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Original research papers

IMPACT OF ACTIVE BREAK WITH GUIDED DANCE IN UNIVERSITY CLASSES

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Abstract
Introduction. In general, during the theoretical content taught in different educational stages, students are seated for several hours and expository methods are used by the teacher. Under these conditions, emotions such as anxiety, boredom and loss of attention may appear. To improve this situation, several studies have shown that active breaks (AB) in class are a good option. Therefore, this research aims to evaluate the effect of AB with dance in the classroom on the emotional state and attention level of university students. ***Material and methods.*** A crossover design was employed where the type of rest (active vs. passive) was compared in two class groups for a total of 68 students (age 20.7 ± 1.7 years, 50% female). The variables studied were the level of attention and emotional state, assessed using the d2 test and the mood rating scale (EVEA). A multilevel linear model was applied and Cohen's d was calculated for the statistical analysis. ***Results.*** Although there was an improvement in the level of attention with the implementation of AB with dance ($p > 0.05$, $|d| = 0.15$-0.28), this was not significant. In the emotional state, a decrease in the level of sadness was found ($p > 0.05$; $d = -0.16$) without statistical significance. ***Conclusions.*** The application of AB with dance in the classroom provides a way to increase students' physical activity levels without negatively affecting the level of attention. Further studies with theoretical classes of longer duration and in a longer intervention period could provide new data on the benefits of AB with dance.

Key words: sedentary lifestyle, physical activity, mental well-being, academic performance

Introduction

Regular physical activity (PA) promotes physical, mental and emotional well-being [1, 2, 3]. There is consolidated scientific evidence that reports that physical exercise increases blood flow, increases oxygen levels and the amount of nutrients reaching the brain, and promotes synapses between neurons, which is critical for the maintenance and development of cognitive processes [4, 5]. In children, PA improves cognitive functions and is related to areas of the brain that support complex cognitive processes [6, 7]. In youth and adults, acute and chronic PA interventions have been studied to improve some cognitive functions such as working memory, attention, processing speed, and language skills [8]. Regarding mental health, PA is associated with lower levels of stress and depression in adolescents [9], and in general being more physically active is related to better mood, preventing anxiety and depression [10, 11]. It can be asserted that PA is a good habit to maintain and recover the psychosocial health of individuals [12, 13].

However, worldwide there is an increase in physical inactivity [14, 15], due to the time spent watching screens, television, and office work, among other variables, which have contributed to the alarming increase in obesity and its related problems such as diabetes, hypertension, and cardiovascular diseases [16, 17]. To contribute to the WHO recommendations of 150 min/week of medium-intensity PA, active breaks (AB) are proposed in different educational stages.

ABs, which are applied during school activities, are short interruptions between the theoretical teaching content, during which students perform PA (3-8 min in duration) of medium to vigorous intensity [18]. The integration of PA can be part of the teaching, or it can be a physical exercise, such as jumping or running on the spot [19]. In a typical procedure, it starts with a brief warm-up; afterwards, stretching, relaxation, aerobic or strength exercises are done, and it ends as the activity begins [20]. This activity can also be developed by watching and following physical exercise videos (21) or by dancing [22].

ABs have been found to increase task engagement, PA levels, and attitude toward PA [23, 24, 25]. Additionally, ABs make classes more enjoyable and pleasant for students, while improving academic performance [5, 18, 26]. However, other studies do not corroborate the effect of aerobic exercise on attention span [27] or mathematics performance [28]. Therefore, it is necessary to evaluate AB and its effect on students' cognitive performance with novel activities such as dance with university students, which has been little explored.

Dance is one of the fundamental arts that involves direct expression through body movement [29]. Dance can be practiced in pairs, in groups or alone, and is characterized by rhythmic body movement and a certain degree of enjoyment; the musi-

cal accompaniment can have cognitive and affective meaning for the person, and can produce a psychophysiological response that manifests itself in dance [30]. The regular practice of dance has many benefits for the general well-being of the person, as it improves flexibility, muscle tone, balance and spatial awareness [29, 31]. In children and youth, recreational dancing has the effect of improving cardiovascular health and bone density [32]. Dance has also been reported to improve the psychological well-being of individuals [33, 34]. The practice of hip-hop and aerobic exercises by college students [35] or tap in people in confinement [36] improve mood. Even in people suffering from Parkinson's disease, dancing regularly reduces anger levels [37]. Therefore, it can be said that dance is a complete PA, where mind and body work simultaneously, and can be a key element in improving people's health from a physical and mental perspective [34].

Taking this into account, the purpose of this research is to establish the effect of AB with dance on the levels of attention and mood in a group of university students. It was hypothesized that applying AB with dance can increase attention level indicators while improving mood, when compared to a group of students who perform a passive rest (PR). In this research, PR is conceptualized as an activity where the person remains at rest, but interrupts the theoretical teaching activity he/she has been doing.

Material and methods

Participants

Two groups of undergraduate students of the Physical Expressive Activities course from the University of Malaga participated in the study. The initial sample of participants was 46 in group 1 and 74 in group 2, to which inclusion criteria were applied. The inclusion criteria were: (1) being enrolled in the "Actividades Físicas Expresivas" course of the University Degree in Primary Education, (2) consenting to participate in the study, (3) completing the Evea Test and the d2 Test correctly at both times of application (4), being in adequate psychophysical condition.

The study was conducted following Spanish regulations for clinical research on humans, the Law on Biomedical Research (Law 14/2007, issued on July 3, 2007), and the obtained data were treated with the greatest confidentiality and scientific rigor complying with Organic Law 15/1999 of the 13th of December on the Protection of Personal Data (OLPPD). The proceedings performed respected the guidelines established in the Declaration of Helsinki of 2008, updated in Fortaleza, October 2013 (World Medical Association, 2013). The study was approved by the Ethical Committee for Human Studies at the University of Málaga (code number: 41-2022-H).

Data collection instruments

The evaluation of the emotional state of the participants was carried out with the application of the mood rating scale (EVEA) [38]. The instrument consists of 16 items with adjectives related to the four mood states it measures: joy, anger, sadness and anxiety. The reliability of this scale determined in other investigations is excellent with Cronbach's alpha values between .88-.96 [39, 40]. For the interpretation of the test, the values scored between 0 and 10 on the Likert scale for each of the subscales were averaged. This instrument has been applied in different studies to establish the situational mood of people [2, 39, 41, 42, 43].

The level of attention and concentration of the students was evaluated with the d2R test [44, 45, 46]. The application of this instrument allows for estimating selective attention, concentration and visual perceptual discrimination, making it suitable for the study of cognitive functions in people of different ages [47, 48, 49, 50]. To do this, the person must review each of the 14 rows from left to right, each in a period of 20 seconds, marking as many relevant elements as possible (and discarding irrelevant ones) [45]. Table 1 defines the scores used to interpret the test.

Table 1. Meaning of the d2 test scores

Score	Meaning	Aspects measured
TOT	Effectiveness of the test	Attentional and inhibitory control and relationship between speed and accuracy
CON	Concentration	Concentration or the balance between speed and accuracy of performance
VAR	Variability	Stability and consistency over time, variation or fluctuation in the way of working

Source: Brickenkamp (2012).

Study protocol

In the study design, each section was divided into two groups: control (CG) and experimental (EG). Participants were randomly divided into both groups and a crossover design was applied. In session one (day 1), CG after PR (8 minutes seated and at rest outside the classroom) responded to the previously indicated instruments; simultaneously, EG performed AB through dance and also completed the evaluation instruments. In the second session carried out the following week (day 8), the crossover design was applied, in which CG participants became EG and vice versa, and the same procedure as in session one was applied.

AB with dance was developed with an 8-minute dance activity after a theoretical class (one hour long). To perform the activity, EG students followed the instructions of the instructor who directed the choreography with musical accompaniment. To assess the intensity of the activity (mean and maximum heart rate), 20 Polar H-10 heart rate monitor bands (Polar Electro Oy, Kempele, Finland) synchronized with the "POLAR BEAT" app on the participants' cell phones were used randomly among EG participants. This instrument has shown reliable heart rate measurements in studies where participants' exercise intensity is varied [51, 52]. The means recorded were 116.75 (23.53) average heart rate and 146.74 (25.43) maximum heart rate, so we could consider it light/moderate intensity physical activity for this age group [53, 54]. The musical track used was POP music of 93 BPM.

Statistical analysis

Descriptive statistics (i.e., means and standard deviations, adjusted means/means and standard errors or percentages) were computed for all variables. Firstly, statistical test assumptions were checked with common procedures (e.g., histograms and Q-Q plots for normality). Then, the internal consistency of the dependent variables measured with the Scale for Mood Assessment was examined with Cronbach's alpha. Next, the comparison of the students' attention/concentration and mood between active and passive breaks was made. Because the unit of intervention was in clusters, the Multilevel Linear Model (MLM; time-passive break vs. active break) with participants nested within groups and measures nested within participants

was employed (i.e., one-way nested ANOVA; 55). The maximum likelihood estimation method was used. From all the potential confounding variables explored (i.e., sex, age, body mass index, condition order, and classes), covariables were used when necessary (see Notes in Table 1). Finally, effect sizes were estimated using Cohen's d for pairwise comparisons. All statistical analyses were performed using SPSS version 25.0 for Windows (IBM® SPSS® Statistics). The statistical significance level was set at $p < 0.05$.

Results

From the total of 120 students (52.3% females) who were invited to participate in the present study, 68 agreed and met the inclusion criteria. 50.0% of the participants (n = 34) were females. Participants' general characteristics were (mean (standard deviation)): age = 20.7 (1.7) years; body mass = 66.8 (11.4) kg; body height = 171.5 (9.8) cm; and body mass index = 22.7 (2.8) kg/m2]. In the sample of the present study, the internal consistency of all the dependent variables measured with the Scale for Mood Assessment was adequate (passive/active breaks: anxiety = 0.75/0.74; anger-hostility = 0.88/0.87; happiness = 0.95/0.89; sadness-depression = 0.85/0.80).

Comparison between passive and active breaks

Table 2 shows the comparison of the students' attention/concentration and mood between active and passive breaks. The MLM results did not show statistically significant differences in students' attention/concentration and mood between active and passive breaks ($p > 0.05$; $|d| = 0.01$-0.28).

Discussion

The purpose of this research was to find some evidence that AB with dance could improve the attention and mood of college students when compared to PR. However, no conclusive differences were found to support this hypothesis, taking into account that the absolute value of the effect size for each variable is small (or close to zero) and not significant [56].

In the study by Blasche et al. [57], it was found that AB and relaxation exercises (and to a lesser extent PR) improved well--being in people who performed activities that demanded great attention, when compared with a group that did not perform any interruption. Similarly, Paulus et al. [58] reported that cognitive skills improved in students doing PR, meditation or PA. This suggests that PR itself may allow the student to recover and maintain attention on the task. In that sense, breaks are important, since fatigue and stressful situations can affect how people perform tasks of high cognitive effort, and the will to do them well, thus increasing the chances of error [59]. Some authors suggest that in very long classes, students' attention gradually decreases, and frequent short breaks are necessary to maintain attention and avoid boredom [60, 61]. In that sense, avoiding boredom is crucial, since in that state of aversion it is very difficult for students to successfully connect to the class [62]. Accordingly, the impact on the attention and fatigue of the study participants may have been reduced because the theoretical teaching load of our intervention program was only one hour long.

The improvement found in the indicators of attention (TOT), concentration (CON) and consistency (VAR) measured with the d2 test was not significant, neither did it compromise the students' attention level. In a review by Infantes-Paniagua et al. [63], they found that AB has positive effects (even acutely) on attention levels, but in many papers, such effects are not significant and do not negatively compromise students' attention. Therefore, our results suggest that it is at least possible to increase students' level of PA without a loss of students' attention and concentration. Similarly, from our results, it is clear that AB and PR can be beneficial in maintaining students' attention on our teaching content.

The background music used in AB with dance also did not impact the variables measured, despite studies showing its effects on mood and in tasks of high cognitive demand. In that sense, Lesiuk [64] reported that listening to the music of choice and in the desired amount can improve mood and performance in tasks of high intellectual demand. Similarly, Kiss and Linnell [65] found that listening to the person's preferred music improves performance in tasks that require sustained attention. In the university setting, classical background music used in classes can improve students' academic performance [66]. Given that, in this study, a dance song predetermined by the researchers was used. However, it is understood that not all participants liked it, so it could also be a factor that conditioned the results of the study.

In this experience, there was also no evidence of the effect of dance on the emotional state despite the benefits it has for pe-

Table 2. Comparison of the students' attention/concentration and mood between active and passive breaks (n = 68)

	Passive breaks	Active breaks	Multilevel Lineal Model[a]			Effect size
	M (SE)	M (SE)	- 2LL	F	p	d
Attention/concentration						
d2TOTb	452.0 (10.1)	466.0 (10.1)	1,579.952	1.447	0.233	0.16
d2CONb	179.3 (4.9)	185.7 (4.9)	1,385.9	1.233	0.271	0.15
d2VAR	18.2 (0.8)	16.2 (0.8)	908.274	2.098	0.152	- 0.28
Mood						
Anxiety	3.0 (0.2)	3.0 (0.2)	541.378	0.040	0.843	0.02
Anger-hostilityc	1.8 (0.2)	1.7 (0.2)	504.416	423	0.518	- 0.08
Happiness	6.8 (0.2)	6.9 (0.2)	554.918	0.006	0.938	0.01
Sadness-depression	2.5 (0.2)	2.2 (0.2)	544.616	1.990	0.163	- 0.16

M = adjusted mean; SE = standard error; - 2LL = -2 log-likelihood; [a] Multilevel Linear Model with participants nested within groups and measures within participants (i.e., one-way nested ANOVA). The covariables used for each analysis are as follows: [b] Class, [c] Age.

ople's well-being [33, 34]. On the other hand, music can improve mood and can provide a means to express emotions [67, 68, 69]. The little evidence found for decreased sadness, for example, may be attributed to the use of the same type of music. In addition, PR may allow young people to be briefly distracted from class and decrease stress levels in a way that makes it difficult to detect differences with the AB group.

The results of this study should be interpreted with caution, as there are variables that by design could not be controlled. Another aspect to consider is the duration of the intervention, and a longer study could be considered to assess the long-term effects of dance.

A possible improvement to the study could be to have the students select music according to their preferences. At the same time, consideration could be given to including a greater teaching load within the intervention program that would subject students to a higher level of stress and attention, and that would replicate the general teaching reality where school days are several hours long. We believe that this last factor could have been a differentiating factor between CG and EG, although an intervention of only one teaching hour was determined in the research design due to the limitations of the educational context in which the research was carried out.

Conclusions

AB with dance can be applied in groups of university students as a way to increase the level of PA, without appreciable effects on the level of attention and emotional state. The application of short PR in class can be an alternative with the same effects, but without changing the sedentary level of the classes. Although the improvement found in the indicators of attention, concentration and consistency measured with the d2 test was not significant, it did not compromise the attention level of the students. At the same time, it could be considered to include a greater teaching load within the intervention program that would subject students to a higher level of attention, and that would replicate the general teaching reality where school days are several hours long.

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