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Self-Esteem and Health Benefits Arising from Regular Physical Exercise

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Abstract

Introduction: The present study examined self-reported physical and mental health among sedentary and exercising individuals.

Methods: The latter consisted of runners (n=23) and martial arts performers (n=21) whereas the former were described as 'physically-inactive' (n=14) with a mean age of 43 to 45 years.

Results: The results showed no differences between exerciser and non-exercisers with regard to memory capacity although there were was a significantly higher intake of Energy drinks by the latter. The former expressed higher levels of positive affect PANAS-positive affect and SE-perceived energy together with 'Aches and pains', 'Use of pain-killers' and SE-perceived stress that the sedentary individuals.

Discussion: These findings are discussed from a perspective of physical and mental health arising from sedentary or active lifestyles.

Keywords: Exercise; Sedentary; Positive affect; Memory; Energy; Stress; Pain; Health

Introduction

Prevailing post-modern circumstance has placed several health burdens upon present-day humans, e.g. time-pressures, stress, etc. Physical exercise has displayed, time-and-again, an impressive capacity to de-stress and health-endower individuals, independent of age, health status, gender, type of exercise, mental health and cardiovascular status, whether endurance or resistance or even presented in the form of 'ever-gaming' etc. [1-3], not least in the relief of negative affect, self-image and motivations [4]. Arguably, sedentary and non-activated lifestyles present among the most threatening risks destroying health, well-being and longevity [5,6]. Twelve weeks of aerobic, endurance exercise induced markedly higher levels, incrementally, in positive mood, and lesser levels of anxiety and anxious compulsions, in comparison with the health education contact control group [7]. There was observed also a main effect of time-taken in the prediction of acute anxiety reduction, such that linear reductions in anxiety over the course of treatment were observed. It has been observed also that individuals' cognitive resources and flexibility, sufficiency to accept challenges and resilience were heightened through recourse to exercise schedules [8]. Consequently, the propensity for regular and repeated physical exercise to induce and maintain an hormesic effect upon health parameters over a broad range of disorder conditions through the progression of resilience to neurodegenerative disorders, diabetes, stroke, sarcopenia, osteopenia, immunosenescence, and metabolic syndrome have time-and again not only been confirmed but broadened to extend over further health manifestations [9]. Physical exercise may be doubly relevant for those individuals afflicted by visual impairment: for example, it has been found that among females 20-49 years old with non-refractive visual impairment compared with those presenting normal vision more time spent being sedentary; thus, these non-refractive visually impaired showed lower levels of lifestyle physical activity and higher levels of sedentary time than those presenting normal vision [10].

Cognitive functioning performance and related brain regional activity concomitant with biomarkers for enhanced learning and memory accomplishment have all been consistently documented [6,11,12]. In many cases, cognitive-academic-intellectual improvement was accompanied by positive affective and well-being enhancement [13]. For example, it is increasingly evident that exercise may modulate glial cell activity, which seems especially the case with astrocyte functionality processes of astrocytic size regulation, attenuation of astroglio-degeneration, improvement of astrocytic aquaporin-4 expression, and the increase in astrocytic transporter levels [14]. Furthermore, there were marked increments in the number of synapses that existing neurons formed, upsurge of the number of synaptic structures, and the augmentation of presynaptic function and postsynaptic receptor localization. Improved cognitive performance following chronic exercise adherence has been shown not only to be promoted through direct influences but also through several biochemical pathways involving epigenetic mechanisms [15]. Exercise has been shown to offer a viable therapeutic agent both by itself and in combination with other interventions, such as cognitive behaviour therapy, invariably through the mediating agency of brain-derived neurotrophic factor, e.g. for enhancement of debilitating conditions, cardiovascular fitness, psychomotor speed, muscular sufficiency, cognition, etc. [16-19]. In a randomized-controlled trial, consisting of short and long sessions, that was performed upon forty patients presenting mild cognitive impairment whom were divided randomly into two groups, aerobic exercise treatment group (n = 21) and no-aerobic control group (n = 19), is was observed that following the short-session that there were marked improvements in the slowness and complexity of the encephalogram results for the aerobic exercise treated group compared with the non-exercise compared with the non-exercise group [20]. In the context of the 'van Dongen' effect which implies the occurrence of gender effects, and based upon the premise that physical exercise, presented in optimal contiguity to the memory encoding episode, provides a sufficiency

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and necessity for consolidation such that female subjects have been found to display superior mobilizations biomarkers and synaptic proteins whereby the greater the intensity of exercise the greater the preponderance of the outcome women>men [21].

The purpose of the present study was to assess whether or not individuals who had the "exercise-habit", i.e. runners and martial arts performers, would express higher levels of physical and mental health and/or cognitive functioning in comparison with those expressing greater levels of inactivity, i.e. sedentary, lifestyles.

Materials and Methods

Participants

This study's results were obtained through a self-report survey with a targeted selection, three groups of participants. Group one, runners from the union/association/organization "Solvikingarna", Gothenburg's oldest running association, formed in 1962, and affiliated to the National Sports Federation RF. Group two, practitioners of bag fighting/karate (with varied experience and level of sport) at the sports association "Keiko". The study chose Keiko as it is a non-profit sports association with a basic philosophy that is based on respect and humility and has Sweden's national team coach for Kyokushin karate Magnus Hanssen as the responsible coach. Group three, participants of various backgrounds who were more or less physically inactive, however, it should be mentioned that some of the participants have professions where they are partially physically active, such as gardeners and opera singers who need to learn texts and notes as part of their daily tasks, which can affect the result of their working memory. In recruiting the participants, the study tried to get as much variability as possible.

A total of 65 individuals participated in the study, with a loss of seven who did not respond to most of the survey and were therefore not included as full participants. The study's results were based on 58 participants, 23 runners, 21 martial art practitioners and 14 who are physically inactive. The participants range between 18 and 72 years of age, (M=44 ± 11.59 years), of whom the runners 23-72 years, (M=45 years) martial arts practitioners 18-56 years, (M=43 years) and the physically inactive 26-56 years (M=44 years). Nine of the runners were women and 14 were men, in the martial arts group 13 were women and 8 were men and in the physically inactive group, 8 were women and 6 were men. The participants' average value for education after compulsory school was M=5.3 years. The experimental groups, i.e. runners and martial arts practitioners were validated through their allegiances to established Gothenburg regional clubs for each of these activities.

Procedure

Data was collected electronically via a survey which was constructed, distributed and collected through the survey tool "Qualtrics survey system" provided by the University of Gothenburg at the Psychological Department. In the letter that was sent out there was a link to the questionnaire, an information letter that presented the survey and its purpose for the respondents, contact information, and a notice that participation was anonymous, voluntary and that the information would be handled confidentially. The letter was sent electronically to Solvikingarna (the running group) who published/announced the questionnaire on their home and Facebook page. The martial arts participants, i.e. Keiko's members, were distributed electronically in combination with a presentation of the study after a bag-fighting/karate class. In order to reach the physically inactive participants, a letter was sent out electronically to former partners of one of the authors (RE) in various companies, after which those who were physically inactive voluntarily answered the questionnaire.

Instruments

The self-evaluation questionnaire consisted of eight parts with a total of 95 questions, in a specific order that required 8-12 minutes to answer, according to a previous pilot study. The study chose not to present the results of part 2, 4, 5 and 7. Part 1 consisted of questions regarding participants general background and health information, age, gender, education, alcohol and energy drink consumption, pain, medication, occupation, movement at work and sleeping problems. Part 3, consisted of a memory test with a text that the participant had to read for 70 seconds, and then respond to ten questions about the text, receiving one point for each correct answer. Part 6, PANAS–The Positive Affect (PA) and Negative Affect (NA) scales/schedule, (Watson & Clark, 1994) was used to measure high activation effect. PANAS is a self-appreciation test where the participants were instructed to describe 20 different emotions or feelings and mood conditions that they had have in the recent weeks. The test consists of ten adjectives for NA (negative emotions) and ten adjectives for PA (positive emotions) with five response options from "not at all" to "very much". Part 8, was a SE-Stress-Energy test which is a self-assessment instrument that assesses the individual's experiences of their own stress and energy. The test is divided into two sub-scales that express each participant's level of mood in two dimensions: perceived stress and perceived energy, twelve statements with six response alternatives (from "not at all" to "very, much") about how the participant has felt the last hour. The participant would answer the questions without thinking too much. In all parts of the test, changes were made in the response alternatives, that is, numbers were exchanged to words that would grade the strength in the response alternatives. The study chose to use only words to describe the respondents' answers. This meant that the respondents could answer the questions in a simpler way, without thinking too much, which also contributed to the test taking less time to perform.

Design

The study used intergroup design, one-way independent ANOVA (between groups) with indicated hypotheses and alpha level 0.05 to test the hypotheses. Physical Activity (fixed variables) included three levels: running, martial arts and physical inactivity. Dependent variables that were presented in the results section were; Memory capacity (number of correct answers), PANAS (Positive Affect and Negative Affect), SE (perceived Stress and Energy), Consumptions of Energy Drinks, Pains & Aches and Use of Pain killers.

Results

The results showed that homogeneous variance existed in six of the tests except in the health variable "consumption of energy drink" (see appendix). The study's dependent variables were analyzed by one-way independent ANOVA. Table 1 presents the main results of all variables with the number of participants (n), means (M) and Standard Deviations (SD) with the variables; Memory capacity (number of correct answers), Consumption of energy drink, Experienced aches and pains, Use of painkillers, PANAS (affect positive), SE (perceived energy) and SE (perceived stress) for the independent variables of the physically inactive group, the running group and the martial arts group.

The aim of the report was two fold. The first result indicated no differences in the cognitive function memory capacity (number of correct answers) between the groups, however, there was a significant difference in the self-perceived health and attitude to oneself between the

physically active groups and the physically inactive group. The second part of the study examined whether or not there were any differences depending on what kind of physical activity was used as exercise. The results showed no difference in effect. The report also examined three health variables; consumption of energy drink, perceived aches/pains in the neck, shoulders, arms, stomach or head in the past year, use of painkillers that showed a significant impact on the result.

Analysis

The results from the question regarding the cognitive function "memory capacity (number of correct answers)" showed in the one-way ANOVA no significant main effect between the three groups p=0.52, F (2.55) =4.79. Bonferronis post hoc test showed no significant effect difference in memory capacity between the three groups (Table 1).

The health variable "consumption of energy drinks" promoted/elevated memory test results and showed significant difference p=0.01, F (2, 54) =4.79. Bonferronis post hoc test showed that the physically inactive group consumed significantly more energy drinks than the runner group (p<0.02) and the martial arts group (p<0.03), however, there was no significant difference between the runner group and the martial arts group (p>1.00) (Table 1).

The result of the study's question how "self-perceived health" was affected indicated in the health variable "how often or not during the past year the participant has experienced pain in the neck, shoulders, arms, stomach or head" significant difference of perceived pains and aches between the groups, p=0.00, F (2.55) =12.58. Bonferronis post hoc test showed that the physically inactive group experienced significantly more pains and aches than the group of runners (p<0.00) and martial artists (p<0.00), however, there was no difference between the running group and the martial arts group (p>1.00), (Table 1). In the health variable "use of painkillers" regarding the question of how the "self-perceived health" was affected, the one-way ANOVA showed significant difference in the use of painkillers between the three groups, p=0.00 F (2.54) =0.46. Bonferronis post hoc test showed that the physically inactive group consumed significantly more painkillers than the group of runners (p<0.00) and martial artists (p<0.01), however, there was no significant difference between the running group and the martial arts group (p>1.00), (Table 1).

PANAS (affect positive) described the participants' positive feelings, emotions and mood situations by showing how the "self-perceived psychological health" was experienced and "the perceived attitude towards one self" by the three groups. The results showed significant effect difference in PANAS (affect positive), p=0.04, F (2.51) =3.40. Bonferronis post hoc test showed that there was significant difference between the group who practiced martial arts and the one that was physically inactive (p>0.04). The group that was physically inactive had significantly lower PANAS (affect positive) than the martial arts group, however, there was no significant difference between the martial arts group and the group of runners or the physically inactive group and group of runners (Table 1). The physically inactive group had the least positive feelings, emotions and mood modes while the martial arts group turned out to be the most positive. Positive feelings, emotions and moods affect the self-perceived health, well-being and attitude towards one self in individuals. PANAS (negative affect factor) showed no significant effect, however, it should be pointed out that there was a small difference, the physically inactive group had the highest PANAS (negative affect) compared to the other two groups.

	Sedentary	Runners	Martial Arts
	(*n* = 14)	(*n* = 23)	(*n* = 21)
	M, SD	*M, SD*	*M, SD*
Memory capacity ns	6.6 (± 2.6)	6.0 (± 2.2)	6.9 (± 2.6)
Energy Drinks	0.3* (± 0.6)	0.0 (± 0.0)	0.0 (± 0.0)
Pain/Aches	3.5* (± 1.0)	1.9 (± 1.0)	2.1 (± 1.0)
Painkillers	2.1* (± 0.9)	1.3 (± 0.6)	1.5 (± 0.6)
PANAS (positive affect)	3.5* (± 0.7)	3.8 (± 0.7)	4.0 (± 0.6)
SE (perceived energy)	3.5* (± 0.6)	4.1 (± 0.7)	4.1 (± 0.5)
SE (perceived stress)	2.6* (± 0.9)	2.1 (± 0.5)	2.1 (± 0.6)

Note: *significant, Bonferroni's test, ns=not significant

Table 1: Means and standard deviations for memory capacity, energy drinks, pains/aches, painkillers, panas (positive affect), SE (perceived energy) and SE (perceived stress) with regard to sedentary, runners and martial arts together with number of participants.

The aim of the SE test was to identify the "self-perceived health" and "the attitude towards oneself" by measuring perceived energy and stress. The result in the energy section showed significant difference in effect/power in "perceived energy" between the three groups, p=0.01, F (2.51) =4.94. Bonferronis post hoc test showed that there was a significant difference between the physically inactive group and the running group (p>0.02) and the martial arts group (p>0.02), however, there was no significant difference between the martial arts group and the runners group in perceived energy (Table 1). The results in the stress section showed significant difference in effect in perceived stress between the three groups, p=0.003, F (2.51) =6.53. Bonferronis post hoc test showed significant difference between the physically inactive group and the running group (p>0.00) as well as the martial arts group (p>0.08), however, there was no significant difference between the martial arts group and the group of runners in perceived stress (Table 1).

Discussion

The purpose of the present study was to ascertain the extent to which different types of physical exercise schedules or a sedentary lifestyle, respectively, may affect memory capacity, self-experienced health and self-esteem. Runners and martial arts proponents expressed higher levels of positive affect, perceived energy concurrent with lower levels of perceived stress, use of painkillers and aches and pains than the self-reported sedentary individuals. Chronic, regular and moderately strenuous exercise, ideally suitable combinations of endurance and resistance will produce shifts of the inverted-u shaped curve to the right thereby implying that, over time, exercise intensity levels that were at situated at descending portion of the curve would be placed at the ascending portion: this shift implies, not only that with repetitive, small-interval training episodes strength and tolerance levels shall increase, but also that resilience to disorder liability would be enhanced. The findings from the memory capacity test produced no group differences between the exercise-sedentary conditions. As evident from Table 1, the sedentary group consumed more of the energy drinks than the exercise groups. It has been noted that these types of beverages affect several aspects of cognitive performance, reaction time in working memory, humour, and reduce tiredness in addition to their postulated strength and energy effects [22]. The energy drink, AMED, was observed to improve two measures of working memory and speed of responding on a composite Working Memory score [23]. Furthermore, the energy drink, Red Bull, induced marked improvements over both a Sugar-free version and a placebo drink on two composite scores from the six working and episodic memory tests; one combining the 12 accuracy measures from the six tasks and the other combining the mean speed of correct responses from the working memory and episodic recognition memory tasks [24]. Nevertheless, well-designed and performed in

a 5-h ENERGY® shot (5-HES) on various cognitive functions across five hours on twenty-four college-aged students through application of a double-blind, cross-over, placebo-based design [25], the authors found no indication of any enhanced/improved effect upon several assessments of cognitive performance, including recognition tests, reaction time, short-term and working memory, or attention capacity, thereby concluding that the 5-h Energy Shot® did not significantly improve short- or long-term cognitive function for selected computer-based tasks despite high levels of perception that it appeared to show efficacy compared to a placebo with college-aged participants.

The positive component (PA) of PANAS was markedly higher among the martial arts group than the sedentary while Scheffé's test indicated that both exercise groups combined, Runners and Martial arts, expressed higher PA as well as SE. There is now an abundance of evidence supporting the contention that physical exercise regimes promote elevations in PA, mood, self-efficacy, energy, and so on [26-28]. The sedentary participants expressed also that they consumed larger amounts of agents designed to reduce aches and pains; this results in turn is somewhat confirmatory of the above since negative affective has been associated with higher usage of pain-killers. For example, among pregnant women approaching, and before and after delivery, there were marked differences in vitality and PA between those receiving exercise and physical activity and those not doing so [29]. Additionally, among individuals expressing chronic pain during the mid- to late-life period, sleep disturbances predicted indirectly pain interference mediated by both negative affect and positive affect [30]. Physical exercise and self-defence training, e.g. karate, is associated with positive influences upon well-being, self-estimations of health and self-confidence [31]. The absence of any influence of exercise upon cognition in the present study seems at odds with the plethora of evidence displaying benefits of exercise for a variety of cognitive tasks among dysfunctional individuals with diagnoses, e.g. ADHD [32], anxiety and depressiveness [33], anorexia nervosa [34]. The Sedentary group expressed greater levels of perceived stress than the Runners and Martial arts groups. Among university students in India and Lebanon, it has been observed that there has been an unhealthy lifestyle defined by stress levels, inability to organize time, stress of exams and deadlines, irregular sleeping pattern, new peer's relationships, and inability to accommodate with the new surroundings, with the source of these distresses identified as their alarmingly sedentary existence [34].

Conclusion

Sedentary lifestyles are associated with health disadvantage, in the form of aches and pains, higher levels of stress experience and lower levels of PA whereas a physically active lifestyle provides a positive experience of one's own health, attitude-to-self, a higher level of experienced energy accompanied by lesser levels of stress, aches and pains. The incremental advance of a sedentary lifestyle among infants, school children, adolescents, young adults, middle-aged, all the way up the lifespan threatens well-being and is one of the major contributing factors to ill-health throughout industrialized countries. Although, traditional, and more exotic, lifestyle interventions, such as group education, coaching sessions or telephone counselling at first sight seem to hold promise at increasing physical exercise participation, nevertheless for a myriad of reasons, not least motivational, exercise levels tend to decline over the course of time. It may be possible for the application of consumer-based wearable activity-trackers, and other instruments, that allow users to monitor activity levels objectively, that are currently available to offer an alternative method for assisting individuals to remain physically active.

Limitations

The major limitation of the present study concerns the presumed paucity of power due to the limited number of participants, particularly in the sedentary group as the result of individuals declining to complete the questionnaire. This power aspect presents an issue relating to the probabilities pertaining to eventual influences of physical exercise upon memory capacity. Another limitation concerns the possible effects of the higher consumption of the energy drink by the sedentary group in comparison with the exercising groups since previous studies point to the likelihood of these beverages improving cognitive performance.

References

1. Caillouet KA, Cosio-Lima L (2019) Association of health empowerment and handgrip strength with intention to participate in physical activity among community-dwelling older adults. Exp Gerontol 121:99-105.
2. Costa MTS, Vieira LP, Barbosa EO, Mendes Oliveira L, Maillot P, et al. (2019) Virtual Reality-Based Exercise with Exergames as Medicine in Different Contexts: A Short Review. Clin Pract Epidemiol Ment Health 15: 15-20.
3. Shigdel R, Stubbs B, Sui X, Ernstsen L (2019) Cross-sectional and longitudinal association of non-exercise estimated cardiorespiratory fitness with depression and anxiety in the general population: The HUNT study. J Affect Disord 252:122-129.
4. Archer T, Fredriksson A, Schtütz E, Kostrzewa RM (2011) Influence of Physical Exercise on Neuroimmunological Functioning and Health: Aging and Stress. Neurotox Res 20: 69-83.
5. Archer T, Rapp-Ricciardi M (2017) Physical Exercise for Life-Long Health. Clin Exp Psychol 3: 2.
6. Abrantes AM, Farris SG, Brown RA, Greenberg BD, Strong DR, et al. (2019) Acute effects of aerobic exercise on negative affect and obsessions and compulsions in individuals with obsessive-compulsive disorder. J Affect Disord 245: 991-997.
7. Garcia D, Archer T, Moradi S, Andersson-Arntén A (2012) Exercise Frequency, High Activation Positive Affect, and Psychological Well-Being: Beyond Age, Gender, and Occupation. Psychology 3: 328-336.
8. Archer T, Lindahl M (2018) Physical exercise to determine resilience: hormesic processes aring from physiologic perturbation. J Publ Heal Gen Med 1: 1-10.
9. Smith L, Jackson SE, Pardhan S, López-Sánchez GF, Hu L, et al. (2019) Visual impairment and objectively measured physical activity and sedentary behaviour in US adolescents and adults: a cross-sectional study. BMJ Open 9: e027267.
10. Mehren A, Özyurt J, Lam AP, Brandes M, Müller HHO, et al. (2019) Acute Effects of Aerobic Exercise on Executive Function and Attention in Adult Patients With ADHD. Front Psychiatry 10: 132.
11. Wassenaar TM, Wheatley CM, Beale N, Salvan P, Meaney A, et al. (2019) Effects of a programme of vigorous physical activity during secondary school physical education on academic performance, fitness, cognition, mental health and the brain of adolescents (Fit to Study): study protocol for a cluster-randomised trial. Trials 20: 189.
12. Garcia D, Daniele T, Archer T (2017) A brief measure to predict exercise behavior: the Archer-Garcia Ratio. Heliyon 3: e00314.
13. Loprinzi PD (2019) The role of astrocytes on the effects of exercise on episodic memory function. Physiol Int 106: 21-28.
14. Barros L, Eichwald T, Solano AF, Scheffer D, da Silva RA, et al. (2019) Epigenetic modifications induced by exercise: Drug-free intervention to improve cognitive deficits associated with obesity. Physiol Behav 204: 309-323.
15. Fortune JM, Kelly ÁM, Robertson IH, Hussey J (2019) An investigation into the relationship between cardiorespiratory fitness, cognition and BDNF in young healthy males. Neurosci Lett 704: 126-132.
16. Pedersen BK (2019) Physical activity and muscle-brain crosstalk. Nat Rev Endocrinol.
17. Ross RE, Saladin ME, George MS, Gregory CM (2019) High-Intensity Aerobic Exercise Acutely Increases Brain-derived Neurotrophic Factor. Med Sci Sports Exerc.

18. Stavestrand SH, Sirevåg K, Nordhus IH, Sjøbø T, Endal TB, et al. (2019) Physical exercise augmented cognitive behaviour therapy for older adults with generalised anxiety disorder (PEXACOG): study protocol for a randomized controlled trial. Trials 20: 174.

19. Amjad I, Toor H, Niazi IK, Afzal H, Jochumsen M, et al. (2019) Therapeutic effects of aerobic exercise on EEG parameters and higher cognitive functions in mild cognitive impairment patients. Int J Neurosci 129: 551-562.

20. Archer T (2019) Physical exercise and cognition among women: mobilization of consolidatory biomarkers. CPQ Women and Child Health 1: 01-08.

21. Giles GE, Mahoney CR, Brunyé TT, Gardony AL, Taylor HA, et al. (2012) Differential cognitive effects of energy drink ingredients: Caffeine, taurine, and glucose. Pharmacology, Biochemistry and Behavior 102: 569-577.

22. Benson S, Tiplady B, Scholey A (2019) Attentional and working memory performance following alcohol and energy drink: A randomised, double-blind, placebo-controlled, factorial design laboratory study. PLoS One 14: e0209239.

23. Wesnes KA, Brooker H, Watson AW, Bal W, Okello E (2017) Effects of the Red Bull energy drink on cognitive function and mood in healthy young volunteers. J Psychopharmacol 31: 211-221

24. Buckenmeyer PJ, Bauer JA, Hokanson JF, Hendrick JL (2015) Cognitive influence of a 5-h ENERGY® shot: Are effects perceived or real?. Physiol Behav 152: 323-327.

25. Garcia D, Archer T (2014) Positive affect and age as predictors of exercise compliance. Peer J 2: e694.

26. Malik AA, Williams CA, Weston KL, Barker AR (2019) Perceptual and Cardiorespiratory Responses to High-Intensity Interval Exercise in Adolescents: Does Work Intensity Matter?. J Sports Sci Med 18: 1-12.

27. Rodriguez-Ayllon M, Cadenas-Sánchez C, Estévez-López F, Muñoz NE, Mora-Gonzalez J, et al. (2019) Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers, Children and Adolescents: A Systematic Review and Meta-Analysis. Sports Med.

28. Bahadoran P, Asefi F, Oreyzi H, Valiani M (2010) The effect of participating in the labor preparation classes on maternal vitality and positive affect during the pregnancy and after the labor. Iran J Nurs Midwifery Res 15: 331-336.

29. Ravyts SG, Dzierzewski JM, Raldiris T, Perez E (2018) Sleep and pain interference in individuals with chronic pain in mid- to late-life: The influence of negative and positive affect. J Sleep Res.

30. Jansen P, Dahmen-Zimmer K, Kudielka BM, Schulz A (2017) Effects of karate training versus mindfulness training on emotional well-being and cognitive performance in later life. Research on Aging 39: 1118-1144.

31. Ziereis S, Jansen P (2015) Effects of physical activity on executive function and motor performance in children with ADHD. Res Dev Disabil 38: 181-191.

32. Abaraogu UO, Dall PM, Brittenden J, Stuart W, Tew GA, et al. (2019) Efficacy and Feasibility of Pain management and Patient Education for Physical Activity in Intermittent claudication (PrEPAID): protocol for a randomised controlled trial. Trials 20: 222.

33. Lloyd EC, Øverås M, Rø Ø, Verplanken B, Haase AM (2019) Predicting the restrictive eating, exercise, and weight monitoring compulsions of anorexia nervosa. Eat Weight Disord.

34. Huang X, Chen H, Li S (2019) The Relationship Between Assistance Satisfaction and Negative Affect in Long-Term Social Assistance Recipients in China: The Moderating Role of Self-Acceptance. Front Psychol 10: 109.