Original Article

RBAFS Revista Brasileira de Atividade Física & Saúde
SOCIEDADE BRASILEIRA DE ATIVIDADE FÍSICA & SAÚDE

rbafs.org.br

Sleep disorders and regular physical exercise in primary health care: an observational study

Distúrbios do sono e exercício físico regular na atenção primária à saúde: estudo observacional

AUTHOR'S

Karina Nunes Assunção[1]
Luísa Teixeira Pasqualotto[2]
Helton Oliveira Campos[3]
Newton Santos de Faria Junior[1]

1 Universidade do Estado de Minas Gerais, Curso de Fisioterapia, Divinópolis, Minas Gerais, Brasil.

2 Universidade Federal de Alfenas, Programa de Pós-graduação em Ciências da Reabilitação, Alfenas, Minas Gerais, Brasil.

3 Universidade do Estado de Minas Gerais, Departamento de Ciências Biológicas, Carangola, Minas Gerais, Brasil.

CORRESPONDING

Newton Santos de Faria Júnior
nsdfj@yahoo.com.br
Universidade do Estado de Minas Gerais – Unidade Divinópolis. Avenida Paraná, 3001, Jardim Belvedere, Divinópolis, Minas Gerais, Brasil.
ZIP CODE: 35501-170.

DOI

10.12820/rbafs.27e0267

ABSTRACT

Physical exercise is currently considered a non-pharmacological alternative to improve sleep quality, but due to the lack of knowledge of some professionals, it is not widely used for this purpose. Thus, the objective of this study was to compare sleep quality, the presence of sleep disorders and insomnia, and the quality of life in patients who practice regular physical exercise (PG) and those who did not practice regular physical exercise (NPG), attended in Basic Health Units (BHUs) in the municipality of Divinópolis, Minas Gerais, Brazil. The study was a cross-sectional observational study carried out with 49 patients recruited from BHUs in the city of Divinópolis, Minas Gerais. They were divided into two groups constituted by those who practiced regular physical exercise (PG) and those who did not practice regular physical exercise (NPG), and then evaluated for sleep quality and the presence of sleep disorders, perception of insomnia, and quality of life addressed according to the respective questionnaires: the Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index and SF-36 Quality of Life Questionnaire. When comparing the groups, there was a statistically significant difference regarding the items good sleep quality, presence of severe insomnia, general health status, social aspects and mental health. Thus, it is suggested that patients who practiced regular physical exercise attended in BHUs have a higher prevalence of good sleep quality, lower rate of severe insomnia and better quality of life.

Keywords: Sleep; Exercise; Quality of life.

RESUMO

O exercício físico é considerado atualmente como alternativa não farmacológica para melhora da qualidade do sono, porém pela falta de conhecimento de alguns profissionais o mesmo não é muito utilizado para essa finalidade. Dessa forma, o objetivo deste estudo foi comparar a qualidade do sono, a presença de distúrbios do sono e insônia, e a qualidade de vida em pacientes praticantes de exercício físico regular (PEFR) e não praticantes de exercício físico regular (NPEFR), assistidos em UBS's do município de Divinópolis, Minas Gerais. O estudo foi do tipo observacional transversal, realizado com 49 pacientes recrutados a partir de Unidades Básicas de Saúde (UBS's) do município de Divinópolis, Minas Gerais. Foram divididos em dois grupos, os PEFR e NPEFR, e em seguida avaliados quanto a qualidade e presença de distúrbios do sono, percepção da insônia, e qualidade de vida, abordados de acordo com os respectivos questionários: Índice de Qualidade de Sono de Pittsburgh (IQSP), Índice de Gravidade de Insônia e Questionário de Qualidade de Vida SF-36. Quando comparado os grupos, houve diferença estatisticamente significativa quanto aos itens boa qualidade do sono, presença de insônia severa, qualidade de vida sob os domínios estado geral de saúde, aspectos sociais e saúde mental. Desta forma, sugere-se que os pacientes que praticam exercício físico regular assistidos em UBS's apresentam maior prevalência de boa qualidade do sono, menor índice de insônia severa e melhor qualidade de vida.

Palavras-chave: *Sono; Exercício; Qualidade de vida.*

Introduction

Sleep is defined as a healthy and restorative state, naturally regenerating and pleasurable, which is necessary to recover the physical exhaustion common to the human experience due to the constant state of alertness and energy expenditure[1]. Sleep is essential for us to have a productive wakefulness period. It restores numerous body functions, recovers the energy spent during wakefulness, promotes physical and mental rest, in addition to offering the individual a sense of well-being[2].

Disorders of the sleep-wake cycle are considered a public health problem[3]. They are usually not diagnosed and treated, as there is a lack of knowledge by the population about them. These disorders cause several consequences to physical and mental health and have a high worldwide prevalence with a negative impact on health[2].

About 6 to 49% of the world population in different groups of patients have moderate to severe sleep breathing disorders[2,3]. A study carried out in a city in the state of São Paulo in Brazil showed the occurrence of disorders in 46.7% of the people interviewed, mostly affecting women, older adults and obese people. These disorders can cause increased irritability, metabolic, endocrine, and immunological changes, hypertensive conditions, joint pain, in addition to changes in mood, attention, memory and balance, as well as contributing to the development of diseases such as obesity, diabetes, and problems in the cardiovascular and respiratory systems[4].

Physical exercise is currently recognized by the American Sleep Disorders Association as a non-pharmacological intervention to improve sleep quality[5] and has been increasingly practiced by people due to promoting several beneficial changes to the body. A randomized controlled trial conducted with middle-aged and older adults with poor sleep quality who practiced moderate-intensity aerobic exercise demonstrated a significant improvement in the sleep quality and cardiac autonomic function of the participants in the short term[6]. Older adults with mild cognitive impairment also benefited from a moderate-intensity aerobic exercise program, obtaining improvement in cognitive function, quality of life, sleep quality and reduction of depressive symptoms[7], as well as overweight adolescents after undergoing a physical exercise program that reduced insomnia levels[8].

The initiative of the Basic Health Units (BHUs) in Brazil to promote groups and physical exercise programs can have a great impact on reducing costs related to the health service, helping to promote and raise awareness of the benefits acquired from their regular practice[9]. When correctly prescribed, physical exercise can reduce the need for medication and contribute to improve sleep quality and quality of life, but due to the lack of knowledge by some professionals, it is not widely used for this purpose[10].

Thus, this study aimed to compare sleep quality, the presence of sleep disorders and insomnia, and the quality of life in patients who practiced regular physical exercise (PG) and those who did not practice regular physical exercise (NPG) attended in BHUs in the municipality of Divinópolis, Minas Gerais, Brazil.

Methods

This was a cross-sectional observational study with patients recruited from BHUs in the city of Divinopolis, Minas Gerais, Brazil, between January and November 2016. The study design followed the guidelines of the "Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement"[11] (Figure 1) and agreed with the ethical standards established in the Declaration of Helsinki (1961). The study was approved by the Ethics Committee in Research with Human Beings of the Universidade do Estado de Minas Gerais under protocol number 1.475.521/2016.

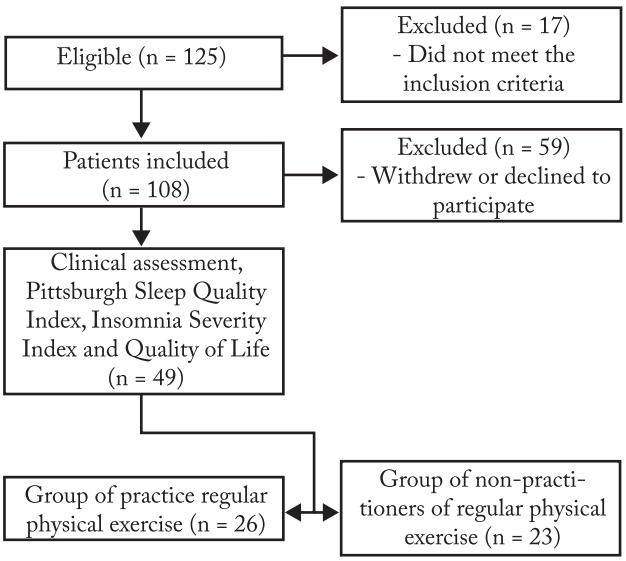

Figure 1 – Flowchart representing the study design

A total of 49 patients attended at BHUs participated in this study. The sample was consecutive and by convenience, and stratified according to sociodemographic variables, comorbidities, presence or absence of sleep disorders and other variables relevant to the study. Patients aged at least 18 years, of both sexes, without cognitive impairment that impeded the interpretation of the questionnaires and who agreed to participate in the study by signing the Informed Consent Form (ICF) were included in the study. Patients who did not agree to answer the questionnaires, who had orthopedic and neurological comorbidities that could influence physical exercise, or those who used medication to induce sleep were excluded.

Participants were divided into two groups according to those who practiced regular physical exercise (PG, n = 26) and non-practitioners of regular physical exercise (NPG, n = 23). Participants in the PG were those with at least three months of supervised regular physical exercise at the BHUs, while those in the NPG were patients who did not participate in regular physical exercise.

The patients were evaluated at the BHUS in the clinical evaluation according to a specific evaluation form which contained personal data, socioeconomic data, comorbidities, physical examination and daily living habits. The assessment of body mass and stature was performed using scales provided by the BHUs. The calculation of the body mass index (BMI) was performed based on the following formula: BMI = body mass (kg) / body height^2 (m) and classified according to the World Health Organization (WHO)[12]. Neck circumference was measured with the individual in the sitting position at the level of the anterior border of the cricoid cartilage using a non-elastic measuring tape with a precision of 1 millimeter[13]. According to the Brazilian Society of Otorhinolaryngology, values ≤ 43.2 cm for men and ≤ 38 cm for women are considered normal references[14]. Abdominal waist circumference was measured using a non-elastic measuring tape. It was measured at the midpoint between the lower margin of the last rib and the iliac crest[15]. Values ≥ 94 cm for men and ≥ 80 cm for women are considered by the V Brazilian Guidelines on Dyslipidemia and Prevention of Atherosclerosis as a reference for increased cardiovascular risk[16].

The researchers responsible for data acquisition in this study received specific training to ensure data quality. Periodic external monitoring was carried out to verify the correct application of the methodology for acquiring information and carrying out different tests.

The Portuguese version of the Pittsburgh Sleep Quality Index (PSQI)[17] was applied to assess patients' sleep quality and the presence of sleep disorders. The questionnaire contains 19 questions, divided into 7 components scored separately. The sum of these points (range: 0-21) provides an overall measure of sleep quality, subdivided as follows: (I) a score less than 5 indicates good sleep quality, (II) a score greater than 5 and less than 10 indicates poor sleep quality, and (III) a score greater than 10 is suggestive of the presence of a sleep disorder. The domains evaluated are related to subjective sleep quality, sleep duration, sleep latency, habitual sleep efficiency, sleep disorders, use of sleep-related medications, and sleep impact on daytime dysfunctions.

The Insomnia Severity Index (IGI) was also applied, a short and simple self-administered questionnaire, validated[18] as a tool to quantify the perception of insomnia severity, taking into account the last two weeks[19]. The questionnaire has a total score of 28 points and is composed of 7 items (each item on a scale from 0 to 4) in which a score from 0 to 7 indicates absence of insomnia; 8 to 14 mild insomnia; 15 to 21 moderate insomnia and 22 to 28 severe insomnia[19]. The Portuguese version of the IGI, whose use was authorized by its authors, proved to be valid and adequate for screening and evaluating such impacts in different contexts[18].

The generic SF-36 questionnaire (Medical Outcomes Study 36 – Item Short-Form Health Survey)[20] was used to assess quality of life, a version validated for the Portuguese language in Brazil[21]. The SF-36 is an instrument which is easy to administer and understand, but not so extensive. It contains 36 items, of which 35 are grouped into eight dimensions (functional capacity, pain, physical aspects, emotional aspects, social aspects, mental health, vitality and general health status), and a last item that assesses the change in health over time. The SF-36 items are coded, grouped and transformed on a scale from 0 (worst health status) to 100 (best health status)[20] for each dimension.

Numerical data were presented as mean and standard deviation for statistical analysis. Categorical data were described as absolute numbers and percentages of the total. The Kolmogorov-Smirnov normality test was performed in order to determine the parametric or non-parametric distribution. The following statistical tests were used for comparisons between variables: (I) Student's t-test: age, waist circumference, and total PSQI; (II) Mann-Whitney test: BMI, neck circumference, subjective sleep quality, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, daytime dysfunction, functional capacity, limitation by physical aspects, pain, general health status, vitality, social aspects, emotional aspects, and mental health; (III) Chi-squared test: sex, smoking, heart disease, diabetes mellitus, arterial hypertension, good sleep quality, poor sleep quality, presence of sleep disorder, presence of insomnia, presence of mild insomnia, presence of moderate insomnia, presence of severe insomnia, and high risk of Obstructive Sleep Apnea (OSA). The SigmaPlot version 10 statistical software program (SYSTAT SOFTWARE Inc, 2006) was used for statistical analyses. The statistical significance level was set at 5% for all tests ($p<0.05$).

Results

A total of 49 patients participated in the study, 26 from the PG and 23 from the NPG.

Table 1 presents the characterization of the groups for the demographic, anthropometric and cardiovascu-

lar comorbidities of the NPG and PG participants involved in the study. It is observed that the NPG and PG are statistically similar for the characterization variables.

Table 1 – Demographic and anthropometric characteristics and cardiovascular comorbidities of patients who do not practice regular physical exercise and who practice regular physical exercise.

Characteristics	NPG (n = 23)	PG (n = 26)	p
Age, years	57.35 ± 13.69	62.82 ± 8.40	0.105
Women, nº (%)	18 (78.3)	22 (84.6)	0.716
BMI, kg.m2	27.64 ± 5.73	26.3 ± 4.95	0.541
Neck circumference, cm	37.84 ± 3.95	36.67 ± 3.68	0.230
Abdominal circumference, cm	94.61 ± 11.95	90.95 ± 11.23	0.273
Smokers, nº (%)	4 (17.4)	6 (23.1)	0.731
Cardiovascular comorbidities			
Heart diseases, nº (%)	2 (8.7)	4 (15.4)	0.671
Diabetes mellitus, nº (%)	3 (13.0)	5 (19.2)	0.706
Systemic arterial hypertension, nº (%)	14 (60.9)	11 (42.3)	0.312

Data are expressed as mean ± standard deviation (SD) or number (%). Cm = centimeters; BMI = body mass index; kg = kilogram; m2 = square meters; nº = number; NPG = non-practitioners of regular physical exercise group; PG = practitioners of regular physical exercise group. For quantitative variables, Student's t test (parametric data) or Mann-Whitney test (non-parametric data) were used. For qualitative variables, chi-square or Fisher's exact tests, when appropriate.

Table 2 shows the results of sleep quality and presence of insomnia. It was observed that the PG had a higher percentage of individuals with good sleep quality (χ^2 = 4.836; p = 0.028), while the NPG had a significantly higher percentage of individuals with severe insomnia (χ^2 = 6.066; p = 0.014). Furthermore, it is observed that both groups had poor sleep quality (NPG: 7.64 ± 3.12 vs. PG: 6.08 ± 3.01; t = 1.750; p = 0.087).

Table 3 presents the results for each of the sleep quality domains assessed by the PSQI for volunteers in the NPG and PG. Individuals in the PG had better subjective sleep quality (U = 205.03; p = 0.041) and daytime dysfunction (U = 187.58; p = 0.026) compared to individuals in the NPG.

Individuals in the PG had better quality of life (Table 4), with statistically significant differences in the domains of general health status (t = -2.52; p = 0.015), social aspects (U = 436.51; p = 0.005) and mental health (U = 465.04; p = 0.028) compared to individuals in the NPG (Table 4).

Discussion

This study aimed to compare sleep quality, the presence of sleep disorders, insomnia, and quality of life in patients who practice and do not practice regular physical exercise. It was observed that the PG patients presented a better index of good sleep quality, lower index of severe insomnia and better quality of life than the NPG patients. Physical exercise directly influences sleep quality and is effective in preventing sleep disorders. It can be said that a good sleep pattern and regular physical exercise are essential for health promotion and better quality of life[8].

According to Zhang et al.[22], sleep disorders are risk factors for major health problems, including systemic arterial hypertension, diabetes, cancer, mental and cognitive disorders. In addition to offering health benefits, an intervention based on regular exercise reduces the risk of mortality and chronic diseases, and can be considered a low-cost alternative[22].

Table 2 – Assessment of the quality and presence of sleep disorders in patients who did not practiced regular physical exercise and who practice regular physical exercise.

	NPG (n = 23)	PG (n = 26)	p
Total PSQI	7.64 ± 3.12	6.08 ± 3.01	0.087
Good sleep quality, nº (%)	3 (13.0)	11 (42.3)	0.028*
Poor sleep quality, nº (%)	15 (65.2)	12 (46.1)	0.293
Presence of sleep disorders, nº (%)	5 (21.7)	3 (11.5)	0.448
Presence of insomnia, nº (%)	12 (52.1)	13 (50.0)	0.893
Presence of mild insomnia, nº (%)	0 (0.0)	0 (0.0)	-
Presence of moderate insomnia, nº (%)	5 (41.7)	13 (100.0)	0.080
Presence of severe insomnia, nº (%)	7 (58.3)	0 (0.0)	0.009*

Data are expressed as mean ± standard deviation (SD) or number (%). PSQI: Pittsburgh Sleep Quality Index; nº: number; NPG: non-practitioners of regular physical exercise; PG: practitioners of regular physical exercise. For quantitative variables, Student's t-test (parametric data) or Mann-Whitney (non-parametric data) tests were used. For qualitative variables, chi-square or Fisher's exact tests, when appropriate. *p < 0.05.

Table 3 – Assessment of sleep quality by the PSQI of patients who did not practiced regular physical exercise and who practiced regular physical exercise.

PSQI domains	NPG (n = 23)	PG (n = 26)	p
Subjective sleep quality	1.26 ± 0.81	0.81 ± 0.63	0.041*
Sleep latency	1.56 ± 1.08	1.08 ± 0.93	0.102
Sleep duration	1.35 ± 1.03	0.84 ± 1.00	0.076
Usual sleep efficiency	0.69 ± 1.06	1.15 ± 1.26	0.208
Sleep disorders	0.83 ± 0.88	0.85 ± 0.61	0.567
Use of sleeping medication	0.96 ± 1.06	0.85 ± 1.25	0.436
Dysfunction during the day	1.00 ± 0.85	0.50 ± 0.65	0.026*

Data are expressed as mean ± standard deviation (SD). PSQI = Pittsburgh Sleep Quality Index; NPG: non-practitioners of regular physical exercise; PG: practitioners of regular physical exercise. For quantitative variables, Student's t test (parametric data) or Mann-Whitney test (non-parametric data) were used.*p < 0.05.

Table 4 – Quality of life assessment by the SF-36 of patients who did not practiced regular physical exercise and who practiced regular physical exercise.

SF-36 domains	NPG (n = 23)	PG (n = 26)	p
Functional capacity	70.61 ± 24.12	64.25 ± 30.84	0.501
Limitation by physical aspects	52.25 ± 40.56	70.44 ± 34.71	0.125
Pain	57.37 ± 30.95	59.68 ± 29.32	0.848
General health status	51.26 ± 22.97	66.36 ± 18.73	0.015*
Vitality	52.43 ± 26.80	64.33 ± 25.35	0.117
Social aspects	55.35 ± 29.03	79.25 ± 26.84	0.005*
Emotional aspects	53.54 ± 42.34	75.51 ± 39.79	0.065
Mental health	52.32 ± 26.65	69.12 ± 25.57	0.028*

Data are expressed as mean ± standard deviation (SD). SF-36 = Medical Outcomes Study 36 – Item Short-Form Health Survey; NPG = non-practitioners of regular physical exercise; PG = practitioners of regular physical exercise. For quantitative variables, Student's t test (parametric data) or Mann-Whitney test (non-parametric data) were used.*$p < 0.05$.

We observed that the PG volunteers had a higher prevalence of good sleep quality compared to the NPG, constituting data which corroborate a study performed with women over 60 years of age who participated in a regular physical exercise program and presented better levels of sleep quality[23]. However, another study carried out in Teresina with older adult practitioners and non-practitioners of physical activity contrastingly revealed poor sleep quality in 62% of the group of practitioners against 40% of the sedentary group, and sleep disorders in 42% of the sedentary older adults versus only 6% of the active group[24].

The different types of exercises, frequency and duration can interfere with their effects, as the clinical manifestations and etiology are different in each sleep disorder, hence the need to develop an exercise protocol for people with changes and poor sleep quality[23].

It was also observed that the PG subjects presented better results in the subjective sleep quality and dysfunction domains during the day of the PSQI, which is in agreement with what was demonstrated by a study carried out with middle-aged and older adults with sleep complaints, also evaluated by the PSQI, in which there was a significant improvement in sleep quality[6] after physical training of moderate intensity.

Studies on physical exercise and sleep show that participation in regular physical exercise programs has positive effects on sleep quality, mood and cognitive skills, further suggesting that high levels of exercise prevent insomnia[25,26]. Our findings also corroborate the systematic review conducted by Xie et al.[27] who analyzed the effects of physical exercise on sleep quality and insomnia in adults, noting a greater risk of insomnia for those who do not exercise and a reduction in the severity of insomnia and improvements in sleep quality after its practice.

Insomnia is a common complaint found in primary healthcare offices with a prevalence of 1 in 3 individuals in the adult population, being higher in women. It is estimated that up to 61% of middle-aged women suffer from sleep problems and are at risk of developing chronic, persistent or intermittent insomnia[28].

The PG subjects in this study showed better quality of life in the general health status, social aspects and mental health domains, as well as in the study carried out by Cassiano et al.[29], who observed significant improvements in physical aspects, general health status and vitality after practicing physical exercises, thus demonstrating the importance of its performance. In addition, people with sleep disorders are less productive and report lower quality of life compared to those without sleep disorders[30].

The present study showed some limiting factors, such as the observational nature, and therefore there was no intervention in the groups. The interview through questionnaires may not guarantee the veracity of the answers obtained and it was not possible to control the intensity of the exercise practiced by the patients or the veracity of the information regarding the performance of the third day of physical exercise (unsupervised).

Our results suggest that patients who practice regular physical exercise attending BHUs have a higher prevalence of good sleep quality, lower rate of severe insomnia and better quality of life under the general health status, social aspects and mental health domains. With the significant increase in sleep disorders in the world population, more studies are needed to prove the effectiveness of physical exercise in improving sleep quality, since it is known the consequences that poor sleep quality and insomnia have on patients' physical and mental health throughout life.

Conflict of interest

The authors declare no conflict of interest.

Funding

This work was carried out with support from FAPEMIG (Fundação de Amparo à Pesquisa do Estado de Minas Gerais – PIBIC/UEMG/FAPEMIG grant) and PAPq (Institutional Research Support Program – UEMG/PAPq grant).

Authors' contribution

Assunção KN and Pasqualotto LT participated in the design of the manuscript, analysis and interpretation of data and writing of the manuscript. Campos HO, participated in the design of the manuscript, analysis and interpretation of data and final approval of the version to be published. Faria Junior NS, participated in the design of the manuscript, analysis and interpretation of data; relevant critical review of the intellectual content and final approval of the version to be published.

Referências

1. Dement WC. A personal history of sleep disorders medicine. J Clin Neurophysiol. 1990;7(1):17-47.
2. Benjafield AV, Ayas NT, Eastwood PR, Heinzer R, Ip MSM, Morrell MJ, et al. Estimation of the global prevalence and burden of obstructive sleep apnea: a literature-based analysis. Lancet Respir Med. 2019;7(8):687-98.
3. Farrell PC, Richards G. Recognition and treatment of sleep-disordered breathing: an important component of chronic disease management. J Transl Med. 2017;15(1):114.
4. Zanuto EA, de Lima MC, de Araújo RG, da Silva EP, Anzolin CC, Araujo MY, et al. Sleep disturbances in adults in a city of Sao Paulo state. Rev Bras Epidemiol. 2015;18(1):42-53.
5. Sateia MJ. International classification of sleep disorders-third edition: highlights and modifications. Chest. 2014;146 (5):1387-94.
6. Tseng TH, Chen HC, Wang LY, Chien MY. Effects of exercise training on sleep quality and heart rate variability in middle-aged and older adults with poor sleep quality: a randomized controlled trial. J Clin Sleep Med. 2020;16(9):1483–92.
7. Song D, Yu DSF. Effects of a moderate-intensity aerobic exercise programme on the cognitive function and quality of life of community-dwelling elderly people with mild cognitive impairment: A randomised controlled trial. Int J Nurs Stud. 2019; 93:97-105.
8. Pereira GP, Rodrigues LVA, Mourão DM, Carneiro ALG, Lima CAG, Oliveira CS, et al. Insônia: o benefício do exercício físico em adolescentes com excesso de peso. J of Health Biol Sci. 2018;6(4):377-82.
9. Rocha VCLG, Kosour C, Pereira MJ, Sostena JRN, Silva SLA. Efeitos de exercícios físicos praticados em Unidades Básicas de Saúde. ConScientiae Saúde. 2017;16(3): 342-50.
10. Gualano B, Tinucci T. Sedentarismo, exercício físico e doenças crônicas. Rev. bras. Educ. Fís. Esporte. 2011;25(1): 37-43.
11. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. BMJ. 2007;335(7624):806.
12. Keys A, Fidanza F, Karvonen MJ, Kimura N, Taylor HL. Indices of relative weight and obesity. Int J Epidemiol. 2014;43(3):655-65.
13. Zen V, Fuchs FD, Wainstein MV, Gonçalves SC, Biavatti K, Riedner CE, et al. Neck circumference and central obesity are independent predictors of coronary artery disease in patients. Am J Cardiovasc Dis. 2012;2(4):323-30.
14. Pinto JA, Ballester LMG, Wanderley VPBM, Branco TS, de Farias CAL, Spadari MA. Medidas antropométricas preditoras da gravidade da apneia obstrutiva do sono. Braz J Otorhinolaryngol. 2011;77(4):516-21.
15. ABESO-Associação brasileira para o estudo da obesidade e da síndrome metabólica. Diretrizes brasileiras de obesidade. 4ª ed. São Paulo: ABESO; 2016.
16. Xavier HT, Izar MC, Faria Neto JR, Assad MH, Rocha VZ, Sposito AC, et al. IV Diretriz Brasileira sobre Dislipidemias e Prevenção da Aterosclerose. Arq Bras Cardiol. 2013;101(4):1-22.
17. Bertolazi AN, Fagondes SC, Holf LS, Dartora EG, Miozzo IC, de Barba ME, et al. Validation of the Brazilian portuguese language of the Pittsburgh Sleep Quality Index. Sleep Med. 2011;12(1):70-5.
18. Castro, Laura de Siqueira. Adaptação e validação do Índice de Gravidade de Insânia (IGI): Caracterização Populacional, Valores Normativos e Aspectos Associados [dissertação]. São Paulo: Universidade Federal de São Paulo; 2011.
19. Bastien CH, Vallieres A, Morin CM. Validation of the insomnia severity index as an outcome measure for insomnia research. Sleep Med. 2001;2:297–307.
20. Ware JEJr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30(6):473-83.
21. Ciconelli RM, Ferraz MB, Santos W, Meinão I, Quaresma MR. Brazilian-Portuguese version of the SF-36. A reliable and valid quality of life outcome measure. Rev Bras Reumatol. 1999;39(3):143-50.
22. Zhang W, Liu Y, Yu J, Li D, Jia Y, Zhang Q et al. Exercise improves sleep quality in older adults: a protocol for a systematic review and meta-analysis. BMJ Open. 2022;12(1):e047555.
23. Guimarães LHDCT, Lima MD, de Souza JA. Atividade física em grupo melhora o sono de idosas sedentárias. Revista Neurociências. 2007:15(3), 203-06.
24. Freire ALL, Alves LF, Torres MV, Xavier CL, Gomes JA, Lopes KS, et al. Análise comparativa da qualidade do sono em idosas praticantes e não praticantes de atividade física na zona sul de Teresina - Piauí. Rev Gest Saúde. Saúde do Idoso, 2014;18(1):3101-14.
25. Kelley GA, Kelley KS. Exercise and sleep: a systematic review of previous meta-analyses. J Evid Based Med. 2017;10(1):26-36.
26. Reid KJ, Baron KG, Lu B, Naylor E, Wolfe L, Zee PC. Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. Sleep Med. 2010;11(9):934-40.
27. Xie Y, Liu S, Chen XJ, Yu HH, Yang Y, Wang W. Effects of Exercise on Sleep Quality and Insomnia in Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Front Psychiatry, 2021;7(12):664499.
28. Baker FC, Willoughby AR, Sassoon SA, Colrain IM, de Zambotti M. Insomnia in women approaching menopause: beyond perception. Psychoneuroendocrinology. 2015;60:96-104.
29. Cassiano ADN, Silva TSD, Nascimento CQD, Wanderley EM, Prado ES, Santos TMM, et al. Effects of physical exercise on cardiovascular risk and quality of life in hypertensive elderly people. Cien Saude Colet, 2020;25(6):2203-12.
30. Kelley GA, Kelley KS. Exercise and sleep: a systematic review of previous meta-analyses. J Evid Based Med. 2017;10(1):26-36.

Received: 22/10/2021
Approved: 28/06/2022

Quote this article as:
Assunção KN, Pasqualotto LT, Campos HO, Faria Junior NS. Distúrbios do sono e exercício físico regular na atenção primária à saúde: estudo observacional. Rev Bras Ativ Fís Saúde. 2022;27:e0267. DOI: 10.12820/rbafs.27e0267