

THE EFFECTIVENESS OF A PERIOD OF ACADEMIC TRAINING EXTRA-CURRICULAR ACTIVITY ON THE LEVELS OF SLEEP DISTURBANCES AND THE QUALITY OF LIFE IN NON-ACTIVE FEMALE STUDENTS

A EFICÁCIA DE UM PERÍODO DE FORMAÇÃO ACADÊMICA DE ATIVIDADES EXTRACURRICULARES SOBRE OS NÍVEIS DE DISTÚRBIOS DO SONO E A QUALIDADE DE VIDA EM ESTUDANTES NÃO-ATIVAS

LA EFECTIVIDAD DE UN PERÍODO DE CAPACITACIÓN ACADÉMICA ACTIVIDAD EXTRACURRICULAR EN LOS NIVELES DE DISTURBIOS DEL SUEÑO Y LA CALIDAD DE VIDA EN ESTUDIANTES FEMENINOS NO ACTIVOS

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Conflict of interest

The authors declare no conflict of interest.

ABSTRACT

Independent living experiences, changing lifestyles, rapid outcomes, and dwelling life are among the student challenges which can have negative effects on the level of sleep and the quality of students' life. The purpose of this study was to determine the effectiveness of a period of academic training extra-curricular activity on the levels of sleep disturbances and the quality of life in non-active female students. The present study was applied in a practical and semi-experimental research. 20 non-active student students were randomly selected. The PSQI questionnaire was used to measure sleep disturbances and the SF-36 questionnaire was used to measure subjects' quality of life. The American College of Sports Medicine (ACSM) practice protocol was used for 12 weeks and 3 sessions a week. Shapiro-Wilk test, t-test parametric test and Wilcoxon nonparametric test and to calculate version 21 of SPSS statistical software were used. The statistical data output showed that the intervention created by the exercise protocol significantly increased the level of sleep disorders as well as the quality of life factor ($p < 0.05$). It can be said that physical activity as a strategy and appropriate, easy and cheap approach, In order to improve the improvement of sleep factors and quality of life among students, it seems more than necessary and officials and educational interests can lead society to healthy with planning and organize physical activities of students and encourage them to do sports.

Keyword: Extracurricular, quality of life, sleep disturbances, student, non-active, training intervention

RESUMO

Experiências de vida independentes, mudança de estilos de vida, resultados rápidos e vida moradora estão entre os desafios estudantis que podem ter efeitos negativos sobre o nível de sono e a qualidade da vida dos estudantes. O objetivo deste estudo foi determinar a eficácia de um período de treinamento acadêmico de atividades extracurriculares nos níveis de distúrbios do sono e na qualidade de vida em estudantes não-ativas. O presente estudo foi aplicado em uma pesquisa prática e semi-experimental. 20 estudantes não ativos foram selecionados aleatoriamente. O questionário PSQI foi utilizado para medir distúrbios do sono e o questionário SF-36 foi utilizado para medir a qualidade de vida dos sujeitos. O protocolo de prática do American College of Sports Medicine (ACSM) foi utilizado por 12 semanas e 3 sessões por semana. O teste de Shapiro-Wilk, o teste paramétrico de teste t e o teste não paramétrico de Wilcoxon e para calcular a versão 21 do software estatístico SPSS foram utilizados. A saída de dados estatísticos mostrou que a intervenção criada pelo protocolo de exercícios aumentou significativamente o nível de distúrbios do sono, bem como o fator qualidade de vida ($p < 0,05$). Pode-se dizer que a atividade física como estratégia e abordagem apropriada, fácil e barata, para melhorar a melhoria dos fatores do sono e da qualidade de vida entre os alunos, parece mais do que necessária e funcionários e interesses educacionais podem levar a sociedade a ser saudável com planejando e organizando atividades físicas de estudantes e encorajando-os a praticar esportes.

Palavras-chave: extracurricular, qualidade de vida, distúrbios do sono, estudante, não-ativo, intervenção de treinamento

RESUMEN

Las experiencias de vida independiente, los estilos de vida cambiantes, los resultados rápidos y la vida en la vivienda son algunos de los desafíos de los estudiantes que pueden tener efectos negativos en el nivel de sueño

y la calidad de vida de los estudiantes. El propósito de este estudio fue determinar la efectividad de un período de actividad extracurricular de formación académica sobre los niveles de trastornos del sueño y la calidad de vida en estudiantes femeninas no activas. El presente estudio se aplicó en una investigación práctica y semi-experimental. 20 estudiantes no activos fueron seleccionados al azar. El cuestionario PSQI se utilizó para medir los trastornos del sueño y el cuestionario SF-36 se utilizó para medir la calidad de vida de los sujetos. El protocolo de práctica American College of Sports Medicine (ACSM) se utilizó durante 12 semanas y 3 sesiones por semana. Se usaron la prueba Shapiro-Wilk, la prueba paramétrica t-test y la prueba no paramétrica de Wilcoxon y para calcular la versión 21 del software estadístico SPSS. La salida de datos estadísticos mostró que la intervención creada por el protocolo de ejercicio aumentó significativamente el nivel de trastornos del sueño y el factor de calidad de vida ($p < 0.05$). Se puede decir que la actividad física como estrategia y enfoque apropiado, fácil y barato. Para mejorar la mejora de los factores de sueño y la calidad de vida entre los estudiantes, parece más que necesario y los funcionarios y los intereses educativos pueden llevar a la sociedad a una vida saludable planificar y organizar las actividades físicas de los estudiantes y alentarlos a hacer deporte.

Palabras clave: extracurricular, calidad de vida, alteraciones del sueño, estudiante, no activo, intervención de entrenamiento

INTRODUCTION

One of the most appropriate health habits or health promotion behaviors is motor activity and regular exercise which has positive effects on human health and quality of life; in a way that reduces the field of psychological and physical disorder and increases mental health in students (Casasola, 2010). Exercise and physical activity lead to biological and biochemical changes, and improve mental health and, consequently, promote sleep quality (Dua, et al., 2010).

Regular Physical Training and exercise, with the effectiveness on the secretion of endorphins, norepinephrine, catecholamine, serotonin, and other neurotransmitter of the brain, are effective on cognitive and emotional functions of the brain such as memory and learning of students (Schuch, et al., 2011).

In addition, research results suggest that exercise can increase blood flow, oxygen and glucose in the brain and as a result optimum brain function will be followed (From, et al., 2010). Exercise, in addition to reducing body fat and making muscle, strengthens the resistance to the disease. In fact, frequent training courses enhance the immune response, reduce the risk of physical illness and, if illness develops, it helps to improve it faster. Sports activities also reduce the incidence of cardiovascular disease, cancer, diabetes and hypertension (Dua, et al., 2010).

On the other hand, human health is related to the quantity and quality of his sleep, So that sleepless nights can affect the quality of life and increase the incidence of depression and anxiety in students and reduce the ability to cope with daily stress (Sasai, et al., 2010).

In the same vein, studies have shown that treating sleep disorders, such as frequent waking, increase physical activity and improve quality of life. Usually, exercise is a non-drug strategy that can have beneficial effects on sleep quality and student sleep disorders; this is supported by epidemiological studies and reports better communication between exercise and sleep (Youngstedt, 2014). Physical activity causes decreased depression, decreased anxiety, increased cheerful mood, increased social interaction, decreased cardiovascular

risk factors, increased self-concept, decreased blood pressure and dozens of other positive effects (Youngstedt, et al., 2003).

The issue of continuing education and the promotion and promotion of science is one of the growing needs of today's societies which attract young talent and effort. Entering a university is an important event in every person's life, because it affects work, income, social relationships, and the future (Youngstedt, 2014).

It must be accepted that student life is accompanied by stressful and new challenges; an independent life experience, a changing lifestyle, rapid outcomes, and dwelling life are among these challenges. So in order to meet these needs, students deliberately change their sleeping habits; This change in habits is to reduce the total sleep time, change the sleep cycle and wake up to later on to go to sleep and wake up, and also deprive yourself of falling asleep during the week and compensating for it on weekends (Buboltz Jr, et al., 2001).

Hence, understanding how sleep deprivation can affect human performance is necessary (Alhola, & Polo-Kantola, 2007). Sleeping properly improves the function of the immune system, stabilizes memory, modulates the metabolic process at the molecular level, and preserves catecholamine in the brain, and plays an important role in the development of the organs of the body (Zubia, 2012).

On the other hand, low quality sleep has a health hazard. Studies show, during sleep sympathetic activity decreases and parasympathetic activity increases. These changes reduce heart rate and overnight blood pressure. Therefore, long-term sleep deprivation may have a direct negative effect on the cardiovascular system and increase the risk of cardiovascular disease (Waterhouse, et al., 2005).

So the changes that are made in the student's sleeping habits disrupt the circadian rhythm whose complications are characterized by inability to wake up at the scheduled time and delayed night sleep. Most students who fail to study do not know that the cause of this weakness may be related to their poor sleep habits. Students with poor quality sleep have significantly lower educational performance than students with good sleep quality (Brown, et al., 2006).

Problems and shortness of sleep duration have irreparable effects on physical and physical health, So that studies show that the limits of sleep lead to severe negative effects on health, quality of life and performance indicators (Norman, et al., 2000).

On the other hand, people now want to improve the quality of life and governments from all over the world are more and more focused on improving the quality of their lives and try to reduce mortality, improve primary health services, and increase the physical, mental and social well-being of people (Kathryn, 2010).

They admit that an increase in the standard of living for people is not enough to satisfy them and their satisfaction and the quality of life should be increased; This means more emphasis on social policy and the improvement of social goals to make life happier; Studies on the effect of sleep deprivation have shown that physical activity is an effective and non-pharmacological method for improving sleep and sleep disorders (Lang, et al., 2013).

On the other hand, performing aerobic exercises can have a positive effect on many important factors in human life, including quality of life. It has been shown in the research that aerobic activity can affect many vitality, social function, mental health and life quality of inactive elderly people (Kathryn, 2010).

Researchers believe that students have a set of problems such as learning problems, financial, marriage, personality, behavior and social. Some studies have introduced student life and academic environment as a stressful environment. Some studies have found the incidence of physical and mental harm to students more than the general population and claim that common mental disorders such as anxiety, depression, tension, and physical impairment are more common in students. They experience more situations such as insomnia and bad luck, excessive fatigue, irritability, sensitivity, forgetfulness, neglect, difficulty concentrating and attention, physical complaints, and personality disorders. Therefore, considering the importance of the topic of sleep and ill-treatment disorders and the quality of life of students, this question was posed to researchers

that do a course of extracurricular activity of academic training can impact on the quality and quantity of sleep and the quality of life of students?

MATERIALS AND METHODS

Considering the goals and main questions of the research; the present research was applicable in terms of purpose that its purpose was the development of applied knowledge in a particular field and this research was a kind of semi-experimental research. Researchers investigated the probability of effectiveness on the dependent variable by applying an independent variable.

Participants

The subjects of this study were 20 non-active female students who participated voluntarily in this study and randomly divided into two groups of control (20 persons) and experimental (20 persons).

Instruments and Tasks

Pittsburgh Sleep Quality Index

To measure sleep disorders, a PSQI questionnaire with 7 sub-scales was selected and the sum of the seven-point scale marks the total score which is from zero to 21. A total score of six or more means poor sleep quality. The coefficient of validity of this questionnaire has been approved by numerous researchers in many countries.

Quality of Life Index (SF-36)

A questionnaire (SF-36) was used to measure subjects' quality of life. The purpose of this questionnaire is health assessment from both comments of the physical and psychological state which is obtained by combining eight health scores. The questionnaire has 36 questions that assess eight different areas. The method of scoring this test is as follows that the lowest score in this questionnaire is zero and the highest score is 100 points. The score of each dimension is determined by rating of the titles in that dimension.

Procedure

The purpose and the process of study were explained to subjects, before the presentation of the consent form for the participation in this study. Then by questionnaire Patients' history of the disease, including cardiovascular, pulmonary, allergic, hypertension, diabetes and other specific illnesses were identified and subjects, who had specific disease, were excluded from the study. Subjects' physical activity records were also examined and people with a history of regular activity or a member of the club were excluded from the research. Subjects were asked to avoid severe physical activity during the test. All 40 subjects from experimental and control groups pre-test was taken. During the implementation of the practice protocol, only the experimental group continued to practice and the control group did not have any physical activity, and finally, all 40 subjects were subjected to post-test.

Training Protocol

The exercise protocol was performed at 60% maximum heart rate for 12 weeks and 3 sessions a week (36 sessions in total). This exercise was conducted based on the recommendations of the American College of Sports Medicine (ACSM). The duration of Subjects' exercise in the first week was about 20 minutes per session which was gradually increased over the following weeks over the duration and intensity of the exercises, until it reached 40 minutes in the last week. The exercises included three heating sessions (8 minutes), aerobic gymnastics and five minutes back. The heating and cooling program was also considered as a part of the training time. The intensity of exercise was controlled by the Pollard Hourly bird watch during exercise. Practical conditions were the same for all subjects. At each stage of the exercise, the researchers controlled the intensity of the exercise by heart rate for each subject, and if exercise intensity needed to increase or decrease, necessary feedback to the subjects was provided.

Statistical method

Descriptive and inferential statistics were used to analyze the collected data. The Shapiro-Wilk test was used to examine the assumption that the data were natural and T-dependent parametric test and Wilcoxon's nonparametric test were used. Also, the SPSS version 21 software has been used for statistical calculations.

RESULTS

The subjects' demographic characteristics and characteristics of the experimental and control groups are visible in the following tables.

Table I - The mean and standard deviation of subjects' age and lack of exercise history

Variable		Mean	SD	Minimum	Maximum
Age	Experimental group	20.9	1.0311	19	21
	Control group	21.2	1.55	18	22
Lack of exercise history (month)	Experimental group	23.6	9.91	14	24
	Control group	21.4	10.13	11	23

Table 2 - Subjects' frequency and percentage based on the marital status

Group	Marital status		Single		Married	
	Percent	Number	Percent	Number	Percent	Number
Experimental	80%	16	20%	4		
Control	80%	16	20%	4		

Table 3 - Subjects' frequency and percentage based on the field of study

group	Field of Study		Environment		Medical Radiation		Law		Financial Management	
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
Experimental	35%	7	25%	5	40%	8	0%	0		
Control	20%	4	40%	8	10%	2	30%	6		

Table 4 - The results of variables examination in the pre-test and post-test

Variable \ Group		Experimental	Control
Sleep quality	Pre-test	9.2 ± 3.24	7.3 ± 3.39
	Post-test	7.3 ± 2.45	7.4 ± 3.45
Mental sleep quality	Pre-test	2.9 ± 0.94	1.9 ± 0.57
	Post-test	2.2 ± 0.73	1.17 ± 0.67
Sleep latency	Pre-test	1.57 ± 0.89	2.9 ± 0.52
	Post-test	1.01 ± 0.73	2.11 ± 0.75
Sleep duration	Pre-test	1.7 ± 0.72	1.4 ± 0.89
	Post-test	1.2 ± 0.67	1.4 ± 0.71
Sleep efficiency	Pre-test	1.21 ± 0.69	0.9 ± 0.81
	Post-test	1.1 ± 0.65	0.9 ± 0.74
Sleep disturbances	Pre-test	2.12 ± 0.76	1.9 ± 0.83
	Post-test	1.19 ± 0.69	1.10 ± 0.79
Daytime dysfunction	Pre-test	1.40 ± 0.64	1.19 ± 0.51
	Post-test	1.7 ± 0.55	1.20 ± 0.59
Quality of Life	Pre-test	83.11 ± 7.74	82.07 ± 8.27
	Post-test	88.07 ± 6.67	82.10 ± 8.25
Mental health	Pre-test	77.2 ± 7.74	76.2 ± 8.34
	Post-test	79.9 ± 6.97	75.2 ± 8.049
Physical function	Pre-test	82.11 ± 6.78	83.11 ± 7.24
	Post-test	86.11 ± 5.34	83.02 ± 7.43
Social function	Pre-test	74.17 ± 13.13	82.61 ± 12.35
	Post-test	78.19 ± 13.69	81.19 ± 12.43

Table 5 - The results of Shapiro-Wilk test for the experimental group

Variables	Group	df	Statistics	Significance level
Sleep quality	Pre-test	0.92	20	0.149
	Post-test	0.928	20	0.221
Mental Sleep quality	Pre-test	0.811	20	0.001
	Post-test	0.790	20	0.00
Sleep latency	Pre-test	0.840	20	0.019
	Post-test	0.810	20	0.001
Sleep duration	Pre-test	0.790	20	0.001
	Post-test	0.799	20	0.001
Sleep efficiency	Pre-test	0.9	20	0.001
	Post-test	0.77	20	0.00
Sleep disturbances	Pre-test	0.814	20	0.002
	Post-test	0.810	20	0.001
Daytime dysfunction	Pre-test	0.76	20	0.00
	Post-test	0.68	20	0.00
Quality of Life	Pre-test	0.940	20	0.290
	Post-test	0.918	20	0.105
Physical function	Pre-test	0.892	20	0.036
	Post-test	0.870	20	0.013
Mental health	Pre-test	0.811	20	0.041
	Post-test	0.926	20	0.138
Social function	Pre-test	0.906	20	0.057
	Post-test	0.894	20	0.034

DISCUSSION

The purpose of this study was to determine the effectiveness of a period of academic training extra-curricular activity on the levels of sleep disturbances and the quality of life in non-active female students. Over the past years, regular physical activity has always been recognized as the cornerstone of healthy behaviors and has been associated with a reduction in chronic lifestyle-related illnesses (Micklesfield, et al., 2003).

As reported by the US Department of Health, Human Services and Human Services, regular physical activity as a non-pharmacological intervention has many psychological and psychological benefits that can be effective in improving the level of sleep disorders and life quality (Van der Heijden, et al., 2013). The results of this study showed that after intervention in the experimental group, significant effect on sleep variable indices and some health related indicators in the component of life quality in inactive students were created. Sleep is an integral part of a person's good health (Buboltz Jr, et al., 2001). The results of this study is consistent with the research of Erlacher et al. (2014), Which examined the effects of exercise on sleep in

adolescents with chronic sleep problems. The results of their research showed that the number of stages and duration were greatly correlated with the improvement of individual sleep and as a result, a significant effect on the subjects' sleep schedule is provided by the sports program. Daily sleep data (sleep recovery, frequency, delay in falling time and wake-up time after sleep) significantly improved during the intervention program (Erlacher, et al., 2015).

Also, the research was consistent with Fabio et al. (2011) research in terms of data analysis. In their research, the pattern of sleep 14 elderly, healthy and inactive men, during the exercise period 60 minutes a day, 3 days a week, and for 24 hours at a rate of activity equal to the respiratory tract threshold, older subjects who underwent a mild exercise were shown to improve some aspects of sleep, insulin resistance, and metabolic problems (Lira, et al., 2011). Physical activity leads to biological and biochemical changes and improves mental health and, consequently, improves sleep quality. Recently, the research team showed that with physical activity, it can reduce pre-sleep anxiety and improve sleep quality in older adults (Passos, et al., 2010). Improving the quality of sleep in subjects caused by aerobic physical activity is probably due to a decrease in REM duration and an increase in the NREM course. Because the central temperature changes in the body through these exercises stimulate the peroptic nucleus and the anterior hypothalamus, which in turn improves the quality of sleep (Gerber, et al., 2014).

Also, increasing the activity of the sympathetic device during exercise and reducing its activity to a parasympathetic device during recovery may result in deepening of sleep and an increase in sleep time (Mello, et al., 2005). Bakhshalipour et al. (2016), In a research paper aimed at determining the effectiveness of moderate-intensity exercise on the quality of sleep in elderly people; Their findings showed that the functions of moderate-intensity aerobic exercise program are effective in the treatment of sleep disorders and obesity problems in inactive people (Bakhshalipour, et al., 2016). Regular exercise is a strategy, appropriate and effective approach to tackle sleep disorders and obesity. So, the use of aerobic training with sleep hygiene education can be an effective therapeutic approach for inactive people with sleep disorders. Among the benefits of physical activity to health, it seems that the idea of proper exercise functions as an effective treatment in people with sleep problems comes from a variety of theories about sleep function, including regulation of heat, body resuscitation or energy conservation. For example, the body's regeneration theory predicts that there is a relationship between energy expenditure and deeper sleep (eg, sleep with slower wave) or longer sleep in elderly people for power regeneration (Tworoger, et al., 2003). In addition, exercise is associated with increased production and release of neurotransmitters and neurotransmitter factors that can have a neurological physiological effect in sleep (Portugal, et al., 2013).

Therefore, according to research samples, various research studies point to the fact that exercise and physical activity can improve a particular type of sleep in individuals. It seems that these effects can be attributed to the role of the main hormone melatonin, which plays an important role in creating sleep (5). It should be noted that the level and level of secretion of this hormone is affected by physical activity, in a way that can affect the pineal gland in the short term and increase the level of sulfa-toxin-melatonin 6 (resulting from the metabolite of melatonin) (Ritsche, 2014). Studies have shown that insomnia symptoms, such as delayed sleep and sleep, may affect the quality of life in people. Sleep disorder is the most common and known sleep disorder (Sadock & Sadouk, 2003), and sleep disorders are a premature symptom in psychiatric illnesses, while getting chronic insomnia can affect quality of life.

Therefore, according to the points mentioned, it can be said that the quality of life scores in the subjects of this research has significantly changed and increased. Given the results of the quality of life of inactive student students, it is inferred that this finding confirmed the impact of the intervention in this study and with that of Park et al. (2014), Seferoğlu et al. (2013), Imayama et al (2011) and Reid et al. (2011) also is consistent. A 2013 study by Park and colleagues entitled *The Effect of Sports Programs on Depression Symptoms, Quality of Life and Self-esteem in the Elderly*. The subjects were 65 years old (male and female).

The results of this study showed that sport programs regularly decrease the symptoms of depression, improve quality of life and self-esteem in elderly people. To improve the quality of life and self-esteem and reduce symptoms of depression, researchers recommend a weekly targeted exercise program for students in their work plan (Park, et al., 2014). Seferoğlu et al. (2013), in a research entitled " The Relationship between Tennis Skill Acquisitions with Sleep Quality and Quality of Life" Which was performed on 33 volunteers in 2 hours and 2 times per week during 12 weeks, Quality of Life Questionnaire (SF-36), Sleep Quality Index (PSQI), Beck Depression Inventory and Ability Test (TAT) were used as a measurement tool in the study. It was concluded that there is a significant relationship between quality of sleep and quality of life, and sports programs such as these can be effective in improving sleep indices and quality of life (Seferoğlu, et al., 2013). The research was conducted by Imayama et al. (2011) entitled " Effects of 12-month exercise on health-related quality of life: a randomized controlled trial ".The subjects included 100 women and 102 middle-aged men who were randomly selected. During the study, moderate intensity aerobic exercises were performed. Statistical analysis of the study showed that after 12 months of exercise, improvement in quality of life, self-efficacy, social performance, vitality, and mental health arose (Imayama, et al., 2011).

Research by Reid et al. (2011) showed that sport activities are one of the important factors influencing the quality of life quality indicators and the level of reports of sleep quality in individuals and can have beneficial results for people with such disorders (Reid KJ, et al., 2011). Given that many studies have shown the relationship between exercise and quality of life, how they can have a positive effect on individuals' physical functioning. Therefore, meaningful factor of physical function, as well as reduction of daily dysfunction and social function in this research can lead to improvement of quality of subjects' life (Seferoğlu, et al., 2013).

CONCLUSION

In general, according to theories of energy conservation, rehabilitation of body stores, as well as the role of growth hormone and melatonin on sleep factors, as well as the impact of quality of life on changes in sleep quality, it can be concluded that performing the appropriate training protocol can have positive and desirable effects on the quality of sleep and, consequently, of quality of life.

REFERENCES

- Alhola, P., & Polo-Kantola, P. (2007). Sleep deprivation: Impact on cognitive performance. *Neuropsychiatric disease and treatment*, 3(5), 553.
- Bakhshalipour, V., Saresheh, S. K., Falah, M., Kazemi, M. K. M., & Keshayeh, S. S. (2016). The effect of regular moderate-intensity physical activity on sleep quality in non-active elderly women.
- Brown, F. C., Buboltz Jr, W. C., & Soper, B. (2006). Development and evaluation of the Sleep Treatment and Education Program for Students (STEPS). *Journal of American College Health*, 54(4), 231-237.
- Buboltz Jr, W. C., Brown, F., & Soper, B. (2001). Sleep habits and patterns of college students: a preliminary study. *Journal of American college health*, 50(3), 131-135.
- Casasola, C. D. (2010). Analysis of heart rate during a tennis training session and its relationship with heart-healthy index. *Journal of sport and health research*, 2(1), 26-34.

- Dua, J. S., Cooper, A. R., Fox, K. R., & Stuart, A. G. (2010). Exercise training in adults with congenital heart disease: feasibility and benefits. *International journal of cardiology*, 138(2), 196-205.
- Erlacher, C., Erlacher, D., & Schredl, M. (2015). The effects of exercise on self-rated sleep among adults with chronic sleep complaints. *Journal of Sport and Health Science*, 4(3), 289-298.
- From, S., Liira, H., Remes-Lyly, T., Frost, A., Leppävuori, J., Tikkanen, H., & Pitkälä, K. (2010). Exercise intervention and health promotion by a nurse in 35–45 year old men at elevated cardiovascular risk: ISMH World Congress 2010 Abstract 067. *Journal of Men's Health*, 7(3), 302-302.
- Gerber, M., Brand, S., Herrmann, C., Colledge, F., Holsboer-Trachsler, E., & Pühse, U. (2014). Increased objectively assessed vigorous-intensity exercise is associated with reduced stress, increased mental health and good objective and subjective sleep in young adults. *Physiology & behavior*, 135, 17-24.
- Imayama, I., Alfano, C. M., Bertram, L. A. C., Wang, C., Xiao, L., Duggan, C., & McTiernan, A. (2011). Effects of 12-month exercise on health-related quality of life: a randomized controlled trial. *Preventive medicine*, 52(5), 344-351.
- Kathryn, J. (2010). Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. *Sleep Med. Oct*;11(9):934-40.
- Lang, C., Brand, S., Feldmeth, A. K., Holsboer-Trachsler, E., Pühse, U., & Gerber, M. (2013). Increased self-reported and objectively assessed physical activity predict sleep quality among adolescents. *Physiology & behavior*, 120, 46-53.
- Lira, F. S., Pimentel, G. D., Santos, R. V., Oyama, L. M., Damaso, A. R., do Nascimento, C. M. O., ... & Esteves, A. M. (2011). Exercise training improves sleep pattern and metabolic profile in elderly people in a time-dependent manner. *Lipids in health and disease*, 10(1), 113.
- Mello, M. T. D., Boscolo, R. A., Esteves, A. M., & Tufik, S. (2005). Physical exercise and the psychobiological aspects. *Revista Brasileira de Medicina do Esporte*, 11(3), 203-207.
- Micklesfield, L., Rosenberg, L., Cooper, D., Hoffman, M., Kalla, A., Stander, I., & Lambert, E. (2003). Bone mineral density and lifetime physical activity in South African women. *Calcified tissue international*, 73(5), 463-469.
- Norman, J. F., Von Essen, S. G., Fuchs, R. H., & McElligott, M. (2000). Exercise training effect on obstructive sleep apnea syndrome. *Sleep Res Online*, 3(3), 121-9.
- Park, S. H., Han, K. S., & Kang, C. B. (2014). Effects of exercise programs on depressive symptoms, quality of life, and self-esteem in older people: A systematic review of randomized controlled trials. *Applied Nursing Research*, 27(4), 219-226.
- Passos, G. S., Poyares, D., Santana, M. G., Garbuio, S. A., Tufik, S., & Mello, M. T. (2010). Effect of acute physical exercise on patients with chronic primary insomnia. *Journal of clinical sleep medicine: JCSM: official publication of the American Academy of Sleep Medicine*, 6(3), 270.

- Portugal, E. M. M., Cevada, T., Monteiro-Junior, R. S., Guimarães, T. T., da Cruz Rubini, E., Lattari, E., ... & Deslandes, A. C. (2013). Neuroscience of exercise: from neurobiology mechanisms to mental health. *Neuropsychobiology*, 68(1), 1-14.
- Reid KJ, Baron KG, Lu B, Naylor E, Wolfe L, Zee PC. (2011). Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. *Sleep Med. Sleep Med. Oct*; 11(9):934-40.
- Ritsche, P.(2014). Sleep patterns and predictors of disturb sleep in a large population of college student. *J Health.*; 46:124-320.
- Sadock BJ, Sadouk VA. Sleep disorder. In Kaplan and Sadouk's Synopsis of Psychiatry. 9th ed. Lipincott-Williams & Wilkins: Philadelphia. 2003. P. 760-782.
- Schuch, F. B., Vasconcelos-Moreno, M. P., & Fleck, M. P. (2011). The impact of exercise on Quality of Life within exercise and depression trials: A systematic review. *Mental health and physical activity*, 4(2), 43-48.
- Seferoğlu, F., Şahan, A., Karaman, T., & Erman, A. (2013). The Relationship between Tennis Skill Acquisitions with Sleep Quality and Quality of Life. *Procedia-Social and Behavioral Sciences*, 93, 1811-1814.
- Sasai, T., Inoue, Y., Komada, Y., Nomura, T., Matsuura, M., & Matsushima, E. (2010). Effects of insomnia and sleep medication on health-related quality of life. *Sleep medicine*, 11(5), 452-457.
- TwoRoger, S. S., Yasui, Y., Vitiello, M. V., Schwartz, R. S., Ulrich, C. M., Aiello, E. J., ... & McTiernan, A. (2003). Effects of a yearlong moderate-intensity exercise and a stretching intervention on sleep quality in postmenopausal women. *Sleep*, 26(7), 830-836.
- Van der Heijden, M. M. P., van Dooren, F. E., Pop, V. J. M., & Pouwer, F. (2013). Effects of exercise training on quality of life, symptoms of depression, symptoms of anxiety and emotional well-being in type 2 diabetes mellitus: a systematic review. *Diabetologia*, 56(6), 1210-1225.
- Waterhouse, J., Drust, B., Weinert, D., Edwards, B., Gregson, W., Atkinson, G., ... & Reilly, T. (2005). The circadian rhythm of core temperature: origin and some implications for exercise performance. *Chronobiology international*, 22(2), 207-225.
- Youngstedt, S. D. (2014). Effects of exercise on sleep. *Clinics in Sports Medicine*, 24(2), 355-365.
- Youngstedt, S. D., Perlis, M. L., O'Brien, P. M., Palmer, C. R., Smith, M. T., Orff, H. J., & Kripke, D. F. (2003). No association of sleep with total daily physical activity in normal sleepers. *Physiology & behavior*, 78(3), 395-401.
- Zubia, G.F. (2012). Effect of sleep deprivation on tolerance of prolonged exercise. *Sleep Res Online* 47: 345-354.