



Skill acquisition is a key mechanism that may be responsible for the cognitive gains elicited by exercise.

Skill acquisition progresses along several stages. Practice and experience enhance motor skills as individuals acquire a more detailed understanding of the skills they are learning including when and how to use them. Also, the development of these skills can be impacted by the learner's environment and how they receive feedback. For example, several studies show that the cognitive benefits that older adults get from aerobic exercise and cognitive training are related to the skills they acquire during overextended training periods. The research team also demonstrates that the link between

exercise and learning becomes more robust when training occurs under conditions that vary from trial to trial when compared to those that remain fixed and predictable. Taken together, it becomes clear that the way skills are taught is important if it is going to benefit cognitive function.

This link becomes more apparent when you examine the relationship between sports training and the mind by looking at the cognitive function of athletes. Individuals who are trained in sports have been shown to have a better attention span and processing

speed, even when tested in a non-sport environment, demonstrating that cognitive skills developed through sports can be applied to other contexts. What's more interesting is that studies have found that these skill sets are not related to the type of sport that an athlete is involved in, although further research is needed to confirm these ideas.

Drs Tomporowski and Pesce have also demonstrated that exercise training may not be necessary at all to improve cognitive function. Although research in this area remains limited, the researchers highlight the benefit that performing arts can have on cognitive function. For example, several studies have linked music training with increased cognitive function, demonstrating that this type of training has the potential to improve several mental processes, including reading, reasoning skills, vocabulary skills, as well as spatial skills, and language acquisition. This link between music training and the mind is further supported by neuropsychological studies that have indirectly provided evidence for a relationship between music training and cognitive function.

TAKE-HOME MESSAGE

The main take-home message of the review supports Drs Tomporowski's and Pesce's hypothesis that skill acquisition through mentally engaging physical activities may explain the relationship between exercise and cognitive function. While moderate-to-vigorous exercise may be important for physical fitness, it is not essential to improve brain health. Motor skills that are learned via a wide assortment of movement activities that require relatively low levels of physical exertion promote cognitive benefits that are enduring. Regardless of exercise mode, instructional methods that motivate learners, generate appropriate performance expectancies and challenge autonomy in thoughts and actions enrich and maintain cognition. These findings apply across the life span and have implications for the advocacy of health-enhancing physical activity and physical education in public health and education settings.



Behind the Research



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Research Objectives

Drs Tomporowski and Pesce's research shows how mentally engaging physical activities reap the largest cognitive benefits.

Detail

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Bio

Phillip D. Tomporowski (PhD, University of Mississippi) is a Professor in the Department of Kinesiology at the University of

Georgia. His research focuses on the effects of physical activity on cognition. Dr Tomporowski serves on the Editorial Board of the *Translational Journal of the American College of Sports Medicine*.

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Collaborators

- Dr Adele Diamond
- Dr Hal A. Lawson

References

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Personal Response

What inspired you to conduct this research?

Tomporowski: My introduction to the Martial Arts led to improvements in physical health and changes in perceptions of my ability to meet and overcome academic challenges. Five decades ago, I asked myself the question, "how are physical and mental skills learned?" I continue to strive to answer the question.

Pesce: When I was young, I intuitively loved moving and thinking, thoughtful moving. Getting older, I learnt the theory that our ability to think emerged as a side effect of the evolutionary advantage of having a brain that was able to lead and monitor complex movement actions in a flexible and adaptive way.

Do you think we could reduce the number of people suffering from cognitive decline later in life by making mentally engaging physical activities a part of regular school curriculum?

Tomporowski: Life-span research confirms that physical activity promotes brain health and that the benefits are enduring. However, physical activity is only one of many factors that may favour cognitive functioning later in life.

Pesce: The broad array of factors that determine the maintenance of cognitive function or the rate of its age-related decline are intertwined. Thus, physical activities designed to be enjoyable and cognitively challenging should be embedded into the broader frame of children's healthy lifestyle habits to set the stage for moving steps to health in cognitive aging. //