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 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 afflicted by visual impairment: for example, it has been found that among females 20-49 years old with non-refractive visual impairment whom were divided randomly into two groups, aerobic exercise treatment group (n = 21) and no-aerobic control group (n = 19), that was performed upon forty patients presenting mild cognitive impairment whom were divided randomly into two groups, aerobic 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 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 astrogliodegeneration, 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), 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.
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 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.

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 Stress and Energy), Consumptions of Energy Drinks, Pains & Aches and Use of Pain killers.
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. Bonferroni 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 health variable “consumption of energy drinks” promoted/ elevated memory test results and showed significant difference p=0.01, F (2, 54) =4.79. Bonferroni 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 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 ascending 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 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 scores from the working memory and episodic recognition memory tasks [24]. Nevertheless, well-designed and performed in

<table>
<thead>
<tr>
<th>Sedentary</th>
<th>Runners</th>
<th>Martial Arts</th>
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<tr>
<td>(n = 14)</td>
<td>(n = 23)</td>
<td>(n = 21)</td>
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<tr>
<td>M, SD</td>
<td>M, SD</td>
<td>M, SD</td>
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<tr>
<td>Memory capacity</td>
<td>6.6 (± 2.6)</td>
<td>6.0 (± 2.2)</td>
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<tr>
<td>Energy Drinks</td>
<td>0.3 (± 0.6)</td>
<td>0.0 (± 0.0)</td>
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<tr>
<td>Pain/Aches</td>
<td>3.5 (± 1.0)</td>
<td>1.9 (± 1.0)</td>
</tr>
<tr>
<td>Painkillers</td>
<td>2.1 (± 0.9)</td>
<td>1.3 (± 0.6)</td>
</tr>
<tr>
<td>PANAS (positive affect)</td>
<td>3.5 (± 0.7)</td>
<td>3.8 (± 0.7)</td>
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<tr>
<td>SE (perceived energy)</td>
<td>3.5 (± 0.6)</td>
<td>4.1 (± 0.7)</td>
</tr>
<tr>
<td>SE (perceived stress)</td>
<td>2.6 (± 0.9)</td>
<td>2.1 (± 0.5)</td>
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Note: *significant, Bonferroni's test, ns=not significant

Table 1: Means and standard deviations for memory capacity, energy drinks, pain/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.

Bonferroni 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 oneself 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.

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. Bonferroni 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. Bonferroni 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 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. Bonferroni 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).

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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 a build-up of negative affect and positive affect [29]. Additionally, among individuals experiencing 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


