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Abstract of the PhD dissertation

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## **Application of local vibration to stimulate cognitive function in adolescents**

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In the context of an increasingly sedentary society, in which children and adolescents, in particular, do not achieve the physical activity goals set by the WHO 2010 guidelines of at least 60 minutes a day by more than 80% (Bull et al. 2020), and especially after the aggravated situation during and after the COVID 19 pandemic, this Ph.D. dissertation investigates the effectivity of short and moderate exercise programs with and without a vibration generating device (VGD) when carried out regularly for 10 weeks as part of the school lessons in adolescent students additionally to the usual PA program in school and leisure time and shows the results concerning selected cognitive functions.

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The research aim was to find out whether there were differences in the outcome after a 10-week intervention program in the 3 different groups concerning the level and the changes in selected cognitive functions.

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In the form of a pre- and posttest study, 15 and 16-year-old students participated in 3 groups: the Control Group (CG) with no additional PA, the Exercise Group (EG) with additional PA without VGD, and the Vibration Exercise Group (VEG) with additional PA and use of VGD. Selected cognitive functions were assessed with commonly used tests for attention, speed of processing tasks, concentration performance, accuracy, verbal fluency, verbal memory, numeric memory, etc.

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Data was collected and analyzed by showing significant differences in independent samples, correlations, and explanatory variables for the Concentration Performance (CP) being one of the most important variables.

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Results show that most of the statistically significant improvements of the variables for cognitive functions occur in the VEG, followed by the EG and at least CG after the 10-week intervention program. The improvement of the working style in percentage behaves as follows: most improvement in all sectors for the results of participants of VEG, followed by CG and at least EG which is rather surprising and possibly due to the short duration of the intervention (Haapala, 2012). CP is mainly related to PTO (working speed) and some further variables, especially in EG and VEG.

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There is evidence that PA with VGD may affect more cognitive functions in adolescents in a relatively short period of time of 10 weeks than PA without VGD and high potential for enhancing CP by improving accuracy in reducing errors. Further investigation with a larger number of study participants and examination especially the application of local stochastic vibration on additional variables related to cognitive functions in adolescents are needed to better understand the effects of PA with additional use of vibration on cognitive functions.

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