Hernández-Álvarez, J.L.; del-Campo-Vecino, J.; Martínez-de-Haro, V. y Moya-Morales. J.M. (2010). Percepción de esfuerzo en Educación Física y su relación con las directrices sobre actividad física / Perception of exertion in physical education and its relationship to guidelines on physical activity. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 10 (40) pp. 609-619. Http://cdeporte.rediris.es/revista/revista40/artpercepcion185.htm

ORIGINAL

PERCEPTION OF EXERTION IN PHYSICAL EDUCATION AND ITS RELATIONSHIP TO GUIDELINES ON PHYSICAL ACTIVITY

PERCEPCIÓN DE ESFUERZO EN EDUCACIÓN FÍSICA Y SU RELACIÓN CON LAS DIRECTRICES SOBRE ACTIVIDAD FÍSICA

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This study is part of project funded by el Ministerio de Ciencia y Tecnología (código: SEJ2007-67267/EDU).

Código UNESCO / UNESCO code: 2411.06 Fisiología del ejercicio / Exercise physiology **5899** Educación Física / Physical education
Clasificación Consejo de Europa / coouncil of Europe classification: 5. Didáctica y metodología / Teaching and Methodology **6**. Fisiología del ejercicio / Exercise physiology.

Recibido 12 de julio de 2009 **Received** July 12, 2009
Aceptado 10 de mayo de 2010 **Accepted** May 10, 2010

ABSTRACT

The purpose of this study was to assess students' perceived exertion in a Physical Education (PE) setting. In addition, it was analyzed the class actual duration, the average time for physical practice, and its relationship with the health guidelines on physical activity.

1,853 males and females between 10 and 18 years old (M= 13.7 ± 1.8) participated in this study. The measure of perceived exertion was performed using the Pictorial Children's Effort Rating Table (PCERT). All classes were recorded (videotape) and observed by experts who reported scores on the content and the duration of the PE sessions.

The results indicated: (1) a PE class duration of 38.7 (± 4.9) minutes, (2) an average time for physical practice (M= 22.3 ± 4.8) minutes and (3) students' perceived exertion scores (M= 4.57 ± 2.0) on a 10-point scale. Significant gender differences were observed on perceived exertion ($p < 0.01$), especially on Fitness' content ($p < 0.001$).

The duration of PE class is not respectful of the curriculum guidelines with respect to the time that would be allocated to this subject at school. Actual-time physical activity does not reach at least the thirty minutes of physical exercise necessary to expect health benefits. The class represents an effort with vigorous intensity only for one out of three students.

KEYWORDS: perceived exertion; physical education class; physical activity; public health; children and adolescents; Spain.

RESUMEN

Objetivos: Este estudio evaluó la percepción de esfuerzo en la clase de Educación Física. Así como la duración real de las clases y el tiempo medio de actividad física y sus relaciones con las directrices sanitarias sobre actividad física.

Método: Participaron 1.853 estudiantes de entre 10 y 18 años de edad (13,7 ± 1,8). La medida de la percepción de esfuerzo se realizó con el *Pictorial Children´s Effort Rating Table* (PCERT). Todas las clases fueron grabadas y observadas por expertos que informaron sobre el contenido y la duración de la clase.

Resultados: Los resultados muestran que la duración de las clases de EF fue de 38,7 (± 4,9) minutos. El tiempo medio de actividad física fue de 22,3 (± 4,8) minutos. La valoración de la percepción de esfuerzo obtiene una puntuación de 4,57 (± 2,0) sobre 10. El género produce diferencias significativas en la percepción de esfuerzo ($p < 0.01$), pero no la edad. El

contenido de “condición física” marca diferencias significativas con el resto de contenidos curriculares ($p < 0.001$).

Conclusiones: Se concluye que la clase de EF no cumple las directrices curriculares sobre el tiempo asignado a esta materia escolar. Además, el tiempo real de actividad física no alcanza, al menos, los treinta minutos mínimos necesarios para lograr beneficios para la salud. Sólo para uno de cada tres alumnos la clase representa un esfuerzo con intensidad vigorosa.

PALABRAS CLAVE: percepción de esfuerzo; clase de educación física; actividad física; salud pública; niños y adolescentes; España.

INTRODUCTION

The lack of physical activity is one of the most influential factors in the increase of non-transmitted diseases in such a way that the negative consequences on health are one of the issues at the core of health and educational policies. Despite the obvious physical and emotional benefits of physical activity, its frequency during adolescence decreases considerably. This is a relevant fact since behavior patterns that have a particular influence on health and lifestyle later on in adulthood build up during this period.

Nowadays, there is an international consensus that children and teenagers need to engage in physical activity everyday of the week during, at least 60 minutes per day to gain benefits on health. However, the percentage of those who comply with the guidelines, at best, does not get beyond half the school-age population. Consequently, the experts who met in Japan during the 4th World Conference on Women and Sport highlighted the necessity to place Physical Education among the priorities for the promotion of healthy lifestyles in school-age population, directly urging countries, organizations and universities to encourage specific research into this school subject. There are at least two reasons that justify the great attention given to the PE class. On the one hand, different studies reveal that the PE class is the only time when half the population carry out any type of physical activity. On the other hand, the level of satisfaction of teenagers with PE classes as well as their quality are influential factors for their adherence to physical activity and adoption of an active and healthy lifestyle.

In this context, one the aims of this research is focused on the evaluation of physical activity that is done in PE lessons in terms of its duration and intensity as well as its relation to the guidelines of the previously mentioned health and scientific-medical organizations. We have found no difficulties with the measurement of the real duration of the classes. Despite this, it is more complex to measure the effective duration of physical activity. Such aspect is commonly carried out through a timed monitoring of pilot pupils.

As regards the intensity of physical activity, there are two highly frequent general procedures. On the one hand the measurement is carried out through objective procedures such as the different physiological monitorings when the selected sample is reduced, but on the other hand the measurement of intensity has been explored through the self-reporting perception of exertion when the sample is ample, either by means of training journals or questionnaires. The measurement of intensity through the perception of exertion has showed a positive correlation with objective physiological indicators in trained subjects as well as untrained ones. In addition, it allows us, among other advantages, to economically and easily study big groups of populations in terms of resources and application respectively.

Over the last decades, the tools used for the evaluation of the perception of exertion experienced an evolution in order to adapt to different groups of the population. The most recurrent scale was Borg's *Rating of Perceived Exertion* (RPE). It was initially validated thanks to its positive correlation with heart rate (values between 0.8 and 0.9) and later on, different studies confirmed its validity, reliability and stability using the heart rate and oxygen consumption. However, Borg's scale and consecutive adaptations failed to prove suitable for studies with children.

The *Children's Effort Rating Table* (CERT) managed to solve the issue of children's comprehension including pictures and more understandable terms. The CERT, based on the scale of Williams et al., was used in our study. Its use with children was validated by Yelling, Lamb and Swaine using the heart rate. More recently, other authors conducted new validation studies with positive results.

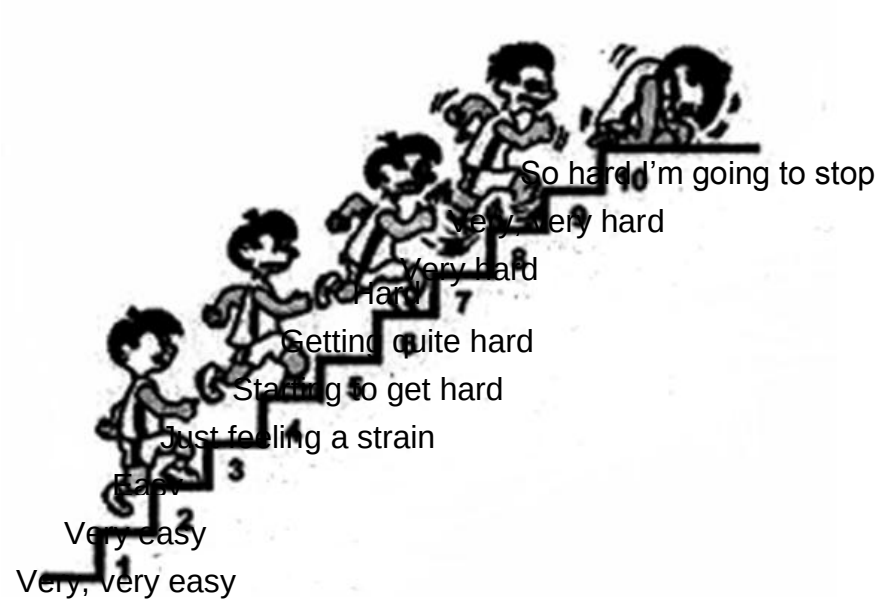

Figure 1. The Pictorial Children's Effort Rating Table (PCERT) (Yelling et Al., 2002)

The relation between the perceived exertion and heart rate was operationalized with a high reliability so that values 4 and 5 from the PCERT correspond to the 140 and 150 bpm as average value. Considering the age of the participants in our study, the 150 bpm match the lower limit of the optimal exertion area where physical activity should be so as to produce healthy effects and improve cardiorespiratory capacity.

In our country, researches into perceived exertion in the context of PE classes are very scarce and refer to small groups of populations. Therefore, studies that target bigger population groups like ours are necessary.
To sum up, this study aims to understand the perceived exertion of pupils in PE classes as well as other parameters like the effective duration of PE classes and its connection with the health guidelines on physical activity as health factor.

METHOD

Participants

1853 pupils aged between 10 and 18 ((13.7 ± 1.8) participated in the study. 48.6% were boys and 51.4% were girls. This is a randomized study by clusters grouped in three groups for the sake of the analysis: G1-PRI, pupils of 5th and 6th Primary Grades; G2-SEC, pupils of 1st and 2nd Secondary Grades; G3-SEC, pupils of 3rd and 4th Secondary Grades. The study was conducted on a total of 163 PE classes.

Measurements

The intensity of the lessons was measured with the *Pictorial Children's Effort Rating Table (PCERT)*. This scale offers the option to choose a representative value between 1 and 10 with an average value corresponding to the value 5 of the scale (see annexe).

Furthermore, the external observers (two/three observers in each class) gathered data on the content and duration of the lessons. The contents grouped in six categories: 1) Fitness; 2) Traditional Sports; 3) Optional Sports (games); 4) Body Expression and Dances; 5) Games and basic Motor Abilities; 6) Others. As regards the duration of the lesson, time was measured since the teacher started to explain until the class was over and the pupils left the place.

Context and process

After the familiarization with the scale prior to the first application, the PCERT was immediately applied after the completion of the lesson and in the same facility preventing non-recall effect. The classes were filmed using audio-visual devices.

The data treatment

The SPSS 17.0 program (SPSS Inc., Chicago, Illinois, USA) was used. The statistical analysis focused on the descriptive aspects average and typical deviation as well as the calculation of the t-test and the ANOVA in order to evaluate the significance of the differences.

Ethical anticipation

In accordance with the ethical conduct criteria of the Research Ethics Committee (REC) of the institution the authors belong to, parents' authorisations were requested (signed agreement) as well as the voluntary and freely accepted participation of the participating pupils.

RESULTS

The average duration of the PE classes was 38.7 (± 4.9) minutes. During that time, the pupils remained active for 22.3 (± 4.8) minutes on average.
For the whole sample, the average value of the average evaluation of the perceived exertion does not reach score 5 (4.57 ± 2.0) (Table 1). The t-test allows us to observe significant gender differences in the whole sample ($p < 0.01$) as well as in each of the groups G1-PRI ($p < 0.01$) and G3-SEC ($p < 0.05$).

Table 1. Perceived exertion (PE) by gender and grade (Average and typical deviation)

Boys			Girls		
Group-Grade	N	PE	N	PE	*p*
	901	4.42 (2.1)	952	4.72 (1.9)	0.002
G1-PRI	234	4.31 (2.3)	286	4.85 (2.0)	0.004
G2-SEC	318	4.62 (2.2)	357	4.69 (2.0)	0.693
G3-SEC	349	4.31 (2.0)	309	4.62 (1.8)	0.033

For the whole sample, the group-grade does not produce significant differences ($F = 1{,}752$, $p = 0.174$). However, the Post-hoc *Scheffe* shows significant differences between the pupils of G1-SEC (first Secondary Grade) and the ones from G3-SEC (3rd and 4th Grades). These significant differences become facts since the perceived exertion increases in that last Secondary Education cycle.
Table 2 reveals that for more than half the population the performed physical activity does not even reach the lower limit of the optimal effort area in order for beneficial effects on health to take place (score < 5; equivalent to < 150 bpm). The lesson represents a high intensity effort for only one in three boys and girls (score > 5).

Table 2. Distribution of the population according to the perceived exertion (%, gender and grade)

Gender	Group-Grade	< 5 points	5 points	> 5 points
Boys		61.4	9.0	29.6
	G1-PRI	64.5	8.1	27.4
	G2-SEC	58.5	8.2	33.3
	G3-SEC	61.9	10.3	27.8
Girls		55.8	12.8	31.4
	G1-PRI	52.4	13.3	34.3
	G2-SEC	57.4	11.5	31.1
	G3-SEC	57.0	13.9	29.1

The results show that only the classes with the content "fitness" get a perceived exertion score above the value 5 (5.79 ± 2.0). Such a factor produces significant differences when "fitness" classes are compared with the rest of the contents ($p < 0.001$) (Table 3).

Table 3. Perceived exertion in class according to the content (average and typical deviation)

Content	Total sample	Boys	Girls	*p*
Fitness	5.79 (2.0)	5.64 (2.2)	5.93 (2.0)	0.246
Traditional sports	4.63 (1.9)	4.55 (2.0)	4.71 (1.8)	0.260
Optional sports	4.04 (1.6)	3.68 (1.6)	4.35 (1.5)	0.001
Body expression	3.70 (2.1)	3.66 (2.2)	3.73 (2.0)	0.826
Basic motor abilities	4.66 (2.1)	4.13 (2.2)	5.18 (1.8)	0.001
Others	4.07 (2.0)	4.09 (2.3)	4.06 (1.8)	0.893

Gender shows significant differences only in the contents of optional sports ($t = -3.426$, $p < 0.001$) and basic motor abilities ($t = -3.517$, $p < 0.001$). The ANOVA (Post-Hoc Scheffe, $p < 0.05$) allows us to observe significant differences for all the possible comparisons between the content of fitness and other contents.

DISCUSSION AND CONCLUSIONS

This study aimed to understand and know the perceived exertion of what PE classes represent for pupils as well as to know a class characteristics such as its duration and the time spent on physical activity. Both factors are explored as it is necessary to evaluate all those possibilities of physical activity practice that move the school-age population close to the compliance with health recommendations regarding the adoption of a healthy and active lifestyle.

As it was verified, the average duration of the class (38.7 minutes) are so far away from the sixty minutes established by the norm for the two weekly periods. Various aspects recorded by the research team such as the school organization of the weekly schedule, the change of clothes and a minimum attention to hygiene following the PE class and, on occasions, the distance from the sport facility are factors that significantly reduce the actual duration of the class. Additionally, the specified duration does not only correspond to motor activity, but also to organizational and teacher-pupil communication processes so that any physical activity is carried out in 22.3 minutes on average. This result confirms the ones found in other studies. Therefore, despite abiding by the guidelines of those organizations which establish that children and teenagers should at least engage in 30 minutes of intensive daily physical practice, it is still worth pointing out that the physical activity carried out during the classes fails to reach the minimum level that would guarantee and ensure the compliance with those recommendations on the days the lesson takes place. If we take into account that, as it was previously mentioned, half the population aged between 12 and 18 only do the PE classes' weekly physical activity, then we should draw the conclusion that this high percentage of the population needs to be considered as being totally inactive as far as the health recommendations on physical activity are concerned. Consequently, at least 50% of the population

represents a risk group according to the public health criteria whose members are likely to suffer from overweight and related diseases.

Although intensity is not the only factor used to evaluate PE teaching, it is a crucial dependent variable for this study. The participants perceive a low intensity of the classes with an average evaluation below the 5 points of the scale. Most of the population (70.4% of boys and 68.6% of girls) perceive an evaluation of 5 points or less on the scale. If we take into account that values > 5 represent a heart rate above the 150 bpm, we can conclude that the PE class represents an activity with a useful and beneficial impact on health for only one thirds of the population. The results of our study are in the same line with other researches that noted heart rates of between 132 and 147 bpm, which is considered insufficient for the production of necessary adaptations for a better body functioning. It is highly probable that short total duration of the class has an influence on that evaluation since there is no accumulation of highly demanding tasks.

The girls inform of a higher perceived exertion than the boys during the class. Their poor cardiorespiratory adaptation capacity evaluated in former studies may be the main reason since the external observers report that the class activities are generally carried out according to the personal rhythm of each pupil. That may be the same reason as to why age does not produce significant differences in the perceived exertion.

The content is the most influential variable regarding the perception of intensity. Only the classes carrying out tasks aimed at the improvement of “fitness” receive an evaluation of perceived intensity above the 5 points on the scale among boys as well as among girls. Despite this, it is worth pointing out that only 55.7% of the participants in the “fitness” classes offer scores > 5.
To sum up, the results allow us to draw certain conclusions: 1) PE classes have a very short duration away from the actual sixty minutes that they should last; 2) that small duration of the class also causes that the time during which the pupils carry out physical activity is very scarce and far away from the 30 minutes intense activity; 3) the perceived exertion for most of the analysed population represents levels corresponding to the 140-145 bpm approximately, which is a scarce intensity if one wants to gain health benefits from physical activity; and 4) only the classes with a leading content of “fitness” represent a sufficient strenuous effort for the pupils so that they may get a benefit in terms of the biological dimension of health.

This study does not pretend to make the statement that the PE class is inappropriate for the achievement of the curricular objectives of this school subject. However, it is necessary to put strategies into practice, which allow us to increase the level of demand in the intensity of the tasks carried out in order to reach at least an average evaluation of 6 points on the scale. At the same time, we have to achieve organizational modifications of the school schedules that allow us to increase the real duration of the class getting it close to the sixty minutes in each of the sessions. By joining both proposals together, we would at least make it possible that the whole school-age population had two occasions per week to practise physical activity that must help ease the

negative effects that sedentism is causing nowadays putting public health on red alert.

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Rev.int.med.cienc.act.fís.deporte- vol. 10 - número 40 - diciembre 2010 - ISSN: 1577-0354