropriate-attention-spans/>

Article describing child’s attention span from ages 3 to 5.

<https://www.psychologytoday.com/us/blog/the-athletes-way/201506/increasing-physical-movement-reduces-symptoms-adhd>

Article about physical movement reducing symptoms of ADHD. Shows kids with ADHD learn better while moving.

<https://www.opencolleges.edu.au/informed/features/30-tricks-for-capturing-students-attention/>

Research-based article about the science of attention.

<https://www.greatschools.org/gk/articles/first-grader-brain-development/>

Article about the 1st grade brain and mentions attention span of 6-20 minutes.

Lin, T., & Kuo, Y. (2013). Exercise benefits brain function: The monoamine connection. *Brain Sciences, 3*(1), 39-53. doi:http://dx.doi.org/10.3390/brainsci3010039

Lee, S., Lee, C., & Park, J. (2015). Effects of combined exercise on physical fitness and neurotransmitters in children with ADHD: A pilot randomized controlled study. *Journal of Physical Therapy Science, 27*(9), 2915-2919. doi:http://dx.doi.org/10.1589/jpts.27.2915

Matta, M. P., Cevada, T., Sobral Monteiro-Junior, R., Teixeira Guimarães, T., da, C. R., Lattari, E., . . . Camaz Deslandes, A. (2013). Neuroscience of exercise: From neurobiology mechanisms to mental health. *Neuropsychobiology, 68*(1), 1-14. doi:http://dx.doi.org/10.1159/000350946

Leibowitz, Akiva & Klin, Yael & F Gruenbaum, Benjamin & Gruenbaum, Shaun & Kuts, Ruslan & Dubilet, Michael & Ohayon, Sharon & Boyko, Matthew & Sheiner, Eyal & Shapira, Yoram & Zlotnik, Alexander. (2012). Effects of strong physical exercise on blood glutamate and its metabolite 2-ketoglutarate levels in healthy volunteers. Acta neurobiologiae experimentalis. 72. 385-96.

Young, S. N. (2007). How to increase serotonin in the human brain without drugs. *Journal of Psychiatry & Neuroscience : JPN*, *32*(6), 394–399.

Reza Shahsavar, Ali & Javad Pourvaghar, Mohammad. (2011). Follow-Up Alterations of Catecholamine Hormones after an Intensive Physical Activity. Biosciences Biotechnology Research Asia. 8. 591-595. 10.13005/bbra/904.

Anderson, E., & Shivakumar, G. (2013). Effects of Exercise and Physical Activity on Anxiety. *Frontiers in Psychiatry*, *4*, 27. http://doi.org/10.3389/fpsyt.2013.00027

Zimmer, P., Stritt, C., Bloch, W., Schmidt, F., Hübner, S., Binnebößel, S., Schenk, A. and Oberste, M. (2016). The effects of different aerobic exercise intensities on serum serotonin concentrations and their association with Stroop task performance: a randomized controlled trial. *European Journal of Applied Physiology*, 116(10), pp.2025-2034.

Schuster, Suann. (2011, September). *Norepinephrine Vs. Epinephrine.* Retrieved from <https://www.livestrong.com/article/226152-norepinephrine-vs-epinephrine/>.

*Exercise may help boost brain neurotransmitters, improve mental health* (2016). . Los Angeles: Anthem Media Group. Retrieved from https://search.proquest.com/docview/1769837218?accountid=143111

*How to Increase Dopamine Levels.* (n.d.). Retrieved from <http://mentalhealthdaily.com/2015/04/17/how-to-increase-dopamine-levels/>

Alban, Deane. (n.d.). *How to Balance Norepinephrine Levels Naturallly.* Be Brain Fit. Retrieved from <https://bebrainfit.com/balance-norepinephrine/>

Bergland, Christopher. (2016, February 28). *Neuroscience Pinpoints Unique Way Exercise Fights Depression.* Psychology Today. Retrieved from <https://www.psychologytoday.com/blog/the-athletes-way/201602/neuroscience-pinpoints-unique-way-exercise-fights-depression>

Nimh.nih.gov. (2018). *NIMH » Brain Basics*. [online] Available at: https://www.nimh.nih.gov/health/educational-resources/brain-basics/brain-basics.shtml

<https://www.edweek.org/tm/articles/2017/08/08/learning-in-motion-bring-movement-back-to.html>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5858437/>

<https://www.washingtonpost.com/news/answer-sheet/wp/2015/01/19/letting-kids-move-in-class-isnt-a-break-from-learning-it-is-learning/?noredirect=on&utm_term=.414a673dbcc3>

<http://literacyandlanguagecenter.com/the-benefits-of-movement-in-the-classroom/>

<https://commons.nmu.edu/cgi/viewcontent.cgi?article=1031&context=theses>