

## Effect of creative and reproductive dance sessions on high school students' physical activity, perceived exertion, and flow state

### Efecto de una sesión de danza creativa y reproductiva sobre el nivel de actividad física, el esfuerzo percibido y el estado de fluidez en estudiantes de Educación Secundaria Obligatoria

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**Abstract.** Expressive Movement and Creative Dance is a discipline teaching in school Physical Education around the world that might benefit physical, psychological, social, and cognitive health. Nonetheless, the studies on the methodology to be followed are scarce. Thus, the purpose of this research was to compare high school students' objective physical activity (ActiGraph GT3X+ accelerometer), perceived exertion (OMNI-walk/run Scale of Perceived Exertion), and flow state (Flow State Scale) between a creative and a reproductive dance session. Following a cluster-randomised crossover design, a total of 328 high school students (mean age =  $14.0 \pm 1.0$ ; females,  $n = 172$ ) participated in the study. Results showed that students experienced higher perceived exertion and were significantly more physically active during the creative session than during the reproductive one. For both sessions, flow state was equally high. Hence, although both dance sessions promoted flow state, the creative session best promoted high school students' physical activity engagement.

**Keywords:** schoolchildren; corporal expression; expressive movement; dance; choreography; program.

**Resumen.** La Expresión Corporal es una disciplina enseñada en la Educación Física escolar en todo el mundo que puede beneficiar la salud física, psicológica, social y cognitiva. Sin embargo, los estudios sobre la metodología a seguir son escasos. Así, el propósito de esta investigación fue comparar la actividad física objetiva (acelerómetros ActiGraph GT3X+), el esfuerzo percibido (Escala OMNI-caminar/correr de valoración subjetiva del esfuerzo), y el estado de fluidez (Escala de Estado de Fluidez) de estudiantes de secundaria entre una sesión creativa y otra reproductiva de Expresión Corporal. Siguiendo un diseño cruzado aleatorizado por grupos naturales, un total de 328 estudiantes de Educación Secundaria Obligatoria (edad media =  $14.0 \pm 1.0$ ; mujeres,  $n = 172$ ) participaron en el estudio. Los resultados mostraron que los estudiantes experimentaron un mayor esfuerzo percibido y fueron significativamente más activos físicamente durante la sesión creativa que durante la reproductiva. Para ambas sesiones, el estado de fluidez fue alto. Por lo tanto, aunque ambas sesiones promovieron el estado de fluidez, la sesión creativa promovió mejor la participación de actividad física de los estudiantes.

**Palabras clave:** escolares; expresión corporal; movimiento expresivo; danza; coreografía; programa.

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## Introduction

Expressive Movement & Creative Dance (EMCD) is a discipline in which persons use their body in an own, creative, aesthetical, and conscious way to communicate and express their inner world (e.g., thoughts, ideas, or feelings; Lara-Aparicio et al., 2021). Participation in EMCD benefits physical, psychological, social, and cognitive health (Burkhardt & Brennan, 2012; Fong-Yan et al., 2018; Montávez et al., 2022; Schwender et al., 2018; Sivvas et al., 2015). These reasons make EMCD a school Physical Education (PE) curriculum component in most countries (Lara-Aparicio et al., 2021). Nonetheless, PE still follows a sport and physical fitness discourse, and many PE teachers lack EMCD area training, affecting the teaching of this PE content (Bonet & Menescardi, 2022; Carriedo et al., 2020; Conesa & Angosto, 2017; Ørbæk & Engelsrud, 2021; Rojo-Ramos et al., 2023).

Evidence shows controversy when it comes to EMCD class methodology. On one hand, EMCD experts emphasise the importance of teaching it through a creative methodology (i.e., develop own answers; Motos & García, 2007; Torrents et al., 2013), and research shows positive results when using this methodology properly programmed (Mattsson & Larsson, 2021; Ørbæk & Engelsrud, 2021) and not when it is used as an escape by the

teacher for not knowing enough the subject (Karlefors & Larsson, 2018). Moreover, teachers and students don't feel pressure to do perfect dance moves when using EMCD creative methodology, since each person does their own ones (Ørbæk & Engelsrud, 2021). On the other hand, reproductive EMCD methodology (i.e., copy a model) shows to be positive by students for not feeling ashamed when dancing, since they all must follow the same pattern and they do not feel personally exposed (Amado et al., 2015). Furthermore, it is useful for teachers to give ideas to students but, in this case, teachers may feel pressure to do perfect dance moves and may feel incompetent and insecure because of that (Ørbæk & Engelsrud, 2021).

Adolescence is a stage during when the positive attitudes and enjoyment experienced during physical activity (PA) and PE can positively affect future PA engagement (Rullesstad et al., 2021). Likewise, having a good flow state in PE, as well as perceived exertion, contributes to students' active participation in class (Guijarro-Romero et al., 2022; Jackman et al. 2021).

The EMCD scientific research is still scarce, and dance's systematic reviews and meta-analysis recommend further research on well-designed randomised controlled and quasi-experimental trials of children in school and community interventions about creative, street, or contemporary dance, analyzing the psychological benefits of structured

dance programmes, the effects on children's PA levels, reducing or preventing weight gain, decreasing anxiety, improving mood, or increasing the health impact of creativity in dance (Burkhardt & Brennan, 2012; Fong-Yan et al., 2018; Schwender et al., 2018).

Flow state is considered as the optimal psychological state to carry out an activity (Csikszentmihalyi, 1997). It is a state of consciousness in which the person becomes totally absorbed in which is doing, reaching the exclusion of any other thought, or emotion, being closely related to motivation, and personal enjoyment (Csikszentmihalyi, 1997; Jackson & Csikszentmihalyi, 1999). According to Csikszentmihalyi's (1990), flow state is composed by nine factors that usually are directly related to the experience of the optimal psychological state (balance between ability level and challenge, merging of action and awareness, clear goals, direct and clear feedback, concentration on the task being performed, sense of control, loss of self-consciousness or inhibition, distortion of the sense of time, and autotelic experience). Not everybody has the same ability to experience this optimal psychological state, the predisposition to perceive it depends on innate conditions, and life learning (Csikszentmihalyi, 1988). Dance has a potential that allows the practitioner to concentrate on the practice, and on the emotions associated to it, which could lead to a loss of awareness and perception of time, creating a complete absorption in the moment (Amado et al., 2011). Furthermore, dance is generally a pleasant experience, both for practitioners and public, which makes it an autotelic experience (Jackson & Csikszentmihalyi, 1999). Moreover, practitioners may feel different feelings related to shame or concern about the own performance depending on whether they are practicing creative or reproductive dance (Amado et al., 2015). Therefore, for the purpose of the present study, we assessed only the flow state factors' loss of self-consciousness (capacity to avoid concerns about the own skill, which helps to feel more daring when facing a task), distortion of the sense of time (a reduced or increased sense of time enhances a more positive psychological attitude, leading to better task performance), and autotelic experience (the intrinsic satisfaction produced by the task, being easier to perform a task when it feels satisfaction simply from doing it).

Objective PA determines a person's PA levels using a little device called accelerometer. However, some non-ambulatory activities (e.g., dribbling a basketball, climbing stairs, or martial arts) tend to give lower accelerometer counts than ambulatory activities with a lower energy expenditure (Romanzini et al., 2012). Thus, knowing a person's perceived exertion about an activity complements the information on PA obtained objectively.

As far as we know, no study has yet compared the effect on PA and flow state of different methodologies during EMCD sessions. The reasons above suggest the convenience of analysing the effectiveness of different types of EMCD interventions aimed at promoting and maintaining physical practice and developing students' health and education at

different high school grades. Hence, the purpose of this study was to compare high school students' objective PA, perceived exertion, and flow state between a creative and a reproductive dance session in the PE setting.

## Materials and methods

### Participants

A convenience sample comprising the Principal and PE teachers of a state high school in the city of Malaga were contacted and informed about the study and asked to participate in it. After we had obtained approval from the Ethical Committee for Human Studies at the University of Malaga to carry out the study, all 369 students (52.3% females) from 13 pre-established high school classes (i.e., five second grade, four third grade, and four fourth grade classes, with students aged 12–17 years) were invited to participate; of which 328 (52.4% females), agreed to participate in the study. Students and their parents or legal tutors were fully informed about the study features. We obtained signed written consent from the students and their legal tutors before beginning the study. According to the school's reports, most of the students' families had a middle socioeconomic level.

### Sample size

In accordance with our purpose, we estimated an *a priori* sample size calculation with Optimal Design Plus Empirical Evidence Software for Windows (Version 3.01). Parameters were set in a conservative manner as follows: significance level,  $\alpha = .05$ ; final number of participants per cluster,  $n = 20$ ; effect size,  $\delta = 0.50$ ; intra-cluster correlation coefficient,  $\rho = .01$ ; and statistical power  $(1 - \beta) = .80$ . A total number of at least 10 clusters (200 participants) was estimated.

### Study design

We conducted this study according to the CONSORT guidelines for randomised crossover trials (Dwan et al., 2019), the protocol conformed with the Declaration of Helsinki statements (64th WMA, Brazil, October 2013), and was approved by the Ethical Committee for Human Studies at the University of Malaga. Participant recruitment was carried out in October 2019, and the intervention was conducted from October to December 2019. The five inclusion criteria for participants were (a) enrolled in the second to fourth grade, (b) participating in regular PE classes, (c) no health problem that would make them unable to engage in PA normally, (d) provided written consent form signed by their legal tutors, and (e) provided written assent by the student. We had two exclusion criteria: (a) had not attended the established evaluation sessions, and (b) had not performed the evaluation of the variables in accordance with the established instructions (i.e., being removed only for incomplete variables and not for the overall study).

This study had a cluster-randomised crossover design, in which the clusters were pre-established classes in the

school setting (Thomas et al., 2015). The crossover design (2x2 design with an AB-BA sequence intervention) was chosen to eliminate any negligible carry over effect. Therefore, we created two experimental groups, and each group was compared with itself. Half of the total participating class groups, which were balanced by grade (clusters; group AB) carried out the creative session (A) first, and the reproductive session (B) second. The other half of the groups (clusters; group BA) did so in a reverse order. The pre-established classes (clusters) comprised 20-33 students each (average of 28.4), matched by grade (second, third, and fourth), and the paired units were randomly assigned with a computer to either the AB or BA sequence. The two intervention sessions (A and B; 1-hr session each) were separated by a washout of at least 2 days (average of 10.7 days). Because of the nature of the intervention, this study was non-blinded (i.e., interventions could not be masked from the students, or teacher).

### Randomisation

In the school where the study was performed, students are randomly assigned, balanced by gender, to each class at the beginning of every school year. Because of that, clusters were these pre-established classes. Our study was conducted in 13 of these pre-established classes (clusters; i.e., five second, four third, and four fourth-grade classes); and these 13 clusters were randomly assigned by the authors,

balanced by grade, using a computer-generated random number list, into the intervention sequence AB or BA.

### Intervention

Both PE sessions for each pre-established class were performed at the same gym and were carefully designed and delivered by the same teacher, who was an expert in EMCD. Each teaching session lasted approximately 50 min and consisted of the following parts: a 5-min theoretical introduction (through questions to the students), a 5-to-10-min warm-up (low to moderate aerobic activities), a 20-to-25-min main part, and a 15-to-20-min final part (for putting into practice everything worked on during the whole session). A general scheme of the intervention can be found in Table 1, and a full description at Lara-Aparicio et al. (2022).

During the creative session, the teacher explained guidelines that were concrete, but open to multiple answers or solutions at the same time, allowing students to focus on a specific topic, but develop it in their own way. Students' favourite songs were used (requested when pre-intervention tests and questionnaires were completed; all students were writing it anonymously when leaving class on the same blank sheet). The activities carried out were based on creativity games (Lara-Aparicio et al., 2021), the expressive movement components (Motos & García, 2007), and aerobic dance (Montávez & Zea, 1998).

Table 1.  
General scheme of the intervention

Phase	Creative session	Reproductive session
Introduction (5 min)	Music theory: the teacher explains the tempo, beat, and accent concepts by asking to the students.	Bachata theory: the teacher explains origin, cultural significance, and dance basic step by asking to the students.
Warm up (5-10-min)	The crazy chain: in groups, and with music, students work on the concepts explained in the introduction by using their voice and body.  The Mirror: in pairs, and with music, the teacher guides students' own body movement exploration by creating own movements and by imitating the partner.	Basics: individually, with and without music, the teacher shows the basic Bachata step in place and in movement, and the students must imitate it. Shines: individually, and with music, the teacher shows a sequence of Bachata steps, and the students must copy it.
Main part (20-25-min)	The sculptor and the statue: in pairs, students' own exploration continue by using movement, static positions, voice (onomatopoeia), and acting (animals).  The aerobic dance world: in groups, with music and doing a circuit, students work on the concepts learned in the introduction by using aerobic dance basic steps and group spatial formations.	Combo: in couples (gender mixed if it is possible), with and without music, the teacher shows a combination of basic Bachata steps, and the students must copy it.
Final part (15-20-min)	B-Dance: the same groups, with and without music, students create a choreography by putting into practice everything learned. Choreography rules are to (1) last 32 beats at least, (2) present a minimum of four steps and two spatial formations from those practiced in the circuit, (3) add body movement and style freely, and (4) ending with a final group pose. Once each group has their choreography assembled, all groups must present it at the same time by forming a circle and then, voluntarily, each group shows it in front of their peers separately.	Show time: the same pairs, and with music, the teacher let the students to practice the learned combination by themselves and voluntarily show it one last time by forming a group of performers and a group of spectators who change roles.

During the reproductive session, the teacher showed specific guidelines that the students had to copy and reproduce to learn a specific dance (i.e., Bachata; Pacini, 1995). Therefore, although the creative session emphasized the entire teaching-learning process, the reproductive session focused on the final outcome.

### Measures

The measurement protocol followed for each variable is detailed in the sections that follow.

#### Demographic characteristics

Information about the students' gender, age, and grade was gathered using a questionnaire.

### Objective PA

Students' PA levels during each session were objectively determined by ActiGraph GT3X+ accelerometers (ActiGraph, LLC, Pensacola, FL, USA). Initialising, downloading, wear time validation, and scoring were performed using ActiLife Lifestyle Monitoring System software version 6.13.3 (ActiGraph, LLC, Pensacola, FL, USA). We initialised the accelerometers with a sample rate of 30Hz (Evenson et al., 2008; Trost et al., 2011). Participants wore the accelerometers on the right side of the hip, secured with an adjustable elastic belt, underneath clothing, near to the centre of gravity. At the end of each session, researchers removed and collected the accelerometers.

Data download was carried out with 1-sec epochs, because young people's behaviour patterns are characterised by short bursts of quickly changing activity (Migueles et al., 2017). Date and time filters corresponding to each session were set, and cutoff points proposed by Evenson et al. (2008) were selected to determine the time spent on the different intensity PA levels: sedentary (0-100 counts/min); light PA (101-2,295 counts/min); moderate-to-vigorous PA ( $\geq 2,296$  counts/min); total PA ( $\geq 101$  counts/min). According to a cross-validation study conducted by Trost et al. (2011), these cut-off points are the most valid for estimating PA intensity with 1-sec epochs among high school students. Steps were assessed by means of the within-instrument processing of the number of cycles in the accelerometer signal, or *cycle counts*. ActiGraph GT3X+ accelerometer scores have been to have high validity for assessing PA levels and steps in young people (Hickey et al., 2016; Lee et al., 2015; Romanzini et al., 2014).

### Perceived exertion

Students' perceived exertion was estimated using the adapted and validated Spanish version of the Children's OMNI-walk/run Scale of Perceived Exertion (RPE, Sañudo & de Hoyo, 2007). In this instrument, ratings, which can range from 0 (*not tired at all*) to 10 (*very, very tired*), are given in response to four pictorial descriptors illustrating a child experiencing various levels of exertion, ranging from walking to running up a hill. The scale was preceded by the sentence: 'Look at the drawing below and take a few seconds to think and put what you really perceive after having done today's class'. The Spanish version of this questionnaire has shown adequate convergent validity (with average heart rate) among high school students ( $r = .54-.76$ ; Sañudo & de Hoyo, 2007).

### Flow state

We assessed students' flow state using the adapted and validated Spanish version of the Flow State Scale (FSS; García et al., 2008). This questionnaire consists of 36 items that estimate nine dimensions of the flow state. For the purposes of the present study, we used only the items related to loss of self-consciousness (e.g., 'I was not concerned with what others may have been thinking of me'), distortion of the sense of time (e.g., 'Time seemed to alter [either slowed

down or speeded up]'), and autotelic experience (e.g., 'I really enjoyed the experience'). The items were preceded by the following sentence: 'Indicate your degree of disagreement or agreement with the following statements'. Students made their ratings on a 10-point Likert-type scale, that ranged from 1 (*very unlikely*) to 10 (*most likely*). The Spanish version of this questionnaire has shown adequate psychometric properties among adolescents (CFI = .91, TLI = .90, RMSEA = .05; Cronbach's  $\alpha > .70$ ; García et al., 2008).

### Procedure

In one PE session time before the intervention was carried out, we recorded the general characteristics of the students (i.e., demographic characteristics), explained the accelerometer function, and asked them about their favourite songs. Then, before the start of each intervention session, pre-initialised accelerometers were adjusted on each student's right hip to measure their PA levels during the sessions. Once the activities in both sessions had been completed, the accelerometers were removed, and students completed the perceived exertion scale and flow state questionnaire. This was completed within the time scheduled for both sessions: 10 min out of each 1-hr session. Each evaluation was carried out by the same researcher, using the same instruments and protocols, and under the same conditions.

The students filled out all the questionnaires in the school setting under silent conditions. They were guaranteed the confidentiality of the obtained data and were asked for their maximum sincerity. Although instructions on how to correctly fulfil the questionnaire were explained ahead of time and written at the top of the paper, one researcher was present during the whole evaluation session to clarify any question that may arise.

### Statistical analysis

Descriptive statistics (i.e., means and standard deviations, adjusted means and standard errors or percentages) were computed for all variables. Statistical test assumptions were checked by common procedures (e.g., histograms and Q-Q plots for normality). First, the internal consistency of the dependent variables measured by the flow state questionnaire was examined with the Cronbach's alpha. Next, we examined the comparison of students' levels of objective PA, perceived exertion, and flow state between the creative and reproductive sessions. Because the unit of randomisation and intervention was the class, we used a Multilevel Linear Model (MLM; *time* -creative session vs. reproductive session-) with participants nested within classes and measures nested within participants (i.e., one-way nested ANOVA; Li et al., 2017). The maximum likelihood estimation method was used. From all the potential confounding variables explored (i.e., age, gender, and wash-out), covariables were used when necessary (see *Notes* in Table 2). Finally, we estimated effect sizes using the 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  $p < .05$ .

## Results

### *Final sample and general characteristics*

Figure 1 shows the flow chart corresponding to the participants in each phase of the study. From the total of 369 students (52.3% females) who were invited to participate in the present study, 328 (52.4% females) agreed and met the inclusion criteria. Finally, between 298 to 311 students (depending on the dependent variable) did not meet the exclusion criteria and remained in the study. Participants' mean age was 14.0 (1.0) years [13.9 (1.0) females, and 14.1 (1.0) males]. From the total of 328 participants, 39.3% belong to second grade, 28.7% to third grade, and 32.0% to fourth grade. From the total of 172 female and 156 male participants, 39.0% and 39.7% belong to second grade, 29.7% and 27.6% to third grade, and 31.4% and 32.7% to fourth grade, respectively.

Sessions lasted an average of 48.3 min (range = 44 to 52) and an average of 44.6 min (range = 40 to 49) for the creative and reproductive sessions, respectively. In the sample of the present study, the internal consistency of all the dependent variables measured by flow state questionnaire was acceptable (creative/reproductive sessions: Loss of self-consciousness/inhibition = .85/.83; Distortion of the sense of time = .67/.69; Autothelic experience = .93/.94).

### *Comparison between creative and reproductive sessions*

Table 2 shows data comparing students' objective PA, perceived exertion, and flow state between the creative and reproductive sessions. The MLM results showed that during the creative session students engaged a higher percentage of time in MVPA and total PA, as well as experienced perceived higher exertion, than during the reproductive session ( $p \leq .001$ ,  $d = 0.19-1.15$ ). The results also showed that during the creative session students spent a lower percentage of time being sedentary and engaging in light PA than

during the reproductive session ( $p \leq .001$ ,  $|d| = 0.19-0.61$ ). However, no differences in flow state were found in students between both sessions ( $p > .05$ ).

## Discussion

The purpose of this study was to compare high school students' objective PA, perceived exertion, and flow state between a creative and a reproductive dance session in the PE setting. Results showed that, objectively measured, students were physically active around 40% of the total time during both sessions. However, the PA patterns were different for each session. In the creative session, the percentage of time in MVPA (17.1%) and self-perceived exertion intensity (2.0) were practically double those in the reproductive one (8.7% and 1.2, respectively). Furthermore, the percentage of time spent being sedentary and in light PA were lower during the creative session (57.2% and 25.7%, respectively) than the reproductive one (59.6% and 31.7%, respectively). These findings are lower than the ones noted in a meta-analysis that found that high school students spent an average of 34.7% of their PE time in MVPA as measured by accelerometers (Hollis et al., 2017). Likewise, the proportion of PE spent in MVPA during the EMCD sessions fell short of the 50% suggested by current recommendations (Association for Physical Education, 2020).

Traditionally, PE has been related to teaching physical condition or sport's technical skills content, where this traditional teaching has been based on the use of a Direct Instruction in which the teacher acquires a main role in the teaching-learning process and the student is left behind to the background (Guijarro et al., 2020b). The criticism that arises from this situation gives rise to the incorporation of new methodologies or pedagogical models that try to improve PE teaching as the Sports Education model, which proposes a teaching in which the student can live an authentic sports experience, with the aim of training enthusiastic, cultured and competent students, through a greater transfer of autonomy and responsibility, and where the teacher acts as a guide (Guijarro et al., 2020b).

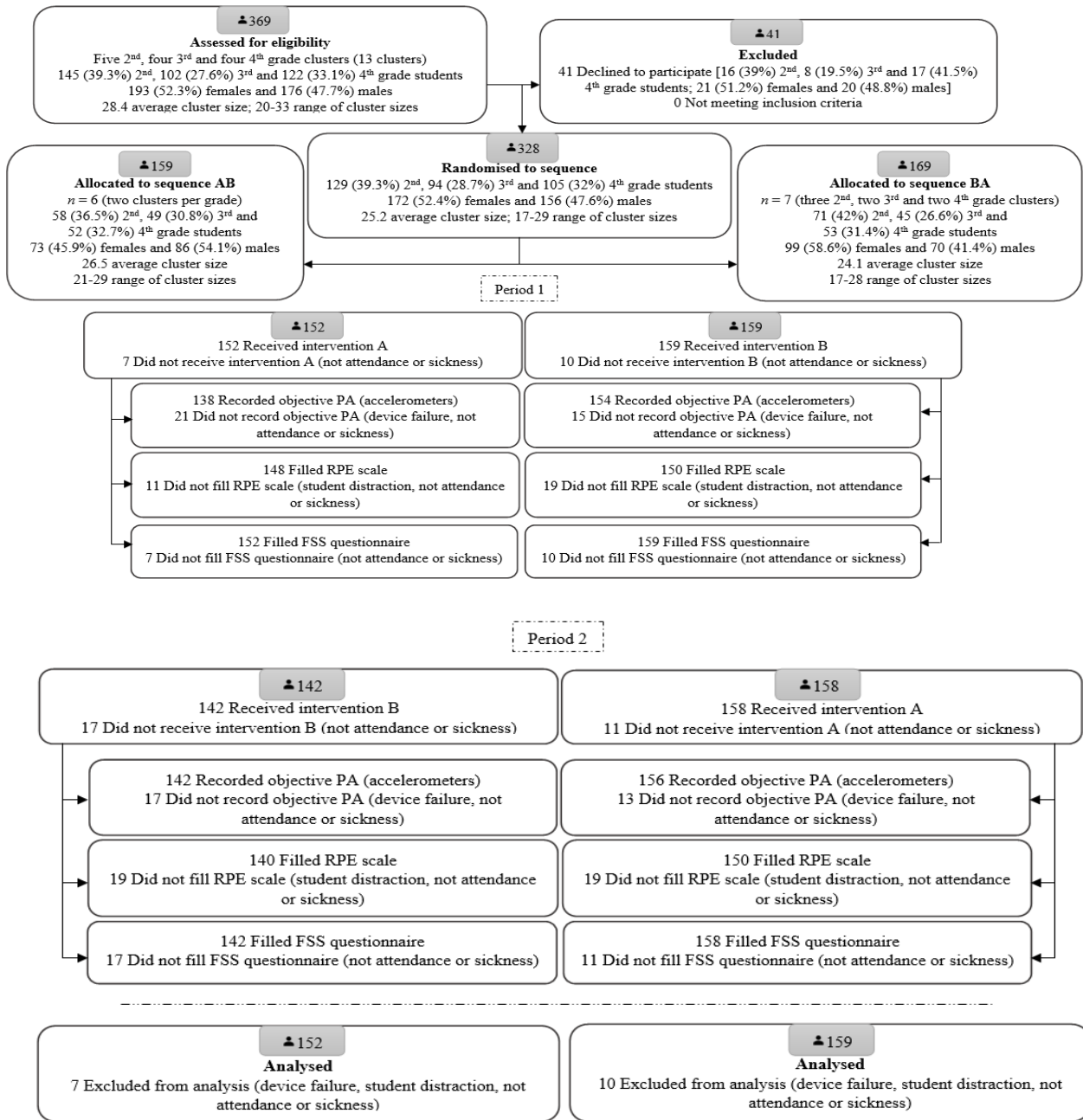


Figure 1. Flow chart of the participants included in each phase of the present study. PA = Physical activity; RPE = Spanish version of the Children's OMNI-walk/run Scale of Perceived Exertion; FSS = Flow State Scale.

Table 2.

Comparison of the students' objective physical activity (PA), perceived exertion, and flow state between creative and reproductive sessions

	Creative session	Reproductive session	Multilevel Lineal Model <sup>a</sup>			Effect size
	M (SE)	M (SE)	- 2LL	F	p	d
Objective PA (n = 298)						
Sedentary (%) <sup>b,c</sup>	57.2 (0.6)	59.6 (0.6)	4435.523	11.655	.001	-0.19
Light PA (%) <sup>b,c</sup>	25.7 (0.5)	31.7 (0.5)	4157.541	91.880	< .001	-0.61
Moderate-to-vigorous PA (%)	17.1 (0.4)	8.7 (0.4)	3903.183	385.919	< .001	1.15
Total PA (%) <sup>b,c</sup>	42.8 (0.6)	40.4 (0.6)	4435.552	11.654	.001	0.19
Total PA (counts/min)	1362.3 (38.0)	715.1 (37.9)	9297.893	203.436	< .001	0.89
Steps (steps/min)	28.4 (0.5)	21.2 (0.5)	4135.006	198.883	< .001	0.80
Perceived exertion (n = 298)						
RPE	2.0 (0.1)	1.2 (0.1)	2351.898	58.638	< .001	0.50
Flow state (n = 311)						
Loss of self-consciousness/inhibition <sup>b</sup>	7.2 (0.1)	7.3 (0.1)	2740.340	1.853	.174	-0.07
Distortion of the sense of time <sup>b</sup>	5.4 (0.1)	5.5 (0.1)	2622.562	1.530	.217	-0.07
Autotelic experience <sup>b</sup>	7.4 (0.1)	7.3 (0.1)	2730.055	0.281	.597	0.03

M = Adjusted mean; PA = Physical activity; SE = Standard error; - 2LL = -2 log-likelihood; <sup>a</sup>Multilevel Linear Model with participants nested within classes and measures within participants (i.e., one-way nested ANOVA). The covariables used for each analysis are as follows: <sup>b</sup>Gender; <sup>c</sup>Age.

The different instructional strategies given during the lessons might explain the differences in MVPA during PE in the current study, which is in line with Slingerland and Borghouts (2011) and Fairclough and Stratton (2005) research. Furthermore, a fitness instruction pedagogy-based intervention noted how active supervision and feedback that included higher rates of teacher interactions with students, corresponded with episodes of increased MVPA (Schuldheisz & Mars, 2001). Other studies have found that a Sport Education pedagogical model helped achieve greater MVPA than Direct Instruction (Guijarro et al., 2020a; Rocamora et al., 2019).

Other possible moderator factors to explain the differences in MVPA during PE is the type of PA in which the students engaged. Some reviews concluded that team games or fitness-oriented activities accumulate the most MVPA during PE lessons with high school students, whereas movement activities (e.g., dance and gymnastics) are reported to accrue the least (Fairclough & Stratton, 2005; Zhou & Wang, 2019). Likewise, Delextrat et al. (2020) found that artistic classes, such as dance and gymnastics, were significantly less active than fitness-based classes, such as fitness and bootcamp activities, confirming that the choice of activity may affect the intensity of PA in PE.

Nevertheless, selecting PE activities from the perspective of PA engagement would imply an oversimplification. An exclusive focus on activity levels puts the question of education in the background, leading to a PE with little concern for the 'E' in PE that would be in danger of becoming mere PA (Coulter et al., 2021; Quennerstedt, 2019). Moreover, some non-ambulatory activities (e.g., dribbling a basketball, climbing stairs, or martial arts) tend to give lower accelerometer counts than ambulatory activities with a lower energy expenditure (Romanzini et al., 2012). Furthermore, as Fairclough and Stratton (2005) stated, activities that imply high levels of PA during PE, as in team games, do not necessarily best prepare students for lifelong PA. Thus, other activities that stimulate lower levels of movement and emphasise different motor skills and aesthetic appreciation, as in EMCD, should not be underestimated.

World Health Organization (2020) reported that all patterns of activity may provide health benefits and so all PA intensities should be considered. In this study, the students were significantly more physically active during the creative dance session compared with the reproductive one. The current study adds to the evidence that, irrespective of activity type, adaptations to teaching methodologies can cause reasonable improvements in MVPA while allowing teachers to maintain planned core aims and educational content.

Flow state was notable during both sessions. The high score of the dimension of the flow state autotelic experience (more than 7 out of 10) in both sessions reveals that the students have lived a comforting, fun, and intrinsically rewarding experience (Nakamura & Csikszentmihalyi,

2014). Although prior research has shown no evidence that manipulating the type of PA activity increases flow (Jackman et al., 2021), it seems that EMCD may provide positive PA experiences during PE (Burkhardt & Brennan, 2012; Fong-Yan et al., 2018; Schwender et al., 2018). This finding is relevant because the enjoyment experienced by adolescents during PA and positive attitudes toward PE may lead to increases in future PA engagement (Rullestad et al., 2021; Schneider et al., 2009).

Likewise, flow has been positively associated with higher intentions to be physically active (Franco et al., 2020), which in turn has been shown to have a positive association with objective habitual PA (Hagger & Chatzisarantis, 2016). In a previous study, a dance-based intervention that compared two instructional strategies showed that a gamified exergaming educational intervention, compared with another almost identical intervention (but with neither gamification nor the exergame), had some positive psychological effects on the autotelic flow dimension (Quintas et al., 2020). In this study, we found no differences in flow dimensions when we compared the two methodological approaches, but in none of them was gamification or exergaming used. Moreover, the intervention in the study of Quintas et al. (2020) lasted one month.

In agreement with previous research on this topic (Lykasas et al., 2009; Sevil et al., 2016), our findings suggest that EMCD may be a well-received teaching content for students. Furthermore, the discovery and learning of both EMCD and other kinds of PA, might mean that a student, upon discovering a PA that they like or are gifted at, begins to be physically active (Milgram, 2003).

The current study has some important strengths. As far as we know, it is the first to compare the effect of different instructional strategies during EMCD sessions on PA and flow state in high school students. Our comparison of the EMCD sessions (i.e., reproductive vs. creative) allowed us to know which is the most appropriate to use in the PE school context, valuable information for PA professionals (Conesa & Angosto, 2017; Ørbæk & Engelsrud, 2021). Moreover, PA was objectively measured during the EMCD sessions, which adds to the knowledge we gained via subjective means. Furthermore, the cluster-randomised cross-over design provided a robust method that allowed use to eliminate any negligible carry over effect.

Despite this study's strengths, it does have some limitations, and thus future research directions should be considered. First, all the participants studied in just one school, which limits the generalisation of the outcomes. However, because of the source and time limitations to the objective monitoring of students' PA, we were not able to examine a probability and larger sample. Second, examination of a longer-term intervention would be convenient. Third, including qualitative methods would have allowed us to obtain more in-depth insights into students that can be gained only by collecting quantitative data (Weeks & Schaffert,

2019). Thus, replicating the current study as a mixed-methods (qualitative and quantitative) intervention could offer a deeper analysis.

Finally, these findings may help reinforce previous research about EMCD, PE, and PA, which seems to point out that the appropriate application of the EMCD is a promising strategy to attend to the high school students' educational needs related to emotional health and to offer varied and equitable PE (Burkhardt & Brennan, 2012; Fong-Yan et al., 2018; Lykesas et al., 2009; Schwender et al., 2018; Sevil et al., 2016).

## Conclusion

In addition to the EMCD benefits on holistic health (Burkhardt & Brennan, 2012; Fong-Yan et al., 2018; Schwender et al., 2018; Sivvas et al., 2015), our findings show that the practice of EMCD following the methodology proposed by experts in the field (i.e., creative session; Motos & García, 2007; Torrents et al., 2013) is more effective for promoting physical practice in adolescents than the reproductive one. Furthermore, results showed that students experienced higher perceived exertion during the creative session than during the reproductive one. What is more, flow state was notable during both sessions.

The present findings show that EMCD sessions promote flow state. In addition, EMCD sessions based on the scientific literature (creative session) bring to students the opportunity to increase their PA engagement within PE. Therefore, teachers should put into practice creative dance sessions by applying the EMCD conceptual and methodological framework in their programming of EMCD, because it is only then that its benefits to both PA and flow state maximize (Lara-Aparicio et al., 2021; Prados, 2020). The results of this research could help shed more light on the study area and to serve as a guide for PA professionals.

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