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ORIGINAL

EXTERNAL LOAD IN BASKETBALL ACCORDING TO GAME SITUATION AND METHODOLOGY

CARGA EXTERNA EN BALONCESTO SEGÚN LA SITUACIÓN DE JUEGO Y LA METODOLOGÍA

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ABSTRACT

The aim was to characterize and compare the external training load according to the game situation in physical education in two different teaching-learning methodologies. Two unit was design and validated with a Direct Instruction methodology, and the other with a Tactical Game Approach methodology. The study sample consisted of 40 tasks. The study involved 70 students between 10 and 12 years of age in a primary school in Spain. The analyzed variables were the game situation and the external load. The results show that students of the Tactical Game Approach methodology obtain higher values of external training load than students of the Direct Instruction methodology. In addition, the external training load decreases when the complexity of the game situation increases. The intensity of the tasks of the Tactical Game Approach method allows reaching the physical activity objectives recommended by the World Health Organization and guarantee the health of the students.

KEYWORDS: Physical education, Tactical Game Approach, External training load, Game situation, Basketball, School Context.

RESUMEN

El objetivo fue caracterizar y comparar la carga externa en sesiones de educación física según la situación de juego en dos metodologías de enseñanza-aprendizaje diferentes. Se emplearon dos programas de intervención diseñados y validados, Direct Instruction y Tactical Game Approach. La muestra estuvo compuesta por 40 tareas. Participaron 70 alumnos de entre 10 y 12 años de un centro de educación primaria de España. Las variables analizadas fueron la situación de juego y la carga externa. Los resultados muestran que los estudiantes de la metodología Tactical Game Approach obtienen valores más altos de carga externa que los de la metodología Direct Instruction. Además, la carga externa disminuye cuando aumenta la complejidad de la situación de juego. La intensidad de las tareas del método Tactical Game Approach permite alcanzar los objetivos de actividad física recomendados por la Organización Mundial de la Salud y que garantizan la salud de los estudiantes.

PALABRAS CLAVE: Educación Física, Tactical Game Approach, Baloncesto, Contexto escolar

INTRODUCTION

The aim of education is the integral development of the students consisting of several components that foment the students' evolution in all spheres of life. Physical education (PE) is aimed at working on fitness and showing its importance in human life (Fernández, Cecchini, & Zagalaz, 2002). In this aspect, the Basic Curriculum Design (DCB) of Primary Education relates the area of Physical Education (EF) with the acquisition of health skills and healthy habits of physical activity. More specifically, they are mentioned in the evaluable learning examples of the sixth course "Improvement of the overall physical condition, knowing the different parameters and factors that affect it through played forms". The scientific literature also emphasizes the area of physical education is responsible for working on the physical condition and its importance in the lives of human beings (Fernández et al., 2002). Therefore, learning sports in PE classes can contribute to the development of physical fitness if it is approached with an appropriate methodology.

Teachers are responsible for transmitting knowledge to the students according that adapt to the evaluable learning protocols determined in the DCB according to the methodology used (Feliz and Ricoy, 2002). The teaching methodology affects all the variables that influence the physical load of the class, as well as the pedagogical ones that define the task, like the game situation, the game phase, the means of initiation to training, the type of contents, etc. (Ibáñez, Feu, & Cañadas, 2016), conditioning the students' responses during the PE class and influencing the improvement of their physical fitness. The teachers used in the design of their tasks and decontextualized means of initiation of the practice of the real game (Feu, García-Rubio, Gamero-Portillo and Ibáñez, 2019), conditioning the burden of the task. Along these lines, the intensities of the EF sessions comply with the recommendations of the World Health Organization (WHO) and the scientific evidence for the improvement of student health.

The training load can be defined as "the sum of stimuli to which the player is subjected during the preparation process" (García, Parejo & Cañadas, 2010). The intensity and external load (CE) of the sessions is influenced by the teaching methodology that the teacher uses (Bendiksen, et al., 2014). Two main approaches exist in the teaching learning methodologies for invasion sports: Teacher-Centred (TCA) and Student-Centred (SCA). Direct Instruction (DI) is one of the typical methods of the TCA (Metzler, 2011). Using this methodology the teacher has absolute control of the lessons, deciding on the contents to be developed, how the class should be managed and student participation. The tasks are designed to create movement patterns and technical skills in the students (Metzler, 2011). The most common method of initiation in the tasks designed according to this methodology is simple and unspecific practical exercises (Alarcón, Cárdenas, Miranda, Ureña, & Piñar, 2011; Cañadas, Ibáñez, Feu, García-Rubio, & Parejo, 2011; Cañadas, Ibáñez, Feu, García, & Parejo, 2011). The progression in technical skills begins with a visual model shown by the teacher, a student or a video that the students have to repeat. First the technical skill is practised in an unspecific manner in tasks which are isolated from the game to be later worked on in a task during actual play (Pill, 2015).

In contrast in the SCA the Tactical Game Approach (TGA), one of the methodologies which can be used in the school context (Mitchell, Oslin, & Griffin, 1997), increases tactical complexity by dividing the process into three stages: modified games, the development of tactical awareness and decision making. The tasks are based on forms of play where a tactical problem has to be solved (Mitchell et al., 1997). The key to the students' solving the tactical problems lies in the feedback that the teachers use to direct them towards achieving the proposed objective (Mitchell et al., 1997). This methodology is based on complex practical exercises and specific games (Cañadas et al., 2011). In spite of the pedagogical and motivational benefits of the TGA for the students, some authors question the intensity of practice when using these methods. (Chen, Martin, Sun, & Ennis, 2007).

Several studies have focused on comparing TCA and SCA (González-Espinosa, Feu, García-Rubio, Antúnez, & García-Santos, 2017; Harvey, Cushion, Wegis, & Massa-Gonzalez, 2010; Mesquita, Farias, & Hastie, 2012). These investigations have used different variables like declarative and procedural knowledge, affective aspects, individual technical skill or game performance (Miller, 2015). Differences have been found in the pedagogical and performance variables in favour of the methodologies using the SCA. However, there is a lack of studies analysing the task load variables in the teaching of invasion sports in the school context. This may be due to the lack of material resources available to teachers for their PE classes.

Different instruments can be used to help teachers quantify the load in PE sessions subjectively or objectively. The subjective methods are good substitutes when there is a lack of technological means or access to them. A very commonly used tool to measure eTL is the subjective rating of perceived exertion (RPE) during a class (Borresen & Lambert, 2008; Foster et al., 2001). Ibáñez, Feu and Cañadas (2016) propose an integral system for training task analysis (SIATE by its Spanish acronym), which is a systematic observation system (Morgan, Muir, & Abraham, 2014) that makes it possible to quantify eTL using a system of categories, as well as to analyse pedagogical and organisational variables. In the category of objective instruments for analysing eTL, inertial movement measurement systems have recently appeared equipped with multiple sensors, like accelerometers or global positioning systems (GPS). These tools make it possible to measure, eTL by recording distances, velocities or accelerations (Delextrat et al., 2015; O'Hara et al., 2013), with great reliability and validity (Barrett, Midgley, & Lovell, 2014; Beato, Bartolini, Ghia, & Zamparo, 2016; Muñoz-Lopez, Granero-Gil, Pino-Ortega, & De Hoyo, 2017).

Reina, Mancha, García-Santos, García-Rubio & Ibáñez (2019) conducted a comparative study on the training load supported by young basketball players, through three types of instruments, inertial devices (objective external load), bands of heart rate (objective internal load) and the training record sheet proposed by SIATE (subjective external load). The results showed a high correlation between the three measuring instruments. Along these same lines, Gómez-Carmona, Gamonales, Feu, & Ibáñez (2019) also found a high

correlation between objective external load measured through inertial devices and subjective external load, measured through SIATE, in the tasks of a football team. These data show the importance of recording the training load, regardless of the means used for it, since they are expensive and technological or basic, they report equivalent information.

The eTL study is widespread in the study of team sports such as basketball (Delextrat et al., 2015; Reina, Mancha, & Ibáñez, 2017; Torres-Ronda, Ric, Llabres-Torres, de Las Heras, & Schelling, 2016), but as far as is known, there are few studies that analyze the EC sessions of EF.

The development of the sessions of EF implies a load of training to the students and that load is conditioned by the methodology that the teacher uses in the sessions. The different teaching-learning methodologies have a different task design in variables such as: game situation, game phase, type of content, specific content, means of initiation to training and level of opposition (González-Espinosa, Ibáñez & Feu, 2017). The design of the tasks is conditioned by the means of initiation to training and the game situation. Depending on the means of initiation to training and the game situation, the intensity of the tasks may vary. According to the recommendations of the WHO (2010) and different scientific studies on the recommendations on the intensity of physical sports activities at school age, it is necessary that students have a high intensity in their EF sessions (Bendiksen et al., 2014; Ingul, Tjonna, Stolen, Stoylen, & Wisloff, 2010; Sperlich et al., 2010). Given the scarcity of studies comparing the EC of the tasks used by teachers in the school context and its methodology, they make it necessary to carry out studies that provide clarity on the physical demands posed by the tasks for learning sports in school. The new inertial devices allow quantifying the eTL objectively. For all the above, the objective of this study is to characterize and compare the eTL of the different types of tasks that are developed in the sessions of PE between two different teaching-learning methodologies, in teaching a collaborative-opposition sport as basketball.

There is also a lack of studies comparing eTL produced by the use of tasks designed using different methodological approaches, either teacher or student centred. Thus the objective of this study was to characterise and compare eTL in the different types of tasks developed in PE lessons using two different teaching learning methodologies, for teaching a collaboration-opposition sport like basketball.

METHOD

Design

The design of the present study was defined as quasi-experimental since it intends to establish a cause-effect relationship and meets the requirement of manipulation of at least one independent variable, but it is not possible (or unethical) to comply with the random assignment for ensure that there are no differences between groups before assigning a program to each one. In

addition, it is part of the longitudinal studies of repeated measures (pretest and posttest) (Ato, López and Benavente, 2013).

Sample

The sample was made up of a total of 40 tasks, 20 in each teaching methodology. The basic analysis unit was the recording from each student for each type of task. A total of 2,139 recording were made for each of the study variables. Of these, 1,087 were from the TGB and 1,052 from the DIB programme. Table 1 shows the total of recordings collected as a function of the types of tasks included in the intervention programmes.

Table1. Distribution of the sample according to game situation

	TGB	DIB	TOTAL
1x0	488	425	913
Off +1	46	89	135
1x1	278	253	531
2x2	177	194	371
3x3	98	91	189
TOTAL	1087	1052	2139

Participants

Seventy students of 10 to 12 years of age (*M*= 10.86 +/- 0.53) from an infants and primary school in southwest Spain took part in the study. The students were from the 5th and 6th years of primary education. There were two groups at each educational level. In each educational level there were two groups, so there were four groups in total: 5ºA (13 students), 5ºB (12 students), 6ºA (21 students) and 6ºB (24 students). The students of 5ºA and 6ºA were those who received the intervention program Tactical Game in Basketball (TGB). The Direct Instruction in Basketball (DIB) intervention program was developed with students in classes 5ºB and 6ºB. They have been randomly trained by the school since the students become part of the school (3 years). The choice of the different programs for each group was made randomly and before meeting the students. All students in both groups carry an inertial physical activity recording device.

Ethical declaration

The school authorised this intervention with the students adding it to the annual general syllabus. All the parents/guardians of the students signed their informed consent to authorise their participation in the study. The research satisfied the ethical principles set out in the Declaration of Helsinki and was approved beforehand by the ethical committee of the local University (nº 67/2017).

Variables

Teaching programmes

Two specifically designed (González-Espinosa, Ibáñez, & Feu, 2017) and validated (González-Espinosa, Ibáñez, Feu, & Galatti, 2017) intervention programmes were used in this study based on the TCA and SCA methodologies.

The DIB and the TGB have the same didactic objectives to meet: *discover the technical-tactical means that allow them to move around the pitch to launch to the basket, experience the launching to the basket, present the basic concepts of the defensive phase and start the game collective*. To accomplish these objectives, 20 tasks were designed for each teaching-learning methodology (Table 2). The game situation of the tasks of the DIB and the TGB were 1vs0, 1vs1, 2vs2, 3vs2 and 3vs3. With these game situations it is intended to achieve the objective of the area that is the initiation to the sport.

Table 2. Objetivos de los programas de intervención.

DIB	OBJETIVO	TGB
T1, T2, T10, T13	Discover the technical-tactical means that allow you to move around the pitch to launch the basket.	A1, A2, A10, A13
T3, T4, T5, T6, T7, T8, T9, T11	Experience the basket shoots	A3, A4, A5, A6, A7, A8, A9, A11
T12, T19	Present the basics of the defensive phase.	A12, A19
T14, T15, T16, T17, T18, T20	Start the collective game	A14, A15, A16, A17, A18, A20

The 20 tasks are carried out during ten intervention sessions. The intervention programs were analyzed through SIATE, identifying that in the pedagogical variables that define the training tasks, there were no differences. The game phase was analyzed (phase in which a team in sports invasion is determined, usually, the possession of the ball), type of content (they are grouped into individual, group and team contents, both for the development of the contents of the attack and defense phase, as well as for tactical behaviors and technical gestures), specific content (content of the specific sport to work) and play space (space in which athletes have to perform the proposed tasks).

The duration of each intervention program is a total of ten sessions. The ten sessions were divided into two parts: the five initial sessions were focused on the individual game and the five final sessions on the collective game. Game situations increase with the evolution of the sessions, starting with simple game situations (1vs0 and 1vs1), to end up in situations close to the real game (3vs3). The sessions were divided into five tasks each, increasing the complexity of the game situation progressively. Each session lasted 50 minutes, using the initial 10 minutes to place the inertial devices, having a total session time of 40 minutes.

In the school context, the official curriculum proposes in the area of physical education in block 2: sport, games and health as content to work the sport in the initiation. It was considered by the researchers that the most complex game situation to work in the school context was 3vs3. This game situation complies with the technical-tactical principles of the sport of basketball at the start and is a reduced form of play better than that of 5vs5 (McCormick et al., 2012). In addition, the 3vs3 game situation is an adaptation that adapts to the needs of the official curriculum. To get to the 3vs3 game situation, previous game situations are worked in order to progress in complexity and situation of the game until 3vs3 as Ibáñez (2002) proposes.

Game situation

This is defined as the groups of players determined by the coaches for each type of task (Ibáñez et al., 2016). The different game situations used in this research were: a) 1x0, b) 1x1, c) defensive superiority of one player 2x1 and 3x2 (Off+1), d) 2x2 and e) 3x3.

The number of game situations worked on with each methodology was similar as all the designed tasks had the same objective, so two analogous tasks were designed, one for each programme, with the same game situation. Some tasks had different game situations in spite of setting the same objective, due to the differences between the two teaching learning methods.

ETL variables

The kinematic eTL variables used for this study were: i) metres covered per minute (m/min); ii) accelerations per minute, changes in the magnitude of the velocity of more than +2m/s^2 (acc/min); iii) decelerations per minute, changes in the magnitude of the velocity of more than -2m/s^2 (dece/min); iv) maximum velocity (V_{max}); v) mean velocity (V); vi) high intensity activity (HIA) (activities performed at more than 16km/h for more than 5 seconds); vii) walk (<6 km/h); viii) jog (6-12 km/h); ix) run (12-18 km/h); x) sprint (>18 km/h); xi) number of sprints ($N_{sprints}$); xii) steps per minute (steps/min); and xiii) jumps per minute (>3G y >600ms) (jumps/min). The neuromuscular eTL variables used were: maximum Player Load (PL_{max}) and Player Load per minute (PL/min). Player Load is the sum of the accelerations produced in the three planes of movement that estimate total training load (Barrett et al., 2014).

The study velocity variables were adapted to the sample by K-means clustering for 4 groups. The statistical analysis identified four ranges of velocity which were characterised as *walk* (0-6 km/h), *jog* (6-12 km/h), *run* (12-18 km/h) and *sprint* (> 18 km/h). The N_{sprint} included every time velocity went above 18km/h.

Instruments

Wimu™ (*RealTrack Systems*™) inertial devices were used to record the eTL variables and monitor physical activity and movement in real time. They record

the data with eight different sensors (accelerometers, pedometers, GPS, etc.). The *Wimu*™ devices are worn by the subjects in custom-made vests and provide a file of raw data from each sensor that is later combined to analyse all possible variables using the official software programme (*Spro*™).

Procedure

Before the intervention in the school context, training was conducted on the intervention in both teaching-learning methodologies with the teacher who was going to carry out the sessions with both teaching programs. The teacher who conducted the sessions is graduated in education and with research training in teaching methodologies. It is a researcher trained exprofeso for the application of the programs. For this, he had a deep knowledge of the characteristics of the research, of the programs and of the way of intervening in each one of them, avoiding bias. Prior to the development of the research, pilot practical sessions were held with another group of students to verify the suitability of the intervention. In addition, to control the teacher during the sessions, his intervention was recorded with a microphone and video.

Firstly data were collected from the school while administering the DIB programme to one group and the TGB programme to another at each educational level. All the lessons were recorded with the *Wimu*™ devices.

After the intervention in the school, the data obtained in the classes were analysed using *Spro*™ software. An exploratory analysis was performed to eliminate outliers and then *K-means* clustering was used to establish the ranges of the variables related to velocity, adapting and personalising them to the study sample. This final data set was used by the *Spro*™ software to configure a specific analysis for the study sample and obtain the final results of the intervention.

Data analysis

All the variables of eTL were normalised to the unit per minute to be able to suitably compare each data record. First the tests to check normality (Kolmogorov-Smirnov), equality of variances (Levene) and randomness (Rachas) were performed (Field, 2009). Given the results obtained it was decided to use non-parametric statistics to test the hypotheses. A descriptive analysis was carried out using the means and standard deviations of all the variables. The different game situations in the DIB and TGB programmes were compared using the *Mann-Whitney* U test (Field, 2009). The *Kruskal-Wallis* H test was used to analyse differences between the types of tasks in the two methodologies. Effect size was calculated to ascertain the relevance of the differences between the two groups using Cohen's d, defining effect sizes of .20 as small, of .50 as medium and of .80 as large (Thalheimer & Cook, 2002). The SPSS v.21 (Inc, Chicago, IL, USA) programme was used for the statistical analyses. In this study significance was set at $p < .05$.

RESULTS

Figure 1 presents the descriptive results of the DIB and TGB programmes for each variable in the 1x0 game situation.

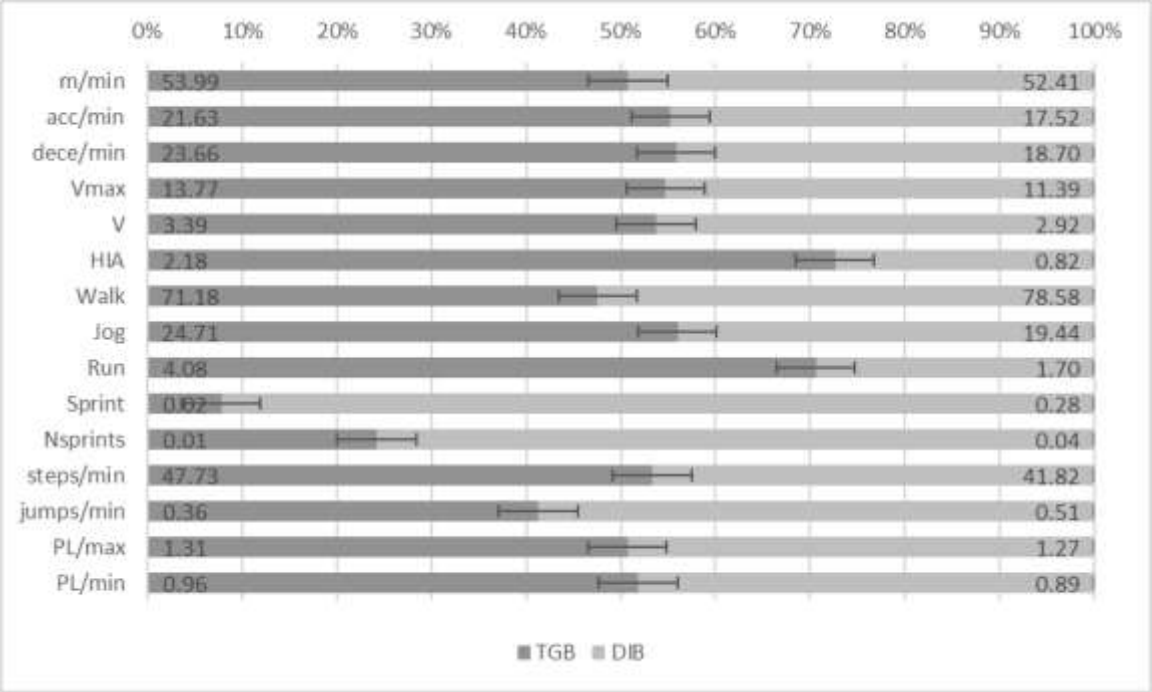

Figure 1. Descriptive results of the 1x0 game situation

Figure 1 shows the average of each group with number and the colored bars represent the weight of the average versus the average of the other group. In addition, the deviation of both measures is presented.

The results show that in the 1x0 game situation the TGB programme obtained higher values in *m/min*, *acc/min*, *dece/min*, V_{max}, *V*, *HIA*, *jog*, *run*, *steps/min*, PL_{max} *and PL/min.* The DIB programme revealed higher values in *walk*, *sprint,* N_{sprint} *and jumps/min*. The *HIA* (TGB=2.177/DIB=.822), *run* (TGB=4.083/DIB=1.703), *sprint* (TGB=.024/DIB=.283) and N_{sprint} (TGB=.014/DIB=.045) variables were those that showed the most differences in the descriptive statistics of the two programmes.

Figure 2 shows the descriptive results of each variable analysed in the Off+1 game situation.

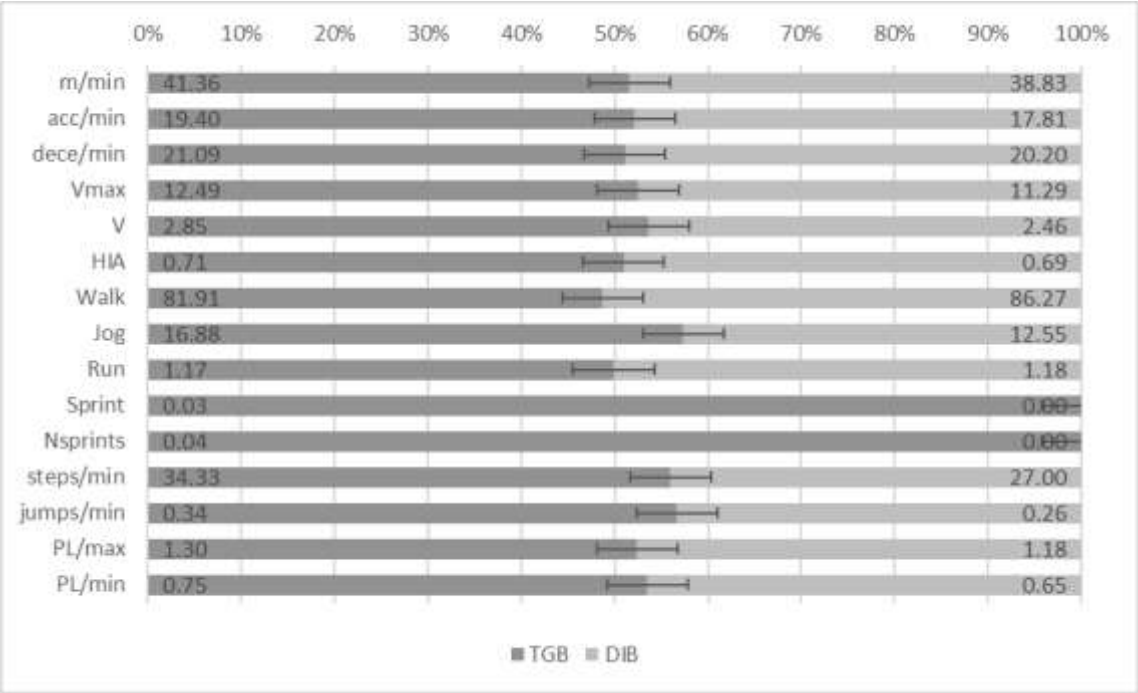

Figure 2. Descriptive results of the Off+1 game situation.

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In tasks where the game situation was one of offensive superiority of one player it is noteworthy that all the variables except *walk* (TGB=81.91/DIB=86.27) and *run* (TGB=1.173/DIB=1.178) obtained higher values in the TGB programme. It is also noticeable that there were no sprint velocities in the DIB programme and therefore no sprints were recorded.

Figure 3 presents the descriptive results of the 1x1 game situation as a function of the teaching learning methodology used.

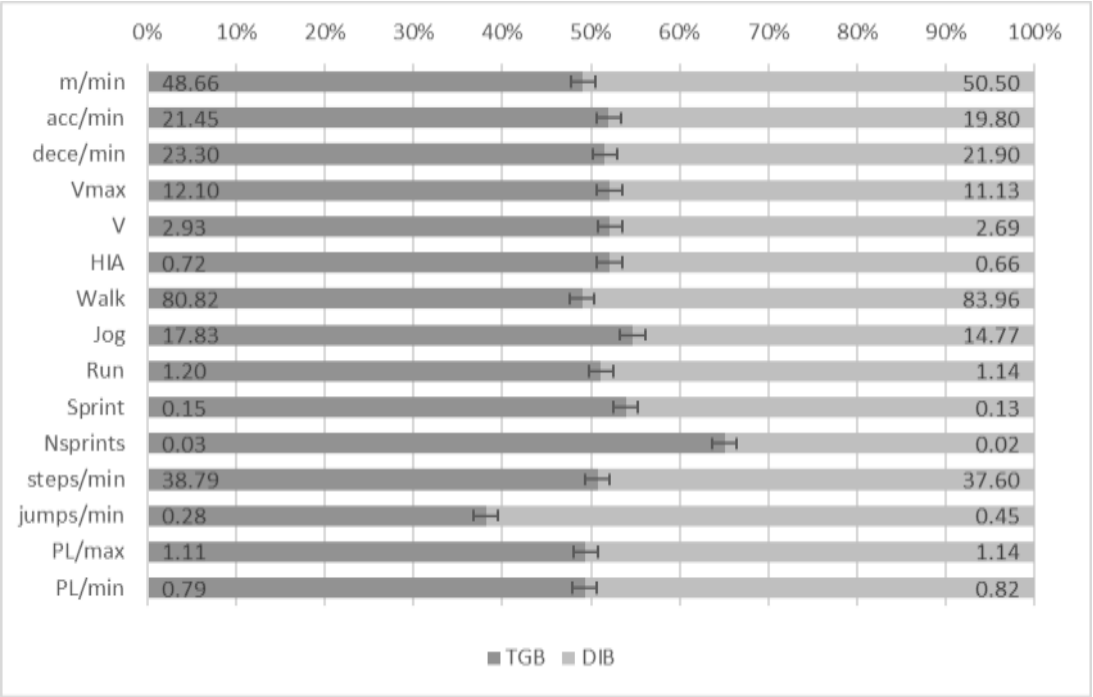

Figure 3. Descriptive results of the 1x1 game situation.

In the descriptive analysis of the 1x1 game situation there is a great similarity in almost all the variables between the two methods, although the TGB programme obtained slightly higher values in most of them. The variables which most stand out are: N_{sprint} (TGB=.029/DIB=.015) and *jumps/min* (TGB=.277/DIB=.448).

Figure 4 presents the results of the 2x2 game situation in each of the intervention programmes.

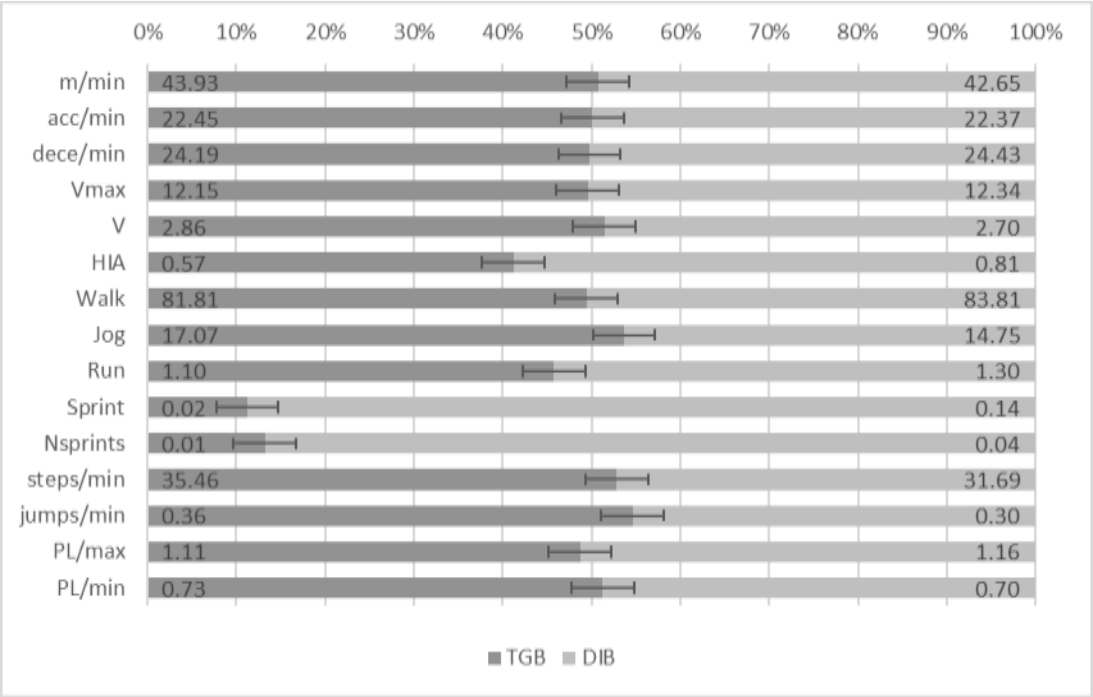

Figure 4. Descriptive results of the 2x2 game situation.

In the 2x2 game situation there were few differences between the two teaching learning methods except in the variables of *HIA* (TGB=.565/DIB=.807), *sprint* (TGB=.0178/DIB=.139) and N_{sprint} (TGB=.006/DIB=.037) where the DIB method recorded higher values than TGB.

Figure 5 shows the means and standard deviations obtained for each method in the 3x3 game situation.

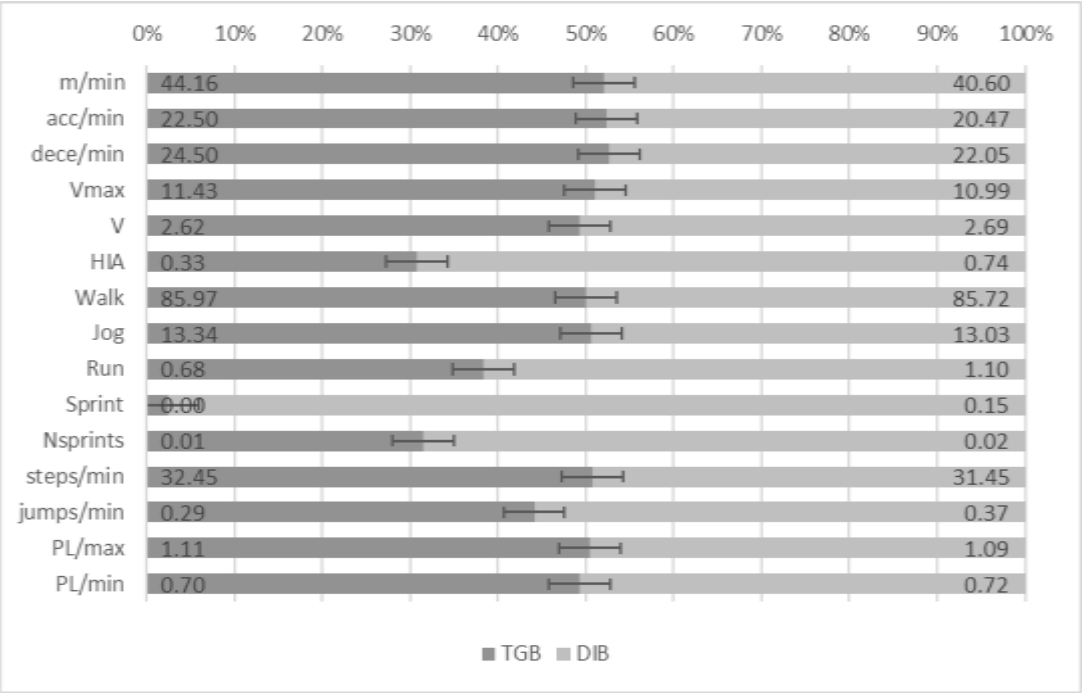

Figure 5. Descriptive results of the 3x3 game situation.

The variables which showed the greatest differences between the two methods were: *HIA* (TGB =.327/DIB =.738), *run* (TGB =.683/DIB =1.098), *sprint* (TGB = .004/DIB =.147) and N_{sprint} (TGB =.010/DIB =.022). All of these variables obtained higher values in the DIB programme. There were differences in the rest of the variables but they were not statistically significant.

Table 3 shows the differences between the intervention programmes in all the analysed eTL variables as a function of game situation.

Table 3. Comparison of the game situations as a function of the teaching learning method.

	1x0	η^2	*d*	Off +1	η^2	*d*	1x1	η^2	*d*	2x2		η^2	*d*	3x3	η^2	*d*
M/min	.000**	.021	.296	.220	.011	.212	.744	.000	.028	.246		.004	.121	.071	.017	.265
Acc/min	.000**	.023	.306	.219	.011	.213	.194	.003	.111	.513		.001	.068	.403	.004	.122
Dece/min	.000**	.037	.390	.334	.007	.166	.218	.003	.106	.542		.001	.063	.359	.004	.134
V_{max}	.000**	.188	**.962**	.030*	.035	.380	.000**	.028	.342	.562		.001	.060	.057	.019	.280
V	.000**	.145	**.824**	.000**	.104	**.681**	.000**	.054	.478	.000	**	.039	.401	.428	.003	.116
HIA	.000**	.143	**.817**	.194	.008	.180	.059	.004	.134	.580		.001	.048	.585	.001	.057
Walk	.000**	.093	**.642**	.014*	.045	.433	.000**	.031	.357	.013		.017	.259	.857	.000	.026
Jog	.000**	.065	**.527**	.003**	.065	**.526**	.000**	.030	.351	.002	**	.025	.320	.747	.001	.047
Run	.000**	.198	**.932**	.208	.010	.197	.003**	.014	.241	.448		.001	.074	.431	.002	.099
Sprint	.366	.000	.022	.048*	.001	.071	.548	.000	.016	.061		.001	.062	.267	.000	.041
$N_{sprints}$	.021*	.000	.041	.048*	.001	.071	.246	.000	.023	.117		.000	.036	.512	.000	.021
Steps/min	.000**	.037	.390	.022*	.039	.401	.407	.001	.071	.035	*	.012	.219	.548	.002	.088
Jumps/min	.000**	.018	.274	.043*	.030	.349	.000**	.045	.436	.378		.002	.090	.857	.000	.026
PL_{max}	.297	.001	.068	.413	.005	.141	.233	.003	.102	.268		.003	.115	.610	.001	.074
PL/min	.001**	.011	.216	.095	.020	.289	.219	.003	.105	.204		.004	.132	.779	.000	.041

*p<.05; **p<.01. d>.50 in bold

In the case of the 1x0 game situation there were significant differences in all the variables except *sprint* and $PL_{max.}$ The *Off+1* game situation accounted for more than half the variables which differentiated between TGB and DIB. In the 1x1 and 2x2 game situations there were fewer variables with statistically significant differences specifically five, and three with *p<.05*. In the 3x3 game situation no variable showed a statistically significant difference between the two programmes. The effect sizes revealed important differences in the 1x0 and Off+1 game situations.

Table 4 shows the differences in the games situations for all the eTL variables analysed in the TGB programme. Significant differences were found in *m/min, V_{max}, V, HIA, walk, jog, run, steps/min, jumps/min, PL_{max}* and *PL/min*. The tasks using 1x0 are the ones which stand out among the others. The effect size in the significant variables was medium and large.

Table 4. Differences, effect size and power among the different game situations in the TGB teaching learning programme.

	p	Post-Hoc	η^2	*d*
M/min	.000**	A,B,C,D,E,F,G	.115	**0.724**
Acc/min	.596			
Dece/min	.199			
V_{max}	.000**	A,B,C,D	.141	**0.811**
V	.000**	A,B,C,D,F,H	.233	**1.102**
HIA	.000**	A,B,C,D	.158	**0.867**
Walk	.000**	A,B,C,D,F,H	.265	**1.201**
Jog	.000**	A,B,C,D,F,H	.219	**1.060**
Run	.000**	A,B,C,D	.184	**0.948**
Sprint	.282		.001	0.062
$N_{sprints}$	.284		.001	0.061
Steps/min	.000**	A,B,C,D,F	.108	**0.695**
Jumps/min	.018*	A	.007	0.170
PL_{max}	.000**	A,B,C	.021	0.295
PL/min	.000*	A,B,C,D	.088	**0.621**

A=1x0-1x1; B=1x0-2x2; C=1x0-3x3; D=1x0-Off+1; E=1x1-2x2; F=1x1-3x3; G=1x1-Off+1; H=2x2-3x3; I=2x2-Off+1; J=3x3-Off+1.

*p<.05; **p<.01. *d*>.50 in bold

Table 5 below shows the differences between the game situations in all the eTL variables analysed in the DIB programme. Statistically significant differences were found in *m/min, acc/min, dece/min, V_{max}, V, walk, jog, steps/min, jumps/min* and *PL/min*. The task showing the greatest difference was 1x0. The effect sizes were small in all the variables except *m/min, steps/min*, and *PL/min.*

Table 5. Differences, effect size and power among the different game situations in the DIB teaching learning programme..

	p	Post-Hoc	η^2	*d*
M/min	.000**	B,C,D,E,F,G,I	.111	**0.707**
Acc/min	.046*		.005	0.145
Dece/min	.035*		.006	0.153
V_{max}	.003**	B,E,H	.011	0.211
V	.000**	A,B,C,D,G,I	.040	0.410
HIA	.380		.000	0.027
Walk	.000**	A,B,C,D	.030	0.351
Jog	.000**	A,B,C,D	.032	0.363
Run	.385		.000	0.024
Sprint	.083		.004	0.126
$N_{sprints}$	.120		.003	0.111
Steps/min	.000**	A,B,C,D,E,F,G	.100	**0.665**
Jumps/min	.000**	B,C,D,E,G	.038	0.396
PL_{max}	.080		.004	0.126
PL/min	.000**	B,C,D,E,F,G	.082	**0.597**

A=1x0-1x1; B=1x0-2x2; C=1x0-3x3; D=1x0-Off+1; E=1x1-2x2; F=1x1-3x3; G=1x1-Off+1; H=2x2-3x3; I=2x2-Off+1; J=3x3-Off+1.
*p<.05; **p<.0. d>.50 in bold

DISCUSSION

The aim of this study was to analyse the differences in eTL variables depending on the game situation and the method used for teaching basketball in the school context. The results obtained show that the TGB methodology produced higher values in the variables that determine eTL than the DIB method. The differences between the two methods decreased when the complexity of the game situation increased (Bendiksen et al., 2014; Ingul, Tjonna, Stolen, Stoylen, & Wisloff, 2010; Sperlich et al., 2010). The difference between the two methodologies is greater in the simplest game situations. The difference between the two methodologies is reduced when the complexity of the game situation increases. The intensity of the sessions of the TGB is greater than those of the DIB, so its use in the school context is more beneficial for the students' health.

When using the methodologies based on the game, teachers can establish and modify different learning situations to improve the students' training (Climent et al., 2015). This progression also includes the technical-tactical contents and physical fitness. The results show that the tasks designed according to the TGB methodology produce a greater eTL in simple game situations like 1x0, 1x1 and Off+1 than those that follow the DIB approach (Bendiksen et al., 2014; Cañadas et al., 2011; Faude et al., 2010). The design of the task and the organization of the students are variables that have modified the CE, being variables of great relevance so that there are significant differences between each methodology in the simplest game situations. The design of training tasks is a very important process for planning both physical demands and pedagogical requirements. It has been shown that changes in the groups of players and the presence of

opponents determines the burden of the task (Gómez-Carmona et al., 2019). The differences between the TGB program and the DIB program decrease as the complexity of the game situations increases. Another reason for differences between the programs is the different means of training that can be used in the tasks. The means of initiation to training can be: i) Simple Application Exercise; ii) Complex Application Exercise; iii) Inespecific Simple Game; iv) Specific Simple Game; v) Inespecific Complex Game; vi) Specific Complex Game; vii) Predeporte or Adapted Sport / Reducid; viii) Sport; ix) Competition; x) Mental Practice (Ibáñez et al., 2016). The means of initiation to the most used training in the TGB program is the specific simple game and the specific complex game. On the other hand, the means of initiation to training that predominates in the TGB program is simple application exercise.

In both intervention programs similar trends in the results are observed despite the difference between the two. In the TGB and in the DIB, the simplest game situations (1vs0, 1vs1, Off + 1) have a higher CE than the more complex situations (2vs2 and 3vs3). When the number of players increases the intensity of the task decreases (Conte, Favero, Niederhausen, Capranica, & Tessitore, 2016). Similarly, in situations with fewer players there is more practice and improvement of the technical elements of the game, while interacting with a larger number of players and opponents improves decision making in the game (Conte et al, 2016). The simplest situations (1vs0 and 1vs1) allow players to get more involved in the game, where they have a shorter duration of repetitions and favor defenses or attacks being more aggressive. When players have a continuous participation in the game or in the task presented to them, the efforts they make are greater, increasing the intensity of the actions (Conte et al., 2016). In addition, in the individual game situations the solutions that players have to make do not depend on the help of other partners, but rather depend exclusively on their physical and technical capabilities.

On the other hand, game situations with more team mates and opponents (2vs2, 3vs3) present greater tactical complexity and less physical effort, and thus the eTL is lower (Bendiksen et al., 2014; Harrison, Gill, Kinugasa, & Kilding, 2013). When the players participate continuously in the game or task presented, their efforts are greater, decreasing the intensity of their actions (Conte et al., 2016). In fact, differences in sports learning as a function of the teaching methodology have already been studied, showing that the methods centred on the game provide greater learning effects both in decision making and skill execution and related tactical behaviours (Ibáñez, Feu, Cañadas, González-Espinosa, & García-Rubio, 2016).

In the literature there are several works that conclude that the modification of the game situations in the teaching and sports training tasks determines the behaviors that the players perform, modifying the training load and the technical and tactical actions that are performed (Dellal, Lago-Penas, Wong, & Chamari, 2011; Gabbett, Jenkins, & Abernethy, 2010; Ngo et al., 2012). This method is commonly used in teaching sports like basketball (Conte, Favero, Niederhausen, Capranica, & Tessitore, 2015). The use of the different teaching methodologies also modifies and alters the variables related to the players' learning and experience. In fact, the same game situations can be oriented

towards one or other of the methodologies changing the students' learning (Cañadas, Ibáñez, García, Parejo, & Feu, 2013). PE teachers' training programmes should highlight the importance of the difference between different approaches in task design, both at the physical fitness level and regarding technical-tactical learning.

In many cases, students only perform physical activity in the school context, specifically in the area of EF (Guerra, Nobre, da Silveira, & Taddei, 2013). In Spain, PE is mandatory from the beginning of primary education (6 years) to the end of secondary school (16 years) with a frequency of two weekly classes of 60 minutes. The WHO (2003) recommends a minimum of 60 minutes a day of this physical activity for school age children to foment a healthy life style and prevent cardiovascular and other diseases in adulthood (Andersen et al., 2006; Trudeau, Shephard, Arsenault, & Laurencelle, 2003). The importance of the intensity of this physical activity has recently been demonstrated for improving physical fitness and preventing disease (Bendiksen et al., 2014; Ingul, Tjonna, Stolen, Stoylen, & Wisloff, 2010; Sperlich et al., 2010). Thus it is important to monitor and increase intensity in PE classes, using teaching learning methodologies and situations that increase physical demands and eTL to improve the physical fitness of the students. Furthermore, PE classes consisting of ball sports are a better choice than traditional PE contents from a fitness and health point of view (Bendiksen et al., 2014).

With all of the above, the importance of increasing the intensity of EF classes is evidenced. For this, the results of the study show that the TGA methodology and the simplest game situations favor a greater intensity of the session, increase the physical demands of the EC and improve the physical condition of the students. In addition, the use of EF sessions where the contents are sports with the ball is a better choice than the use of traditional EF contents from a physical and health point of view (Bendiksen et al., 2014). In addition, the existence of short rest periods, typical of initiation means such as play, allows the appearance of improvements in other physical aspects other than aerobic, such as neuromuscular (Bishop, Girard, & Mendez-Villanueva, 2011), favoring , for example, the ability to repeat sports springs.

CONCLUSION

The programmes designed for this study work on simpler game situations appropriate for sports initiation. The results show that these simple game situations produce higher values of eTL than more complex ones. The intensity of the tasks performed in the TGB programme are more beneficial for the students' health, and teachers should use the TGB teaching methods for initiation into this sport. By using this programme designed according to the TGA methodology teachers will favour greater technical and practical knowledge. The tasks are also adapted to the students' level of experience, with mainly 1x0 and 1x1 situations causing a greater eTL. The intensity of the TGB programme is more beneficial for health as it is higher that that of other more directive programmes.

Currently the Spanish education system only guarantees two hours of PE a week. Given this limited amount of time for following basic recommendations for the students' health, teachers are advised to use methodologies that imply greater physical and learning benefits like those based on the SCA. It is also advisable that teachers design and validate specific programmes based on the different teaching methodologies before beginning any intervention or research process.

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