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EPER

European Physical Education Review
2016, Vol. 22(2) 185–200
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DOI: 10.1177/1356336X15597927
epe.sagepub.com
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Students' game performance improvements during a hybrid sport education–step-game-approach volleyball unit

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Abstract

The purpose of this study was to examine a hybrid combination of sport education and the step-game-approach (SGA) on students' gameplay performance in volleyball, taking into account their sex and skill-level. Seventeen seventh-grade students (seven girls, 10 boys, average age 11.8) participated in a 25-lesson volleyball season, in which the structural features followed those of sport education and the specific content followed the didactical framework of the SGA. Data were collected prior to the first lesson (pre-test), following the completion of the unit (post-test) and seven days after the post-test (retention). The game performance assessment instrument was used in a systematic observation of video records of students' behaviours while playing a 10-minute 2vs2 game. A 2 (sex) $\times$ 3 (time) and a 2 (skill-level) $\times$ 3 (time) analysis of variance (ANOVA) with repeated measures across the three tests was used to compare the students' performances on all indexes. Results showed that both boys and girls made improvements from the pre-test to the post-test and maintained those improvements to the retention test in almost all the indexes analysed. Further, the results also showed that lower skill-level students realized greater gains than those of higher skill during the unit, which reinforces the idea that future implementations of this hybrid approach should adjust content and learning task to different skill-levels.

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Keywords
GPAI, learning outcomes, physical education, sex, skill-level

Introduction

Sport education is a pedagogical model born from Siedentop's (1994) desire to provide richer and more authentic sports experiences to students in the context of physical education. By adopting a more democratic and inclusive pedagogy that incorporates the key features of institutionalized sport, the goal of sport education is the development of competent, literate and enthusiastic sportspersons (Siedentop et al., 2011).

To date, reviews of research on sport education (Araújo et al., 2014; Hastie et al., 2011; Wallhead and O'Sullivan, 2005) have highlighted evidence of the achievement of those goals. With respect to competence, a number of authors have recognized the potential of sport education in developing students' skill, gameplay and tactical awareness (Alexander et al., 1996; Hastie, 1998b; Hastie et al., 2013; Mesquita et al., 2012; Pritchard et al., 2008). Nevertheless, those reviews highlighted some key factors that warrant further investigation (Araújo et al., 2014; Hastie et al., 2011; Wallhead and O'Sullivan, 2005).

Research on competence in sport education

Araújo et al. (2014) have suggested that a key factor warranting further investigation within the development of competence in sport education is that of content development within seasons. The justification for this call lies in the location of sport education as an 'outward-focused' model (Hastie and Curtner-Smith, 2006: 23), in which the primary concern is the performance of the teacher and the students in their various participatory roles (Siedentop et al., 2011). What is less understood with respect to sport education is the nature of learning tasks and the content to be taught during seasons. Where such investigation has taken place, it has been through the examination of hybrid models which have used the organizational characteristics of sport education (persisting teams, formal competitions, roles, etc.) with other forms of game-based instruction that focus more on specific pedagogies. To date, these have included 'teaching games for understanding' (TGfU) (Hastie and Curtner-Smith, 2006), and the 'invasion game competence model' (IGCM) (Mesquita et al., 2012).

Sport education hybrid models

When combining sport education and TGfU, Hastie and Curtner-Smith (2006) found the act of teaching to be particularly labour-intensive, and given the need for the teacher to drive and give momentum to the proceedings, demanded that the teacher possess superior content and pedagogical content knowledge. Notwithstanding, the specificity of tactics within team sports (in particular the differentiation between invasion and non-invasion games) makes it necessary to build models that attend to this specificity, which is not taken into account by TGfU (Mesquita et al., 2012). In a study examining the impact of a hybrid sport education–IGCM on students' improvements, Mesquita et al. (2012) found that the learning tasks structure provided by the ICGM offered students the opportunity to improve their skill execution and decision-making. This outcome was particularly beneficial for girls and lower skill-level students.

Nevertheless, to date, no study has examined the effectiveness of hybrid models in any form other than invasion games (Araújo et al., 2014; Harvey and Jarret, 2014; Hastie et al., 2011; Wallhead and O'Sullivan, 2005). The *Step-Game-Approach* model (SGA) (Mesquita et al., 2005) is one such model that may provide an appropriate framework for the development of gameplay ability in net/wall sports such as volleyball, badminton or tennis. In the SGA, students are presented with progressive (step-by-step) game problems that challenge their capacity for understanding and current performance profiles. Within the SGA, three types of instructional tasks are used. These are known as adaptation tasks (in which the goal, action structure and basic tactical features are identical to the full game), structuring tasks (comprehend the same tactical and technical skills of the game but without opposition) and acquisition tasks (focused on the development of a specific skill) (Pereira et al., 2011).

Research using the SGA has shown its effectiveness in the development of volleyball gameplay performance (Mesquita et al., 2005). However, student gains were not uniform across students, with girls and those in the lower skill-level ranges seeming to improve more than boys and higher skill-level students. The rationale for combining sport education with the SGA is that the idea of the persisting team allows students to practise together and to support and hold their teammates accountable in their quest for success. Further, this affiliation seems to promote increased engagement as all students (boys and girls, higher and lower skilled) consider themselves as important and useful to their team's success (Hastie, 1998a, 1998b).

Purpose of this study

Given the lack of research on gameplay performance in sport education non-invasion games, the purpose of the current study was to test the assertion that a hybrid combination of sport education and SGA can promote students' gameplay performance in volleyball. Within the study itself, a subsequent goal was to determine the extent to which gains in students' performance levels might vary according to sex and skill-level.

Methods

Participants

The participants in this study were 17 seventh-grade students (seven girls, 10 boys, average age 11.8) from one middle school physical education class in northern Portugal. While the entire class consisted of 20 students, the data of three students were not included in any analysis as they were not present for all three assessment. The students had no previous experience learning volleyball, and had not participated in sport education seasons prior to this study. The teacher had more than 20 years of teaching experience, and one year's experience implementing both sport education and SGA models. The ethics committee of the researchers' university approved the protocol of the study, and all participants provided assent following parental informed consent.

The sport education–SGA unit

The students participated in a 25-lesson volleyball unit that took place over seven weeks. During each week, one lesson was allocated 45 minutes with the second being of 90 minutes duration. The structural features of the unit followed those of sport education (persisting teams, formal

competition and student roles), while the specific content and learning tasks followed the SGA model. The complete unit plan is shown in Table 1.

The sport education features. In the first week of the unit (lessons 1 and 2), the students were divided into four mixed-ability teams of five students each. Team allocation was based upon the teacher's evaluation of the students' performance in a volleyball lesson prior to the unit. The educational goals and procedures of sport education were also introduced to students in these lessons. During the following 10 lessons (the pre-season), the students participated in within-team practice in which they were given the opportunity to practise skills and team-related roles. Non-consequence games (within and against other teams) were also scheduled within these lessons. During the competition phase (lessons 13–24), all teams participated in a series of matches that counted towards a class championship. The formal competition schedule guaranteed the equitable participation of all students by ensuring the same playing time for all students and that all students competed in matches against those of a similar skill-level.

Students also experienced different roles (coaches, referees and statisticians) on a rotating basis. The student taking the role of coach was chosen by the teacher. In this way, potential imbalanced power relations between students based on status portrayed by accounts in earlier research on sport education (e.g. Brock et al., 2009; Hastie, 1998a) were minimized. In addition, the students were held accountable for their fair-play behaviours. For example, teams accumulated point penalties within lessons if they displayed actions that compromised inclusive practices, effort, peer encouragement, and engagement in the managerial tasks.

The teacher took most of the instructional leadership responsibilities in the beginning lessons. Nevertheless, throughout the season the student-coaches were progressively called on to take on more responsibility for instruction during peer-assisted tasks. From leading instruction only during warm-ups from lessons two through five, the student-coaches began to lead instruction from lesson seven and chose the learning tasks deemed required for their teams' performance improvements from lesson 11 onwards. The training of the student-coaches included prior-lesson meetings throughout the unit where they learned not only subject matter content, but also instructional strategies related to task presentation, management and feedback.

The SGA processes. Based on students' performance on a 2*vs*2 assessment test conducted prior to the unit, the first step game was applied (Mesquita et al., 2005). The 2*vs*2 game is a modified game form most suitable for the diagnosis of the level of the participants. On the one hand, it allows the identification of basic performance levels when players are unable to minimally sustain the ball. On the other hand, it also identifies performance levels above that range from the minimum capacity to support the ball (step 2) to the capacity of organizing game actions (early 3rd step), or even the ability to differentiate the most suitable solutions for the game situation (early 4th step). The main goal of the first step was for students to understand the logic of the simplest game form, that being 1*vs*1. In order to maximize performance during the 1*vs*1 game, two main tactical skills were taught. These were coined as 'intervention' (get your body to the ball), and 'opposition' (send the ball to the vulnerable place on the opponent's court, both in the serve and in the attack). During this step, the technical focus was on the overhead pass and the underhand serve. In the second phase of the unit, the second step of the SGA was also taught, in which the main goal was to cooperate with their teammate in the 2*vs*2 game. The SGA suggests the introduction of the forearm pass because after learning the overhead pass the player needs another skill for touching the ball

Table 1. Sport education–step-game-approach volleyball unit outline.

Lesson	Content
1 and 2	Explanation of the model and competition format Allocation of teams and individual roles Teacher-directed instruction: overhead pass, 1*vs*1 Within-team event practice
3	Teacher-directed instruction: overhead pass and 1*vs*1 (position on court) Within-team practice
4 and 5	Teacher-directed instruction: overhead pass, 1*vs*1 (intervention) Within-team practice
6	Teacher-directed instruction: overhead pass, 1*vs*1 (intervention) Within-team practice
7 and 8	Student-directed instruction: warm-up, overhead pass and 1*vs*1 (opposition) Lesson planned by the teacher Within-team practice and role practice (shared teacher- and student-directed monitoring)
9	Student-directed instruction: warm-up, overhead pass and 1*vs*1 (opposition) Lesson planned by the teacher Within-team practice and role practice (shared teacher- and student-directed monitoring)
10	Student-directed instruction: warm-up, overhead pass and 1*vs*1 (opposition) Lesson planned by the teacher Within-team practice and role practice (shared teacher- and student-directed monitoring)
11 and 12	Student-directed instruction: warm-up, serve and 1*vs*1 (opposition) Lesson planned by the teacher with students having the opportunity to plan some learning tasks Within-team practice and role practice (shared teacher- and student-directed monitoring)
13	Formal competition: 1*vs*1 Student-directed instruction: warm-up, serve and 1*vs*1 (opposition) Lesson planned by the teacher with students having the opportunity to plan some learning tasks Within-team practice and role practice (shared teacher- and student-directed monitoring)
14 and 15	Formal competition: 1*vs*1 Student-directed instruction: warm-up, and 1*vs*1 Lesson planned by the teacher with students having the opportunity to plan some learning tasks Within-team practice and role practice (shared teacher- and student-directed monitoring)
16	Formal competition: 1*vs*1 Student-directed instruction: warm-up, and 1*vs*1 Lesson planned by the teacher with students having the opportunity to plan some learning tasks Within-team practice and role practice (shared teacher- and student-directed monitoring)
17–19	Formal competition: 1*vs*1 and 2*vs*2 Student-directed instruction: warm-up, and 1*vs*1 Lesson planned by the teacher with students having the opportunity to plan some learning tasks Within-team practice and role practice (shared teacher- and student-directed monitoring)
20–24	Formal competition: 2*vs*2 Student-directed instruction: warm-up, and 2*vs*2 Lesson planned by the teacher with students having the opportunity to plan some learning-tasks Within-team practice and role practice (shared teacher- and student-directed monitoring)
25	Culminating event

coming from lower and faster trajectories. However, there was no time during the unit to teach this skill.

This sport education–SGA hybrid also comprised procedures for game modification, namely representation and exaggeration modes (Thorpe et al., 1984). Throughout the unit, based on the previous recommendations of Mesquita et al. (2005), some rules were adapted in order to provide a more developmentally appropriate form. First, one rebound was permitted when necessary, as it provided more time to analyse the trajectory of the ball and helped players to place their bodies behind the ball. Second, double touches were allowed in order to permit players to correct a previous defective contact.

During team and individual practice sessions, three types of instructional tasks were used. In the adaptation tasks, the goal, action structure and basic tactical features were identical to the full volleyball game. Nevertheless, in order to improve the quality of gameplay, the teacher found it was not sufficient to work directly on adaptation tasks. When students were not able to control actions to play basic game tasks, the structuring tasks afforded students the opportunity to improve the quality of their tactical and technical skills. These tasks preserved the sequence of defensive and/or offensive actions even if the choice of possible solutions to the actual game problem had to be restricted. Beyond that, when necessary, acquisition tasks were also used. These tasks were only focused on the development of a specific piece of technical or tactical content. From the first to the last lessons, the variability of practice was gradually reduced, but the time spent in acquisition tasks was reduced to the minimum necessary to prevent game disruption (Mesquita et al., 2005).

Instructional and treatment validity

In order to determine the influence of a particular pedagogical model on students' learning, it was critical to validate that the instruction was consistent with accepted standards of the models and whether the contextual features allowed for the successful implementation of those models (Hastie and Casey, 2014).

Itemizing teacher and learner processes. A 10-item checklist (Table 2) with benchmarks was adapted from Hastie et al. (2013) and Pereira et al. (2011) to confirm the behavioural fidelity of the teacher's instruction according to the sport education model and SGA. One researcher of the present study and an outside-trained observer not associated with the study (but with extensive research in instructional models in physical education) observed randomly selected lessons from the unit to assess the presence of those items. Items 1, 3, 4, 5, 7, 8 and 9 are characteristics of sport education, while the rest of the items are related to the SGA model. A 100% agreement between these observers confirmed the absence of doubt regarding the instructional model used in each lesson.

Contextual and operational requirements. For an instructional model to work it has to reunite some favourable contextual conditions, such as teacher expertise and operational requirements (Metzler, 2011). With respect to teacher expertise, the teacher participated in a sport education professional development programme during the year previous to this study. The workshop consisted of (a) several lectures focused on teaching styles and instructional models; (b) lectures on the features of the sport education model as well as its conceptualization and purposes; (c) the application of sport education to teaching individual sports with the example of track and field seasons; (d) the application of sport education to teaching volleyball; and (e) sport education research: domains and

Table 2. Instructional checklist (adapted from Hastie et al., 2013 and Pereira et al., 2011).

Element of the lesson	Present	Absent
1. Group of students go to a designated home area and begin warming up with that group.		
2. The tasks under observation are basic game forms, game-like tasks or acquisition tasks, and the time spent on acquisition tasks is reduced to the minimum necessary.		
3. Students practise together with their group/team under the direction of a peer leader.		
4. The content of the task is related to the stage of the step-game-approach that is being taught during the unit.		
5. Students remain a part of easily identifiable groups throughout the lesson and throughout different tasks.		
6. All the tasks are related to the small-sided game that is being taught.		
7. Performance records are kept by students.		
8. Students perform specialized tasks within their group/team.		
9. Student performance scores count toward a formal and public scoring system.		
10. Modifications to the full-game were performed.		

empirical evidence. Also during the year prior to this study the teacher had accomplished his master's degree, which involved the implementation of a hybrid sport education–SGA volleyball unit. Finally, the space (at least three volleyball courts in all lessons) and material available for practice (e.g. balls, cones, scorers, whistles, etc.) were sufficient to create the necessary conditions to maximize student learning during practice and competition.

Design

The goal of this study was to examine the efficacy of a particular curriculum intervention in promoting improvements in students' volleyball gameplay skills. It was not the goal to demonstrate the superiority of this model over other forms of instruction, but merely to determine if improvement scores were possible in this context. By consequence, a pre–post-retention test quasi-experimental design was used without the concurrent application of a control group, which is consistent with the designs of other studies involving hybrid models (e.g. Mesquita et al., 2012; Pritchard et al., 2014).

Data collection

Data were collected prior to the first lesson of the unit (pre-test: PreT) and following completion of the unit (post-test: PosT). Consistent with the recommendations of Haerens and Tallir (2012) and Magill (2011), a retention test (ReT) was also applied seven days after the PosT in order to provide a more accurate assessment of all students' improvements. During the time from PosT to ReT, none of the students received any instruction related to either sport education or volleyball.

A systematic observation of video records of students' behaviours while playing a 10 minute 2*vs*2 game was used in order to analyse students' play performance at the PreT, PosT and ReT. The game performance assessment instrument (GPAI) (Oslin et al., 1998) adapted to volleyball by Mesquita et al. (2005) was used. More specifically, the tally scoring method recommended by Mitchell et al. (2006) was used, in which students' gameplay actions were assessed as appropriate/

effective or inappropriate/ineffective responses. When the amounts of those actions were totalled, an individual component index was calculated.

For the purpose of the present study four indexes were calculated. These were decision making (DM), adjust (ADJ), skill efficiency (SE) and skill efficacy (SEF). The DM index refers to the ability to choose which movement to execute in response to a tactical problem (for instance, play the ball to the vulnerable place of the opponent's court). In addition, ADJ involves the ability to adjust position to the play the ball (for instance, adjust a position to play the ball according to the player who does the 2nd touch). Moreover, after the players decide what they are going to perform and adjust as needed to the game, skill execution (for instance, raise and cup hands in front and above the forehead in order to touch the ball) and skill efficacy (point, continuity or error in the attack) should be attended to achieve the desired outcome (Mitchell et al., 2006). Narrow definitions of these behaviours were developed in order to specifically and reliably identify appropriate and inappropriate actions (Memmert and Harvey, 2008). The game performance (GP) index was also calculated [(DMI+AI+SEI+EFI)/4], as was game involvement (GI) (Mitchell et al., 2006). A total of 18,368 students' behaviours in a total of approximately 510 minutes of observations were collected.

Reliability

The reliability of the data was examined from two perspectives, namely intra-observer (15 days after the first observation) and inter-observer testing procedures (performed by a second observer). Keeping with the recommendations of Tabachnick and Fidell (2007), over 10% of all player actions were examined. Two observers with experience in the area of instructional models, particularly sport education, and also volleyball coaches and former volleyball players, conducted the reliability analysis. Both received training in order to effectively identify appropriate and inappropriate actions. This reliability was calculated with all indexes considered in the present study (in a total of 36) using the intraclass correlation coefficients (ICC) (Atkinson and Nevill, 1998; Baumgartner and Jackson, 1995). The only correlation scores that fell below the recommendations of van der Mars (1989) were for DM at post-test for both inter and intra-oberver assessments (0.66 and 0.77 respectively).

Data analysis

A 2 (sex) × 3 (time) and a 2 (skill-level) × 3 (time) analysis of variance (ANOVA) with repeated measures across the three tests (PreT, PosT and ReT) was used to compare the students' performances on all indexes. Skill-level groups were determined through a non-hierarchical cluster analysis based on students' performance on the PreT using the *K*-means method with the number of clusters being fixed at two (Cluster 1: 11 higher skill-level students; Cluster 2: six lower skill-level students).

The data of the repeated measures ANOVA were subjected to Mauchley's test for sphericity. When the Mauchley's sphericity assumption was violated, the ANOVA results were adjusted using the Geisser–Greenhouse correction. Main effects and interactions were analysed and subsequent Bonferroni post hoc comparisons were conducted to access better where differences occurred.

Results

The students' performance for all indexes at the three time points of the unit are shown in Table 3. From this table, it can be seen that the whole class made significant improvements in almost all

Table 3. Student performance for all indexes.

				Time effect					
						PreT–PosT comparison		PostT–ReT comparison	
	PreT *M (SD)*	PosT *M (SD)*	ReT *M (SD)*	*F* *p*	η^2	*F* *p*	η^2	*F* *p*	η^2
GP	0.58 (0.18)	0.75 (0.07)	0.73 (0.08)	12.91 <0.001	0.465	18.33 0.001	0.4534	1.10 0.310	0.064
GI	189.82 (82.27)	358.41 (140.09)	382.71 (126.43)	40.62 <0.001	0.717	52.78 <0.001	0.767	1.00 0.332	0.059
DM	0.47 (0.19)	0.61 (0.13)	0.57 (0.16)	2.98 0.065	0.157	6.02 0.026	0.273	0.539 0.474	0.033
ADJ	0.55 (0.18)	0.72 (0.08)	0.72 (0.09)	12.39 <0.001	0.44	13.90 0.002	0.465	0.00 0.985	0.00
SE	0.72 (0.25)	0.91 (0.07)	0.89 (0.08)	8.87 0.001	0.38	10.54 0.005	0.397	2.051 0.171	0.114
SEF	0.56 (0.24)	0.75 (0.13)	0.73 (0.14)	11.45 0.002	0.42	13.36 0.002	0.455	0.592 0.453	0.036

M: mean; SD: standard deviation; PreT: pre-test; PosT: post-test; ReT: retention test; GP: game performance; GI: game involvement; DM: decision making; ADJ: adjust; SE: skill efficiency; SEF: skill efficacy.

areas of volleyball play from PreT to PosT, and maintained these improvements at least until the ReT. Only the DM index showed no differences across the three points of assessment. In addition, Figure 1 outlines the game performance improvements of all students throughout the season.

Analysis by sex

Results from the repeated measures ANOVA are shown in Table 4. From this table it can be seen that there was a significant main effect for time for all variables, but the only significant sex × time interaction was found for GI. In this case, the gains for boys were more substantive than those for girls. Post hoc analysis of all variables showed improvements from PreT to PosT and no difference between the PosT and ReT.

Analysis by skill level

Table 5 shows the students' performance by skill-level. A significant main effect for time was found for all variables. Similar to the analysis by sex, improvements were from PreT to PosT. A number of significant skill-level × time interactions were found, with the lower skill-level students showing greater improvements from PreT to PosT for GP, ADJ, SE and SEF, and only from PreT to ReT for DM.

Discussion

The present study sought to examine students' performance improvements following a hybrid sport education–SGA volleyball unit. The results showed that the sport education–SGA was an effective

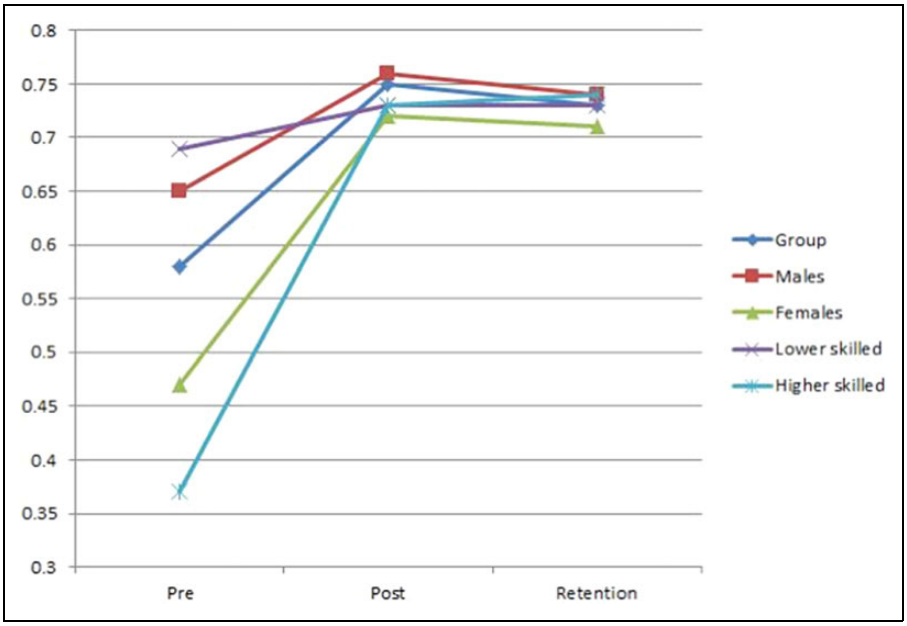

Figure 1. Students' game performance improvements throughout the season.

hybrid model in improving game performance and involvement in volleyball, including the sub-categories of decision-making, adjustment, skill efficiency and skill efficacy, from the entry to the end of the unit. Results also showed maintenance of these improvements to the retention test.

Improvements related to students' sex

In this sport education–SGA hybrid model, both boys and girls made improvements from the pre-test to the post-test and maintained those improvements to the retention test in almost all the indexes analysed. Differences according to students' sex were only found in the game involvement index, favouring boys. However, despite the importance of game involvement to the students' overall game performance (Memmert and Harvey, 2008), this index might not translate students' improvements but only how participants are involved during gameplay (Pritchard et al., 2008). For example, during long rallies, game involvement scores will increase, but there is also the potential that students can show lower game performance scores (i.e. if there was a long rally, game involvement can have higher scores but students can also show only inappropriate actions in all other gameplay indexes).

Research focused on sport education (Hastie, 1998a, 1998b; Hastie et al., 2009; Pereira et al., 2015) and hybrid models (Mesquita et al., 2012) that considered sex in the analysis of students' improvements have often produced contradictory results (Araújo et al., 2014). For example, some studies report superior learning opportunities for boys (Hastie, 1998a, 1998b; Hastie et al., 2009) while for others, girls are favoured (Mesquita et al., 2012; Pereira et al., 2015). In the particular case of the study of Mesquita et al. (2005) with the application of the SGA model, the authors found that girls achieved greater advantages from the programme, particularly in some tactical and technical skills. In the present study, the learning environment sustained over the hybrid season

Table 4. Descriptive statistics by students' sex.

	Boys			Girls			Time effect						Sex × time interaction	
									PreT–PosT comparison		PosT–ReT comparison			
	PreT *M (SD)*	PosT *M (SD)*	ReT *M (SD)*	PreT *M (SD)*	PosT *M (SD)*	ReT *M (SD)*	*F* *p*	η^2	*F* *p*	η^2	*F* *p*	η^2	*F* *p*	η^2
GP	0.65	0.76	0.74	0.47	0.72	0.71	16.98	0.531	22.56	0.601	0.903	0.057	2.53	0.144
	(0.12)	(0.07)	(0.09)	(0.20)	(0.07)	(0.07)	<0.001		<0.001				0.12	
GI	216.30	448.80	439.80	152.00	229.29	301.14	50.08	0.770	125.38	0.893	1,83	0.109	7.58	0.34
	(92.77)	(103.45)	(127.03)	(48.01)	(56.67)	(72.32)	<0.001		<0.001		0.20		0.002[a]	
DM	0.56	0.62	0.57	0.35	0.59	0.58	4.12	0.216	8.51	0.362	0,405	0.026	2.46	0.141
	(0.11)	(0.13)	(0.17)	(0.21)	(0.14)	(0.16)	0.02		0.011		0.534		0.10	
ADJ	0.58	0.74	0.73	0.51	0.70	0.70	11.73	0.439	13.55	0.467	0.001	0.00	0.11	0.70
	(0.20)	(0.03)	(0.08)	(0.15)	(0.12)	(0.11)	<0.001		0.002		0.979		0.81	
SE	0.76	0.89	0.87	0.65	0.94	0.92	10.26	0.406	12.20	0.449	1.79	0.107	1.57	0.095
	(0.22)	(0.08)	(0.09)	(0.29)	(0.03)	(0.05)	<0.001		0.003		0.201		0.22	
SEF	0.68	0.81	0.80	0.38	0.66	0.64	13.33	0.470	15.68	0.511	0.56	0.036	1.80	0.107
	(0.11)	(0.12)	(0.12)	(0.26)	(0.07)	(0.11)	<0.001		0.001		0.466		0.18	

M: mean; SD: standard deviation; PreT: pre-test; PosT: post-test; ReT: retention test; GP: game performance; GI: game involvement; DM: decision making; ADJ: adjust; SE: skill efficiency; SEF: skill efficacy.

[a] Boys ($p < 0.001$) showed superior improvements than girls $p = 0.007$) from the PreT to the PosT.

Table 5. Descriptive statistics by students' skill-level.

	Higher			Lower			Time effect						Skill-level × time interaction	
									PreT–PosT comparison		PosT–ReT comparison			
	PreT *M (SD)*	PosT *M (SD)*	ReT *M (SD)*	PreT *M (SD)*	PosT *M (SD)*	ReT *M (SD)*	*F* *p*	η^2	*F* *p*	η^2	*F* *p*	η^2	*F* *p*	η^2
GP	0.69	0.73	0.73	0.37	0.73	0.74	58.453	0.796	80.90	0.844	0.470	0.030	30.86[a]	0.673
	(0.08)	(0.07)	(0.09)	(0.11)	(0.07)	(0.06)	<0.001		<0.001		0.504		<0.001	
GI	218.55	402.36	416.73	137.17	277.83	320.33	34,216	0.695	44.03	0.746	1.20	0.074	0.39	0.25
	(89.76)	(126.39)	(131.14)	(20.12)	(137.15)	(97.69)	<0.001		<0.001		0.291		0.682	
DM	0.57	0.65	0.55	0.31	0.53	0.61	5.226	0.258	7.50	0.33	0.026	0.002	4.63[a]	0.236
	(0.08)	(0.10)	(0.19)	(0.21)	(0.15)	(0.10)	0.011		0.015		0.874		0.018	
ADJ	0.65	0.72	0.74	0.37	0.72	0.69	26.492	0.638	38.63	0.720	0.081	0.005	10.16[a]	0.404
	(0.12)	(0.06)	(0.09)	(0.11)	(0.12)	(0.09)	<0.001		<0.001		0.780		0.002	
SE	0.86	0.91	0.88	0.45	0.92	0.92	45.218	0.758	56.34	0.790	1.20	0.074	34.51[a]	0.697
	(0.09)	(0.06)	(0.08)	(0.23)	(0.09)	(0.08)	<0.001		<0.001		0.289		<0.001	
SEF	0.66	0.75	0.74	0.37	0.75	0.72	24.043	0.616	30.33	0.669	0.653	0.042	9.46[a]	0.387
	(0.13)	(0.15)	(0.13)	(0.28)	(0.10)	(0.17)	<0.001		<0.001		0.432		0.002	

M: mean; SD: standard deviation; PreT: pre-test; PosT: post-test; ReT: retention test; GP: game performance; GI: game involvement; DM: decision making; ADJ: adjust; SE: skill efficiency; SEF: skill efficacy.

[a] Only lower skill-level students improved ($p < 0.001$ from PreT to PosT to GP, ADJ, SE and SEF; $p = 0.015$ from PosT to ReT to DM).

seemed effective in minimizing inequities and power imbalances between boys and girls. Both groups had access to game roles (statistician, referee, player) on a rotating basis and the formal competition schedule ensured the same opportunities for boys and girls to practise and compete. Moreover, the powerful team roles (in this case, the student-coach) were chosen by the teacher in order to prevent imbalanced power relations between students based on their sex. In addition, the accountability systems applied during the learning tasks promoted learning opportunities for all students, broadly to boys and girls. These included the requirement that the ball had to be touched by all players (a minimum of two touches per team required) and the promotion of three touches to send the ball to the opponent's court (for instance, more points to the team who execute three touches) during the 2*vs*2 game, as well as that all students should participate in all the functions of the drill (i.e. server, receiver, setter, attacker, and defender).

Improvements related to students' skill-level

The results of this study seem to suggest that lower skill-level students were the primary beneficiaries of the hybrid unit, a finding that corroborates previous research on sport education (e.g. Carlson and Hastie, 1997; Mesquita et al., 2012; Pereira et al., 2015) as well as SGA (Mesquita et al., 2005). While the lower skill-level students improved on all parameters of gameplay, those who began the season with higher entry levels may have been limited by a ceiling effect. It is positive to note, however, that for some dimensions (e.g. DM, ADJ, SE and SEF), the final scores of the lower skilled students were matching the entry scores of the higher skill-level students.

One factor that may have limited the development of the higher skilled students was the nature of the formal competition. That is, while all students participated in the same formal competition with the 1*vs*1 small-sided game, the higher skill-level students may have needed more challenging contests (perhaps more time dedicated to the 2*vs*2) in order to ensure that all students worked according to what Vygotsky (1978) called their 'zone of proximal development'. As such, future sport education–SGA units' plans should adjust the content and learning task to the different skill-levels presented within the participants of the season, notably through task modification. Examples might include modification by representation and exaggeration, as well as differentiated criteria of success within the tasks according to students' skill-level. More use of the notion of 'graded competition' might also be warranted. Siedentop et al. (2011) describe graded competition as a case where each team creates sub-teams who then compete against other students of similar skill-levels. In some cases, the games themselves may differ with respect to court size and/or scoring rules.

Overall, this study has shown that this sport education–SGA hybrid unit had a positive impact on the gameplay performance of both boys and girls. Nevertheless, this study also showed that lower skill-level students realized greater gains than those of higher skill during the unit, which reinforces the idea that future implementations of this hybrid approach should adjust the content and learning task to different skill-levels. Given the results of the present study, future sport education implementation should move forward to designs that attend to the individual rhythm of learning without losing the affective and social goals of this model. As previously mentioned, the content and learning tasks presented within the season should be adjusted according to students' skill-level. In this way, it would be possible to provide authentic and rich sport experiences to all students in the context of physical education (Siedentop, 1994).

This study also showed that the use of the retention test was particularly crucial to a more accurate assessment of all students' improvements during this hybrid sport education–SGA unit

(Haerens and Tallir, 2012; Magill, 2011). This suggests the need to evaluate students' learning outcomes beyond the end of the instructional period. As already stated by Mesquita et al. (2012: 215), 'teachers should evaluate the impact of the teaching–learning process not just at the end of the units, but also at a later date, as the time effect may have a significant influence on learning gains'.

Nevertheless, the results of the present study are limited to inferences made from a single unit experience of a hybrid model. Research suggests that skilful gameplay takes time and the application of more than one unit consecutively over time might benefit the dynamics of social and instructional systems within working groups and consequently improve students' learning (Araújo et al., 2014; Brunton, 2003; Wallhead and O'Sullivan, 2005). Future research should therefore analyse the impact of these hybrid instructional models with more longitudinal data collection that extends beyond one or two units.

Future research should also move forward to research designs that attend to the complexity of teaching and learning processes and the working dynamics operating within teams (Araújo et al., 2014; Hastie et al., 2011; Wallhead and O'Sullivan, 2005). Therefore, research is encouraged to use more qualitative research designs to examine students' engagement and the dynamics operating within these two instructional models, or in fact any instructional models (Pereira et al., 2015). For instance, research has highlighted inequities related to students' status (Brock et al., 2009), which should be deeply analysed in order to guide future hybrid implementations. Among these research designs, action-research and case studies are two possible ways to provide a richer description of model-based instruction.

Conclusions

The results of the present study strongly reinforce the value of incorporating instructional models that provide a more purposeful didactical framework to sport education, in particular with respect to the tasks and the content to be taught. Only with these alliances between instructional models with different frameworks would it be possible to achieve the learning outcomes without losing the affective and social goals of sport education that are so valued by students. In particular, both boys and girls improved in all the gameplay dimensions from the beginning to the end of the season. Notwithstanding, when students' skill-level was considered, only lower skill-level students made significant improvements, which suggests that future implementation should consider students' different skill levels when developing content within the season.

Acknowledgements

The authors would like to thank Cláudio Farias and Professor José Maia for their assistance with the preparation of this manuscript.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Portuguese Foundation for Science and Technology (FCT) / POPH / QREN / European Social Fund [grant number SFRH/BD/72361/2010].

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