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Research article

A Comparative Study of Students' Track and Field Technical Performance in Sport Education and in a Direct Instruction Approach

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Abstract
This study examined students' technical performances improvements in three track and field events (hurdles, shot put, and long jump) following either a Sport Education season or a Direct Instruction unit. An experienced Physical Education teacher taught two classes totalling 47 sixth-grade students (25 boys and 22 girls, aged between 10 and 13 years old) in 20, 45-minute lessons over 10 weeks. The students' technical performances were analysed and evaluated through systematic observation of videos. The Wilcoxon signed-rank test was used to compare scores at three time points (pre-test, post-test and retention), and the Mann-Whitney U test was used to examine the differences within each instructional model at each assessment moment, as well as by gender and skill level. The impact of each instructional model in student learning was markedly distinct. While in Sport Education students of both genders and skill levels improved significantly in all events, in Direct Instruction, evidence of significant improvements was limited to boys and students of higher skill level.

Key words: Sport education, athletics, instructional models, student learning.

Introduction

The reform movement within Physical Education which gained momentum during the 1980's proposed a move from teacher-centred approaches grounded on behaviourist premises towards student-centred teaching approaches based on constructivist and social learning theories (Chandler and Mitchell, 1991). As an example of a teacher-centred approach, Metzler (2011) lists Direct Instruction as an example of one model that foregrounds the teacher as the instructional leader. In Direct Instruction, teachers are placed on "centre-stage" (Curtner-Smith and Sofo, 2004, p. 351), and by consequence are responsible for most of the decisions about content development, class management, student accountability, and student engagement (Metzler, 2011).

On the other hand, Sport Education is proposed as following a more student-centred set of pedagogies, grounded within the tenets of constructivist premises (Metzler, 2011). In Sport Education the assumption is that learning comes as an interactive and cooperative construction of shared meanings between students devised by means of authentic learning environments and meaningful activities (Siedentop, 2002). Thus, students' sporting experiences are framed within specific features commonly found in youth, community, and interscholastic sports programs. First, students in Sport Education become members of teams and maintain their affiliation throughout the entire season. Second, there is a system of formal and regular competition in which significant record keeping takes place. Third, the entire season is designed to be festive and concludes with a culminating event that celebrates team and student performance (Siedentop et al., 2011). In a major departure from most forms of competition within physical education, students in Sport Education act not only as players, but also take on responsibilities such as coaches, referees, trainers, scorekeepers, and statisticians among others. By consequence, the increased range and complexity of learning activities dictates that Sport Education seasons require a longer allocation of time that might be found in other formats of physical education. The model's pedagogical structure also encompasses several formal accountability procedures aimed at enhancing student inclusion and equitable learning opportunities. Namely, it seeks to create a sense of community among students by means of extensive teamwork where the higher-skilled students work with their less-abled peers so that all students believe they are making contributions to their teams and enjoy the sense of belonging (O'Donovan et al., 2010).

Reviews of Sport Education (e.g., Hastie et al., 2011; Wallhead and O'Sullivan, 2005) have confirmed the effectiveness of the model in enabling student engagement within student-centred learning tasks of the curriculum, and that the emphasis on persistent team membership encourages personal and social development. However, with respect to students' skill development, there is still a need for further empirical evidence showing the impact of Sport Education on student learning. As a case in point, research to date has either been grounded primarily on survey reports seeking the perceptions of students and teachers (Hastie et al., 2011), or has consisted of empirical studies that lacked appropriate comparison groups in experimental or quasi-experimental research designs (Wallhead and O'Sullivan, 2005).

Nonetheless, two studies (Hastie et al., 2013; Pritchard et al., 2008) have indeed compared student skill accomplishment in units taught using either Sport Education or Direct Instruction approaches. However neither of these studies showed a definitive advantage of one method over the other. For example in the volleyball study of Pritchard et al. (2008), while there was no significant difference between models for skills and knowledge, Sport Education was considered more efficient in enhancing students' volleyball game-play. Similarly, in the track

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and field study of Hastie et al. (2013) Sport Education was shown to be slightly more effective than Direct Instruction in promoting students' improvements across three events (hurdles, triple jump, and shot-put), even though students had enhanced technical performance in both approaches.

It should be noted those both the above mentioned studies presented their results without taking account of the students' gender or their initial skill levels. By consequence, these studies perhaps missed the opportunity to provide "a more complete analysis of the impact of Sport Education on the development of player competence" (Hastie, 1998, p. 374). This point is important given research in Physical Education that has highlighted the critical role that gender holds in the conduct of the subject, particularly in instances where some settings socially reward boys for aggressive and dominant game behaviours (Ennis et al., 1997; Gutiérrez and Garcia-Lopez, 2012). Within these settings of pervasive male-dominance in lesson activities, more learning opportunities are afforded to boys over girls, who in turn are often alienated from power roles and decision-making processes (Chase et al., 1994; Ennis et al., 1997; Ennis, 1999; Griffin, 1984, 1985; Harrison et al., 1999; Hastie, 1998; Parker and Curtner-Smith, 2012; Pritchard et al., 2014).

In the same way as gender, students' initial skill levels also have the potential to influence skill development. As an example from volleyball, French et al. (1991) showed that the initial level of lower-skilled students constrained their participation during all class transitions to increasingly complex activities. In contrast, two studies by Mesquita et al. (2005; 2012) found greater gains by lower-skilled students compared with their higher-skilled classmates in units of volleyball and soccer respectively.

Given the limitations of previous research on student achievement in physical education with respect to both design and accounting for gender and initial skill levels, the purpose of the current investigation was to examine the effects of two instructional units (one Sport Education and the other using Direct Instruction) on students' technical performance in three track and field events (hurdles, triple jump, and shot put). By incorporating an increasing number of dependent variables, the significance of this work lies in its ability to provide a more complete account of the impact of different instructional approaches on student learning.

Methods

Participants

The participants in this study were 47 sixth-grade students (25 boys and 22 girls) aged between 10 and 13 years old from two classes in a school in Northern Portugal. Each class completed either a season of Sport Education (9 boys and 10 girls) or Direct Instruction (16 boys and 12 girls) in track and field athletics. The classes met twice a week during a period of 10 weeks for a total of 20 lessons. Each lesson was scheduled for 45 minutes.

The teacher of both classes was a female who had 19 years of experience in teaching Physical Education at both 2nd and 3rd levels of schooling (5th to 9th grade), and as such had significant experience teaching the track and field, as it is a mandatory element of the Physical Education curriculum in Portuguese schools. The ethical committee of the authors' university approved the research protocol, and the parents or legal guardians of each student signed an informed consent letter allowing the participation of their child in the study.

The track and field athletics units

The sport education season: The Sport Education season included all the features suggested by the benchmark literature in the model (seasons, persisting teams, formal competition, record keeping, festivity and a culminating event) (Siedentop et al., 2011). The first lesson served the purpose of introducing the educational goals and procedures embedded in Sport Education to the students, as well as allocating them to four mixed-ability teams based upon their performance on skills tests performed in lessons prior to the season. During this first lesson, the students allocated themselves to various team roles. Consistent with the study of Hastie et al. (2013) these roles were student-coaches, statisticians, starters, timekeepers, and finish judges assigned for running events and for taking measurements in the jumps and throws.

The following lessons saw students interspersing practicing athletics skills with formal competition of hurdles, shot put, and triple jump in a competition format known as the "event model" (Siedentop et al., 2011, p. 111). During within-team event practice, students were given the opportunity to practice roles and to compete with teammates within a noncompetitive environment. During formal competition the teams were paired to compete with one another on a rotational basis while alternating scoring records and the competition managerial requisites (i.e., role performance - taking measurements and running times). Throughout the season each team's statistician kept an updated account of the performance of all team members and transferred the team's scores to the main class score chart.

Sustaining an equitable learning environment: The structure of this Sport Education season implied that students could experience participation in different roles throughout the unit on a rotating basis, while the formal competition schedule ensured the equitable participation of all students. Additionally, the power roles (i.e., the student-coach role) were proportionally assigned to girls and boys in order to prevent potential imbalanced power relations between students based on status and gender portrayed by some accounts of earlier research on Sport Education (Brock et al., 2009; Hastie, 1998). The students were regularly held accountable formally by fair-play behaviours during competition, and teams could also score additional points within lessons by exhibiting behaviours reflecting inclusive practices, effort, peer encouragement, and engagement in the managerial tasks (i.e., role performance).

Instructional procedures: Although the teacher took most of the instructional leadership responsibilities in the beginning lessons, throughout the season the students were progressively called to take upon more responsibility for instruction during peer-teaching tasks. From

leading instruction only during warm-ups from lessons two through seven, the students-coaches began to lead instruction and choose the learning tasks deemed required for their teams' performance improvements from the eighth lesson onwards. While the teacher closely monitored the alignment between the intended learning content and the students' behaviours during practice in the learning tasks, the teacher together with the student-coaches shared the monitoring of student learning for a majority of the season. By the final lessons, the students were completely independent and were able to make decisions regarding both the managerial and instructional requirements of practice. The training of the students-coaches included extracurricular weekly meetings throughout the unit, where students learned not only subject-matter content, but also became progressively familiar with instructional strategies related to task presentation, structure and management. Additionally, the students were also provided with a student-coach handbook that contained sample learning tasks. Coaches were also able to communicate with the teacher via email if they sought extra help.

The Direct Instruction unit: The 20-lesson Direct Instruction unit was conducted within a teacher-directed format whereby students were engaged both in whole-class instruction, competition events scored on an individual basis, or were assigned to practice in groups that did not remain consistent across lessons.

This unit was characterized by teacher-controlled decisions and teacher-directed engagement patterns for learners. More specifically: (1) the teacher was the instructional leader of the unit, monitored practice, set the learning goals and tasks, and presented students with a model of desired movement; (2) students learning activities took place into segmented blocks of time, and teacher controlled the rhythm of the tasks and the timing between task progressions; (3) the teacher was the timekeeper during the students' hurdles trials and they were called only occasionally to help the teacher take measurements on the long jump and shot put trials. Formal records of these measures were not retained.

The teacher's instructional focus was on creating immediate and high levels of success through repetition of responses in the movement patterns regarding hurdles, shot put, and triple jump practice. The purpose was to provide the most efficient use of class time and resources in order to promote very high rates of students' motor responses and to maximize the delivery of high rates of positive and corrective feedback. The lesson content for both instructional models is presented in Table 1.

Table 1. Unit plans for the two instructional approaches.

	Instructional focus	
Lesson	**Direct instruction**	**Sport Education**
1	Triple jump, hurdles, and shot put formal introduction	Explanation of the model and competition format Allocation of teams and individual roles Teacher-directed introduction of the three skills
2	Hurdles formal instruction and practice	Student-directed instruction: Warm-up Teacher-directed instruction: Triple jump skills
3 -7	Triple jump, hurdles, and shot put formal instruction and practice	Student-directed instruction: Warm-up Teacher-directed instruction: Triple jump, hurdles, and shot put skills; formal instruction on rules and scoring protocols for events Within-team event practice and role practice (shared teacher- and student-directed monitoring)
8	Individual competition on shot put	Formal competition Day 1 Student within-team event and role practice: Student-directed instruction (shared teacher- and student-directed monitoring) - Warm-up/skills practice (triple jump, hurdles, and shot put)
9	Individual competition on long jump and hurdles	Formal competition Day 2 Student within-team event and role practice: Student-directed instruction (shared teacher- and student-directed monitoring) - Warm-up/skills practice (triple jump, hurdles, and shot put)
10-16	Triple jump, hurdles, and shot put formal instruction and practice	Student within-team event and role practice: Student-directed instruction (shared teacher- and student-directed monitoring) - Warm-up/skills practice (triple jump, hurdles, and shot put)
17	Free-choice practice on all three events	Formal competition Day 3 Student within-team event and role practice: Student-directed instruction (shared teacher- and student-directed monitoring) - Warm-up/skills practice (triple jump, hurdles, and shot put)
18	Free-choice practice on all three events	Formal competition Day 4 Student within-team event and role practice: Student-directed instruction (student-directed monitoring) - Warm-up/skills practice (triple jump, hurdles, and shot
19	Individual competition on all three events	Formal competition Day 5 Student within-team event and role practice: Student-directed instruction (student-directed monitoring) - Warm-up/skills practice (triple jump, hurdles, and shot put)
20	Individual competition on all three events	Finals competition Festive event

Table 2. Instructional checklist.

Name of Observer:_____ Date: _____
1. Group of students go to a designated home area and begin warming up with that group.
2. Students warm up as a whole class under the direction of the teacher.
3. Students practice together with their group/team under the direction of a peer leader
4. Students practice individually, or in small groups under the direction of the teacher.
5. Students remain a part of easily identifiable groups throughout the lesson and throughout different tasks.
6. Student grouping throughout the lesson is variable across tasks.
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. Student performance scores are not recorded or are recorded in private.

Hastie et al. (2013)

Instruction and treatment validity: Given the purpose of the present study to determine the influence of two instruction models on students' learning, it was critical to validate if the instruction was indeed coherent with the accepted standards for each model. Metzler (2005) lists three key procedures that should be addressed in order to reach an acceptable level of fidelity. These include: (1) fully explaining the model under study, (2) verifying that those processes were sufficiently present in the unit by itemizing the key teacher and/or learner process designed into the model; and (3) demonstrating that the necessary contextual and operational requirement for the models under study were met. The following section will discuss items 2 and 3 given that a more complete outline of both Sport Education and Direct Instruction units is presented earlier in the article.

Itemizing teacher and learner process: In order to confirm the behavioural fidelity of the teacher's instruction according to both units, a 10-item checklist with benchmarks measured the characteristics of each instructional model (Hastie et al., 2013). This checklist asked an outside-trained observer not associated with the study to make decisions with regard to an item which should be observed in a lesson (see Table 2). In this case, two researchers viewed four randomly selected lessons from both models and checked the presence of those items. Items 1, 3 5, 7, 8 and 9 are characteristics of Sport Education, while the rest of the items are related to Direct Instruction model. These observers reached a 100% agreement with regard to the instructional model used in each lesson.

Demonstrating the presence of necessary contextual and operation requirements: An instructional model needs to have in place essential contextual conditions such as teacher expertise and student readiness for the model to have any chance of working (Metzler, 2011). In this particular study, the teacher had experience in Sport Education and Direct Instruction models, both as participant (during her on-campus coursework) and as teacher (during earlier seasons with the same classes). Additionally, this teacher participated in a Sport Education workshop during the entire year prior to this study. The workshop consisted of lectures on the conceptualization, purposes and characteristics of Sport Education, but also applications of the model to both track and field and team sports. In the second phase, this workshop comprehended a practical stage, in which the participants applied different Sport Education units during an entire year with selected classes. Beyond the idea of teacher expertise, the school in which the study was conducted had sufficient space and equipment so that each team/group of students had ready access to shot puts, hurdles, and landing pits for practicing events. Other materials such as cones, tape measures, and stopwatches were also available to students during practice and competition.

Data collection

Data were collected prior to the first lessons through a pre-test (PreT) and following completion of the units through the realization of a post-test (PosT). A retention test (ReT) was also applied 15 days after the post-test, a time in which none of the students received any instruction related to track and field. The application of a retention test was crucial for a more accurate assessment of all students' improvements than simply a post-test (Haerens and Tallir, 2012; Magill, 2011).

All students were videotaped while performing each of the three events. The first event was conducting a speed run (30 meters hurdles) starting up after a teacher's signal. The second event was the shot put, while the third event was the triple jump. Two digital camcorders were positioned to the side and front of the performers, so that all the details in their technical performance could be captured. The research team conducted all the assessments.

In assessing the students' technical competence, two observers were trained to qualitatively evaluate student performance. These observers first noted student performance at normal speed, then used the slow motion feature for a review, and finally made its assessment of the performance components specific to each test. In making this evaluation, each student was evaluated one time for each of the events and all of the components of those events were scored as "appropriate" (score=1) or "inappropriate" (score=0). Table 3 provides a list of the technical components assessed for each event. The final score for each of the track and field events was given by the sum of all the appropriate executions to each of the technical components.

Reliability

Data reliability was assessed through intra-observer (25 days after the first observation) and inter-observer testing procedures (performed by a second observer) in 20.4% of the participants. This percentage exceeded the 10% value recommended by Tabachnick and Fidell (2007). Values of Cohen's Kappa for intra-observer reliability showed 89% of agreement and inter-observer reliability 80% of agree-

ment, which exceed the percentages noted by van der Mars (1989) as appropriate to suggest strong agreement.

Table 3. List of event components assessed for technical performance

Shot put
1. Ball on the fingers (not the palm)
2. Ball next to the neck (low part)
3. Lifted elbow
4. Linear and with no stop gliding
5. Balance and rhythm during gliding
6. Landing position with two steps
7. Power position; Lifted elbow/follow-through
8. Rigid trunk upright
9. Full arm extension
Triple jump
1. Running approach progressive and rhythm (slow to fast)
2. From running to takeoff (final preparation of the takeoff)
3. Complete leg (hip, knee–ankle) extension in the takeoff posture
4. Rhythm, right sequence (left-left-right or right-right-left)
5. Balance in the distance of every jump (distribution)
6. Free arm and leg from back to front
7. Trunk upright (slight forward lean) (body balance)
8. Foot plant flat, very active
9. Takeoff leg backward-downward-pawing
10. Trunk and arms bent forward
Hurdles
1. Front leg perpendicular to the hurdle
2. Attack with semi extended leg
3. Not too much distance to attack (not too far, not too near)
4. Opposite arm of the front leg doing the same movement
5. Trunk flexion over the hurdle
6. Hip abduction over the hurdle
7. Constant velocity between hurdles
8. Rhythm between hurdle (good trunk position)
9. Rhythm between hurdle (good feet contact)

Hastie et al. (2013)

Data analysis

Descriptive statistics (means and standard deviations) were calculated and exploratory data analysis revealed a non-normality of the distribution of data. Therefore, non-parametric statistics were used through the IBM Statistical Package for the Social Sciences, version 20. To test differences between groups in the three assessment moments (PreT, PosT and ReT), the Mann-Whitney test for two independent samples (gender and skill level) was used. These differences were measured between girls and boys and between the skill-level groups of students. Skill-level groups were determined through a non-hierarchical cluster analysis using the K-means method with the number of clusters being fixed at two (Cluster 1: higher skill; Cluster 2: lower skill). In order to test intra-group differences from the entry point to the two final assessment moments, the Wilcoxon test was applied to each gender and skill level. Beyond that, in order to prevent an inflated error rate, a multiple-group comparison (Bonferroni correction) was used to adjust the alpha value, initially set at 0.05.

Results

Analysis by gender

Table 4 presents the descriptive statistics of the three assessment moments (PreT, PosT and ReT) for both boys and girls in the three track and field events (shot-put, triple jump and hurdles). In the PreT, boys that participated in the Sport Education lessons were significantly better than girls only in triple-jump (Table 5). These differences increased at the PosT, with boys presenting higher values in the three analysed events (shot-put, triple-jump, and hurdles). No differences were found between students who participated in the Direct Instruction unit.

While both boys and girls who participated in Sport Education improved from the PreT to the PosT (see Table 6), only boys showed improvement within the Direct Instruction unit. From the PreT to the PosT boys improved in all the three events (shot-put, triple-jump, and hurdles) and in the sum of the scores for the three events. No differences were found between the PosT to the ReT for both boys and girls in either model.

Analysis by skill-level

Table 7 shows the descriptive statistics of the three assessment moments (PreT, PosT and ReT) for students of different skill levels in the three events, while Table 8 shows the comparisons between higher and lower skill level students across the three assessment moments. In PreT higher skill level students participating in Sport Education units showed superior values when compared to lower skill level students in the three events and in the sum of the scores for the three events. These differences faded in the PosT and ReT, in which higher skill level students demonstrated superior values only in hurdles and in the sum of the scores for the three events. Within Direct Instruction, the PreT higher skill level students scored higher values in triple-jump and in the sum of the scores for the three events. No differences were found in the PosT and ReT for the Direct Instruction unit.

Table 4. Means (±Standard Deviations) across time for boys and girls.

		Boys (n = 9)			Girls (n = 10)		
	Event	**PreT**	**PosT**	**Retention**	**PreT**	**PosT**	**Retention**
SE	**SP**	4.2 (2.3)	7.9 (.9)	7.9 (.8)	2.8 (2.6)	6.7 (1.2)	5.9 (1.8)
	TJ	5.9 (2.1)	9.0 (.0)	8.9 (.3)	3.6 (2.1)	8.4 (1.0)	8.5 (.8)
	H	2.8 (1.3)	8.0 (1.0)	8.0 (.7)	2.4 (1.6)	6.2 (1.0)	6.1 (1.1)
	Sum	12.9 (4.9)	24.9 (1.2)	24.8 (1.1)	8.8 (4.6)	21.3 (1.8)	20.5 (2.5)
		Boys (n = 16)			**Girls (n = 12)**		
		PreT	**PosT**	**Retention**	**PreT**	**PosT**	**Retention**
DI	**SP**	5.4 (1.3)	6.9 (1.2)	7.1 (1.1)	5.7 (1.6)	6.0 (2.3)	6.9 (1.3)
	TJ	6.7 (2.5)	8.9 (.5)	8.6 (.5)	6.4 (2.5)	8.9 (.3)	8.6 (.9)
	H	5.2 (1.7)	6.4 (1.1)	6.5 (1.4)	5.2 (.8)	5.6 (1.5)	5.5 (1.2)
	Sum	17.4 (3.9)	21.6 (2.6)	21.8 (2.2)	17.2 (3.6)	20.5 (2.8)	20.5 (3.0)

SP = shot-put; TJ = triple-jump; H = hurdles

Table 5. Differences between boys and girls across time.

		SE			DI		
	Event	**Mann-Whitney**	**p**	**r**	**Mann-Whitney**	**p**	**r**
Pretest	**SP**	-1.20	.230	.27	-.43	.668	.08
	TJ	-2.23	.026 *	.51	-.38	.700	.07
	H	-0.34	.736	.08	-.38	.701	.07
	Total	-1.69	.091	.39	-.23	.815	.04
Postest 1	**SP**	-2.19	.029 *	.50	-.73	.468	.14
	TJ	-2.07	.039 *	.47	-.39	.697	.07
	H	-3.04	.002 *	.70	-1.34	.179	.25
	Total	-3.53	.001	.81	-.88	.380	.16
Retention	**SP**	-2.87	.004 *	.66	-.33	.742	.06
	TJ	-1.09	.276	.25	-.51	.608	.10
	H	-3.39	.001 *	.78	-1.76	.078	.33
	Total	-3.46	.001 *	.79	-1.30	.193	.27

* $p < 0.05$

In the Sport Education season, higher skill level students improved from the PreT to the PosT in the triple-jump, hurdles and the sum of the scores for the three events (Table 9). Lower skill level students improved in all the events and in the sum of the scores for the three events from the PreT to the PosT. In the Direct Instruction unit, higher skill level students improved in triple-jump, hurdles and in the sum of the scores for the three events from the PreT to the PosT. No improvements were found for lower skill level students from PreT to PosT and ReT. No improvements were found from the PosT to the ReT for higher or lower skill level students in either Sport Education or/and Direct Instruction units.

Discussion

The results of this study show similar outcomes to those reported by Hastie et al (2013) in a study that involved the same three events. That is, students' technical improvements were evident for both Sport Education and Direct Instruction from pre- to post-test for both conditions, with the effect sizes being larger for Sport Education. However, in the case of Hastie et al. (2013) the gender and skill level of the students were not considered, and it is in these areas that more notable differences between the units of instruction became evident. While in Sport Education there were statistically significant technical performance improvements in all students, evidence of significant improvements in Direct Instruction was found only for boys and students located in the higher skill level cluster. A second feature of the present study that provided a deeper analysis was the inclusion of the retention test, the results of which show particularly effectiveness in the maintenance of skill gains within Sport Education. These findings support the call for more comprehensive measures of the impact of instructional models on students' learning (Chase et al., 1994; French et al., 1991; Gutiérrez and García-López, 2012; Harrison et al., 1999;

Table 6. Comparison of boys and girls across time.

			SE			DI		
	Moment	**Event**	**Wilcoxon T**	**p**	**r**	**Wilcoxon T**	**p**	**r**
Boys	**PreT–PosT**	**SP**	-2.56	.011 *	.85	-2.89	.004	.75
		TJ	-2.67	.007 *	.89	-2.57	.010	.66
		H	-2.73	.007 *	.90	-2.75	.006	.71
		Total	-2.67	.008 *	.89	-2.67	.008	.69
	PreT–ReT	**SP**	-2.54	.011 *	.84	-3.18	.001 *	.82
		TJ	-2.68	.007 *	.89	-2.45	.014	.63
		H	-2.70	.007 *	.90	-3.00	.003 *	.77
		Total	-2.68	.007 *	.89	-2.90	.004 *	.77
	PosT–ReT	**SP**	.00	1.000	.00	-1.26	.206	.33
		TJ	-1.00	.317	.33	-1.34	.180	.35
		H	.00	1.000	.00	-.30	.763	.08
		Total	-.14	.888	.05	-.04	.971	.01
Girls	**PreT–PosT**	**SP**	-2.51	.012 *	.79	-.16	.876	.04
		TJ	-2.84	.004 *	.90	-2.39	.017	.69
		H	-2.82	.005 *	.89	-.92	.357	.27
		Total	-2.81	.005 *	.89	-2.46	.014	.71
	PreT–ReT	**SP**	-2.56	.010 *	.81	-1.99	.046	.57
		TJ	-2.82	.005 *	.89	-2.39	.017	.69
		H	-2.81	.005 *	.89	-.55	.816	.16
		Total	-2.81	.005 *	.89	-2.37	.018	.68
	PosT–ReT	**SP**	-1.38	.167	.44	-1.19	.234	.34
		TJ	-.18	.854	.06	-1.13	.257	.33
		H	-.58	.564	.18	-.82	.414	.23
		Total	-.84	.399	.27	-.20	.839	.06

* Bonferroni adjusted significant differences ($p < 0.013$)

Table 7. Means (±Standard Deviations) for higher and lower skill level students across time.

		Higher skill level (n = 8)			Lower skill level (n = 11)		
	Event	**PreT**	**PosT**	**ReT**	**PreT**	**PosT**	**ReT**
SE	**SP**	5.5 (1.2)	7.6 (1.2)	7.6 (.7)	2.0 (2.2)	7.0 (1.3)	6.3 (2.0)
	TJ	6.8 (1.3)	9.0 (.0)	9.0 (.0)	3.2 (1.8)	8.4 (.09)	8.4 (.8)
	H	3.6 (.7)	8.1 (1.0)	7.9 (1.0)	1.8 (1.3)	6.3 (1.0)	6.4 (1.2)
	Sum	15.9 (.8)	24.8 (1.6)	24.5 (1.3)	7.0 (3.0)	21.7 (2.0)	21.1 (3.0)
		Higher skill level (n = 20)			**Lower skill level (n = 8)**		
		PreT	**PosT**	**ReT**	**PreT**	**PosT**	**ReT**
DI	**SP**	5.7 (1.5)	6.7 (1.6)	6.9 (1.3)	4.8 (.8)	6.4 (1.7)	7.2 (1.1)
	TJ	7.4 (1.7)	8.9 (.5)	8.7 (.5)	3.0 (2.0)	9.0 (.0)	8.8 (.4)
	H	5.3 (1.2)	6.2 (1.2)	6.2 (1.2)	4.2 (1.6)	5.2 (1.5)	5.0 (1.6)
	Sum	18.4 (2.5)	21.8 (2.0)	21.8 (1.7)	12.0 (1.0)	20.6 (2.0)	21.0 (1.6)

Mesquita et al., 2012; Mesquita et al., 2005). The findings are also in keeping with previous evidence of research on Sport Education that have shown the model to be particularly advantageous for students of lower skill level (Hastie, 1998; Mesquita et al., 2012).

The outcomes of the general levels of improvement of students can be explained by examining specific features of each model. For example, in Sport Education the extensive practice in persistent teams, and inherently more time for students practice together, and the commitment of pupils toward achievement of common performance goals offer them positive conditions to cooperate and therefore to be engaged and committed with the team performance (Siedentop et al., 1986). In Direct Instruction, the planned step by step progressions and the teacher's close monitoring of student responses during all phases of the learning should promote the development of new technical skills (Rink, 1993). Nevertheless, the study raises questions which cannot be answered by an examination of the data it produced. By consequence, the remainder of the discussion contains a set of questions and postulates which provide possible agendas for future research on both models.

Questions relating to gender

Given that girls in Direct Instruction did not achieved significant levels of improvements, while those in Sport Education were able to improve, the question to be considered is "whether boys and girls received differential opportunities to practice during these models". While previous research on girls in physical education suggest that their alienation results from socially institutionalized gender roles that maintain and reproduce boys' dominance and girls' subordination (e.g. Azzarito, Solmon and Harrison, 2006), most of those studies have focused on team sports where there are more overt opportunities for boys to express aggression, competitiveness, and dominate game play. Within this study, one might have expected that practice opportunities would have been more equitable, given there was significant amounts of equipment for practice for all student, and that student practice was at an individual level in both units. Nonetheless, within the Sport Education season, the students were more in control of the pace for task transition on mastery-oriented tasks. That is, they were provided with task cards and were encouraged to select the level of task difficulty suitable to the specific abilities of each team member.

Beyond taking a quantitative approach concerning opportunities for practice in future models-based units (a laudable goal), more qualitative accounts of student engagement are to be encouraged. It has been suggested that one area in which Sport Education promotes engagement is that within seasons, students work cooperatively in small groups were they are closely monitored by their teammates. This peer-mediated accountability accompanied by the interplay between the instructional and task systems and student social system in Sport Education seems to have a strong impact on pupils' effort, responsibility levels, and by consequence task accomplishment (Hastie, 2000). However, there is minimal research that has specifically examined students' interactions during seasons of Sport Education or in fact any instructional model.

Table 8. Differences between higher and lower skill level students across time.

		SE			DI		
Moment	**Event**	**Mann-Whitney**	**p**	**r**	**Mann-Whitney**	**p**	**r**
PreT	**SP**	-2.93	.003 *	.67	-1.22	.223	.23
	TJ	-3.29	.001 *	.76	-3.39	.001*	.64
	H	-2.77	.006 *	.63	-1.31	.188	.25
	Sum	3.66	.001 *	.84	-3.42	.001	.65
PosT	**SP**	-1.04	.298	.24	-0.38	.700	.07
	TJ	-1.86	.063	.43	-0.72	.470	.14
	H	-3.08	.002 *	.71	-1.59	.112	.30
	Sum	-2.86	.004 *	.66	-1.18	.236	.22
ReT	**SP**	-1.67	.095	.38	-0.46	.647	.09
	TJ	-1.85	.064	.43	-0.44	.663	.08
	H	-2.61	.009 *	.60	-1.59	.112	.30
	Sum	-2.66	.008 *	.61	-1.12	.263	.21

***** $p < 0.05$

Table 9. Comparison of higher and lower skill-level students across time.

			SE			DI		
	Moment	**Event**	**Wilcoxon**	**p**	**r**	**Wilcoxon**	**p**	**r**
Higher skill level	**PreT–PosT**	**SP**	-2.23	.026	.79	-1.94	.052	.43
		TJ	-2.54	.011 *	.90	-2.69	.007 *	.60
		H	-2.55	.011 *	.90	-2.58	.010 *	.58
		Sum	-2.53	.012 *	.90	-3.34	.001 *	.75
	PreT–ReT	**SP**	-2.23	.026	.79	-2.91	.004 *	.65
		TJ	-2.54	.011 *	.90	-2.56	.010 *	.57
		H	-2.54	.011 *	.90	-2.53	.011 *	.57
		Sum	-2.54	.011 *	.90	-3.49	.001 *	.78
	PosT–ReT	**SP**	0.000	1.000	.00	-.63	.528	.14
		TJ	0.000	1.000	.00	-1.13	.257	.25
		H	-1.000	.317	.35	-.26	.796	.06
		Sum	-0.58	.564	.20	-.28	.782	.06
Lower skill level	**PreT–PosT**	**SP**	-2.85	.004 *	.86	-1.35	.176	.48
		TJ	-2.96	.003 *	.90	-2.03	.042	.72
		H	-2.95	.003 *	.89	-1.13	.257	.40
		Sum	-2.94	.003 *	.89	-2.02	.043	.72
	PreT–ReT	**SP**	-2.86	.004 *	.86	-1.84	.066	.65
		TJ	-2.94	.003 *	.89	-2.03	.042	.72
		H	-2.96	.003 *	.89	-1.00	.317	.35
		Sum	-2.94	.003 *	.89	-2.03	.042	.72
	PosT–ReT	**SP**	-1.38	.167	.42	-1.41	.157	.50
		TJ	-0.14	.891	.04	-1.00	.317	.35
		H	-0.58	.564	.17	-1.00	.317	.35
		Sum	-0.56	.573	.17	-.74	.458	.26

***** Bonferroni adjusted significant differences ($p < 0.013$).

Questions relating to skill level

While research in physical education with respect to students' skill levels is particularly sparse, Portman (1995) has suggested when low skilled students experience failure, their most common response is to stop engaging in the learning task. By consequence, an examination of practice opportunities made available to higher- and lower-skilled students during models-based instruction is warranted. To date, only the project of Rink (1996) has reported significant quantitative data on the quantity of practice trials afforded to students of different skill levels during an extended unit of instruction. In that study, the quality of student practice was indeed lower for the low-skilled. For reasons described in the section on gender, it might well be that in this study, those features applied to lower skilled students as well.

Questions relating to motivation

One research topic within Sport Education that has seen increasing research attention is that of student motivation. In the main, the results of these studies have suggested that Sport Education seasons may increase perceptions of a task-involving climate and perceived autonomy, and in so doing, enhance the motivation of high school students (Wallhead and Ntoumanis, 2004). Indeed, Spittle and Byrne, (2009) in a comparative study between Sport Education and units conducted with a more skills-drills-game approach, using direct teaching style, found that Sport Education was more successful in maintaining high levels of intrinsic motivation, task orientation, and mastery climate. These were manifested in significant differences between the conditions on changes in perceived competence, task orientation, and mastery climate, with student scores in the more direct style decreasing significantly from pre- to post-test compared with the Sport Education condition. In another study focusing on non-motivated students, Perlman (2010) found significant changes in those students' perceptions of enjoyment and relatedness satisfaction within Sport Education in contrast to a more direct instruction unit.

Despite these findings, what is critically necessary is the development of studies that provide more detailed accounts of "what's happening in the gym", particularly with respect to the purpose of uncovering those aspects of the teaching and learning dynamics within any instructional model that promote students' skill development. Such agenda research might be accomplished by more qualitative and sophisticated designs such as action-research and case-studies.

Conclusion

This study continued a line of research that showed that while Sport Education and Direct Instruction approaches can both lead to improvements in the development of technical performance in track and field, Sport Education outperforms the more teacher-directed approach. This is particularly the case when student gender and skill levels are accounted for. It is postulated the certain structural features of Sport Education which serve to provide higher levels of student autonomy (and hence promote motivation to practice) can account for some of the gains made by girls and lower-skilled students.

Nonetheless, more research is warranted in order to determine the positive contributions that various instructional models can make towards the development of significant learning gains in physical education. In particular, the potential relationship between the nature of the learning environment generated within each instructional approach and issues regarding motivation, enjoyment and

task engagement, and ultimately its impact on the learning outcomes needs further inspection. It is suggested that such research might be better accomplished by more qualitative and sophisticated designs such as action-research and case-studies.

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Key points

- The impact of each teaching approach in student learning was distinct. While in Sport Education the technical performance improvements spread throughout students of both genders and skill levels, in Direct Instruction significant improvements were exclusive to boys and students of higher skill level.
- The extended analysis in the current study, taking into account student gender and skill level, permitted a more comprehensive measure of the learning impact of the two approaches. More sophisticated analyses of the tasks and instructional strategies of each approach are encouraged.

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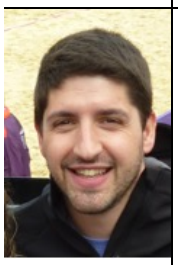

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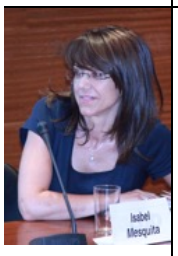

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