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Can a Hybrid Sport Education/Teaching Games for Understanding Volleyball Unit Be More Effective in Less Motivated Students? An Examination into a Set of Motivation-Related Variables

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Received: 4 June 2020; Accepted: 30 July 2020; Published: 31 July 2020

Abstract: Grounded in Self-Determination Theory (SDT), this study aims to examine whether the effects of a hybrid Sport Education (SE)/Teaching Games for Understanding (TGfU) a volleyball teaching unit were equally effective on a set of SDT-related variables according to students' initial motivations. A pre-experimental pre-/post-test design without a control group was conducted in a volleyball teaching unit in Physical Education. A final sample of 49 students (M = 15.50, SD = 0.57), in their fourth year of secondary education, participated in a hybrid SE/TGfU volleyball teaching unit composed of 10 lessons. The structure of this unit was designed according to the characteristics of an SE model, while learning tasks were designed using the TGfU model. Different validated questionnaires on basic psychological need (BPN) support and satisfaction, novelty and variety satisfaction, motivation, and intention to be physically active were completed by students. Three different profiles with different Relative Autonomy Index (RAI) levels (i.e., "high", "moderate", and "low") were identified through cluster analysis before starting the intervention. Although the SE/TGfU of a volleyball teaching unit were effective in improving SDT-related variables in the three profiles identified, a large effect size was observed in profiles with a "moderate" or "low" RAI. The hybridization of these two pedagogical models could be a tool for improving motivational outcomes in students who are less motivated in Physical Education lessons.

Keywords: models-based practice; physical education; self-determination theory; basic psychological needs; novelty; variety; motivation; person-centered approach

1. Introduction

Despite the benefits of physical activity (PA) [1], less than a quarter of young people met the PA recommendations of the World Health Organization [2]. Of the factors that influence PA participation [3], student motivation in PE has been identified as one of the most important correlates [4]. However, there is a growing body of literature that evidences that student motivation decreases over the high school years [5]. In the last few years, PE has continued to be immersed in a process of pedagogical

renewal of the methodologies used in classrooms to increase not only student learning, but also student motivation. Currently, teacher-centered technical models are evolving towards student-centered pedagogical approaches, such as sport education (SE) [6] and teaching games for understanding (TGfU) models [7].

1.1. SE and TGfU Models in Physical Education

The number of interventions based on the SE model or TGfU models have increased over the last few years in PE lessons [8–10]. The SE model [6] was designed to provide students with a more inclusive and authentic sport experience in PE lessons in order to develop competent, literate, and enthusiastic students [11]. It is a model that is based on cooperative and constructivist pedagogy, and in which the teacher designs a student-centered teaching–learning process. It is organized around a series of characteristics that must be followed for its correct implementation [11]: (a) the teaching unit is organized as a sport season; (b) students are organized into teams that are maintained throughout the entire season; (c) a formal competition phase is developed; (d) students undertake different roles (e.g., referee, statistician, coach, etc.); (e) record keeping; (f) the season ends with a final event that has a festive atmosphere. The aim of the TGfU model is for students to learn the technical–tactical aspects of the sport by means of modified versions of the real game (i.e., simplified and/or small-sided games) [12]. To this end, a series of structural and functional game elements can be modified (e.g., space, number of players, rules, ball, goal, etc.), applying principles of representation, exaggeration, and tactical complexity to adapt the sport to the students, and favor greater participation in the game [7]. Despite the priority being given to the cognitive domain, technical execution is developed at the same time as the tactical skill in this model [13]. One of the main purposes of TGfU is to guide students towards the analysis of different game situations, where problem-solving, in a changing game environment, is one of the foundations of this pedagogical approach [12]. To this end, teachers use a questioning feedback related to the tactical principle tackled to help students to understand the game (e.g., Where would you stand to receive the ball from a teammate?).

It has been suggested that the hybridization of pedagogical models could be an effective resource to develop a flexible PE curriculum within multi-model programs and, therefore, could be considered an innovative trend that is necessary to achieve higher quality learning outcomes (see [13,14] for a review). Specifically, the SE and TGfU models are complementary pedagogical models as they share some objectives, concepts, and pedagogical processes (e.g., student-centered learning, authentic assessment, outcome-based education, etc.) [15]. Therefore, despite each model pursuing a main objective, a hybridization between both approaches may mutually complement each other's characteristics, and overcome some of their own limitations [14,16,17]. It has been evidenced that the hybridization of these two models allows for a broader and deeper scope of learning to be achieved than the development of these two pedagogical models separately [16]. For example, previous studies showed improvements in game performance when students were taught through a hybrid unit of the SE/Invasion Games Competence Model (IGCM) or SE/Step Game Approach (SGA)—both of which share a similar conceptual structure to TGfU—compared to students who were taught using direct instruction [18–20]. However, despite the possible complementary nature of these two pedagogical models, there is a very limited number of studies that has examined the hybrid effects of SE/TGfU models on a set of motivational outcomes [10].

1.2. Self-Determination Theory in PE

Different research studies have identified motivation in PE lessons as one of the variables that most influences students' intentions to be physically active [21,22]. Self-determination theory (SDT) [23] is one of the most used theories in the PE context to explain the underlying motivational processes in student behavior. In the educational context, SDT supports the existence of some social antecedents (e.g., teachers, peers, etc.), which can help to satisfy the three basic psychological needs (BPNs) of autonomy, competence, and relatedness [24]. PE teachers can satisfy students' BPNs by adopting a

motivating teaching style of autonomy support (e.g., progressively handing over responsibility and decision-making to the students), competence support (e.g., adapting the activities to the students' skill level), and relatedness support (e.g., favoring group and collaborative activities in class) [22,25]. Students satisfy their autonomy when they feel that this is due to their own actions, their competence when they feel that they are effective or skillful in the activities carried out, and, finally, their relatedness when they have positive communicative exchanges, and they feel connected with their peers [23]. Likewise, novelty (i.e., the need to experience something relatively new, or something they have not previously experienced) has been recently proposed as a possible fourth BPN [26,27], while variety (i.e., alternating different activities, whether they be new or familiar), has been described as a psychological experience that could help to offset failure to satisfy the BPNs [28]. Consequently, BPN satisfaction, as well as novelty and variety satisfaction, may determine the type of motivation experienced by students in their PE lessons [22,26,29].

SDT describes a motivational continuum, showing different types of motivation that go from a higher to a lower level of self-determination: intrinsic motivation (i.e., students participate in PE just for pleasure), extrinsic motivation (i.e., students participate in PE to receive a reward or avoid punishment), and amotivation (i.e., students have no intrinsic or extrinsic reason to participate in PE lessons) [30]. More precisely, SDT distinguished different types of motivational regulations within extrinsic motivation, which vary along a continuum from more to less internalization as follows: integrated regulation (i.e., students participate in PE as it goes with their lifestyle), identified regulation (i.e., students participate in PE for its benefits), introjected regulation (i.e., students participate in PE so they do not feel bad about themselves), and external regulation (i.e., students participate in PE for a series of external rewards) [30]. Previous studies in the PE context have indicated that BPNs satisfaction in students is related to more self-determined forms of motivation, such as intrinsic motivation, integrated regulation, and identified regulation [22]. According to SDT, the most self-determined forms of motivation are related to positive affective outcomes (e.g., enjoyment), cognitive outcomes (e.g., academic achievement), or behavioral outcomes (e.g., intention to be physically active), while the least self-determined forms of motivation, and especially amotivation, are associated with negative and less adaptive outcomes (e.g., boredom, low intention to be physically active, etc.) [22,26–29].

1.3. Effects of the SE Model and/or TGfU Model on SDT-Related Variables

The implementation of teaching units in PE, based on different pedagogical models (e.g., SE model or TGfU model) has proven to be effective in satisfying BPNs in students and, consequently, in increasing self-determined motivation and other adaptive outcomes [9,31]. The SE model and the TGfU model share common pedagogical characteristics, which help PE teachers comply with the curricular elements described in current educational frameworks. According a previous systematic review about the hybridization of pedagogical models [10] there are only two studies that have analyzed the effect of hybrid SE/TGfU teaching units on a set of SDT-related variables [32,33]. In the study by Gil-Arias et al. [33], the students who received the SE/TGfU teaching unit obtained significant improvements in autonomy and competence satisfaction, as well as enjoyment, compared with students who had received a technical models-based teaching unit within a cross-over designed study. Yet, no improvements were obtained in autonomous motivation, in relatedness satisfaction, and in intention to be physically active. In the other study conducted by Gil-Arias et al. [32], significant improvements were observed in the students' perceptions of autonomy support from PE teachers in competence, satisfaction, and in enjoyment, when students received the hybrid SE/TGfU teaching unit. Therefore, due both to the limitation of studies, as well as the identification of some discrepancies in the findings, more studies which analyze the effects of the hybridization of these two models on a wide range of SDT-related variables, are required.

1.4. Effects of Pedagogical Models According to Students' Initial Motivation

Previous studies suggest that students may participate in PE lessons for different reasons. In this sense, the cluster analysis can be used to identify profiles or groups of students who have a similar score pattern in terms of the different types of motivational regulations [34]. Only one study has examined the effects of SE model on students' game play participation, in agreement with a set of motivational profiles identified prior to the intervention (i.e., "high motivation", "moderate motivation", and "amotivation") [35]. After implementing the SE model, the "high motivation" profile experienced higher active participation rates than the "amotivation" group. However, no differences were found between the three profiles in ball engagement and ball success rates [35]. Likewise, it is noteworthy that there are other studies that have examined the effects of the SE model on a set of SDT-related variables in amotivated students [36–38]. A significant improvement was observed in these studies in competence and relatedness satisfaction, as well as in enjoyment and in PA levels in students who had participated in SE-based teaching units [36–38]. Examining the effects of the hybridization of the pedagogical models according to student motivation may be of considerable importance to discover if, for example, the most amotivated students in PE lessons can benefit, as the rest of their peers, from a SE/TGfU hybrid unit intervention.

1.5. The Present Study

According a previous systematic review about the hybridization of pedagogical models [10], only two previous intervention studies have examined the effects of hybrid SE/TGfU teaching units in PE lessons on SDT-related variables [32,33]. None of them have examined their effects according to the initial motivational profiles found in the students. In addition, no previous studies have examined the effects of hybridization of these two models on students' perceptions of support for the three BPNs, novelty and variety satisfaction, and on different motivational regulations. Framed in SDT, the aim of this study is, therefore, to examine whether the effects of a hybrid SE/TGfU volleyball teaching unit was equally effective on a set of SDT-related variables according to students' initial motivations. Based on previous studies, the study hypothesis is that students would, after the development of the intervention, perceive a significant increase in the perception of BPN support and satisfaction, in novelty and variety satisfaction, and in the intention to be physically active, regardless of their initial motivation.

2. Materials and Methods

2.1. Design and Participants

A pre-experimental pre-/post-test design without a control group was developed in a volleyball teaching unit composed by 10 lessons. From an initial sample of 56 fourth year secondary education students (M_{age} = 15.51, SD_{age} = 0.58) who attended a public school, 49 students (M_{age} = 15.50, SD_{age} = 0.57; 49% female; 51% male) finally participated in the study. The methodological inclusion criteria for this study were as follows: attending eight of the 10 lessons that comprised the intervention and responding to all the questionnaires relating to the study variables. In parallel, a statistical inclusion criterion was used to avoid using participants with univariate (values of more than 3SD above or below the mean) or multivariate (students with high Mahalanobis values) outliers. Although none of the students stated that they had played volleyball at federation level, several students did point out that they had played other team sports at federation level (e.g., field hockey, soccer, basketball, and handball). However, none of the participants had previously received a SE or TGfU models-based teaching unit in their PE experience. The previous teaching received by the participants of the study had traditionally been using direct instruction. The sample study selection was determined considering the curricular plan of the school and the availability of the PE teacher to conduct a hybrid SE/TGfU volleyball teaching unit.

2.2. Measures

Data were compiled before and after applying the hybrid SE/TGfU volleyball teaching unit through a series of validated questionnaires. As the students had not previously participated in a volleyball teaching unit, a group of experts decided that the first round of data collection (pre-test) would refer to team sports practiced previously in PE, while the second round of data collection (post-test) would refer solely to volleyball.

2.2.1. Need-Supportive Behaviors from PE Teacher

The Basic Psychological Needs Support Questionnaire in PE (Spanish acronym, CANPB) was used to measure the students' perceptions of support to BPNs from PE teachers [25]. The questionnaire begins with the stem: "In the PE lessons of team sports (pre-test)/volleyball (post-test), my PE teacher ... ". It contained 12 items grouped into three factors (four items per factor), measuring autonomy support (e.g., tries to grant us freedom when carrying out the activities), competence support (e.g., always tries to get us to achieve the objectives proposed in the activities), and relatedness support (e.g., tries to make all us students feel integrated). Responses were registered on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Cronbach alpha values obtained in this study were 0.60 (pre-test) and 0.70 (post-test) in autonomy support, 0.76 (pre-test) and 0.75 (post-test) in competence support, and 0.65 (pre-test) and 0.61 (post-test) in relatedness support. Values above 0.60 can be accepted due to the reduced number of items for each factor [39,40].

2.2.2. Basic Psychological Need Satisfaction

The Spanish version adapted to the PE context [41] of the Basic Psychological Need in Exercise Scale (BPNES) [42], was used to measure the students' perceptions of BPN satisfaction in PE lessons. The scale begins with the stem: "In the PE lessons of team sports (pre-test)/volleyball (post-test) ... ". It contained 12 items grouped into three factors (four items per factor) that measured autonomy satisfaction (e.g., I get the chance to choose how to perform the exercises), competence satisfaction (e.g., I believe that I have advanced a great deal in pursuit of my final goal), and relatedness satisfaction (e.g., I carry out the exercises effectively). Responses were registered on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Cronbach Alpha values obtained in this study were 0.61 (pre-test) and 0.60 (post-test) in autonomy satisfaction, 0.81 (pre-test) and 0.80 (post-test) in competence satisfaction, and 0.70 (pre-test) and 0.74 (post-test) in relatedness satisfaction. Values above 0.60 can be accepted due to the reduced number of items for each factor [39,40].

2.2.3. Novelty Satisfaction

The students' perceptions of novelty satisfaction in PE were assessed by means of the Spanish version of the Novelty Need Satisfaction Scale (NNSS) [29]. This scale contains five items (e.g., I frequently feel there are novelties for me), headed with the stem: "In the PE lessons of team sports (pre-test)/volleyball (post-test) ... ". Responses were registered on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Cronbach alpha values obtained in this study were 0.80 (pre-test) and 0.82 (post-test).

2.2.4. Variety Satisfaction

The students' perceptions of variety satisfaction in PE lessons were assessed by means of a PE-adapted version of the Perceived Variety in Exercise questionnaire (PVE) [43]. The scale contains five items (e.g., I feel that I engage in a variety of exercises). In this study, the questionnaire was adapted to school PE through the following stem: "In the PE lessons of team sports (pre-test)/volleyball (post-test) ... ". Likewise, one of the items of the scale was slightly modified to the PE context. Specifically, the item, "I feel that my exercise program is varied" was changed to "I feel that my team sport classes (pre-test) or volleyball classes (post-test) are varied". Responses were registered on a

6-point Likert scale ranging from 1 ("false") to 6 ("true"). The Cronbach alpha values obtained in this study were 0.74 (pre-test) and 0.75 (post-test) in variety satisfaction.

2.2.5. Motivation

The students' perceptions of the different motivational regulations in PE were assessed using the Spanish version [44] of the Perceived Locus of Causality Questionnaire [45]. The scale begins with the stem: "I engage in PE lessons of team sports (pre-test)/volleyball (post-test) … " and it comprises 24 items (four items per factor) that measure intrinsic motivation (e.g., because I enjoy learning new skills), integrated regulation (e.g., because I believe that PE is in agreement with my values), identified regulation (e.g., because I can learn skills that could be used in other areas of my life), introjected regulation (e.g., because I want others to think I am good), external regulation (e.g., so that the teacher does not shout at me), and amotivation (e.g., but I really feel that I am wasting my time in PE). The items were rated on a 7-point Likert scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree"). The Cronbach alpha values obtained in this study, both in pre-test and in post-test, were 0.68 and 0.76 in intrinsic motivation, 0.24 and 0.80 in integrated regulation, 0.80 and 0.82 in identified regulation, 0.70 and 0.69 in introjected regulation, 0.73 and 0.16 in external regulation, and 0.68 and 0.77 in amotivation, respectively. The integrated regulation and external regulation factors were excluded from the main analyses of the present study as they included Cronbach alpha values of way below 0.70 in the pre-test and post-test, respectively. To identify different initial motivational profiles of the students, and in line with previous research [41], the relative autonomy index (RAI) was calculated using the following formula [46]: "(2 × intrinsic motivation + identified regulation) − ((introjected regulation + external regulation)/2 + 2 × amotivation). Despite external regulation being removed from the main analysis due Cronbach alpha was low in the post-test, it was kept to calculate the RAI since its reliability had been adequate in the pre-test (i.e., 0.73)".

2.2.6. Intention to be Physically Active

Students' perceptions of intention to continue participating in team sports (pre-test) or volleyball (post-test) were measured using an adapted three-item scale of a questionnaire on intention to be physically active [47] (e.g., I intend to participate in team sports (pre-test)/volleyball (post-test) during my free time over the next 5 weeks...). The scale is rated on a 7-point Likert scale ranging from 1 ("strongly agree") to 7 ("strongly disagree"). Cronbach alpha values in this study were 0.94 (pre-test) and 0.89 (post-test) in this variable.

2.3. Ethics and Procedure

Ethical approval for this study was obtained from the first author's university research ethics committee (PI15/0283). The guidelines of the Declaration of Helsinki (2013) [48] were followed for its development, with respect to consent and the confidentiality of replies. The lead researcher contacted the school to inform the school board and the PE teacher of the study objectives, as well as to ask for their collaboration in implementing the hybrid SE/TGfU teaching unit. Afterwards, both permission from parents and informed consent from students were obtained prior to start the intervention. The questionnaires were completed by the students in approximately 25 min in a pleasant environment. The students were continuously informed that their answers were anonymous, individual, and confidential. The hybrid SE/TGfU volleyball teaching unit was implemented by a single novice male PE teacher in both classes, who also had no previous knowledge or experience using SE/TGfU models.

Therefore, before starting the intervention, the PE teacher completed a training period on both pedagogical models. This training process lasted for four weeks and 16 h, and it was given by a research team with experience in implementing teaching units based on SE and/or TGfU models and guided by SDT framework. During the first two weeks, the PE teacher spent about four hours reading different manuscripts related to the TGfU model (e.g., [12]), SE model (e.g., [49]), and hybrid SE/TGfU

models (e.g., [10,33]). The PE teacher was given examples of hybrid TGfU/SE teaching units. Once the teacher had read all the manuscripts, the research team held a couple of two-hour meetings with the PE teacher to analyze the content of the studies. During the third week, the research team and the PE teacher spent four hours designing the hybrid SE/TGfU volleyball teaching unit, following the structure established in previous research studies [33]. In this phase of the training process, the objectives and contents were proposed, as well as the learning tasks for each one of the lessons. During the final week, the PE teacher led a pair of one-hour PE lessons with two different groups of students, who did not form part of the study sample of this study. After these two lessons, in which a hybrid SE/TGfU teaching unit was applied, the research team and the PE teacher held a couple of one-hour meetings to identify the limitations and strengths observed.

2.4. Intervention Program

A hybrid SE/TGfU volleyball teaching unit was implemented twice per week over a period of five weeks (10 lessons of 50 min). The duration of the intervention was determined by the teaching program of the PE teacher. The usual duration of the teaching units in Spanish curriculum varies between 8 to 12 lessons. A summary of the structure and the content of the lessons for this hybrid SE/TGfU volleyball teaching unit is provided in Table 1. The structure of the teaching unit was designed based on the principles and characteristics of the SE model (i.e., season, affiliation, formal competition, record keeping, final event, and festivity) [6]. The season was divided into three phases: (1) a learning phase (lessons 1–5); (2) a formal competition phase (lessons 6–9); and (3) a final event (lesson 10). In the first session of the learning phase, the teacher organized the teams in agreement with the guide of Siedentop et al. [6]. Students developed their team identity (i.e., name, pet, badge, color, and song), and selected the roles that best adapted to their personal interests (i.e., sport coaches, photographer, statisticians, fitness coaches, and captains). During the learning phase, the PE teacher designed the tasks in agreement with the pedagogical principles of the TGfU model (i.e., representation, exaggeration, and tactical complexity). In each session, the teacher initially presented a tactical problem to be solved, and the students tried to find a solution. Thus, contextualized situations were presented to the students, which maintained the essential part of volleyball, through the design of modified games [12,32]. The tactical complexity of the tasks was adapted to the students' needs and characteristics. For example, at the start of the teaching unit, cooperative tasks were carried out (e.g., 1 + 1 or 2 + 2). Then, the tactical demand of the tasks was progressively increased, as the number of teammates and opponents increased, as well as the possibility of executing other technical actions (e.g., serve, set, dig, and spike). In addition, rules were introduced to exaggerate certain tactical problems, thus facilitating the students' answers. For example, allowing one bounce before contacting the ball or allowing a catch before playing the ball back over the net. Moreover, the teacher used questioning feedback to guide students towards self-reflection, and technical–tactical problem-solving, so that they would understand the internal logic of the game and were more effective in the different game situations proposed. For instance, while students were participating in the different tasks designed, the PE teacher asked questions, such as: What part of the court is covered by the defense?; What tendencies do the opponents from the other team have in defense?

In the formal competition phase, the teams participated in different reduced volleyball matches (3 vs. 3). In this phase, students continued to undertake the roles already established in the learning phase. For example, the student who played the role of fitness coach led the warm-up of the team under the teacher's supervision, the photographer took pictures during the formal competition, the statistician compiled information to later decide on the winning teams based on the established competition system.

When the competition phase ended, a final event was held to decide the winning teams. In this final phase of the season, an award presentation ceremony was held. Based on the data obtained by the students who played the role of statistician, the team and individual awards were as follows:

most original team, winning teams, most organized team, most festive team, a fair play award, and an award for the most valuable player.

Table 1. Season planning of the hybrid SE/TGfU volleyball teaching unit.

Lesson	TGfU Component	SE Component
1	Instruction led by the teacher: 1 + 1—overhand pass (cooperative).	Introduction to the season concept. Explanation of the model and competition format. Training of mixed (gender and skill) and persistent groups. Role assignment. Instruction led by the teacher within the teams.
2	1 + 1—overhand pass (cooperative). 1 vs. 1—overhand pass.	Instruction led by the teacher within the teams. Introduction to the team roles and responsibilities (photographer, captain, sport coach, fitness coach, and statistician). For example, the fitness coach does the warm-up and cool-down.
3	1 vs. 1 + 1—overhand pass. 2 + 2—overhand pass (cooperative).	
4	2 vs. 2—serve and overhand pass. 2 vs. 2 + 1—serve, overhand pass and questioning feedback.	
5	3 vs. 3—serve and overhand pass. 3 vs. 3—serve, overhand pass, forearm pass and questioning feedback (e.g., What spaces must be occupied in defense?)	
6	3 vs. 3—serve, overhand pass, forearm pass and questioning feedback (e.g., Which free spaces must I attack?)	League based on a score. Matches with the other teams. Team responsibilities (photographer, captain, sport coach, fitness coach, and statistician). For example, the fitness coach does the warm-up and cool-down at each match. The statistician compiles data about the number of sets won, the number of points won per player, and rule breaches. The photographer takes a photograph to publish it on the school website.
7		
8		
9		
10	Play-off system with four teams, holding semi-finals and final	Final event and festivities.

2.5. Instructional and Treatment Validity

A checklist was used to verify the fidelity of the intervention carried out by the PE teacher [50] (see Table 2). Items 1, 2, 4, and 6 permitted assessing the fidelity of the SE model [49], and items 3, 5, and 7 for the fidelity of the TGfU model [12]. The fidelity of the hybrid SE/TGfU teaching unit was assessed in agreement with a direct and external type systematic observation. Following Tabachnick et al. [51], the first author and an external observer to the research, both specialists in pedagogical models, randomly observed five of the 10 lessons of the hybrid SE/TGfU volleyball teaching unit. One hundred percent agreement was reached by both observers, indicating that each observer confirmed that all the key aspects included in the checklist had been applied by the PE teacher in the five lessons observed.

Table 2. Example of the instructional checklist implemented.

Date:	Present	Absent
1. Students go to a designated home area and begin to warm up with their own group/team.		
2. Students keep performance records.		
3. All the lesson tasks are related to the small-sided game that is being taught.		
4. Students perform specialized roles within their group/team.		
5. Modifications to the full game are performed.		
6. Students' individual performance scores count for a formal and public scoring system.		
7. Students spent at least 30 min of the lesson playing modified games.		

2.6. Data Analysis

First, the descriptive statistics (*M* and *SD*) and reliability analysis of the different study variables were calculated. The Cronbach alpha coefficient (α) was used, considering values of over 0.70

as acceptable [52] and values above 0.60 can be accepted due to the reduced number of items for each factor [39,40]. All factors over or close to 0.70 were included in the study. Levene and Kolmogorov–Smirnov tests were used to ensure the homogeneity of variances and univariate normality of distribution, respectively ($p > 0.05$). In addition, Mardia's multivariate kurtosis was inspected to check multivariate normality. Taken together, these analyses overall supported the use of parametric statistics. The main aim of the study was to examine whether the effects of a hybrid SE/TGfU volleyball teaching unit was equally effective on a set of SDT-related variables according to students' initial motivations. For that reason, a cluster analysis was conducted based on the RAI calculated from the data obtained in the pre-test. Before conducting the cluster analysis, the univariate and multivariate outliers were identified and removed [53]. In agreement with Garson [54], a combination of hierarchical and non-hierarchical methods was used, through two consecutive steps, to identify the number of profiles. In the first step, a hierarchical cluster analysis was conducted using Ward's method to minimize variance between the different clusters, and to avoid the formation of long chains. To identify the number of identified profiles, the variance percentage explained in the RAI was examined, using 50% of the variance as minimum criterion [55]. If the proposed profile solution did not exceed this variance percentage, that option was eliminated. In the number of identified solutions exceeded 50%, the additional explained variance percentage was examined, as well as its possible interpretation to identity the number of final profiles. In the second step, a k-mean non-hierarchical analysis was conducted to confirm the solution of identified profiles in the previous analysis. To examine the stability of the identified profiles, the sample was randomly divided into two sub-samples, applying the two previously described steps (i.e., Ward and k-means). Participants from each subsample were assigned to new clusters based on their Euclidean distances to the cluster centers of the other half of the sample. The two solutions from the two sub-samples were compared with the original solution, through Cohen's Kappa (K) statistic. The mean value of the two resulting Kappa coefficients was calculated. A concordance of at least 0.60 is considered acceptable [56]. Finally, to explore the hybrid SE/TGfU teaching unit general effect, a within-group differences analysis was made by a repeated-measures multivariate analysis of variance (MANOVA). Univariate repeated measures procedures were used to assess within-group differences in each motivational profile group. The values of 0.01, 0.06, and 0.14 were interpreted as thresholds for low, moderate, and high effect sizes (η_p^2), respectively [57]. All statistical analyses were conducted using SPSS software version 23.0 (IBM SPSS Inc., Chicago, IL, USA) [58].

3. Results

3.1. Preliminary Results: Identifying Profiles Based on Students' Initial Motivations

Prior to conducting the main analysis, seven participants were excluded due to not satisfying the methodological or the statistical inclusion criteria, resulting in a final sample of 49 students. More precisely, two students were excluded due to the fact that they did not attend to 80% of the lessons, and the other two because they did not respond to all the questionnaires. In addition, one student was removed due to being identified as a univariate outlier (i.e., reported values of more than 3SD above or below the mean) and the other two were removed because were identified as multivariate outliers (i.e., reported high Mahalanobis values). Three significantly different motivational profiles or groups were identified, explaining 87% of the variance for the RAI. This three-cluster solution obtained Cohen Kappa values of 0.70, indicating good stability and replicability.

The retained profiles among children were characterized as follows. The "low RAI" profile comprised nine students who reported a mean RAI value of −6.55 (SD = 2.02), covering a score interval of −9.25 to −4.00. The "moderate RAI" profile comprised 27 students, who obtained a mean RAI value of 2.19 (SD = 2.89), reporting a score of −2.50 to 7.00. Finally, the "high RAI" profile comprised 13 students who presented a mean RAI value of 12.17 (SD = 2.52), covering scores from 8.75 to 16.25. With these results, it was possible to split the participants into three groups for the subsequent analyses.

Therefore, this study aimed to examine whether the effects of a hybrid SE/TGfU teaching unit was equally effective on a set of SDT-related variables in these three groups of students.

3.2. Within-Group Effects of the Intervention on the Study Variables in the Three Identified Initial Motivational Profiles

Results indicated a significant main effect of the hybrid SE/TGfU teaching unit with a high effect size (Wilks' Lambda = 0.117; $F_{(9,36)} = 30.135$; $p < 0.001$; $\eta_p^2 = 0.883$). In Table 3, a significant increase in the students' perceptions of support to BPNs from the PE teacher can be observed in the three identified motivational profiles, with the exception of relatedness support in the group with "high RAI". The same was observed in the students' perceptions of satisfaction of the three BPNs in the three identified profiles, except for competence satisfaction in the group with "high RAI", and of relatedness satisfaction in the groups with "moderate and high RAI". Regarding novelty and variety satisfaction, students belonging to the three identified motivational profiles obtained a significant increase in these two study variables. Finally, intention to be physically active significantly decreased in students from groups with "moderate RAI" and "high RAI", while there were no changes in students with "low RAI". It is noteworthy that the effect sizes in the study variables were greater in the "low RAI" group of students and especially in the "moderate RAI" group.

Table 3. Descriptive statistics and within-group analyses of differences in the study variables based on the three identified motivational profiles before the intervention (pre-test).

Variables (Measurement Range)	Profiles	Pre-Test		Post-Test		M Diff	SE	$F_{(1,44)}$	*p*	η_p^2	95% CID	
		M	*SD*	*M*	*SD*						LL	UL
Autonomy support (1–5)	Low RAI	2.64	0.91	3.83	0.55	1.18	0.23	25.55	<0.001	0.350	0.71	1.66
	Moderate RAI	2.85	0.49	3.98	0.56	1.13	0.17	44.38	<0.001	0.405	0.78	1.47
	High RAI	2.79	0.61	3.85	0.38	1.06	0.23	20.45	<0.001	0.168	0.58	1.53
Competence support (1–5)	Low RAI	3.06	0.60	4.18	0.45	1.12	0.23	23.73	<0.001	0.264	0.66	1.59
	Moderate RAI	3.39	0.73	4.30	0.53	0.91	0.16	29.96	<0.001	0.460	0.57	1.24
	High RAI	3.56	0.72	4.25	0.42	0.69	0.23	8.86	0.005	0.207	0.22	1.15
Relatedness support (1–5)	Low RAI	3.31	0.65	4.18	0.58	0.87	0.26	11.16	0.002	0.202	0.34	1.40
	Moderate RAI	3.69	0.64	4.31	0.56	0.62	0.18	10.72	0.002	0.196	0.23	1.00
	High RAI	4.06	0.75	4.39	0.51	0.33	0.26	1.62	0.210	0.036	−0.19	0.86
Autonomy satisfaction (1–5)	Low RAI	2.20	0.72	3.72	0.49	1.52	0.21	51.18	<0.001	0.538	1.09	1.94
	Moderate RAI	2.76	0.60	3.95	0.48	1.19	0.15	60.63	<0.001	0.579	0.88	1.50
	High RAI	2.56	0.57	3.79	0.48	1.22	0.21	33.43	<0.001	0.432	0.80	1.65
Competence satisfaction (1–5)	Low RAI	2.75	0.92	3.72	0.59	0.97	0.21	521.68	<0.001	0.330	0.55	1.40
	Moderate RAI	3.50	0.49	4.19	0.55	0.69	0.15	20.98	<0.001	0.323	0.39	1.00
	High RAI	3.95	0.72	4.12	0.75	0.16	0.21	0.62	0.432	0.014	−0.25	0.59
Relatedness satisfaction (1–5)	Low RAI	3.06	0.89	4.14	0.60	1.08	0.28	14.87	<0.001	0.253	0.51	1.64
	Moderate RAI	3.85	0.95	4.35	0.57	0.50	0.20	6.07	0.018	0.121	0.91	0.90
	High RAI	4.18	0.69	4.39	0.53	0.21	0.28	0.55	0.462	0.012	0.35	0.77
Novelty satisfaction (1–5)	Low RAI	2.11	0.74	3.91	0.53	1.80	0.18	97.17	<0.001	0.688	1.43	2.17
	Moderate RAI	2.93	0.42	4.18	0.54	1.25	0.13	89.79	<0.001	0.671	0.98	1.52
	High RAI	3.00	0.40	4.04	0.48	1.04	0.18	32.34	<0.001	0.424	0.67	1.41
Variety satisfaction (1–6)	Low RAI	2.50	0.88	3.93	0.40	1.43	0.20	48.12	<0.001	0.522	1.01	1.85
	Moderate RAI	3.20	0.43	4.20	0.44	0.99	0.14	44.11	<0.001	0.501	0.69	1.29
	High RAI	3.16	0.51	3.95	0.56	0.78	0.20	14.37	<0.001	0.246	0.36	1.20
Intention to be physically active (1–7)	Low RAI	2.66	1.39	2.86	1.61	0.19	0.59	0.10	0.744	0.002	−0.99	1.38
	Moderate RAI	4.46	1.45	2.91	1.30	−1.55	0.42	13.21	0.001	0.231	−2.41	−0.69
	High RAI	5.08	1.89	2.38	1.15	−2.69	0.59	20.80	<0.001	0.321	−3.88	−1.50

Note: *M* = Mean; *SD* = Standard deviation; CID = Confidence interval differences; LL = Lower limit; UL = Upper limit.

4. Discussions

To date, only two previous intervention studies have examined the effects of hybrid SE/TGfU teaching units in PE lessons on some SDT-related variables [32,33], and none of them have examined if less amotivated students could benefit more from this type of intervention. To fill this gap, this study aimed to examine the extent to which a hybrid SE/TGfU volleyball teaching unit was equally effective on a set of SDT-related variables according to students' initial motivation. After implementing the hybrid SE/TGfU volleyball teaching unit, a significant increase was found in students' perceptions of BPNs support from the PE teacher (with the exception of relatedness support in the "high RAI" profile), BPNs satisfaction (with the exception of competence satisfaction in the "high RAI" profile, and relatedness in the "moderate and high RAI" profiles), novelty and variety satisfaction in the three

identified motivational profiles (i.e., "high RAI", "moderate RAI", and "low RAI") compared to their baseline values. As no significant increases were found in the intention to be physically active in any of the three motivational profiles, it can be concluded that the study hypothesis was partially fulfilled. The positive impact of this hybrid SE/TGfU volleyball teaching on student motivational outcomes in PE may suggest the sustainability of this type of intervention. The results of this study suggest that shorter teaching units (i.e., 10 lessons) than those recommended in the SE model [11] may also be effective in improving SDT-related variables. These findings are in agreement with the two previous existing studies, in which, based on short-duration hybrid SE/TGfU teaching units, a significant increase in students' perceptions of autonomy support from PE teachers was found [32], as well as in autonomy and competence satisfaction [33]. To date, this is the first study to analyze the effects of a hybrid SE/TGfU teaching unit on a set of SDT-related variables in agreement with the profiles identified prior to the intervention, so the results cannot be compared with previous studies [10]. Yet, it is noteworthy that, in one previous study, which only analyzed the effects of the SE model according to students' motivational profiles, they found that the "high motivation" profile had higher rates of active participation than the "moderate motivation" and "amotivation" profiles [35]. It is also worthy of note that there are previous research studies that only compared the effects of SE teaching units and technical units in amotivated students [36–38], in enjoyment [36], and in PA levels [38] in amotivated students who had participated in SE teaching unit(s).

This study's findings are promising as, although the three profiles obtained significant improvements in the study variables, students with "moderate RAI" and "low RAI" profiles benefited more from the effects of this hybrid SE/TGfU teaching unit. This fact can be verified by the larger effect size observed in these profiles in the different motivational variables studied. Therefore, the implementation of a hybrid SE/TGfU teaching unit could help to optimize the motivational processes in all students, regardless of their degree of motivation in PE lessons. The fact that students with a low RAI had acquired a more participatory role in the teaching–learning processes within the hybrid SE/TGfU teaching unit, could explain why this student profile experienced a greater increase in the study variables. However, future qualitative studies are necessary to understand the reasons why the hybrid SE/TGfU teaching units have a greater effect on a set of motivational variables in students who do not have a high RAI in PE lessons.

The increase in perceived support to the three BPNs in students belonging to the three identified motivational profiles, except for relatedness support in the "high RAI" profile, could be due to the structural characteristics of the SE (i.e., affiliation, roles, final event, etc.) [11] and TGfU model (i.e., representation, exaggeration, and tactical complexity) [7]. For example, with respect to the SE model, group affiliation, through the creation of persistent teams, could favor an increase in perceived relatedness support. Likewise, the election of roles and the delegation of responsibilities could benefit perceived autonomy support. With respect to the TGfU model, the design of reduced games, according to the pedagogical principles that characterize this model (i.e., representation, exaggeration, and tactical complexity), as well as their possible modification in agreement with the students' needs and interests, could have fostered an increase in perceived competence and autonomy support, respectively. Moreover, posing technical–tactical problems, which entailed exchanging ideas and involved the entire team, could generate greater perceived relatedness support. These results are in line with the study conducted by Wallhead et al. [35] in which the students from the experimental group perceived significant improvements in perceived autonomy support from the PE teacher, after the hybridization of both models. The results of this study are also promising, as the PE teacher who gave the teaching unit was a novice teacher with specific training but with no experience giving PE lessons or with pedagogical models. Thus, the inclusion of pedagogical models in the training plans of future PE teachers seems essential to enhance the sustainability of these types of hybrid SE/TGfU interventions in PE lessons.

Likewise, in this study, students belonging to the three identified motivational profiles, showed an overall increase in BPNs satisfaction, with the exception of competence and relatedness satisfaction in

the "high RAI" profile. In the same vein, in a previous study conducted by Gil-Arias et al. [33], students who followed a hybrid SE/TGfU teaching unit, obtained significant improvements in autonomy and competence satisfaction compared with students who received a technical model. However, in this study (i.e., [33]), no significant improvements were obtained in relatedness satisfaction, contrasting with the current study. Following the postulates of SDT, the students' improved perceptions of support to the three BPNs in this study could also have improved the satisfaction of the three BPNs of autonomy, competence, and relatedness [22]. Therefore, the results of this study suggest that the inherent characteristics of both models could facilitate an increase in students' perceptions of autonomy satisfaction (e.g., being able to choose the type of training or competition, roles, sportswear, etc.), competence satisfaction (e.g., being able to undertake not only the role of player but also other roles, understanding the internal logic of the game through the teacher's questioning feedback, etc.), and relatedness satisfaction (e.g., feeling integrated into a team) [32,38,59].

Likewise, the students belonging to the three identified motivational profiles showed an increase in novelty and variety satisfaction. To date, there are no previous studies that have examined the effects of a hybrid SE/TGfU teaching unit on novelty and variety satisfaction [10]. However, previous studies in which SE teaching units were implemented in PE lessons, found that students perceived greater novelty satisfaction [60,61]. The lack of previous experience of the students in this study with hybrid SE/TGfU models could explain an increase in novelty satisfaction. For example, students may not be used to undertaking a role other than player or participating in small-sided games. Moreover, this type of teaching unit, based on a sport season, may be novel for all students who do not participate in any sport outside of the school context. On the other hand, alternating training and competition situations, as well as modified games, in which some structural and functional elements of the game were changed, might have favored an increase in variety satisfaction. Therefore, designing a hybrid SE/TGfU unit may be a pedagogical resource to create learning environments that make it possible for students to experience novel and varied activities in PE lessons.

Finally, it is worth mentioning that the intention to participate in volleyball may experience a significant decrease in the "high and moderate RAI" motivational profiles due to the way in which the data compilation was proposed. In the pre-test, students were asked about their intention to continue participating in team sports, while, in the post-test, they were specifically asked about their intention to continue participating in volleyball. This could explain the high values found in intention to continue participating in team sports, in the pre-test, in the student profile with "high and moderate RAI", as many of them were probably already competing and practicing other types of team sports in their leisure-time. This could mean that students who participated in traditional team sports in Spain (e.g., soccer and basketball) would perceive that they had no intention to play other, less commonly practiced sports, such as volleyball. However, in the "low RAI" profile, the initial values in intention to participate in team sports were very low due, probably due to the fact that they did not participate in other team sports in their leisure time. Thus, in this profile, perhaps, there were no significant differences in intention to participate in volleyball after the intervention was conducted. However, future studies should assess intention to participate, not only on a situational level (i.e., team sports and volleyball), but also on a contextual level (i.e., PE subject), to verify the effects of the intervention on this study variable. Moreover, the use of qualitative methodology could shed more light on this question.

Some limitations must be acknowledged in the interpretation of the results, and with a view to possible future studies that will lead to advances in this field of knowledge. First, one of the study limitations was that only the effects of the intervention were assessed through self-reported questionnaires. Therefore, future studies should use other complementary measurement methods, such as qualitative and observational methodology. Second, the sample of participants in the study was small. Thus, in future studies it would be necessary to include a larger number of students from different schools. Third, the intervention was developed for a team sport—in this case, volleyball—that is not very common in Spanish extra-curricular physical activities and PE curricular programs. Therefore, in the pre-test, students were asked about their perceptions of SDT-related variables in team sports

in general, practiced previously in PE, while the post-test would refer solely to volleyball. As new avenues of research, future studies should develop hybrid SE/TGfU teaching units in other common team sports, such as soccer or basketball, to refute these findings at a situational level. Finally, the main limitation of this study was the lack of a control group. Hence, future studies should include a control group, implementing the same teaching unit through a technical model, or different experimental groups in which the SE or TGfU model would be exclusively applied during the development of the teaching unit. This would allow us to know if the proposal of a hybrid SE/TGfU teaching unit is more effective than the development of these two pedagogical models separately.

As practical implications, these results suggest that SE and TGfU seem to be two student-centered pedagogical models that can complement each other. The six characteristics of the SE model (i.e., season, affiliation, formal competition, record keeping, final event, and festivity) along with the pedagogical principles of the TGfU model (i.e., representation, exaggeration, and tactical complexity) can create more inclusive and sustainable environments where all students can develop positive motivational experiences in PE and foster feelings of novelty and variety in PE. Given that less motivated students benefited more from the hybrid SE/TGfU teaching units, it could be important to carry out baseline assessments in group classes to identify class groups where there are a greater number of amotivated or less autonomously motivated students, where SE/TGfU teaching units should be prioritized. Additionally, if curricular constraints exist, shorter teaching units with around 10 lessons could be implemented to benefit students' experiences of PE. If a more known team sport is used in PE (e.g., soccer, basketball or handball), the use of SE/TGfU could add novelty to the teaching–learning process, with a positive effect on motivational students' experiences.

5. Conclusions

This hybrid SE/TGfU volleyball teaching unit permits designing learning environments where students can make decisions and assume responsibilities, perceive themselves as skilled, and establish positive relationships with teammates. The findings of the present study suggest that a hybrid SE/TGfU teaching unit may be an effective pedagogical resource in PE to improve students' motivational processes, especially those who show an initial low or moderate self-determined motivation at the start of the intervention. Based on this, it seems that the hybridization of these student-centered pedagogical models could foster the design of more inclusive interventions, which would favor the acquisition of more positive experiences by all students in PE lessons. Finally, the results of this study suggest that short seasons of the SE model (i.e., 10 lessons), implemented by a novice PE teacher with no previous experience in this model, may also be effective in improving students' motivational experiences in PE, also bringing novel and varied experiences. Thus, the inclusion of pedagogical models in the training plans of future PE teacher seems essential.

Author Contributions: Conceptualization, S.D.-P., J.S.-S., Á.A., A.G.-A., and L.G.-G.; data curation, S.D.-P., Á.A., and L.G.-G.; formal analysis, S.D.-P., Á.A., and L.G.-G.; investigation, S.D.-P., J.S.-S., Á.A., A.G.-A., and L.G.-G.; supervision J.S.-S., Á.A., and L.G.-G.; writing—original draft preparation, S.D.-P., J.S.-S., and Á.A.; writing—review and editing, S.D.-P., J.S.-S., Á.A., A.G.-A., and L.G.-G. All authors have read and agreed to the published version of the manuscript.

Funding: Javier Sevil-Serrano is supported by a 'Juan de la Cierva' Postdoctoral Research Fellowship from the Spanish Ministry of Economy, Industry, and Competitiveness (grant number: FJC2018-038691-I). Sergio Diloy-Peña is supported by a fellowship from the Government of Aragon and the European Social Fund.

Conflicts of Interest: The authors declare no conflict of interest.

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