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Fitness and Cognition: A Significant Connection with Implications for Students and Teachers

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Abstract

The connection between fitness and cognition is an often overlooked but crucial factor in not only managing stress but also plays a pivotal role in optimal cognitive function. Analyzing this connection provides multiple implications for teachers and students alike. Topics in this paper will include the findings of a survey related fitness and cognition as well as insights from Spark: The Revolutionary New Science of Exercise and the Brain by John Ratey, M.D. and Built to Move by Kelly Starrett and Juliet Starrett. Lastly, classroom implications for teachers and learners will be discussed as well as general lifestyle enhancements. The two main research questions addressed were "Is there a connection between fitness and cognition?" and "If there is a connection between fitness and cognition, what are the implications for learners and teachers?".

Keywords: Fitness; cognition; kinesthetic learning; wellness; classroom implications

1. Introduction

1.1. The decreasing physical and cognitive demands of modern life

Why is it that modern life is becoming increasingly easier while both our bodies and our cognitive faculties are declining (Mirowsky 2011)? In an age where sedentariness is increasing and mental tasks are beginning to be facilitated by artificial intelligence, the topic of fitness and cognition is ever of importance. Not only is this connection and the

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proceeding implications important for the general population, but specifically for individuals acting in the role of student and of teacher.

1.2. Previous research related to fitness and cognition

In their publication Cerebrovascular Reserve: The Link Between Fitness and Cognitive Function, Davenport et al (2011) explore the implications of fitness level on cognitive function. By comparing the vascular function and cognitive function of various participants ranging in age, researchers found exercise to be beneficial to stop age-related cognitive decline; this was especially accurate concerning the issues of vascular dementia and Alzheimer's Disease. As a general conclusive statement, the researchers assert, "Exercise could well turn out to be the most convenient, practical, and cost-effective way to ameliorate age-related declines in cognition while mitigating other age-related diseases (Davenport 2011)." Although aging can't be prevented, people can preserve their cognition through health-bettering physical activity.

Physical activity assists in cognitive preservation throughout the aging process, but what can be said about the effect of physical activity on cognitive performance in general? In a study conducted on adolescents, Ruiz-Ariza et. al found that fitness observed and sustained over time correlated with increased levels of cognitive performance (CP) and academic performance (AP). This was the case since higher instances of cerebral blood flow and synaptic plasticity were found in participants who were physically fit (Ruiz-Ariza et al 2016).

Furthermore, to examine the impact of physical fitness and exercise on the effectiveness of foreign language learning, other studies have been conducted. Qian et al describe sustained exercise over time as a beneficial aspect for all language learners. They did not find, however, language learning and physical activity to be significantly related (Qian et al 2024). Thus, physical activity and fitness, especially sustained over time, can be seen to aid cognitive function in learning and academic tasks.

1.3. Other literature on fitness and cognition

In his very intriguing and groundbreaking book, Spark: The Revolutionary New Science of Exercise and the Brain, author and renowned psychiatrist John J. Ratey, MD. reported that exercise plays roles of immense significance related to stress, depression, and attention. Echoing the findings reported from the studies above, Ratey asserts that "exercise has a profound impact on cognitive abilities and mental health" (Ratey 2008).

Concerning benefits in the domain of learning, specifically, Ratey emphasises that exercise "...optimizes your mindset to improve alertness, attention, and motivation; second, it prepares and encourages nerve cells to bind to one another, which is the cellular basis for logging in new information; and third, it spurs the development of new nerve cells from stem cells in the hippocampus" (Ratey 2008). Clearly, the connection between exercise and

cognition is seen. Without exercise, cognitive actions such as logging new information and mental processing deteriorate.

As a further benefit of physical activity, Ratey explores the occurrence of problem mitigation as applied in areas such as stress, anxiety, and depression. According to Ratey's findings, exercise not only prevents the negative effects of stress but can actually "reverse" them. As an antidote to depression, physical activity is described as a way to "...[encourage] the mind to embrace life". Furthermore, Ratey argues that exercise is more effective at fighting depression than medication or therapy is because "antidepressants work from bottom up and therapy works from the top down" while exercise does "both at the same time".

One common learning impediment faced by many today is attention-deficit/hyperactivity disorder (ADHD). Since Ratey himself has ADHD, he presents and reflects upon the ways he and others have combated the symptoms of ADHD with regular physical activity. Exercise is reported to help alleviate symptoms of ADHD, provide ADHD patients with a sense of regulation and control, and experience an increased sense of overall wellness (Ratey 2008).

The connection between physical activity and cognitive function is also emphasized by Starrett, K., & Starrett, J. (2023) their book Built to move: The ten essential habits to help you move freely and live fully. Activity as little as a short walk results in an increased production of not only serotonin but also brain-derived neurotrophic factor (BDNF). BDNF is responsible for optimizing neuron function and the generation of new neurons and neuron pathways. This results in enhanced cognitive ability which includes focus and creativity.

1.4. The current study

The current study aims to examine the connection between fitness and cognition and also to expound upon the potential applications which can be applied by students, teachers, and the general population. The two main research questions addressed were "Is there a connection between fitness and cognition?" and "If there is a connection between fitness and cognition, what are the implications for learners and teachers?".

2. Method

2.1. Research Design

Our research method was a qualitative design consisting of an eight item survey. The first four questions inquired about the participants' age, fitness habits, and also their motivation for fitness. The remaining four questions required answers that were self-

reported in nature and queried about the participants' fitness habits and cognitive function as well as recommendations they may have for others.

2.2. Participants

A total of 18 participants completed the survey. Participants' ages ranged from 29 years of age to 67 years of age and came from various ethnic and national backgrounds. All participants reported themselves to "workout regularly" (at least 2 to three times each week). When asked "How long have you been working out regularly?" participants answered anywhere from "a few months" to a "few years". One participant reported she has been working out regularly the past 35 years at the time she was surveyed.

2.3. Data Collection

The survey was conducted and disseminated electronically through Google Forms. The survey was conducted in the first few months of 2024.

2.4. Data Analysis

Due to the qualitative nature of the acquired data, researchers chose to analyze data through a thematic analysis. Researchers uploaded participant responses to each open-ended question to ChatGPT and prompted ChatGPT to analyze and classify answers into themes; the following prompt was used to analyze participants' answers: "aggregate themes by frequency and list them separately for reasons , along with frequency. list from most to least frequent, with the number of comments in brackets".

3. Results

3.1. Results from the Survey Questions

As the thematic analysis for participant answers to each open-ended survey question was completed, researchers were able to observe main trends and themes represented by the qualitative data.

3.2. Analysis summary: reasons for starting to work out

When asked for reasons why he/she started working out regularly, the theme "health, fitness, or staying in shape" was mentioned ten times. Having "energy and feeling better physically or mentally" was mentioned five times. "Sport-related motivation (training, athletics)" was mentioned twice. Other reasons such as "stress relief or relaxation", "social motivation or companionship", "habit or lifestyle formation", "cultural or identity related

reasons", "age or physical condition awareness" and "life transition/ new phase" were all mentioned once.

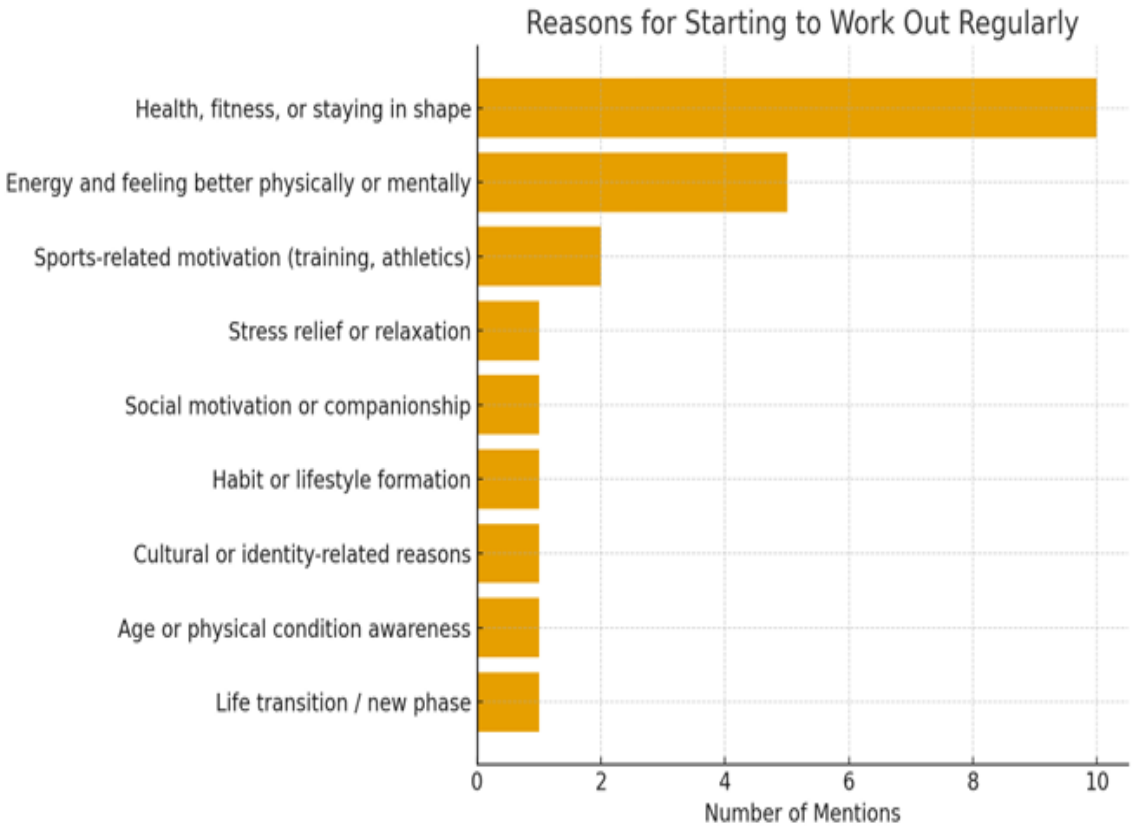

Figure 1. Analysis Summary: Reasons for Starting to Work Out Regularly

Description: The above analysis summarizes participant responses to the question: 'What made you start working out regularly?' Aggregated themes and frequencies are visualized above.

3.3. Analysis summary: perceived benefits of fitness

When asked "What benefits do you believe fitness brings you?" participants responded with the following themes. "Mental health, stress relief, clarity, and emotional balance" was mentioned ten times. "Physical health, strength, and endurance" was mentioned eight times. "Energy and alertness" as well as "self-discipline, structure, and motivation" were both mentioned four times. "Confidence and self-image", "sense of accomplishment or

satisfaction", and "functional fitness/ practical life benefits" were each mentioned twice. "Spiritual or reflective benefits" was mentioned once.

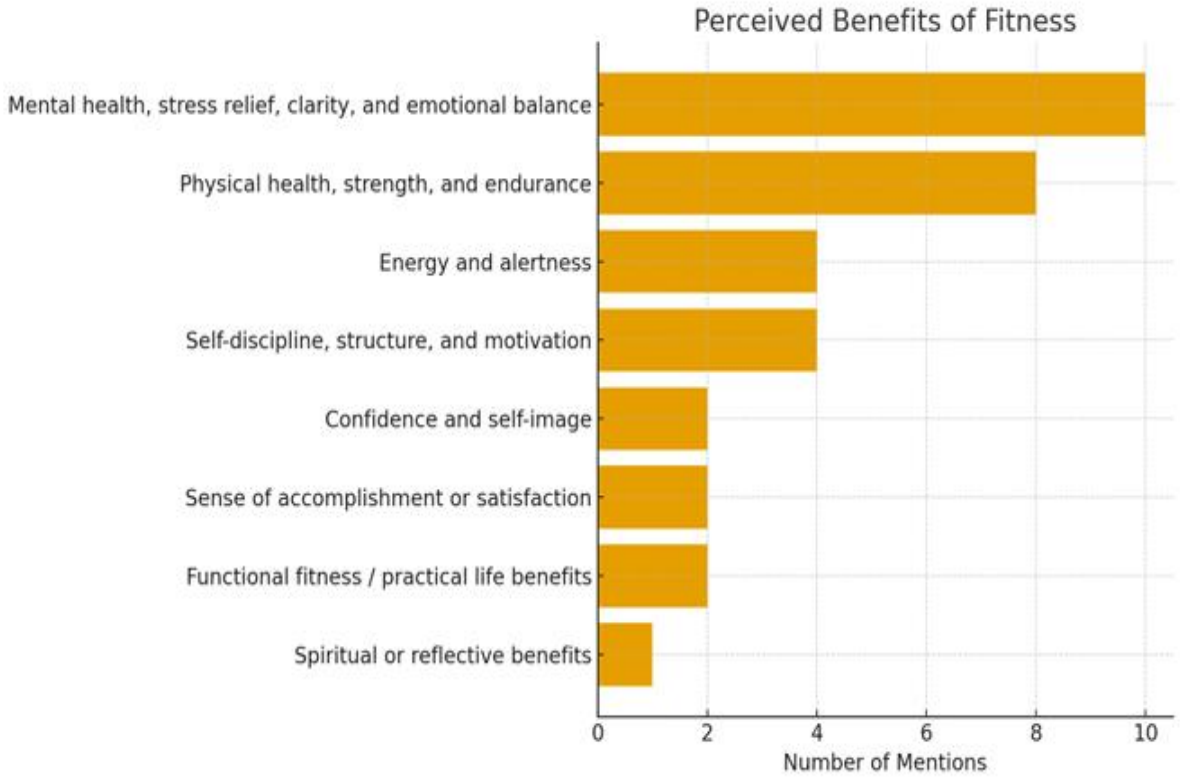

Figure 2. Analysis Summary: Perceived Benefits of Fitness

Description: The analysis summarizes participants' answers to the question: 'What benefits do you believe fitness brings you?' The above chart and list shows aggregated themes and their frequency.

3.4. Analysis summary: general view of fitness and cognition

When asked if he/she had other thoughts or recommendations about the topics of fitness and cognition, participants offered comments that fit into the following themes. The theme "universality & inclusivity" was mentioned 4 times. "Individualization & starting small" and "holistic health & lifestyle" were mentioned three times. "Motivation & structure" as well as "quality of life & emotional well-being" were mentioned twice. Lastly, "social

benefits", "ego awareness", "financial considerations", and "accomplishment & fulfillment" were each mentioned one time.

4. Discussion

4.1 real-life observations that mirror those found in the literature

The researchers were able to propose certain interpretations and possible implications suggested in the data through a thematic analysis of the open-ended questions.

Most participants' reasons for working out echo those mentioned by Dr. Ratey (2008); the primary reasons were physical but also included mental/emotional needs or desires like "greater focus", "stress relief", and etc. The fitness-cognition connection reported by Starrett (2023) was affirmed by participants' answers to the survey question related to perceived benefits of exercise. "Mental health, stress relief, clarity, and emotional balance" was the theme most reported by participants. Starrett emphasized the benefits of adding more movement to general life with hopes of a better overall quality of life as the result. This idea was one of Ratey's overall implications; "Body and brain are connected. Why not take care of both?" (2008).

Considering findings from the other literary sources mentioned, fitness bolsters cognition and protects and prevents declines in overall health. This idea is echoed in participant answers to the question related to "reasons for starting to workout regularly". The related answers were classified into the theme "age or physical condition awareness" and "habit or lifestyle formation". Similarly, the answers to the question related to the questions of "perceived benefits of exercise" that were classified into the themes "energy and alertness" and "functional fitness/ practical life benefits" enforce the idea of fitness as a preventative measure against the negative effects of aging.

4.2 Fitness and cognition as universal experiences

Through the present study, it is observed that participants' reflections of fitness and cognition in their own lives offer possible implications for all, regardless of age, life stage, or occupation. The participants of this study were a variety of ages, ethnic backgrounds, nationalities, and had various occupations. The reported answers about the connection between fitness and cognition (as well as the findings reported in the literature) seem to be relevant for all people. Perhaps this is true because of the universal nature of our physical bodies and the unavoidable process of aging. Therefore, several implications related to

fitness and cognition and to language learners in general will be discussed in the "implications" section.

5. Conclusions, Suggestions and Limitations

This vital connection between fitness and cognition offers several implications for teachers and learners alike. Primarily, teachers should consider their own overall health and wellbeing. As teachers are role models for students, teachers should have a balanced diet, prioritize physical fitness, and encourage learners to do the same. Teachers should help students understand how disregarding physical health can cause academic performance to wane. Especially concerning the challenges to mental/emotional well being (such as anxiety and depression), teachers and students should collaborate and create a community of sharing ideas so that all parties can mutually benefit and engage in the learning process together.

Secondly, teachers should create learning environments that get students moving and actively engaged in the learning process. In the foreign language classroom, teachers should try to integrate more "movement" or kinesthetic learning activities in the classroom.

5. 1 Suggested in-class activities

The following activities can be integrated into various curricula since they are not really novel activities, but just alternative methods of traditional activities used in the classroom. The first is "walking vocabulary". For this activity, teachers choose a set of target vocabulary items. The teacher should write each vocabulary item on a sheet of blank paper. Then, the teacher should tape or hang the vocabulary papers on all four walls of the classroom. Once the papers are ready, the teacher should ask students to walk around the room to view the vocabulary items and to write a definition, synonym, antonym, draw a picture, or write anything related to the word on each paper. Students should write something on each paper. After students have completed the activity, they should return to their seats. Then, the teacher and the students should spend time discussing and defining each word. This activity offers a more movement-driven option to the traditional method of students sitting in their seats and listening to the teacher talk about each vocabulary or explain items with PowerPoint slides or other presentation software.

Peer surveys are another activity that teachers can use to increase students' movement in class. Peer surveys can be designed and organized in various ways. Surveys can easily be used in listening and speaking courses. Discussion questions given in textbooks can be adapted into survey items. Once students have a list of survey items, they can walk around the room, asking for their classmates' ideas about each item. At the end of the surveying time, the teacher can ask students to report the answers they received. Finally, the teacher

can lead the students in a discussion of the survey results and possible implications, all while emphasizing target vocabulary or grammar items in each part of the survey.

Lastly, involving students in board writing is a possible way to have them contribute to distributing instruction as well as increasing their overall engagement. After the teacher explains a lesson concept, the teacher can call students up to the board individually and ask them to write example sentences or phrases using the target items that were just taught. Alternatively, the teacher can project textbook exercises on the board and then call students up to the board to complete the items projected on the screen (that is, if the projection covers the board).

5.2 Limitations

Although the results of the current study offer insightful findings for teachers and students alike, there are several limitations to be noted. Firstly, the small number of participants limits the amount of insights that can be gleaned from the survey responses. A higher number of participants might be useful to gain more diverse answers and to provide deeper insights related to fitness and cognition. Secondly, since answers were self-reported, the reliability of answers could be considered low. A more in-depth survey and other data collection methods could be used to insure a higher reliability of reported answers. Although this is true, researchers still believe the current study provides meaningful results and implications that can be used to reinforce cognitive tasks that are bolstered by sustained fitness in both learners and teachers.

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