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Hybridisation of the Teaching Personal and Social Responsibility Model and Gamification in Physical Education

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Abstract

The purpose of this study was to analyse the outcome of a teaching intervention based on hybridising the Teaching Personal and Social Responsibility (TPSR) pedagogical model and innovative gamification strategy. It uses a mixed methods analysis consisting of the observation of teacher-student interaction and student motivation questionnaires to demonstrate the impact of this innovative teaching approach on both genders. The sample consisted of 55 students from a school in the Region of Murcia (28 girls and 27 boys) aged 13 to 17 (M = 14.29; SD = 0.875) from two courses in 2nd- and 3rd-year lower secondary education. The observational analysis of the teacher's performance and teacher-student interactions was conducted by recording ten sessions on video, coded with the Personal and Social Responsibility Observation (SORPS) instrument and recorded with the LINCE v.2.0 software. The THEME v.6 Edu. software was used to obtain the behavioural temporal patterns (t-patterns). The Secondary Education Motivation Scale (EME-S) was administered to analyse the students' self-determined motivation and the data were entered in the SPSS v.22.0 statistical program to perform the Wilcoxon signed-rank test. The results showed a clear assignment of autonomy and responsibility to the participants in the teacher's behaviours which generated greater self-determined motivation among the students. In conclusion, the application of a programme based on hybridising the TPSR pedagogical model and gamification is effective in improving student levels of autonomy, responsibility and motivation.

Keyword: pedagogical innovation, pedagogical model, t-pattern detection, mixed methods re-search

Introduction

Around the 1970s, leading figures in the area of physical education (PE) such as Muska Mosston introduced concepts including learning strategies and teaching styles to open up new perspectives for teachers and move away from the military ap-proach prevalent in PE (Mosston & Ashworth, 2002). This allowed progress to be made in the didactic aspects of PE at that time by shifting from a teacher-centred teaching-learning process to a more student-focused approach (Menéndez & Fer-nández-Río, 2016a).

Over the years, fresh concepts relevant to education in general were introduced, such as Joyce and Weil's (1985) teaching model, defined as a structured plan used to shape the curriculum, teaching materials and teaching practice. For PE in particu-lar, it was defined as the curriculum model by Jewett et al. (1995), seen as a general pattern for creating contextualised programmes that include learning objectives, con-tent, procedures and environments, or the instructional model by Metzler (2011) re-ferring to a teaching intervention based on learning theories, educational context, objectives, content, class management, teaching strategies and styles and assessment (Menéndez, 2017).

However, Haerens et al. (2011) subsequently introduced the new pedagogical model concept which emphasises the interdependence between teaching (teacher), learning (student), context and content in order to build teaching programmes or units which facilitate student learning by creating learning environments that are consistent with these models (Peiró & Julián, 2015).

Innovation in PE's pedagogical models

Against this backdrop of innovation, Blázquez (2016) underscores the importance of introducing active methodologies and how to implement them as a curricular component which fosters skills development, motivation and active participation. Pedagogical models are part of these active methodologies which, together with model-based practice (MBP), are replacing teacher-centred teaching (Hastie & Casey, 2014).

The more tried and tested pedagogical models (PM) include the Teaching Games for Understanding (TGFU) model (Thorpe & Bunker, 1989); the Teaching Personal and Social Responsibility (TPSR) model (Hellison, 2011); the Cooperative Learning (CL) model (Johnson et al., 2013); the Sport Education (SE) model (Siedentop et al., 2011) or the Health-Based Physical Education (HBPE) model (Haerens et al., 2011). Not all PMs can be applied to all educational contents and/or contexts, which means that they have to be used and combined with each other and also be mixed with innovative methods and new pedagogical strategies.

The Teaching Personal and Social Responsibility (TPSR) model

The TPSR model (Hellison, 1995) emerged as a physical activity programme aimed at young people at risk of social exclusion in the cities of Chicago and Port-land in the United States. The purpose of the programme was to provide this group with a series of learnings, behaviours and values through the development of re-sponsibility which would be useful for the fulfilment of their personal lives. Hellison (2011) worked on values through physical activity and sport based on five progres-sive and cumulative levels of responsibility with concrete and simple goals: a) re-spect for the rights and feelings of others; b) participation and effort; c) personal au-tonomy; d) helping others and leadership; and e) activity outside the context of sport.

Over the last decade, the TPSR model has been used much more widely to work on values through physical activity, thus making it a core component in PE (Escartí et al., 2011; Belando et al., 2012; Sánchez-Alcaraz et al., 2016).

The gamification method

Gamification (GF) is the use of game mechanics in non-game environments to stimulate motivation, concentration, effort, loyalty and other positive values common to games (González & Mora, 2015). However, in education gamification also refers to the use of game features to engage students, motivate them and promote learn-ing and problem-solving (Beltrán, 2017).

It is important to note that while gamification does include game features for them to be leveraged in the educational framework, it is not a question of using games in themselves but rather of taking some of their features and operating mechanics to enhance the learning experience (Deterding et al., 2011). The constituent features of gamification are: dynamics (rewards, status, achievements, competition, altruism, feedback or fun); mechanics (levels, avatars, missions or challenges, virtual goods, gifts or prizes); aesthetics (images that are pleasing to the player's eye); motivation through challenge; problems and goal (Kapp, 2012; Zichermann & Cunningham, 2011).

Gamification has been introduced in PE as a new method for teaching teams and has become established as an emerging learning strategy since it provides positive aspects such as fostering motivation, student interest in learning, greater perfor-mance and adherence to physical activity (PA) (Escarvajal & Martín-Acosta, 2019; Menéndez & Fernández-Río, 2016b; Navarro et al., 2017; Ordiz, 2017; Quintero et al., 2018).

Hybridisation of pedagogical models in PE

The current emergence of new pedagogical models runs in lockstep with their hy-bridisation with diverse teaching methods, a surge of combinations currently put for-ward as an innovative teaching strategy. The inclusion of this type of method in the current educational system is becoming increasingly more significant, since it fur-nishes students with a greater role, participation, autonomy and self-regulation (Puigarnau et al., 2016) and most importantly provides them with greater motivation (Fernández-Río et al., 2016).

TPSR is closely associated with the Sports Education Model (SEM) because they both share certain approaches to responsibility (Siedentop et al., 2011). One of the first studies in which these two models were used in conjunction was rugby (Gordon & Doyle, 2015) where significant improvements in student behaviour were achieved. The recent study by Menéndez and Fernández-Río (2016a) in educational kickbox-ing (non-contact) for 4th-year lower secondary students also stands out. The other major pedagogical model hybridised with TPSR is cooperative learning (CL) (Merino et al., 2017) due to the connections between the two models; the teaching-learning process is student-centred; learning takes place in a participatory context; the student takes responsibility for active learning and social interaction (Fernández-Río, 2014).

There are few projects in this innovation strand that build TPSR into a gamification project. The purpose of this study was to implement a teaching strategy based on hybridising the TPSR pedagogical model (providing greater prominence, participa-tion, autonomy and self-regulation) with gamification to observe behavioural patterns in a teacher's performance and their impact on the motivation, differentiated by gen-der, of their PE students over a school term.

Methodology

Participants

The single case study sample consisted of a PE teacher with experience in active methodologies and 55 teenage PE students (28 girls and 27 boys) aged 13-17 (M = 14.29; SD= .875) from two uniform 2nd- and 3rd-year secondary school courses in a state school in the Region of Murcia. The sample was chosen for accessibility and convenience since the teacher used a methodology based on combining TPSR with gamification (TPSR+GF). The exclusion criteria were students who had already taken classes with this type of methodology. The participants, and their parents or legal guardians in the case of underage students, were informed about the study following the guidelines (consent, confidentiality and anonymity) of the University of Murcia's Ethics Committee (ID: 2380/2019).

Instruments used

The *observation instrument* (Table 1) was the Personal and Social Responsibil-ity Observation System (SORPS) (Prat et al., 2019) based on teaching communica-tion (Castañer et al., 2010), validated by experts and tailored to gamification. This instrument consisting of six exhaustive criteria and 22 exclusive categories within the same criterion allowed categorisation of the teacher's performance, recorded on video, and the response of the students in the ten sessions in the innovation programme.

The recording instrument (Figure 1) was the Lince Plus v.1.1. free software (Soto et al., 2019), whose multiplatform versatility allowed visualisation of two images of the session, entry of the SORPS categories, quick coding from the recorded images and automatic log transformation for further processing.

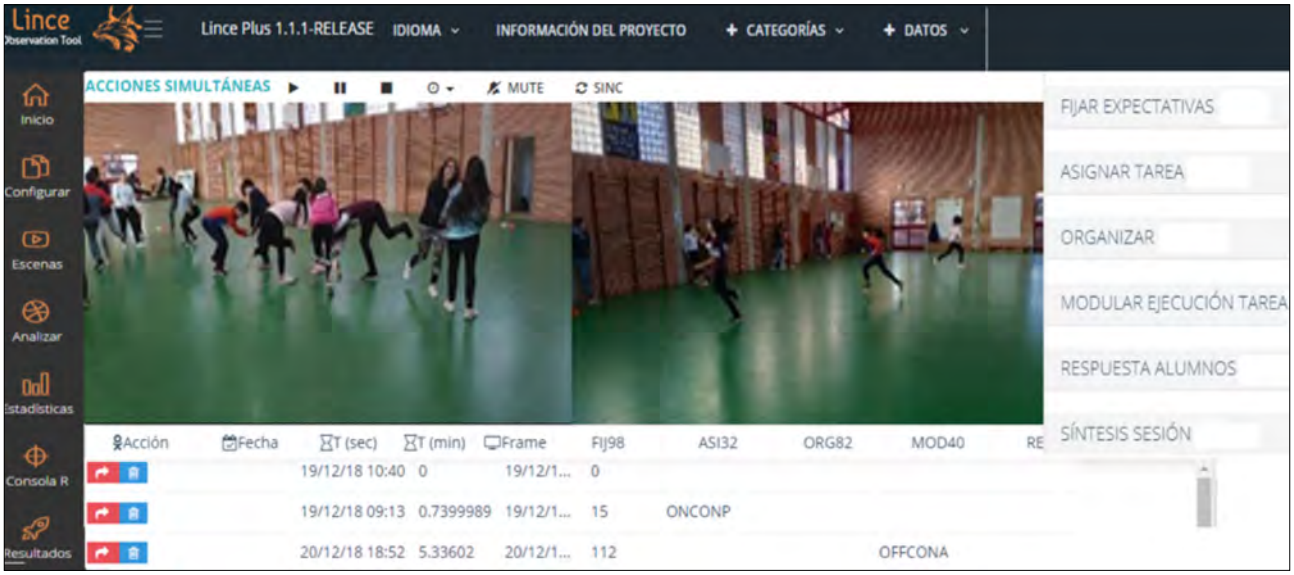
The *motivation questionnaire* was the Secondary Education Motivation Scale (EME-S) (Núñez et al., 2010). It consists of 28 items divided into seven subscores: amotivation, external regulation, introjected regulation, identified regulation, intrin-sic motivation - intrinsic motivation to know (IM-to know), intrinsic motivation towards accomplishments (IM-to accomplish things), and intrinsic motivation to experience stimulation (IM-to experience stimulation). Each subscale consists of four items. The

Table 1
TPSR+GF observation system

Criterion	Category	Code	Description
Expectations	Objective of session	OBS	Prospects and aims of the session
	Objective of task	OBT	Prospects and aims of the task
	Objective of gamification	OBG	Objectives of gamification (music/videos, decoration, etc.)
	Undefined objective	UOB	Not generate session expectations or objectives
Explanation	Imposition Instructions	IMP	Without the possibility to include changes
	Shared	SHA	Proposals are allowed to be decided in common
	Dynamics	DYN	Generate emotions (curiosity), social interrelationships, etc.
Organisation	Established	EST	Spaces and materials are mandated
	Distribution of Function	DIS	Functions and roles are allocated
	Suggested	SUG	Teachers pose opportunities to pupil's interventions
Task adjustments	Negative Evaluation	NEG	Rebuke to the students
	Redirect	RED	Correct student's responses
	Positive Evaluation	POS	Encourage and motivate the students
	Proposals	PRO	Formulate new options to be successful
	Rewards	REW	Offer rewards for good task performance
Student's responses	Reproduction	REP	Replicate tasks or situations
	Unbalances	UNB	Disarranged or disordered responses (talking, distractions, etc.)
	Autonomy and Leadership	AUT	Drive initiatives
	Self-Assessment	SAS	The student evaluates their own performance
Session summary	Guided summary	GUS	The teacher summarises the session
	Shared summary	SHU	The students take part in the session summary
	Non-existent summary	NSU	The sessions end without being summarised

answers were recorded using a seven-point Likert scale from 1) *Does not corre-spond at all to* (7) *Fully corresponds*. The scales were grouped into intrinsic motivation (IM-to know, IM-to accomplish things and IM-to experience stimulation), extrin-sic motivation (identified regulation, introjected regulation and external regulation) and amotivation. The self-determination index was also calculated (SDI, Vallerand, 1997) using the formula [SDI = (Intrinsic M. x 2+Identified R.) - (Introjected R.+External R./2 - (Amotivation x 2)].

Figure 1
Lince Plus recording instrument with a session log (Soto et al., 2019)



Design and Procedure

This descriptive observational study used a mixed method of multilevel triangula-tion (Anguera et al., 2014; Castañer et al., 2013) (Figure 2) for the convergence of the qualitative data from observation of the teacher and the quantitative data from the students' motivational perception.

Once the school and the PE teacher had been informed of the objective of the study and been asked to participate with the endorsement of the University of Mur-cia's Ethics Committee, the students completed an informed consent form (they and their parents or legal guardians).

The intervention was conducted throughout the 2018/19 school year by hybridis-ing TPSR+GF, a new methodological association in PE, over 10 sessions lasting 55 minutes each using a gamification intervention project called "The Enigma of Sen-eb" (Melero et al., 2019). By designing learning scenarios consisting of a motivating aesthetic and activities, the students were encouraged to tackle challenges which took them from the Late Modern Period to Egyptian mythology, while taking in oth-ers such as Aztec, Nordic, Chinese, Greek-Roman and Mesopotamian, in search of "The Root" of PE (Seneb in Egyptian hieroglyphs) to safeguard worldwide physical, psychosocial and emotional health. Hence, affective social relationships, decision-making, social skills enhancement and their transfer outside the school environ-ment were fostered during this intervention (Tarin-Moreno et al., 2013), as were other aspects such as creativity, group membership and motivation.

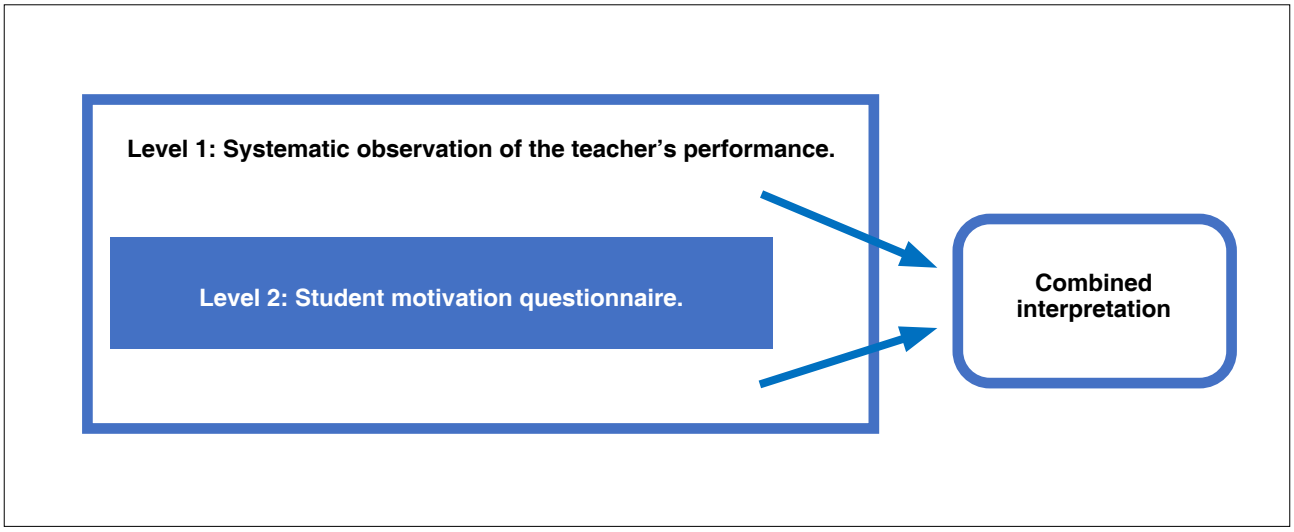
The main objectives of the session were to explore and experience a recreation-al competitive structure and reflect upon the emotional and affective aspects pro-duced by games with winners and losers.

In the first session, lasting approximately 15 minutes, the student participants filled in the questionnaires in the presence of the PE teacher and the lead re-searcher in case any clarification was required. After this initial assessment, video recordings were made of the 10 sessions in the course of the term; five sessions of 2nd-year and five sessions of 3rd-year lower secondary. A Panasonic digital cam-era (Lumix FZ-100) and a wireless microphone worn by the teacher were used. The observers were trained beforehand to check the quality of their record-keeping by calculating the inter-observer and intra-observer reliability concordance using Cohen's kappa coefficient (Cohen, 1960), in which they obtained a mean value of more than 0.86 (Hernández-Mendo et al., 2014).

Data Analysis

Temporal pattern (t-pattern) detection was used, which has yielded excellent re-sults in previous studies (Casarrubea et al., 2018; Castañer et al., 2011; Lozano et al, 2016). In the first analysis to identify the most relevant t-patterns of teacher per-formance and student response, the

Figure 2
Multilevel triangulation of the design



log from Lince Plus (Soto et al., 2019), the set of the 10 sessions, was exported in .txt format to the Theme v.6 Edu. software (Mag-nusson, 2000) and the search parameters of three constitutive multi-events and a significance of .005 were added, as in the study by Prat et al. (2019).

Subsequently, the SPSS v.22.0 statistical program (Statistical Package for the Social Sciences, SPSS Inc.) was used to perform a descriptive and inferential analysis of the results of the participants' initial and final questionnaires in order to de-termine the impact of the intervention on their self-determined motivation. The data-base was pruned to detect atypical cases, and two participants were eliminated as they had a $p < .01$ value in the Mahalanobis distance. Data normality was calculat-ed; for quantitative variables, yielding a value of $p < .05$ in the Kolmogorov-Smirnov test; for categorical variables, yielding a significance level of $p < .05$. Cronbach's test was used to analyse reliability, yielding a value of ($> .70$). Finally, the Wilcoxon signed-rank test for related samples was applied to compare proportions and means of the data collected in the pretest and posttest questionnaires and to see whether there were any significant differences with a significance level of $p < .05$.

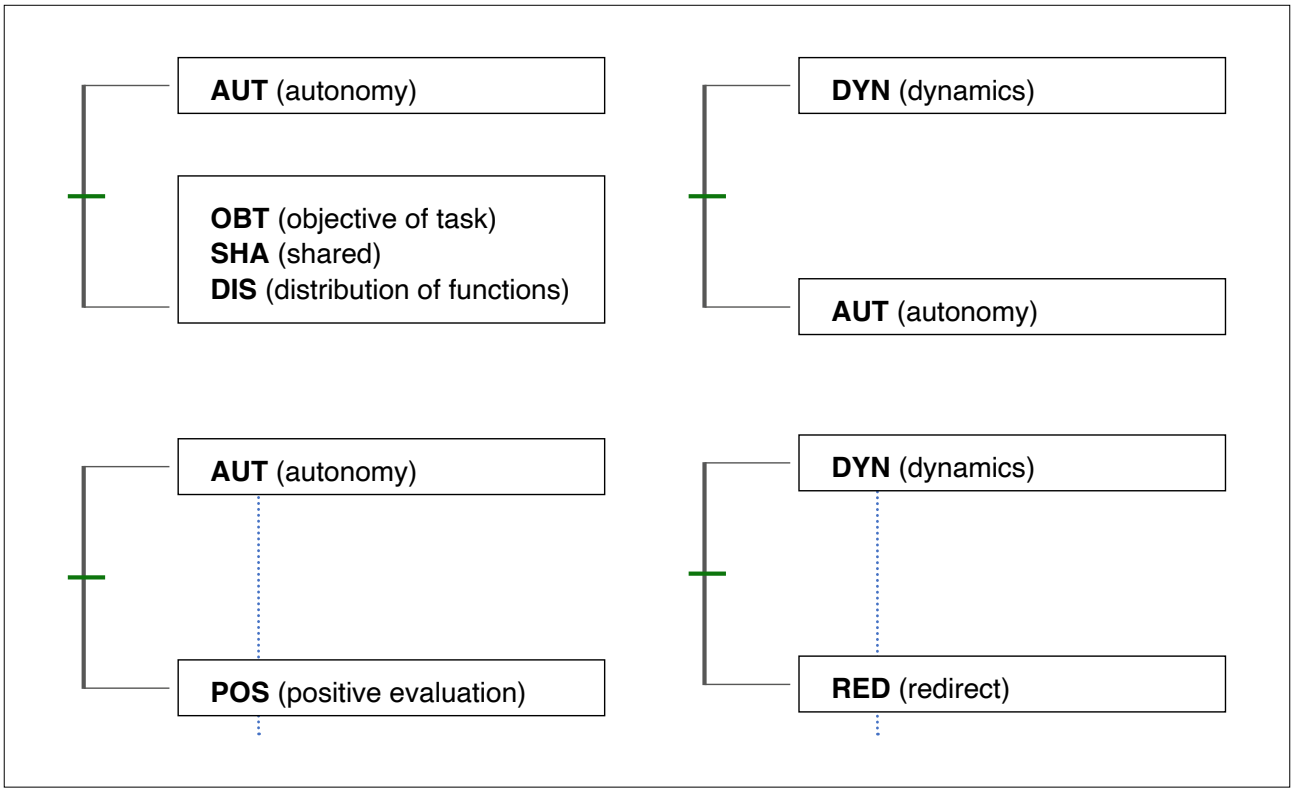
Results

Teacher performance and student response

Four t-patterns representative of the interactive behaviour were obtained with the following interrelated behaviour depicted in the dendrograms below (Figure 3); teacher behaviours that reinforce student autonomy (AUT) and generate shared explanations (SHA) and focus on the objectives of task (OBT) and on distribution of functions (DIS). This reinforcement of autonomy (AUT) was followed by a positive assessment in the form of positive evaluation (POS) or was preceded by generation of emotions by the teacher (DYN). This emotion generation promoted curiosity and interpersonal relations (DYN) among the students, which consequently stimulated autonomy and leadership (AUT) and led to redirection of the task (RED) on another occasion by the teacher.

The more exhaustive analysis of the teacher's performance obtained in the course of the 10 sessions is provided below in the form of a plot (Figure 4). The plot shows how the teacher engaged in a series of behaviours which improved the stu-dents' autonomy and leadership, redirected disarranged or disordered responses and generated curiosity and encouraged social interrelationships and companion-ship by motivating them.

Figure 3
T-pattern dendrogram of teacher performance and student response



These behaviours have been highlighted in Figure 4 in different colours and differentiated areas:

- The lower area (green area, lines 1-5) shows how the autonomy and leadership response of the students (AUT) was repeated with: self-assessment (SAS), shared task or explanation (SHA) and distributing roles in collaborative activities (DIS).
- In the intermediate area (red area, lines 12-22), creating dynamics generating curiosity and emotions, social interrelations (DYN) and companionship (112 times) stood out. Consideration should also be given to the stimulus which emerged with distributing roles, collaborative activities, challenges, tri-als/missions or scoring systems (DIS) combined with exciting dynamics (DYN) that earned rewards (REW).
- In the intermediate area (yellow area, lines 53-57), formulating proposals (PRO) or new options to be successful which were combined with drive initiatives (AUT) were observed; objectives of task (OBT), task proposals (SHA) and distribution of function (DIS) also appeared.
- In the upper area (purple area, lines 67-80), redirection of the student's re-sponse (RED) combined with autonomy and leadership (AUT) and unbalances (UNB) with more regulatory teaching action were particularly prominent, although in lockstep he offered rewards (REW) and positive evaluations (POS) to motivate the students.

Students' perception of their level of motivation

Although there are no significant differences in the relationship between the pre-test and posttest motivation variables (Table 2), differences do emerge in the level of student amotivation (p: .008). This also led to significant changes in the SDI among students, increasing by 1.12 points on average from the beginning (3.41) to the end (4.53) (p = .040).

Figure 4
Teacher and student behaviour distribution plot for all sessions

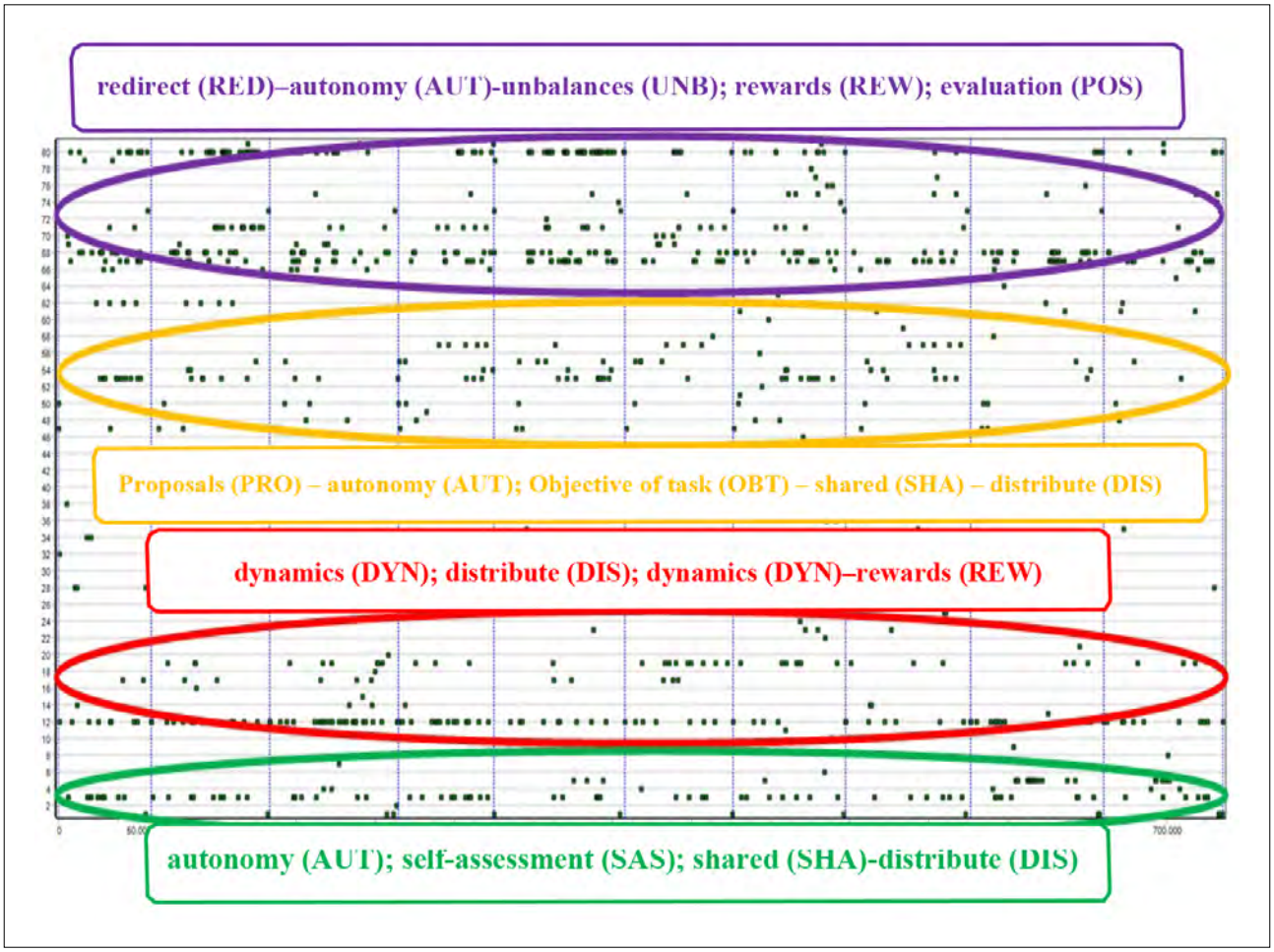


Table 2
Data on student opinions before and after the intervention.

Variables	Pretest		Posttest			
	M	(SD)	M	(SD)	Z	Sig.
Amotivation	2.74	(1.64)	2.14	(1.45)	-2.671	.008**
Intrinsic motivation	4.50	(1.42)	4.42	(1.48)	-.134	.894
Extrinsic motivation	5.38	(1.05)	5.35	(1.07)	-.372	.710
Self-determination	3.41	(4.63)	4.53	(4.47)	-2.057	.040*

Key: M = mean; SD = standard deviation; Z = Wilcoxon signed-rank test value; Sig.= asymptotic significance (2-sided); * = difference has a significance level p < .05; ** = difference has a significance level p < .01

These adjusted data can be seen in Figure 5, where the significant differences between the result of the pretest self-determination index (PRESDI) and the result of the posttest self-determination index (POSSDI) stand out.

The comparison of these data by gender (Table 3) revealed differences between them. In the case of boys, there was no change in their perception of motivation in any of the variables and therefore no change in their SDI. By contrast, girls present-ed a major fall in amotivation (*p*: .003). which was reflected in a significant increase in their SDI (p: .000).

Discussion and Conclusions

The purpose of this study was to implement a strategy based on the hybridisation of the TPSR+GF pedagogical model and to verify the behavioural patterns of a teacher's actions and their impact on the motivation of their lower secondary PE students.

Teacher's communication scenario

This study found that the teacher's performance enhanced his teaching by seek-ing greater initiative and res-

Figure 5
Differences in the level of motivation before and after the intervention

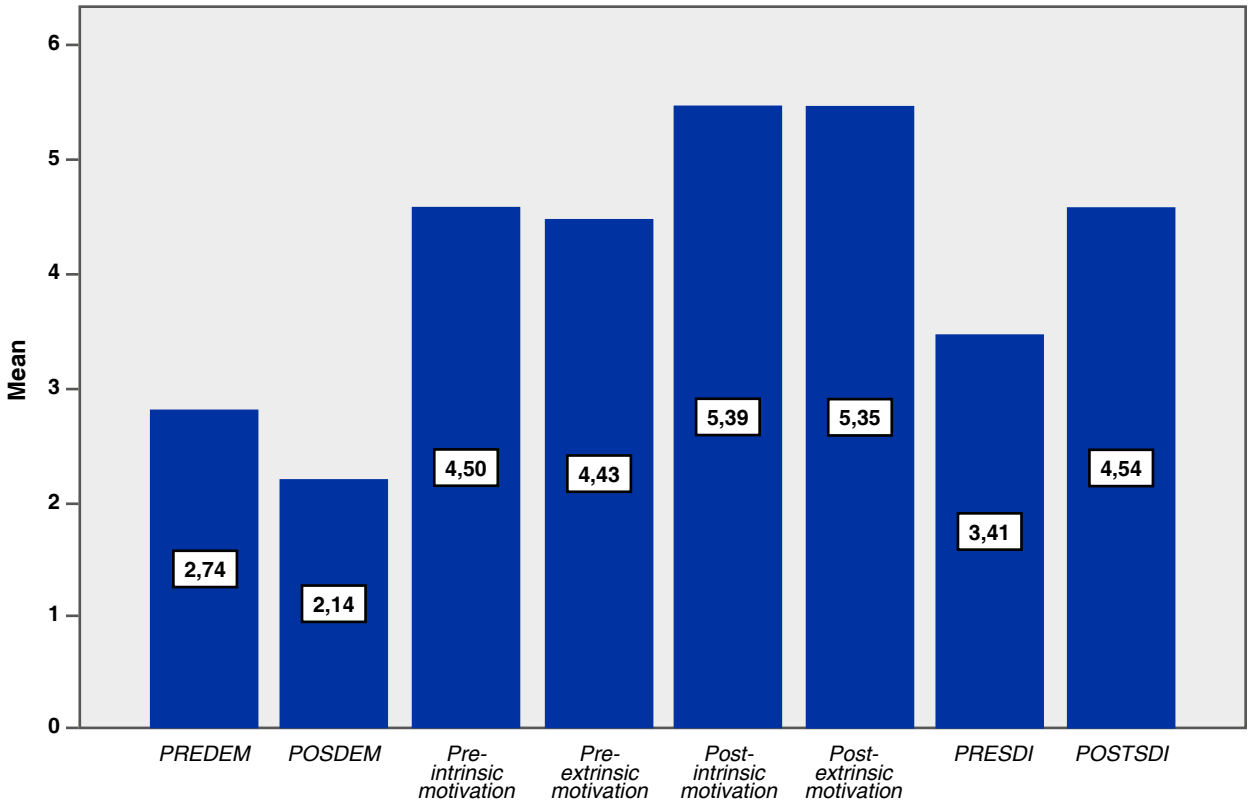


Table 3
Values of student opinions before and after the intervention, by gender

	Boys (n = 27)						Girls (n = 28)					
	Pretest		Posttest				Pretest		Posttest			
Variables	M	(SD)	M	(SD)	Z	Sig.	M	(SD)	M	(SD)	Z	Sig.
AM	2.90	(1.75)	2.50	(1.66)	-.992	.321	2.59	(1.53)	1.79	(1.14)	-3.00	.003**
IM	4.61	(1.40)	4.18	(1.58)	-1.43	.151	4.39	(1.46)	4.66	(1.36)	-1.24	.214
EM	5.31	(1.05)	5.12	(1.17)	-1.10	.269	5.45	(1.07)	5.57	(.95)	-.577	.564
SDI	3.42	(4.67)	3.33	(5.02)	-.456	.648	3.41	(4.68)	5.69	(3.59)	-3.48	.000**

AM: Amotivation; IM: Intrinsic Motivation; EM: Extrinsic Motivation; SDI: self-determination index. M: mean; SD = standard deviation; Z : Wilcoxon signed-rank test value; n: number; Sig: asymptotic significance (2-sided); ** = difference has a signifi-cance level p < .01.

ponsibility from the students, including proposing collaborative activities in which roles and functions were established with proposals for trials and challenges explained in shared fashion among the students. This pro-gressive empowerment, a basic pillar of the TPSR, made it possible to promote de-cision-making and the assumption of management roles in the session in the inno-vative teaching strategies (Pérez & Hortigüela, 2020). Similar results were found in studies in which a programme based on TPSR was used in isolation, such as a de-crease in aggressive behaviours and interruptions (Cecchini et al., 2007; Escartí et al., 2011) and an improvement in attitudes of respect, participation and effort and personal autonomy (Walsh et al., 2010).

This work utilised a gamified environment featuring a narrative combined with the use of an aesthetic packed with visually appealing images for the player, rewards such as badges or totems, seeking to generate curiosity in the students to feel more competent and autonomous (Kapp, 2012; Zichermann & Cunningham, 2011). This type of strategy is viewed as crucial in redirecting participants in the case of unbal-anced responses and stimulating autonomous resolution, thus achieving an improvement in their understanding (Romar et al., 2015; Prat et al., 2019; Sánchez-Alcaraz et al., 2019).

This innovation proposal drawing on methodological hybridisation and its com-munication scenario allows teachers to improve teaching behaviours based on autonomy, participation and effort on the part of students, as indicated by similar stud-ies (Camerino et al., 2019; Prat et al., 2019).

Students' perception of their level of motivation

The students' amotivation diminished after the intervention, while their SDI in-creased, which is very encouraging considering the dynamics followed. What probably reduced their demotivation were the incentives with a climate packed with ex-ternal stimuli: distribution of roles, generation of challenges, scoring systems typical of gamification dynamics (Kapp, 2012; Zichermann & Cunningham, 2011). Similar studies also included improvements in other aspects which impact the constructive climate of the session, such as the generation of conflict between peers. Mention should be made of the study by Navarro et al. (2017), where a gamification project in PE led to improved student motivation for both the subject and also regular PA performance. The students were more interested in attending classes, conflicts were reduced during the period studied and conviviality at the school improved. In relation to these results, numerous studies have revealed the importance of stu-dents' perceptions of the motivational climate in PE classes and its impact on their intrinsic motivation and SDI (Moreno-Murcia et al., 2008; Moreno-Murcia, Huéscar & Ruiz, 2018).

In terms of gender differences, there was a notable decrease in amotivation and a large increase in self-determination in girls, with no differences in motivation after the programme among boys. These results contrast with the bulk of studies to date in which boys have always shown greater satisfaction with the subject than girls (Gómez-Rijo et al., 2011), indicating a greater appreciation for the subject and the PE teacher since they see the subject as a fun activity and relate more to the teach-er than the girls do, who find PE and sport boring (Sánchez-Alcaraz & Gómez-Mármol, 2015). In the same line as this research, the study by Manzano-Sánchez, Valero-Valenzuela, Conde and Ming (2019) found that applying TPSR in lower secondary education yielded improvements in responsibility in both groups, albeit only in girls in terms of intrinsic motivation and meeting basic psychological needs.

Practical applications of the study

On the basis of this study, it is recommended to combine basic pedagogical models with specific techniques and follow these practical suggestions:

- Bear in mind the participants' organisational and self-management limitations.
- Try out the pedagogical models separately first and then blend them with other innovative pedagogical strategies and methods.
- Tailor assessment to the proposal of this study so that it will be continuous and instructive.
- Leverage group conflicts once they have emerged as part of the teaching-learning process.
- Work on a preliminary level of autonomy in order to consolidate self-management.

Motor skill teachers ought to study new alternatives since PE innovation must seek new horizons. They should also cater to the new needs of their participants so as to achieve adherence to physical activity and sport in students' daily lives.

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