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Therapeutic Benefits of Physical Exercise over Multiple Disease States

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Commentary

As a therapeutic intervention over a range of neurologic, psychiatric and somatic disease conditions, the protective and restorative properties of physical exercise present remarkable health-promoting propensities especially when combined with dietary and lifestyle alterations with positive outcomes for the afflicted and seemingly healthy individual, in additions to those conditions arising from the encroachments of immunosenescence as individuals confront later stages of the lifecycle [1-10]. For example, meta-analyses and systematic indicate that exercise-based procedures for cardiac rehabilitation have shown repeatedly to ameliorate clinical disease states by improving outcomes for patients presenting coronary heart disease [11]. Physical exercise/activity provides both psychological and physiological resilience to buttress against disease states originating from dysregulation in neuro-immune, metabolic, psychopathologic and traumatic health disruptions, by ensuring the prevention/intervention of chronic heart disease, cardiovascular problems, type II diabetes, obesity and psychological Ill-health, e.g. depressiveness and apathy. For example, the unconditional benefits of exercise and motor activity, across type, duration or intensity, pertaining to general health, brain regional, behavioral and somatic integrity and quality-of-life among individuals and laboratory animals reinstates the modulatory influences of natural rewards through reparation of functional circuits appertaining reward sensitivity, conditioning and cognitive control [12,13]. Increasingly, there is meagre support for the positions contending that any particular type of exercise, e.g. the superiority of progressive resistance training, in comparison with other physical training for rehabilitation in PD shall exert a greater or lesser degree of therapeutic influence [14]; the overriding notion remains: “Use it or lose, move it or be vanquished”. Sedentary lifestyles are implicated in several conditions of illness and indisposure that may or may not co-occur with other co-morbidities through the shared propensities for neuro-inflammation, oxidative stress and/or metabolic syndrome at cellular levels [15,16]. Not least at the workplace the physical and mental health, sometimes a considerable cause for managerial concern, has the exercise intervention proven beneficial: In a study of health-related and disruptive behaviors at work on weight loss in a group of overweight and obese nursing-home employees participating in a 16-week weight-loss intervention with 12-week follow-up, it was observed that eating behavior self-efficacy and exercise-self-efficacy were significant mediators between health behaviors and weight loss [17]. Here, it was shown that incentives moderated significantly the effects of self-efficacy on weight loss. Obesity reality in an ever-increasingly sedentary proportion of the general population has placed a premium upon carefully monitored, multidisciplinary exercise program on assessing the physical fitness, metabolic profile and nutritional status of the afflicted patients [18].

Physical exercise has been linked also to improved neurocognitive performance and everyday functioning, that was estimated through the measurement of instrumental activities of daily living in older HIV+ patients [19,20]. In this regard, Brown et al. assessed the efficaciousness of a physiotherapy-led, group-rehabilitation intervention program involving different elements of exercise and activity to implement the functioning of HIV patients with regard to referrals, adherence and outcomes; they obtained improvements in the 6 min walk test, strength in triceps and biceps, lattisimusdorsi, shoulder-press, chest-press and leg-press, and the physical, emotional and functional subscales, with higher levels of valid expectancies; similarly, these programs improved cardiovascular fitness and higher endurance performance in afflicted patients [21,22]. Treadmill walking exercise was found to improve significantly health and well-being of Alzheimer’s patients as assessed by both pro-inflammatory cytokines, tumor necrosis factor-alpha and interleukin-6, and the Rosenberg Self-Esteem Scale (RSES), Beck Depression Inventory (BDI), Profile of Mood States (POMS) and SF-36 health quality of life (SF-36 HRQL) over an intervention period of two months [23]. In a population of sedentary middle-aged adults (49 ± 6 years), high-intensity interval training and prolonged intermittent sprint training over nine weeks improved aerobic capacity while the former only reduced waist girth; nevertheless, neither intervention affected pro-inflammatory cytokine markers [24]. Furthermore, in patients presenting diabetes type II, a treadmill-based, high-intensity interval training or a moderate-intensity, continuous training that was followed by a procedure of forty weeks of home-based training at those same intensities failed to induce any acute effects upon pro-inflammatory cytokines and oxidative stress markers [25]. However, low intensity and moderate-to-vigorous intensity

physical exercise/activity did induce small improvements in glycemic control, adiposity and inflammation [26]. In this latter context it is necessary to note that severe metabolic dysregulation could likely disrupt the beneficial effects of exercise programs [27]. Interestingly, reduced levels of the pro-inflammatory cytokine, interleukin-6, were intimately associated with reductions in depression symptom severity [28]. Finally, it was observed that the combination of aerobic exercise and resistance training decreased chronic inflammation, interleukin-10, tumor necrosis factor-alpha and interleukin-6 levels as well as body mass index, waist circumference and body fat percentage and increased lean body mass among obese postmenopausal women [29].

Different forms of physical exercise promote different outcomes for muscle strength development and the raising of pain thresholds. Chronic pain, the ubiquitous partner of arthritis-type conditions, may be defined as pain experiences extending beyond the normal tissue healing time, generally expected to be 3 months, and contributes to disorder and disability, anxiety, depression, sleep disturbances, poor quality of life, and healthcare costs. Chronic pain has a weighted mean prevalence in adults of twenty percent. Physical exercise offers specific benefits in reducing the severity of chronic pain, that are accompanied by more general benefits associated with improved overall physical and mental health, and physical functioning. Despite a myriad of confounding factors that complicate straightforward conclusions, there is a certain consensus, from conditions including rheumatoid arthritis, osteoarthritis, fibromyalgia, low back pain, intermittent claudication, dysmenorrhoea, mechanical neck disorder, spinal cord injury, postpolio syndrome, and patellofemoral pain, that physical activity and exercise provides an intervention with few adverse events that may improve pain severity and physical function, and consequent quality of life [30]. In a meta-analysis of 45 eligible trials involving 4699 participants and 56 comparisons of patients presenting knee osteoarthritis, it was found that exercise interventions increased knee extensor strength but failed to affect pain thresholds or disability levels [31]. Progressive resistance training over a six-week period provided lasting benefits for patients presenting early and established inflammatory arthritis [32]. In autoimmune rheumatic disorders, a lifestyle described by an absence of exercise-activity and excessive indulgence in sedentary behavior have been shown to predict morbi-mortality linked with poor health-related outcomes, e.g. the deterioration of disease symptoms and low levels of functionality [33]. Systemic lupus erythematosus affliction among suffering individuals which is linked to enhanced cardiovascular risk factors is inevitably exacerbated by physical inactivity. In a meta-analysis of it was shown that the exercise intervention did not influence disease domains, while positively influencing depression, improving cardiorespiratory capacity and reducing fatigue, in comparison with sedentary control groups [34]. In an animal laboratory model of lupus nephritis using NZM2410/J mice, it was observed that social distress stress, over six days, enhanced kidney disease in comparison with age-matched, randomly selected control mice, as assessed by histopathological analysis of haematoxilin and eosin (H&E) staining and immunohistochemistry, i.e., complement component 3 (C3) and IgG complex deposition, with 88% of non-exercised mice displayed significant renal damage by 43 weeks of age [35]. Contrastingly, daily moderate exercise alleviated the histopathology observed in kidney tissue and decreased markedly the deposits of C3 and IgG complexes. Social distress stress generated greater expression of IL-6, TNF-α, IL-1β, and MCP-1, whereas daily moderate exercise suppressed pro-inflammatory IL-6, TNF-α, IL-10, CXCL1, and anti-dsDNA autoantibodies. Finally, older/elder-aging individuals, whether or not presenting arthritic disorders, should be recipient of invaluable furtherance of health gains from aerobic exercises, strength-resistance training using weights and other apparatus, flexibility/stretching exercises, as well as balance and posture training [36].

Over each individual's lifecycle the adherence to regular physical exercise-activity programs present a necessary component throughout development and aging and not least remain important for chronic disease management of symptoms and markers. In order to promote a satisfactory health status, regularity of daily living activity and functional capacity, physicians ought to pay particular attention to prescribing a spectrum of schedules. Just sustaining exercise schedules presents a lifestyle that is incalculably superior to remaining sedentary, even taking into account the situation that maintaining that health status may preclude the individual from achieving acclaimed goals/rewards of lesser intrinsic value. For most health outcomes, more benefits occur with physical activity performed at higher intensity, greater frequency, or longer duration. Around 2-3 h per week of mild varying in-between bouts of moderate-intensity aerobic activity or one and a half hours of strain-level vigorous-intensity endurance exercise accompanied by two-three day-sessions of muscle-strengthening resistance exercise offers a highly suitable and applicable blend to promote heal at all age-levels.

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