

# Stretching exercises accompanied or not with music, reduce the stress level of pre-college student

Priscila Carneiro Valim-Rogatto<sup>1</sup>, Gustavo Puggina Rogatto<sup>1</sup>, Eric Francelino Andrade<sup>2</sup>

<sup>1</sup>Department of Physical Education, Federal University of Lavras, Brazil. <sup>2</sup>Department of Veterinary Medicine, Federal University of Lavras, Brazil.

**Received:** 05.06.2015

**Accepted:** 01.09.2015

## Summary

In Brazil, many students take preparatory courses for entrance exams at university. However, these tests can be a stressful event, because their realization usually coincides with a phase of students' lives when they are still finding out and structuring their identity. Considering that stress is a prevalent syndrome in young people, especially those in the admission phase in college, there is a need to evaluate the influence of strategies aiming to reduce the stress in this population. Thus, we investigate the effects of a single bout muscle stretching exercise, listening to music and stretching exercise accompanied by music sessions on the number of stress symptoms in students from preparatory schools for the university admission exams (UAE). Two hundred fifty students were evaluated using Lipp's Inventory of Stress Symptoms for adults (ISSL). This instrument was standardized for the Brazilian population, and allows to evaluate the level of stress and determine the number of stress symptoms of an individual. Volunteers responded the ISSL before and after one of the experimental situations (30 minutes): SA (active and static stretching exercise), SM (listening to a New Age music), SAM (SA and SM combined) and control situation (SC). It was verified that 55.2% of the volunteers were stressed. The Kruskal-Wallis test observed significant differences ( $H=13.63$ ;  $p<0.01$ ) between SA and SAM situations compared to SC in stressed students ( $n=138$ ). It was observed significant reduction for physical and psychological symptoms in SA and SAM. It was concluded that static and active stretching exercises can be used before exams to reduce stress symptoms.

## Key words:

Muscle stretching exercise.  
Music. Stress. University admission exams.  
Young people.

## Los ejercicios de estiramiento, acompañado o no con la música, reduce el nivel de estrés de los estudiantes pre-universitarios

### Resumen

En Brasil, muchos estudiantes toman cursos de preparación para los exámenes de ingreso a la universidad. Estas pruebas pueden ser un evento estresante, ya que por lo general, su realización coincide con una fase de vida de los estudiantes en la que aún están descubriendo y estructurando su identidad. Teniendo en cuenta que el estrés es un síndrome frecuente en los jóvenes que están en la fase de admisión a la universidad, se hace necesario evaluar las estrategias dirigidas a reducir la tensión en esta población. El objetivo de esta investigación fue verificar los efectos del estiramiento muscular, la audición musical y ejercicios de estiramiento con música en el número de síntomas de estrés en estudiantes de los cursos preparatorios para pruebas de admisión universitarias. Doscientos cincuenta estudiantes contestaron el Inventario de Síntomas de Estrés para adultos de Lipp (ISSL). Este instrumento permite evaluar el nivel de estrés y determinar el número de síntomas de estrés de un individuo. Los voluntarios realizaron el ISSL antes y después de una de las situaciones experimentales (duración de 30 minutos): SA (ejercicio de estiramiento estático y activo), SM (música del estilo New Age), SAM (SA y SM combinadas) y situación control (SC). Verificando que el 55,2% de los voluntarios presentaban estrés. El test de Kruskal-Wallis mostró diferencias significativas ( $H=13,63$ ;  $p<0,01$ ) entre las situaciones SA y SAM comparadas a la SC en los estudiantes con estrés ( $n=138$ ). También se observó reducción significativa en los síntomas físicos y psicológicos en SA y SAM. Permitiendo concluir que el ejercicio de estiramiento estático y activo puede ser utilizado antes de las pruebas de admisión a la universidad como estrategia para la reducción de síntomas de estrés.

## Palabras clave:

Ejercicios de estiramiento muscular. Música. Estrés. Pruebas para admisión en la universidad. Joven.

**Correspondence:** Eric Francelino Andrade  
E-mail: ericfrancelinoandrade@gmail.com

## Introduction

In Brazil, many students take preparatory courses for entrance exams at university<sup>1</sup>. However, these tests can be a stressful event, because their realization usually coincides with a phase of students' lives when they are still finding out and structuring their identity.

The term stress has been often related to the response of the organism before challenging situations, which can harm or weaken it somehow. When exposed to external stressors, the response of the body can be identified by three stages: alert, resistance and exhaustion<sup>2,4</sup>. Additionally, a new phase was included by Lipp<sup>5</sup> during the development and validation of an instrument for assessing the symptoms of stress. It was the stage of near-exhaustion, inserted between the resistance and exhaustion phase.

Among the most susceptible populations to stress, it highlighted the teenagers and young adults<sup>6</sup>. In the academic context, it was observed that during the period before the entrance exams at university (UAE), young people showed an increase in the consumption of alcohol and cigarettes, as well as decrease in physical activity which aggravated even more stress caused by this situation<sup>7</sup>. Additionally, stress, both physical and psychological, can influence the immune system<sup>8</sup>.

In this sense, different interventions can be effective in reducing stress levels, emphasizing relaxation techniques involving muscle stretching and music listening<sup>9,10</sup>. Thus, considering some physical symptoms of stress as "feeling of constant physical stress", "muscle strain", "hyperventilation" and "fatigue"<sup>11</sup>, some body movements alternating contraction and relaxation could alleviate certain symptoms for some time or prepare the body for adverse events. With regard to music, a suitable style could help stretching programs in order to eliminate or reduce stress points in certain areas of the body<sup>12</sup>. In this way, the correct manner to integrate these components can affect physiological and/or psychological responses of the individual generating different reactions to reduces stress<sup>13,14</sup>.

Considering that stress is a prevalent syndrome in young people, especially those in the admission phase in college, there is a need to evaluate the influence of strategies involving stretching and music aiming to reduce the stress in this population. Thus, the aim of this study was to investigate the effects of an acute bout of stretching muscle, listening to music sessions and the association between stretching and music on the number of stress symptoms on from pre-university students.

## Material and methods

This study was approved by the Research Ethics Committee of the Institute of Biosciences of Universidade Estadual Paulista (UNESP), Campus of Rio Claro – SP, under protocol 000052/01.

### Participants

Two hundred and fifty young men and women volunteered to participate in the study. The inclusion criteria in the study were that all subjects had completed high school and were regular students of all preparatory courses for UAE in the city of Rio Claro, São Paulo,

Brazil. In addition to these criteria were only selected individuals who were classified in at least one of the phases of stress according to the Lipp's Inventory of Stress Symptom for Adults (ISSL). In this way, 138 individuals (45 men and 93 women) effectively participated of the study. The average age of the men was  $20.3 \pm 5.7$  years, while the age of the women was  $19.5 \pm 4.7$  years. The participants signed a free and informed consent form allowing their participation in the research. Later they were randomly divided into four groups: SA - participation in a stretching session; SM - participation in a Music listening session; SAM – participation in a stretching session accompanied by music listening; and SC - continuation of the activities of the preparatory course in class (control situation). Each experimental situation lasted 30 minutes. Thus, all the experimental conditions were performed on the same day during the classroom activities.

The songs used were taken from the New Age style album "Secret Garden - White Stones"<sup>15</sup>. This style mix classical music with elements of folk melodies, making a reinterpretation of classical music, with the addition of elements from Celtic and Norwegian folklore. This selection focuses in both music segments stimulative and sedative, the same procedure adopted by Scheufele<sup>16</sup>. This author was based on previous studies that suggested that such variation in musical progress is more effective for relaxation responses compared to only sedative music selections. This type of music is usually used in stretching classes, and contains only instrumental arrangements, being chosen so that there were not additional factors (vocals, lyrics) that could influence the research. The musical selection was used both in SM and SAM experimental situations. Regarding to stretching, the group SA and SAM underwent the same protocol described by Valim<sup>17</sup>. During these sessions were conducted 18 exercises based on the postures of *Hatha Yoga*, combining static and dynamic variations emphasizing breathing in every movement. The sequence of exercises was started with the individuals in dorsal decubitus and finalized in standing position<sup>17</sup>. In this protocol, every movement was verbally explained and physically demonstrated (slowly, clearly and objectively) to participants.

The ISSL was applied before and after each experimental situation. This instrument was standardized for the Brazilian population by Lipp and Guevara<sup>18</sup>, and allows to evaluate the level of stress and determine the number of stress symptoms of an individual<sup>4</sup>. The ISSL consists of three tables, corresponding to three-phase Selye's stress model<sup>2</sup>, including the fourth phase (near-exhaustion) found at the time of standardization of the ISSL<sup>18</sup>. The first chart of the instrument is composed of the symptoms presented by the individual in the last 24 hours and contains 15 items referring to the symptoms (12 physical symptoms and three psychological), corresponding to the alert phase. The second table also provides 15 symptoms (10 physical and five psychological), divided into two frames corresponding to the stages of resistance and near-exhaustion, graded according to a certain minimum amount of symptoms presented during the last week. The third chart contains 23 items, 12 physical and 11 psychological, corresponding to the symptoms presented in the last month, featuring thus the exhaustion phase. The definition of stress phase is given by the sum of the symptoms presented on each frame. There is a minimum value in each of the stages, which can characterize the individual as stressed or not.

### Statistical Analysis

To evaluate the homogeneity of the groups and possible differences in stress responses among groups after the experimental situation Kruskal-Wallis test was used. Multiple comparisons test was used in order to identify significant differences between treatment pairs. To separately analyze the physical and psychological symptoms and verify possible changes between before and after each experimental situation, we used Wilcoxon's test. The significance level of 95% ( $p < 0.05$ ) for all tests was used.

### Results

It was observed that from the 250 subjects, 138 (55.2%) were stressed and 99 (39.6%) showed no stress. Thirteen people (5.2%) were excluded for not answering the entire quiz or incorrectly performing the research procedures (eg leave the room before the end of the experimental situation). Thus, data analysis was applied to a sample of 138 young students, so only those with stress.

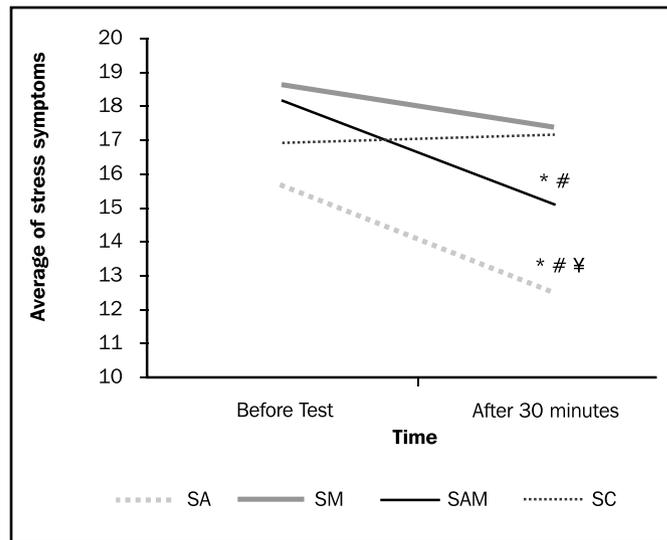
Most of the stressed patients were female (67.4%) and 63.8% were enrolled in daytime, 55.8% practiced some physical activity regularly and 73.9% were not working.

All stressed volunteers were found in resistance or near-exhaustion phase, as shown in Table 1.

The Kruskal-Wallis test showed that the group of individual of SA, SM, SC and SAM were homogenous before each treatment. There were no significant differences in average levels of stress among the four groups evaluated before the execution of their respective experimental situations ( $H = 6$ ;  $p > 0.05$ ). After 30 minutes from baseline time differences were observed between the experimental conditions ( $H = 13.63$ ,  $p < 0.01$ ). The SA and SAM situations differed from the control situation ( $p < 0.001$  and  $p < 0.01$ , respectively) and SM and SA situations differed each other ( $p < 0.05$  - Figure 1).

For a more detailed analysis of the reduction of stress, physical and psychological symptoms were analyzed separately within each experimental situation (Table 2). Using Wilcoxon's test it was examined whether there was superiority of one treatment over the other as to the nature of the data collected. The level of significance for differences between

**Figure 1. Mean number of stress symptoms of pre-college students before and after 30 minutes of their respective experimental conditions.**



\*: Indicates difference between before test and after 30 minutes; #: Indicates difference from SM and SC groups; ¥: Indicates difference from SAM group.

situations before and after the SA and SAM was high ( $p \leq 0.01$ ) for both the physical and psychological symptoms therefore, these conditions were effective in reducing both types of symptoms of stress.

### Discussion

In present study, it was expected better results for the SAM situation considering the potency of music to the effects of stretching. The music alone did not bring significant results, at least 30 minutes, and the enhancement of benefits did not happen because there were no significant differences between the stretch with music and without music stretching. It is evident the difficulty to interpret and relate the results of the research addressing the utilization of different physical activities or different types of music in stress responses. This difficulty is due to the various forms of assessment employed (physical, physiological, psychological) and the discrepancy found between the results of

**Table 1. Number of individuals situated in each stress phase.**

Groups (n=138)	Stress phase			
	Alert	Resistance	Near - exhaustion	Exhaustion
SA	0	30	1	0
SM	0	30	6	0
SAM	0	38	4	0
SC	0	29	0	0
Total	0	127	11	0

SA: participation in the stretching session; SM: participation in a music listening session; SAM: participation in a stretching session accompanied by music listening; and SC: continuation of the activities of the preparatory course in class (control situation).

**Table 2. Wilcoxon test values for the physical and psychological symptoms in each group.**

Groups	Physical symptoms (z)	Psychological symptoms (z)
SA	-3.91**	-2.74*
SM	-1.55	-1.01
SAM	-3.45*	-2.54*
SC	-0.29	-0.20

\* $p \leq 0.01$ . \*\* $p \leq 0.0001$ . SA: participation in a stretching session; SM: participation in a Music listening session; SAM: participation in a stretching session accompanied by music listening; and SC: continuation of the activities of the preparatory course in class (control situation).

a further evaluation even in just one study. An example is the study of Steptoe *et al.*<sup>7</sup> in which the physiological and psychological responses were compared during the performance of aerobic exercise. These researchers concluded that, through physiological measurements, aerobic training is not associated with stress reduction. However, through psychological measurements they observed responses associated with reduced stress as a decrease in tension-anxiety, depression, mental confusion and improved ability to cope with stress<sup>7</sup>. Similarly, it was observed that music therapy decreased anxiety and pain in patients who underwent cardiac surgery, whereas no differences were observed in blood pressure and heart rate of individuals<sup>19</sup>. However, Möckel *et al.*<sup>20</sup> observed beneficial responses related to stress only in physiological aspects when compared different types of music.

The Stretching exercises used in the present study are similar to Progressive Relaxation (RP), which is the type most often cited in the literature. RP is characterized by relaxing each muscle or muscle group so that the individual recognizes the contrast between tension and relaxation<sup>16,21</sup>. Thus, stretching can be considered as a sort of relaxation which promotes reduction of muscle stress levels, respiration rate and blood pressure, as well as subjective and objective states of excitation of the individual<sup>21</sup>. The relaxation exercise has been considered effective for stress management, being compared to hearing music sessions<sup>16</sup>. In this sense, Scheufele<sup>16</sup> compared two experimental situations by checking the effects of RP and classical music in measurements of attention, relaxation and stress responses. It has been found that the RP condition showed high scores as relaxation, despite the music have caused decreased heart rate and provided distraction from stressors.

In the present study, in addition to stretching and music listening conditions, it was also included the condition stretching accompanied by music, so that to the research could reproduce the actual situation of stretching classes and not just in a controlled experimental condition. Robb<sup>22</sup> compared four experimental conditions: Progressive Relaxation associated with music (RP + M), Progressive Relaxation (RP), music Hearing (M), and control situation of silence (S) on anxiety and perceived relaxation and found that each treatment might be equally effective, producing significant changes in anxiety and perceived relaxation.

Möckel *et al.*<sup>20</sup> stated that music with faster tempo increases heart rate whereas classical and New Age decreases and stimulates physical and mental relaxation. These researchers observed significant reductions in the concentration of plasma cortisol – the hormone related to stress – in meditative slow pace music hearing.

Regarding to the use of sedative music (slow), excitatory (quick), classical music or music preference of listeners, categorical statements about their suitability for stretching activity still cannot be made due to the few studies in this area or the contradictory results already submitted. In the Iwanaga & Moroki study<sup>13</sup>, listening to classical exciting music brought feelings of vigor and tension to listeners while sedative classical music brought relief from tension. However, the authors also found that musical preference did not affect physiological responses as heartbeat, breathing and blood pressure, caused by hearing both songs. Thus, these authors concluded that the dominant factor on the emotional response was the type of music rather than musical preference. However, the classical style is the least heard by young people, being less present in the daily lives of these individuals<sup>23</sup>.

In this sense, it was reported that the styles of music listened by more young people of both sexes aged 18 to 30 were the Rock (93%), Pop (66%) and the New Wave (57%), which are styles described as preferred for the practice of aerobics<sup>24</sup>. Thus, there are differences in the effects of the listening session according to the type and characteristics of music applied. The New Age music used in present study is similar to classical music; it is derived from the union with Folk, characterized by spatial sounds, sharp melodies and soft harmonies. The New Age style evidently differs from songs with faster tempo and stronger rhythms such as Rock or Techno-music. Listening to Techno-music, for example, may cause increase in heart rate and blood pressure, as well as, in adrenocorticotrophic hormone (ACTH) and cortisol levels. Therefore this type of music is not suitable for the reduction of stress<sup>25</sup>. Furthermore, softer songs may promote therapeutic implications on stress treatment<sup>26</sup>.

Regarding the physical and psychological symptoms analyzed separately, it is considered that relaxation techniques may be more effective for certain symptoms of stress<sup>27</sup>. The Yoga, a somatic relaxation technic, focuses directly on the body and is considered most effective in the treatment of physical stress symptoms (eg muscle tension, tachycardia, loss of energy and physical fatigue) while the cognitive techniques are more effective in changing mental processes that result in cognitive symptoms such as anxiety, worry and insomnia<sup>27</sup>. However, the results of the present study show that a “physical” intervention may also decrease psychological symptoms of stress.

Alter Jr<sup>28</sup> reports through physiological mechanisms, why and how the stretching exercise can be used to facilitate the relaxation. Such mechanisms involve the adjustment of components such as the Golgi tendon organs and muscle stretching receptors (muscle spindle) which promotes reduction of muscle tension and increase in relaxation. Additionally, proper breathing also assists in reducing tension<sup>28</sup>.

## Conclusion

Based on the results obtained in this study we can conclude that 30 minutes of stretching, accompanied or not by New Age music, significantly reduced the stress symptoms (both physical and psychological) in pre-college students. Although it cannot be statistically affirmed that New Age music style reduces stress, it can be affirmed that music listening during stretching exercise did not negatively interfere on exercise efficacy for stress symptoms reduction. Future studies should be conducted using another musical style to verify the influence on stress reduction.

The stretching, static and active, can be prescribed for young people during the period of evaluation tests as a strategy to decrease stress symptoms and can then be adopted as a coping strategy for this type of population.

## References

1. Guhur ML, Alberto RN, Carniatto N. Influências biológicas, psicológicas e sociais do vestibular na adolescência. *Revista*. 2010;35:115-38.
2. Selye H. Forty years of stress research: principal remaining problems and misconceptions. *Can Med Assoc J*. 1976;115:53-6.
3. Selye H. Stress and Physical Activity. *McGill J Educ*. 1976;11:3-14.

4. Bargas JA, Lipp MEN. Stress and maternal parental style in attention deficit hyperactivity disorder. *Psicol Esc e Educ.* 2013;17:205-13.
5. Lipp MEN. *Manual do inventário de sintomas de stress para adultos de Lipp (ISSL)*. São Paulo. Casa do Psicólogo; 2000. p 93.
6. Schmidt MV, Scharf SH, Sterlemann V, Ganea K, Liebl C, Holsboer F, et al. High susceptibility to chronic social stress is associated with a depression-like phenotype. *Psychoneuroendocrinology.* 2010;35:635-43.
7. Amato Neto V, Tedesco J. Immunologic aspects of physical activity. *Rev Med.* 1999;78:491-7.
8. Calais SL, Andrade LMB, Lipp MEN. Gender and Schooling Differences in Stress Symptoms in Young Adults. *Psicol Reflex Crit.* 2003;16:257-63.
9. Valim PC, Bergamaschi EC, Volp CM, Deutsch S. Redução de Estresse pelo Alongamento: a Preferência Musical Pode Influenciar? *Motriz.* 2002;8:43-9.
10. Taets GGD, Borba-Pinheiro CJ, Figueiredo NMA, Dantas EHM. Impact of a music therapy program on the stress level of health professionals. *Rev Bras Enferm.* 2013; 66: 385-90.
11. Doria MCS, Lipp MEN, Silva DF. Acupuncture effectiveness for stress symptoms. *Psicol Cienc Prof.* 2012;32:34-51.
12. Scheve AM. Music Therapy, Wellness, and Stress Reduction. *Adv Exp Med Biol.* 2004; 546:253-63.
13. Iwanaga M, Moroki Y. Subjective and Physiological Responses to Music Stimuli Controlled Over Activity and Preference. *J Music Ther.* 1999;36:26-38.
14. Krout RE. Music listening to facilitate relaxation and promote wellness: Integrated aspects of our neurophysiological responses to music. *Arts Psychother.* 2007;34:134-41.
15. Sherry F, Lovland R. Secret garden – white stones. Norway: gravadora Poligram A/S, 534605-2. (51 min); 1997.
16. Scheufele MP. Effects of progressive relaxation and classical music on measurements of attention, relaxation, and stress responses. *J Behav Med.* 2000;23:207-28.
17. Valim PC. Interferência do alongamento e da música no estresse pré- vestibular. Dissertation. Universidade Estadual Paulista (UNESP) 2000 (Accessed in 0406/2015). Retrieved from: [http://issuu.com/priscilacarneirovalim-rogatto/docs/dissertacao\\_priscila\\_carneiro\\_valim](http://issuu.com/priscilacarneirovalim-rogatto/docs/dissertacao_priscila_carneiro_valim)
18. Lipp MNE, Guevara AJH. Validação empírica do Inventário de Sintomas de Stress (ISS). *Estud Psicol.* 1994;11:43-9.
19. Sendelbach SE, Halm MA, Doran KA, Miller EH, Gaillard P. Effects of Music Therapy on Physiological and Psychological Outcomes for Patients Undergoing Cardiac Surgery. *J Cardiovasc Nurs.* 2006;21:194-200.
20. Möckel M, Röcker L, Störk T, Vollert J, Danne O, Eichstädt H, et al. Immediate physiological responses of healthy volunteers to different types of music: cardiovascular, hormonal and mental changes. *Eur J Appl Physiol Occup Physiol.* 1994; 68:451-9.
21. Carlson R, Collins Jr FL, Nitz AJ, Sturgis ET, Rogers LJ. Muscle stretching as an alternative. *J Behav Ther Exp Psychiatry.* 1990;21:29-38.
22. Robb SL. Music assisted progressive muscle relaxation, progressive muscle relaxation, music listening, and silence: a comparison of relaxation techniques. *J Music Ther.* 2000; 37:2-21.
23. Harrison J, Ryan J. Musical taste and ageing. *Ageing Soc.* 2010;30:649-69.
24. Gfeller K. Musical Components and Styles Preferred by Young Adults for Aerobic Fitness Activities. *J Music Ther.* 1988;25:28-43.
25. Gerra G, Zaimovic a, Franchini D, Palladino M, Giucastro G, Reali N, et al. Neuroendocrine responses of healthy volunteers to "techno-music": relationships with personality traits and emotional state. *Int J Psychophysiol.* 1998;28:99-111.
26. Reddy TLN, Ammani S. Stress Management: A Case Study of Professional Students on Impact of Meditation & Yoga on stress levels. *J Educ Psychol.* 2013;6:42-7.
27. Berger BG. Coping With Stress: The Effectiveness of Exercise and Other Techniques. *QUEST.* 1994;46:100-19.
28. Alter Jr M. Ciência da flexibilidade. São Paulo. *Artmed.* 1999. p 365.

## PREMIOS FEMEDE A LA INVESTIGACION 2015

Los trabajos que han logrado los premios FEMEDE a la investigación en el año 2015, consistentes en la **publicación en la revista Archivos de Medicina del Deporte, junto con una dotación de 600 euros y el certificado acreditativo** son los que se relacionan a continuación con sus correspondientes autores:

- **María Perales**, por el trabajo titulado "*Fetal and maternal heart rate responses to exercise in pregnant women. A randomized Control Trial*", con coautoría de Silvia Mateos, Marina Vargas, Isabel Sanz, Alejandro Lucia y Ruben Barakat.
- **Oriol Abellán-Aynés**, por el trabajo titulado "*Anthropometric profile, physical fitness and differences between performance level of Parkour practitioners*", con coautoría de Fernando Alacid.
- **Eliane Aparecida de Castro**, por el trabajo titulado "*Peak oxygen uptake prediction in overweight and obese adults*" con coautoría de Rocio Cupeiro, Pedro J. Benito, Javier Calderón, Isabel R. Fernández y Ana B. Peinado.