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ORIGINAL

EFFECT OF A PHYSICAL ACTIVITY SESSION ON MOOD STATES

EFFECTOS DE UNA SESIÓN DE ACTIVIDAD FÍSICA SOBRE EL ESTADO DE ÁNIMO

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ABSTRACT

This article analyses the effects of a physical activity session on mood states in a group of adolescents from the city of Malaga (Spain). Participants of this study were 67 individuals aged between 14 and 17 years ($M=14.93$; $SD=.99$). Mood states in the sample were evaluated using the Profile of Mood States (POMS) questionnaire (McNair, Lorr, & Droppleman, 1971) and analysing the following factors: tension-anxiety, depression-dejection, anger-hostility, vigour-activity, fatigue-inertia, and confusion-bewilderment. Results indicated that, after the physical activity session, there was a significant decrease in the depression, anxiety and confusion scores, and an increase in vigour. The changes were similar for both sexes, although the state of tension improved only for boys, and vigour increased to a greater extent in girls.

KEYWORDS: mood states, physical activity, adolescence.

RESUMEN

Este trabajo analiza los efectos de una sesión de actividad física sobre el estado de ánimo en un grupo adolescentes de la ciudad de Málaga (España). Participaron en este estudio 67 personas con edades entre los 14 y 17 años ($M=14.93$; $DT= .99$). Para evaluar el estado ánimo de la muestra se utilizó el cuestionario POMS (*Profile of Mood States* - McNair, Lorr y Droppleman, 1971), analizándose los siguientes factores: tensión-ansiedad, depresión-melancolía, angustia-hostilidad-cólera, vigor-actividad, fatiga-inercia y confusión-orientación. Los resultados indicaron que, tras la sesión de actividad física, disminuyeron las puntuaciones en depresión, angustia y confusión, aumentando en vigor. En función del sexo, los cambios fueron similares, aunque el estado de tensión mejoró únicamente en chicos y el vigor tuvo un aumento mayor en chicas.

PALABRAS CLAVE: estado de ánimo, actividad física, adolescencia.

INTRODUCTION

In spite of the beneficial effects that regular physical activity brings to health, there is an excess of sedentary habits in developed societies which should be dealt with as a matter of public health care (Candel, Olmedilla and Blas, 2008; Casis and Zumalabe, 2008; Coelho, Junior, Vilarouca, César and Nasser, 2009). In fact, people who have an active lifestyle experience higher well-being standards in different areas of their lives (Blacklock, Rhodes and Brown, 2007). New technologies applications and the increase of entertainment possibilities which cut down on physical effort have brought about behaviours not related to active lifestyles (Niñerola, Capdevila and Pintanel, 2006). This is particularly relevant at adolescence, a period when many lifelong habits are developed, apart from the consequences which will take place at that age (Buhring, Oliva and Bravo, 2009).

With regard to psychological well-being, in particular, several studies have brought to light the positive effects caused by physical activity. Significant connections with perceived health, self-concept, self-efficacy, self-control or mood, among other variables, have been described (Karageorghis, Drew and Terry, 1996; Karageorghis and Terry, 1997; Toskovic, 2001; Annesi, 2005; Macone, Baldari, Zelli and Guidetti, 2006; Casis and Zumalabe, 2008; Olmedilla, Ortega and Madrid, 2008). This study focuses on mood states, since they represent a general emotional condition. They stem from experienced events which every individual internalizes in his particular way. They may last a short or a long time and they are important for the individual because they can affect cognitive processes, as well as conduct (Lane and Terry, 2000).

The impact which situations and circumstances make on human beings have a noticeable repercussion on their health. Several research works have brought to light such effect, and have revealed that stimuli and specific actions spur particular reactions at a psycho biological level (Watanuki and Kim, 2005; Barak, 2006). Those studies that focused on the effect of physical activity on moods have noticed that they can substantially modify them. They have assessed the results of a long term programme as well as the acute effect of a single session, they have studied healthy populations as well as populations with various pathologies, or sedentary populations as well as populations with some experience of physical activity (King, Taylor, Haskell and DeBusk, 1989; O'Neil, 1989; Barabasz, 1991; Toskovic, 2001; Annesi, 2002; Candel et al., 2008)

Some of the theories that have tried to explain this fact are based on the action of endorphins and other hormones which can work as painkillers and inhibit processes which end up in feelings of pain and discomfort. Some others base their arguments on the liberation of dopamine or noradrenaline and other neurotransmitters involved in the making of emotions (Salvador et al., 1995; Paffenbarger, Lee and Leung, 1994). But the most subjective theories are based on the rising of body temperature or the theory of distraction as the source of sensation of comfort (Arruza et al., 2008). At any rate, as Morgan points out (1985), all those mechanisms have a high degree of synergy and do not exclude each other. On the other hand, we can underline that the optimization of brain neurotransmission systems associated with mood improvement have something to do with a better insulin or cardiovascular function, as well as a higher cognitive performance, in clinical as well as in healthy populations (Cervilla and Prince, 2000; Flory, Manuck, Matthew and Muldoon, 2004; Vázquez, Hervás, Rahona and Gómez, 2009; Latha and Jaya, 2010)

When studies of this kind are planned, a series of observations and criticism raised over the years have to be considered and solved in order to achieve satisfactory conclusions. On the one hand, special care must be taken if findings on clinical populations with mental ailments are generalised, since mistakes can occur when transferring them to healthy populations. On the other, we must be strict when applying methods and research designs and give a precise definition of the processes carried out (Wilfley and Kuncze, 1986; Ismail, 1987; Rehor, Dunnagan, Stewart and Cooley, 2001). It is also necessary to specify what kind of exercise is done, together with its intensity, frequency and duration, for the results to be reliable and accurate, since different kinds of exercise bring different effects (Steptoe, Edwards, Moses and Andrew; 1989; Gleser and Mendelberg, 1990; Plante and Rodin; 1990; Byrne and Byrne, 1993; Jiménez, Martínez, Miró and Sánchez, 2008)

There are some studies, for instance, that underline the importance of monitoring the intensity of the effort, since a very demanding activity can render negative effect or no improvement of mood (Mack, Huddleston, Dutler and Bian, 2000). Following this point, Weinberg, Jackson and Kolodny (1988) pointed out in a study that swimming, tennis and racketball did not bring any positive changes, and it was running the only activity which affected mood. These authors also suggested that the results could have been determined depending on whether each activity had a competitive purpose or not. Likewise, Rehor et al. (2001), after evaluating participation in different tasks, concluded that the necessary technical difficulty or the stress caused by the competition can hinder a significant effect of improvement on mood.

The aim of this piece of research is to study the acute effect of physical activity on mood in a sample of adolescents. In order to prevent possible errors that have been identified in this kind of research work, we have made our best to thoroughly define the research design and the method to be applied, as well as the kind, duration and intensity of the exercise participants were to undertake. The hypothesis behind this study is that a session of physical activity based on moderate intensity team games, where participants have been arranged by same ability, would affect in a positive way the mood of the sample.

MATERIAL AND METHODE

Sample

The sample comprised 67 adolescents from Malaga city, 52.24% boys (n=35) and 47.76% girls (n=32). They were pupils in a secondary school and took part on a voluntary basis. They neither had diseases of any kind nor difficulties to do any physical activity. The sample was split into two natural groups: one of them was a 3rd year ESO class and the other, a 4th year ESO class. Group 1, taken as control group (17 boys and 15 girls), made up 47.76% of the sample (n=32) and group 2, the experimental group (18 boys and 17 girls) was 52.24% (n=35). Their ages ranged between 14 and 17 years ($M=14.93$; $SD= .99$). In the first group, 10 boys and 4 girls took physical activity regularly and in the second group, 9 boys and 5 girls did.

Instruments

a) Socio demographic questionnaire: we collected information on their sex and age with a few questions.

b) Profile of Mood States questionnaire (POMS) by McNair, Lorr and Droppleman (1971), Spanish version (Balaguer, Fuentes, Meliá, García-Merita and Pérez, 1993; Balaguer, Fuentes, Meliá, García-Mérita and Pons, 1994). This instrument

assesses six states, namely, tension-anxiety, depression-dejection, anxiety-hostility-anger, vigor-activity, fatigue-inertia and confusion-bewilderment. A 58-item version with a 5-point scale, from 0 (Not at all) to 4 (Extremely) was administered. This instrument was firstly designed to evaluate the results of psychotherapy treatment and psychotropic medication in psychiatric patients, but it has been tested afterwards with other populations and it has become widely used in sport psychology and other research fields (Andrade, Arce and Seoane, 2000). It has been more commonly used in sport performance related areas, but in recent years this instrument has become useful to assess the effect of physical activity on health and recovery from injuries (O'Neil, Dunn and Martinsen, 2000; Abenza, Olmedilla, Ortega and García-Más, 2010)..

Procedure

This study belongs in the experimental model and follows specifically a quasi-experimental method with a nonequivalent control group design, with pre- and posttests (Cook and Campbell, 1976; Fitz-Gibbons and Morris, 1978; Ato and Vallejo, 2007; Ramos, 2011). Both control and experimental groups sat a pretest and a posttest. The control group filled out the questionnaires before and after an ordinary class of Natural Science and Social Sciences. We made sure that these students were not given exams or any special activity at that time. They listened to the explanation of their teacher and did their activities. The experimental group on their part filled out the questionnaires before and after their PE class. This was devoted to group sports, comprising warming-up and several exercises related to soccer, basketball and volleyball within an all-inclusive framework. Some games were real, some included alterations, focusing on offensive tactics of moderate intensity, adapted to the abilities of the participants. In order to make the game appealing to all, participants were split into same-ability teams so that there never was anyone too far above nor too far below each one's abilities. Questionnaires were self-administered, but the evaluator was present to help with any comprehension difficulties. It took them 10 minutes on average. Some time was taken from the periods before and after to make sure that the study was made in the allotted time.

Data analysis

The SPSS 15.0 statistics programme was the tool to collate data. Multivariate analyses of variance (MANOVA) were used, followed by the corresponding univariate analyses (ANOVAs) to check any differences between the pretest measures of both control and experimental groups, and the same for posttest measures. On the other hand, mixed analyses of variance 2x2 were taken, with a first factor of independent groups (control and experimental) and a second factor of repeated measures (pre and posttest) to check any significant differences in the pre and posttest score variance between the control and the experimental group.

Finally we carried out analyses of variance in each group to check any significant changes in the value of each factor.

RESULTS

Reliability of the instrument

Reliability analyses reveal an adequate internal consistency for each POMS subscale, taken through Cronbach alpha (1951), for the sample as a whole, but also for the treatment and pretest and posttest measures. Values fell between .76 and .94.

Descriptive analysis and comparison between and within groups

Firstly, table 1 shows that there were no pretest differences between pupils who had taken a team sports class and those who had taken a theoretical subject class. MANOVA revealed no significant differences depending on treatment in the different subscale scores in the POMS questionnaire (λ de Wilks = .92, $F_{[6,60]} = .85$; $p > .05$) (table 1).

Table 1. PRE-TEST differences depending on treatment

	Group 1 M(SD)	Group 2 M(SD)	F	Sig.
Tension	8.19 (6.27)	8.26 (6.40)	.00	.964
Depression	8.28 (6.11)	8.83 (8.07)	.10	.756
Anxiety	9.26 (7.29)	9.95 (7.78)	.14	.710
Vigor	15.34 (7.11)	15.03 (5.62)	.04	.840
Fatigue	8.75 (5.07)	8.17 (6.06)	.18	.675
Confusion	7.91 (4.23)	9.23 (5.49)	1.20	.277

MANOVA applied to posttest measures revealed differences depending on treatment (λ de Wilks = .67, $F_{[6,60]} = 4.94$; $p < .001$), specifically in the *depression* ($F_{[1,65]} = 5.16$; $p < .05$), *anxiety* ($F_{[1,65]} = 10.29$; $p < .01$), *vigor* ($F_{[1,65]} = 8.16$; $p < .01$) and *confusion* ($F_{[1,65]} = 6.20$; $p < .05$) subscales (table 2).

Table 2. POST-TEST differences depending on treatment

	Group 1 <i>M(SD)</i>	Group 2 <i>M(SD)</i>	F	Sig.
Tension	7.69 (6.51)	8.03 (6.76)	.04	.834
Depression	7.86 (5.75)	4.64 (5.82)	5.16	.026
Anxiety	10.18 (6.26)	4.99 (6.90)	10.29	.002
Vigor	15.19 (7.71)	19.90 (5.72)	8.16	.006
Fatigue	8.03 (3.70)	8.29 (5.25)	.05	.821
Confusion	7.63 (4.52)	5.23 (3.31)	6.20	.015

Repeated measures analyses revealed that there was a significant interaction effect between pre-post measures and treatment variable, in some of the POMS subscales. Those with a statistically significant result were *depression* ($F_{[1,65]} = 8.90$; $p < .01$), *anxiety* ($F_{[1,65]} = 16.12$; $p < .001$), *vigor* ($F_{[1,65]} = 17.23$; $p < .01$) and *confusion* ($F_{[1,65]} = 17.92$; $p < .001$). However, there were neither significant effects in *tension* ($F_{[1,65]} = .06$; $p > .05$) nor in *fatigue* ($F_{[1,65]} = .40$; $p > .05$).

Table 3 shows that those teenagers that had attended the PE class experienced a significant reduction in *depression* ($F_{[1,34]} = 15.08$; $p < .001$), *anxiety* ($F_{[1,34]} = 13.79$; $p < .001$), and *confusion* ($F_{[1,34]} = 28.18$; $p < .001$), but their *vigor* increased ($F_{[1,34]} = 20.45$; $p < .001$). Pre and posttest differences in the group who had taken an ordinary class were no significant.

Table 3. Differences between pre and posttest values for each group

	Control group				Experimental group			
	Pre-test <i>M</i> (<i>SD</i>)	Post-test <i>M</i> (<i>SD</i>)	F	Sig.	Pre-test <i>M</i> (<i>SD</i>)	Post-test <i>M</i> (<i>SD</i>)	F	Sig.
Tension	8.19 (6.27)	7.69 (6.51)	1.23	.277	8.26 (6.40)	8.03 (6.76)	.05	.824
Depression	8.28 (6.11)	7.86 (5.75)	.55	.462	8.83 (8.07)	4.64 (5.82)	15.08	.000
Anxiety	9.26 (7.29)	10.18 (6.26)	3.97	.055	9.95 (7.78)	4.99 (6.90)	13.79	.000
Vigor	15.34 (7.11)	15.19 (7.71)	.11	.739	15.03 (5.62)	19.90 (5.72)	20.45	.000
Fatigue	8.75 (5.07)	8.03 (3.70)	1.74	.197	8.17 (6.06)	8.29 (5.25)	.01	.922
Confusion	7.91 (4.23)	7.63 (4.52)	.95	.337	9.23 (5.49)	5.23 (3.31)	28.18	.000

On the other hand, interaction between pre-post measures with sex and treatment variables revealed significant effects in *tension* ($F_{[1,63]}= 5.31$; $p<0.05$) and *vigor* ($F_{[1,63]}= 4.07$; $p<0.05$) subscales, but not in *depression* ($F_{[1,63]}= 1.87$; $p> .05$), *anxiety* ($F_{[1,63]}= .17$; $p> .05$), *fatigue* ($F_{[1,63]}= .16$; $p> .05$) or *confusion* ($F_{[1,63]}= .41$; $p> .05$). As can be seen in table 4, results between control and experimental group vary depending on sex. In *tension*, boys in the experimental group registered a significant reduction ($F_{[1,17]}= 4.55$; $p< .05$) whereas that dimension did not change significantly in girls ($F_{[1,16]}= 1.04$; $p> .05$). However, in the *vigor* subscale boys and girls increased that feeling after taking part in the physical activity session, although in boys ($F_{[1,17]}= 4.66$; $p< .05$) not so sharp an increase as in girls ($F_{[1,16]}= 19.23$; $p< .001$).

Table 4. Differences between pretest and posttest values for each group depending on sex.

	Control group				Experimental group			
	Pre-test <i>M</i> (<i>SD</i>)	Post-test <i>M</i> (<i>SD</i>)	F	Sig.	Pre-test <i>M</i> (<i>SD</i>)	Post-test <i>M</i> (<i>SD</i>)	F	Sig.
Boys								
Tension	9.68 (7.73)	9.76 (8.01)	.017	.899	10.56 (5.94)	8.44 (6.90)	4.55	.048
Vigor	16.59 (7.56)	16.53 (8.20)	.007	.933	16.28 (6.52)	18.97 (4.92)	4.66	.045
Girls								
Tension	6.50 (3.61)	5.33 (3.07)	4.54	.051	5.82 (6.12)	7.59 (6.79)	1.04	.323
Vigor	13.93 (6.52)	13.67 (7.08)	.18	.678	13.71 (4.28)	20.88 (6.47)	19.23	.000

DISCUSSION AND CONCLUSIONS

Working with this kind of research designs implies that at times it is somewhat risky to talk about a control group. However, on the basis of the guidelines set by Ramos (2011), we can take the group that performs their usual activity as the control group, despite the fact that they have undertaken a specific task. Since they are natural groups, we believe that such task does not cause an unusual effect due to its everyday nature. On the other hand, and following that author's recommendations, we can argue that the validity requirements for this kind of designs have been met. Firstly, there were no pretest significant differences between both groups, but there were in the posttest. And secondly, the control group did not yield significant differences between pretest and posttest measures, but the experimental group did.

As it has been explained in the introduction, the conclusions of this study match those of others that have brought to light how mood is improved by physical activity (McLafferty, Wetzstein and Hunter, 2004; Taylor-Piliae, Haskell, Waters and Froelicher, 2006). These results are particularly in line with studies carried out on adolescents and undergraduates which evidence an immediate effect on mood of a

single session of physical activity (Barabasz, 1991; McGowan, Pierce and Jordan, 1991; Mack, et al., 2000; Rehor et al., 2001; Macone et al., 2006). It must be underlined that this effect was studied on a non clinical sample, which supports the use of this tool to evaluate samples of healthy population.

For the last few decades, it has been taken into account the importance of defining the intervention to be applied, and specifying the kind, the frequency, the intensity, etc. (Byrne and Byrne, 1993). In fact, not all kinds of intervention bring the same consequences on people's mood. A gratifying, voluntary and pleasant activity is more likely to be beneficial than an intense and demanding activity, mostly on those individuals who have not got a wide experience of it (Díaz, 2004; Peluso and Andrade, 2005). In our case, we have noticed big variations in some factors in the questionnaire, which we put down to the kind of practise carried out, regardless of the effect caused by physical activity itself. Controlled group activity, without big expectations in performance, probably contributes to bring enjoyment, feelings of attachment among the pupils and group bonding.

An improvement in mood is not just beneficial by itself, but in an indirect way it also contributes to strengthening socializing skills, school work and other situations, because they are faced with more enthusiasm (Sallis and Patrick, 1994; López, González and Rodríguez, 2006). This is particularly relevant at adolescence, a period when the personality is not yet shaped and habits are not consolidated and they could be influenced by positive frames of mind. Taking this into account in Physical Education makes it a useful tool to influence those factors mentioned above. This is an argument to be seriously considered at school.

On the other hand, it is necessary to do further research on the impact that different physical tasks may exert on the attachment to physical activity since, currently, we find a high degree of sedentariness among teenagers: they gradually drop out physical activity as they grow up. According to several authors, teenagers stick to the practise of those activities they started years before, if they were pleasant enough for them. Besides, some social actors like friends play an essential role in this situation (Alvariñas and González, 2004; Amigó et al., 2004). We think that group activities enhance the effect generated on health and well-being by physical exercise itself, because it adds the support of the social networks which arise from an efficient interaction with others (Morgan, 1985; Ransford, 1982).

Veiga (2004) proves the importance of psychosocial factors to create attachment to physical activity. Besides if we look over some of the theories that have described this circumstance, as for instance achievement motivation (Cecchini, Méndez and Muñiz, 2003), self-motivation (Dishman, Ickes and Morgan, 1980), health belief model (Becker and Maiman, 1975), theory of self-determination (Deci and Ryan, 1985), theory of reasoned action (Ajzen and Fishbein, 1980), self-efficacy

(Bandura, 1986) or Welk's model (1999), there is a series of key factors which, in our view, are met by activities of the kind carried out in our study. All the pupils are included, same-ability grouping is applied so that they all feel competent and capable of attaining goals, activity is shared with class mates, which will strengthen achievements, and objectives are adapted. Some take the competition more earnestly but some others take part just to enjoy themselves.

It is important to keep in mind that mood states are dynamic processes which can be modified by the impact of the environment and human activities (Corral, 2003). It is well known that, either directly or indirectly, improvement in perceived psychological well-being is based on a combination of physiological and psychological mechanisms (Blasco,1997). When we apply activities of this kind so as to drive some improvement in these factors, we are trying to enhance the subjective effect of physical activity, seeking a stronger evasive effect and strengthening the psychosomatic effect which is concomitant to many human reactions (Márquez, Rodríguez and De Abajo, 2006; Arruza et al., 2008).

Our study supplies new data on the impact of physical activity on people's psychological health, and it focuses on adolescence which is a particularly important population. Besides, we have carried out our research with a specific kind of activity, namely group exercises adapted to the abilities of the participants. Our study has brought to light that a single session of team sports practise has favourably modified the mood in the target sample. We think this is an interesting line of work and recommend further research leading to find adequate parameters to better people's well-being and, secondly, to raise attachment and healthy lifestyles.

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