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The importance of physical activities in modulation of learning behavior of students: A bio-psychological perspective

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Abstract- Technological development and growing popularity of different social networking forums have engaged millions of people throughout the world to communicate and share experiences which have created a "social media addiction" phenomenon in adolescents, particularly in students. Many studies have outlined that overuse of social media and inclination towards computer based engagements in youth diminish their participation in physical activities which trigger different psychological problems ranging from mild to severe episodes of depression, stress, and anxiety. These problems often negatively influence the learning behavior and overall academic activities of students. Since physical activities –aerobic ones in particular –are well known for imparting stimulatory effects on physique and mental health; encouragement of students to participate regularly in physical activities and making physical activities as an integral component of syllabi could lead to enhanced learning potentials and better academic achievements. The objective of this review is to correlate biological and psychological effects of physical activities to the learning potentials of students.

Keywords: aerobic exercises, inactivity, hormonal balance, stamina, mental stress, anxiety

I. INTRODUCTION

Physical education has been a widely acknowledged discipline of instruction in many institutes with a significant role in addressing the promotion of human health and maintenance of body through engagement in healthy exercises and appropriate physical activities (Ntoumanis, 2001). The discipline has gained an enormous popularity during the last two decades because of its growing role in reducing mortality rate, management of different cardiovascular diseases and psychological disorders (Netz et al., 2005; Warren et al., 2010). Regular participation of youth in physical activities on daily basis has revealed several health benefits including muscle and bone strength, reduced anxiety and resistance to different chronic diseases (Rasberry et al., 2011). On the other hand, many of the non-communicable diseases in youth and older people show strong relation with inactivity and sedentary life style (Bauman et al., 2012).

From the perspectives of students' academic performance, the importance of physical activities has even more emergent and such activities have been well recognized for raising the cognitive and academic standards (Dwyer et al., 2001; Stevens et al., 2008). Results of empirical studies strongly suggest that physical activities have direct or indirect effect on the learning potentials and academic performance of students (Hillman et al., 2005; Rasberry et al., 2011). It has been observed that chronic diseases and fitness problems associated with physical inactivity correspond to students' behavioral changes which affect their study schedule, motivation for study and final results outcomes (Ward et al., 2008). Obesity and overweight, for instance, caused significantly lower academic scoring in children and adults of different groups which was estimated by different assessment parameters such as grade point average, math and reading performance (Datar et al., 2004; Sabia, 2007). In many similar findings, obesity of students was linked with primary health risks such as cardiovascular diseases, orthopedic concerns, diabetes and gastrointestinal problems which

drastically affected their academic abilities (Datar et al., 2004; Cottrell et al., 2007). Moreover, students challenged with obesity, diabetes and cardiovascular diseases are often at more risks of getting anxiety, depression and other psychological conditions.

Students' participation in physical activities cause different healthy changes –biological and psychological in nature –in their bodies. These changes contribute to short as well enduring positive outcomes. Primary visible healthy effects of physical activities are reduction in obesity, stabilization of blood pressure, management of cardiovascular problems and several other non-communicable diseases (Sabia, 2007; Rasberry et al., 2011) which in turn bring about positive changes in student' mode, self-esteem, social development and peer relations (Tremblay et al., 2000; Kristjánsson et al., 2010). Healthy effects of physical activities whether physical or emotional are distinctive elements which provide substantial support to academic improvement of students. This review explores the role of physical activities in modulation of learning behavior of students from biological and psychological view point.

II. BIOLOGICAL AND PSYCHOLOGICAL CONSEQUENCE OF PHYSICAL ACTIVITIES

Human body performs several biological reactions such as respiration, digestion, secretion and excretion which are strongly associated with psychological performance of the individuals because malfunctioning of these processes serve as psychological stress factors. Proper functioning and further improvement in these processes will lead to overall physical performance and psychological wellbeing. Evidently, physical activities have a determining role in the enhancement of basic biological phenomena which consequently improve psychological health status of participating individuals (Short et al., 2004; Penedo and Dahn, 2005). Studies conducted on the effect of exercise on respiratory functions of controlled atheltes and patients with chronic respiratory disorders suggests its positive implications in rehabilitation (Cheng et al., 2003). Aerobic fitness, lung functions and muscular fatigue which are influenced by respiratory activities have also been demonstrated in some studies to be improved by consistent exercises of at least 30 minutes day-1 (Mostert & Kesselring, 2002). Physical activity training coupled with medication given to patients with pulmonary hypertension, revealed significantly improved oxygen consumption, walking stamina and pulmonary arterial pressure than control group (Mereles et al., 2006). During exercise, particularly prolong one, maximum amount of oxygen (O_2) is taken up by the body and is used for energy production by muscular activity. These used energy system and O_2 stores must be restored after exercise. The energy from creative Phosphate system (CPS) is used to reconstitute adenosine triphosphate (ATP) reserves in the body while energy from glycogen lactic system is used to reform both ATP and CPS of energy (Weneck et al., 2014). Likewise, different problems pertaining to digestion and gastrointestinal tracts such as hemorrhage, constipation, bowl inflammation, colon cancer and intestinal mobility were improved by low intensity consistent physical activities (Peters et al., 2001). Secretory products in human body play a key role in homeostasis and their release is generally regulated by endothelium and endocrine system (Meier & Gressner, 2004; Di Francescomarino et al., 2009). Di Francescomarino et al. (2009) asserted that physical exercise stimulated endothelial functions by altering hormonal release, accelerating blood flow, producing more nitric oxide and balancing oxidant and anti-oxidant agents. Loreto et al. (2004) established that physical exercise (body vibration) induced healthy changes in the endocrine system resulting in the release of certain hormones and enhanced muscular performance which could correspond to reduced obesity in men. Other studies have outlined that physical activities have positive impact on immune system of human subjects. Pedersen et al. (2000) for instance, stated that some of the white blood cells like lymphocytes – which have prominent roles in body immunity – tend to increase during and after exercise, highlighting the significance of physical activities in immune system responses. Galvão et al. (2008) observed increased level of leukocytes and growth hormone after resistance exercise follow up in patients diagnosed with prostate cancer.

Besides evident role in biological processes, physical activities are also of great importance in improving psychological health status. Although several factors determine psychological stresses in youth; abnormalities in biological functions and consequent health problems seem major contributors to anxiety and depression. Obesity, for instance, is a confirmed risk factor leading to major episodes of depression in American population (Luppino et al., 2010). Similarly, chronic diseases like stroke, hypertension, diabetes and lung abnormalities have been found to cause depression of varying level (Huang et al., 2010). Netz et al. (2005) presented their data to conclude that aerobic exercise at moderate level had positive influence on self-

efficacy and functional performance of the studied adults. Paluska and Schwenk (2000) revealed that physical exercises had effective role in management of anxiety, panic disorders and depression. Salmon (2001) described that aerobic exercises helped in reducing stress, anxiety and depression in many clinical studies. Penedo and Dahn (2005) have also provided supporting data which establish a healthy association between physical activities and different mental health problems. Similarly, Strong et al. (2005) believed that engagement in physical activities for 30-45 minutes $week^{-1}$ in youth corresponded to better emotional health and they recommended extension of duration to at least 60 minutes day^{-1} for elevated health outcomes. Lautenschlager et al. (2008) found moderate improvement in memory problems of patients with Alzheimer disease following exercise training which lasted for six months. Biddle and Asare (2011) reviewed systemic studies which clearly indicated that individuals participating in physical exercise had lower rate of depression and anxiety while improved self-esteem and cognitive abilities. Similarly Asmundson et al. (2013) have pointed towards the influential role of physical activities in correcting some mood disorders and anxiety.

III. Association with learning potentials of students

Learning abilities of adult students is influenced by several factors ranging from genetically inherited traits to environmental conditions. Physical and psychological health of young students appear to have strong relation with their cognitive abilities. Virtually, students with physical health problems will face direct difficulty in focusing on their academic tasks due to relevant challenges posed by health issues. Students challenged with obesity, diabetes, anemia, heart diseases, epilepsy, hemophilia, cancers and other chronic health problems might exhibit low academic performance, high tendency of absentee from classes and low interest in assignments (Taras and Potts-Datema, 2005). Problems in education and learning abilities of students due to health problems are generally due to clinical consequences of the disorders; however, in chronic conditions they may act as stress factors causing psychological issues of students which can further affect their learning efficacy. It is evident from findings of many studies that physical health problems often lead to depression, anxiety and mood alterations. Roberts et al. (2003) indicated that obesity had greater influence on mental health and depression development of American population. In separate studies targeting different subjects of different ages, Simon et al. (2006) and (2008) established a positive association between obesity and psychological disorders such as major depression, bipolar disorder, anxiety and panic episodes. Similarly, diabetes, cancer and cardiovascular problems have been identified as potential risk factors for development of anxiety, depressions and several other mental abnormalities in adults of different ages and sexes (Carels, 2004; Lloyd-Williams et al., 2004; Licht et al., 2008; Pan et al., 2010).

Health problems whether physical or mental, strongly disturb students' learning capabilities, motivation to work and attention in classroom because healthy body and mind are the pre-requisites for major work tasks including learning. Participation in regular exercises can help students to minimize undesirable influences of physical and mental health problems upon their studies. The association between physical activities and learning potential of students seem multidirectional in effects. Firstly, physical exercise confer direct health promotory effects on participants and secondly, they contribute to either reduce or prevent the onset of psychological stresses which have devastating effects on the learning outcomes of students. Trials conducted on animals and humans have clearly indicated that aerobic exercises resulted in higher cognition performance of the subjects and could be successfully employed in education institutions to improve academic performance of students (Hillman et al., 2008). Non communicable diseases in students such as obesity, heart defects, hypertension and different cancers while psychological abnormalities like anxiety and depression show significant reduction following recommended intensity and duration of physical exercises (Anon., 2010; Hillman et al., 2008). Tremblay et al. (2000) demonstrated that male and female students who participated in physical exercises had high level of self-esteem and academic scores than non-participating individuals. Kirkcaldy et al. (2002) found that employment of regular physical activities among German students resulted in improved self-image, social interactions and learning outcomes while reduced depression and anxiety. Asci (2003) advocated students' participation in physical exercises (at least ten weeks training) for achieving better physical, emotional and mental health and improving academics. Strong et al. (2005) recommended participation in regular physical exercises for at least 60 minutes per day to achieve better health, behavioral and academic performance of youth. Coe et al. (2006) documented that

students participating in vigorous exercises based the recommendation of health guidelines achieved significantly higher grades than control samples. Hillman et al. (2008) asserted that aerobic exercises results in developmental, cognitive, and functional improvement of brain. Taliaferro et al. (2009) attributed reduced risk of suicidal tendency, depression and hopelessness among male and female college students to rigorous aerobic physical activities. In general, participation of students in physical exercises of varying intensities and duration is linked with significant improvement in health abilities, social interactions, disease management and enhanced learning outcomes.

IV. Conclusion

Learning potential of students is influenced several factors originating from inherited attributes to environmental conditions. Physical and mental health are among the key determinants in modifying the learning abilities in both desirable and un-desirable directions. Students with chronic diseases have greater chances of mental and psychological health issues which may negatively affect their learning abilities. Both physical and mental health issues are governed by proper functioning of biological processes. Physical activities stimulate the regulation of biological processes in body which lead to better psychological health. There is substantial evidence in literature which suggests that exercises and physical activities reduces obesity, cardiac disorders, cancers, anxiety, depression and hopelessness while promote self-esteem, social interaction and cognitive functions and thus have a proven association with physical and psychological health which are further linked with better learning outcomes. Participation in exercises on regular basis provide a feasible model for students to manage many health problems with subsequent improvement in learning abilities.

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