Assessing the effect of different teaching strategies on students’ affective learning outcomes during volleyball lessons

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Abstract
Background: Physical education (PE) plays a relevant role in promoting health- and well-being-related behaviours in youths. Anyway, there is a lack of evidence about the effect of game-centred teaching strategies on the affective domain of learning. Purpose: The aim of this study was to assess the effect of two different PE teaching strategies on the affective domain of learning for high school students. Methods: Seventy-seven students were divided into a control group (n=37), which were then enrolled in an instructional plan based on drill-practice and a teacher-centred approach, and an intervention-group (n=40), which experienced PE lessons developed by following the tactical game model (TGM). The affective domain of learning was assessed by considering the level of enjoyment and the perceived motivational climate. The Italian version of the physical activity enjoyment scale was used to assess the level of enjoyment, while the second version of the perceived motivational climate in sport questionnaire was used for the motivational climate. Data analysis and results: Independent sample t-tests were used to compare the scores estimated with the aforementioned instruments between the different students groups. Cohen’s d measure was used to interpret the effective size of the groups’ score differences. Significant higher scores resulted in a level of enjoyment and in a task-involving climate dimension for the students of the TGM group. Alternatively, significant scores were found in the control group for the ego-involving climate dimension and for the negative level of enjoyment. The effect of these differences was from moderate to large. Conclusion: Therefore, the current results suggested the use of the TGM to provide a valuable teaching-learning experience to obtain positive effects on the affective domain of learning throughout physical education lessons. In a practical perspective, the use of a game-centred approach led the teacher to provide fun and task-oriented teaching-learning processes during PE lessons. Keywords: Tactical Game Model; Enjoyment; Motivational Climate; PACES; PMCSQ-2.

Introduction
In the last few decades, the relevant role of physical and sport activities for establishing lifelong health- and well-being-related behaviours have been supported by numerous studies (Allender, Cowburn, & Foster, 2006; WHO, 2018; Russo, Nigro, Raiola, & Ceciliani, 2019). In this respect, previous studies focused their research aims on primarily assessing the development level of fundamental movement skills (Sgrò, Quinto, Pignato, & Lipoma, 2016; Sgrò, Quinto, Messana, Pignato, & Lipoma, 2017a; D’Isanto, D’Elia, Raiola, & Altavilla, 2019), as a proxy of an adequate psychomotor development, also using technological approaches (Sgrò, Nicolosi, Schembri, Pavone, & Lipoma, 2015; Sgrò, Mango, Pignato, Schembri, & Lipoma, 2017b). Recently, World Health Organisation (WHO, 2018) provided a factsheet that addressed the relationships between school-based educational processes and the participation in physical and sport activities in EU countries. Specifically, this report outlined the relevant role of the school to promote children and youth participation in these activities.

Anyway, several studies have identified the teaching-learning processes of physical education (PE) as bad experiences in many students’ “career”, and consequently, some students indicated these experiences as a barrier to practicing physical activity or playing sports during childhood and adolescence (Allender, et al., 2006). Precisely, the strategies used to teach sport concepts and skills have been identified as the main limit to supporting an adequate development towards the psychomotor, cognitive, and affective domain of learning during physical education lessons (Kirk, 2013).

In this respect, in the revision provided by Harvey and Jarret (2014), the use of the game-centred approach (GCA) was confirmed as a valid teaching strategy to overcome the previous issues. This approach exaggerates the use of the games throughout all the teaching-learning phases, particularly in primary and middle schools, and promotes cooperative learning and a student-centred approach as adequate pedagogical
perspectives. Recently, the use of a GCA (i.e., Teaching Games for Understanding) has been proposed for secondary school, as well (Viscione, Invernizzi, & Raiola, 2019). Among these approaches, the use of the tactical game model (Mitchell, Oslin, & Griffin, 2013) has been indicated as a valid solution for school setting because it is based on the use of progression, sequence, and scope pedagogical concepts and is linked with a valid and authentic method for assessing games-related psychomotor learning outcomes (i.e., GPAI). The teachers who want to use this model have to know the classifications of formal games (i.e., invasion, net and wall, and striking/targeting games) and the use of small-sided games because their intertwined relationship has been indicated as necessary to address adequate learning goals related to psychomotor, cognitive, and affective domains of learning.

Regarding the affective domain, motivational climate and enjoyment during PE lessons represent significant elements for providing valuable teaching-learning processes, which have been addressed by previous studies (Harvey & Jarret, 2014). The motivational climate refers to the teacher’s ability to promote an adequate situational goal structure of the environment, which can be considered along its two major components: master (task) and performance (ego) (Ames, 1992). Ames (1992) defined a task-involving climate as a setting where the students used collaborative learning and peer-support to improve a personal level of knowledge and expertise. This component is also associated with an improvement in the student’s intrinsic motivation. On the other hand, ego-involving performance is a motivational climate that promotes interpersonal competition and social challenging and has been linked to inadequate learning outcomes (Ames, 1992).

Previous studies have identified a strict relationship between the use of drill-oriented and teacher-centered teaching strategies with the development of an ego-involving climate (Allender et al., 2006; Gray, Sproule, & Morgan, 2009). Alternatively, several studies addressed the effects of the tactical game for understanding (TGfU) model (Bàguena, Sevil, Julián, Murillo, & García, 2014; Hohengasser, 2014; Chivas, Bartoll, Salvador-Garcia, & Ruiz Montero, 2018) or the effects of the sport education model (Spittle & Byrne, 2009; Fernández-Río, Méndez-Giménez, & Méndez-Alonso, 2017) on affective domain of learning. Common evidence derived from the previously cited studies suggested that the use of a teaching strategy based on games and sport features supports the development of a task-involving motivational climate.

Furthermore, because several of these studies used comparison groups who followed drill-practice teaching approaches, the ego-involving climate was mainly confirmed in relation to this last type of teaching strategy. Finally, to the best of the authors’ knowledge, the use of volleyball as a game for teaching net-game-based movements and skills has been addressed only by considering the psychomotor domain of learning (Araujo, Mesquita, Hastie, & Pereira, 2016; Sgrò, Pignato, & Lipoma, 2018; Araujo, Hastie, Lohse, Bessa, & Mesquita, 2019).

Anyway, to the best of the authors’ knowledge, two aspects need further studies: assessing the effect of the TGM on the affective domain of learning and on the level of enjoyment perceived by the students enrolled in PE lessons that followed different teaching strategies. Therefore, the aim of this study was to assess the effects of a TGM instructional plan on two aspects belonging to the affective domain of learning. Specifically, we hypothesized that a high level of enjoyment and a task-involving motivational climate were the significant elements associated to the students involved in the TGM lessons, while, alternatively, a low level of enjoyment and an ego-involving climate were the effects related to the students involved in a plan based on drill-practice and teacher-centred instructional approaches.

Methods

Design

A quasi-experimental study with a non-equivalent control group post-test design was used in this research. We maintained an intact class group for supporting the characteristics of an ecological research design in an educational context, as suggested in a previous study by Harvey and Jarret (2014).

Participants and procedures

Eighty-one students (56 boys, 25 girls) participated in this study, and the students were in four classes of the first year of a high school in the south of Italy. Two of these classes followed a sports science curriculum, with four extra hours of physical and sports activities per week. One class for each curriculum was associated to the control group, and the other two classes were assigned to the experimental group. The students of both groups followed an instructional period for 11 weeks, and all the participants were enrolled in physical education (PE) lessons for 120 minutes per week (i.e., 60 minutes per lesson). The same PE teacher, who had more than 10 years of experience in PE lessons, followed both groups. The students’ characteristics related to the affective domain of learning were assessed at the end of the last lesson. In this respect, questionnaires were administered in the gym. The students who attended 85% of the instructional time and completed the proposed questionnaires were included in the further analysis.

The study was developed by following the ethic and methodological indications provided for such studies (Anzalone, Medina Morales, Sgrò, & Lipoma, 2017). Theschool board approved this study, and the parents or legal guardians of each student involved in the research signed informed consents prior to the start point. The Ethical Committee of University of Enna approved the design and methodological procedure here used.
**Experimental group: tactical game model approach (TGM)**

The students involved in this group followed an instructional plan based on lessons that were designed by using the tactical game model to teach volleyball. In this respect, each lesson addressed specific volleyball tactical problems and followed this schema: (a) initial game, (b) questioning, (c) task practice, and (d) final game. Small-sided games were used to design game experiences adequate to the skill levels of the students. The questioning time was used to support the decision-making development process, while the task practice was used to train the technical skills related to the solution of the tactical problem.

During each lesson, the students were divided into mixed-ability teams, and they always played with the same teammates. The validity of this lesson plan was based on the following elements: (1) the teacher was trained on the use of TGM according to the suggestions provided by Metzler (2005); and (2) an external researcher, who had knowledge and experience in the use of TGM, reviewed the plan by using the benchmarks proposed by Metzler (2005).

**Control group: technique-oriented approach (TG)**

The teacher provided this group with 18 lessons that were related to volleyball, but she followed a direct-method and a drill-oriented teaching approach. The focus of each lesson was related to specific technical skills (i.e., serve, toss, or block), and each lesson ended with a formal game (6 vs.6) on a regular court. During the lesson, the teacher provided few cues for skill development, while the link between skills and gameplay characteristics was not exaggerated.

**Measures**

The effect of the above-cited teaching strategies on the affective domain of learning was measured by considering motivation climate and enjoyment dimensions.

The Perceived Motivational Climate in Sport Questionnaire (PMCSQ-2) (Newton, Duda, & Yin, 2000) was used to assess students’ perception of the task- and ego-involving motivational climate. The questionnaire consists of 33 items rated on a five-point scale (1 = strongly disagree; 5 = strongly agree), which describe two dimensions with three subscales for each dimension. The first dimension describes the “Task-Climate” and is composed of the following subscales: Cooperative Learning (CL), Effort/Improvement (EI), and Important Role (IR). The second is the “Ego-Climate” dimension, which is composed of the following subscales: Punishment for Mistakes (PM), Unequal Recognition (UR), and Intra-team member rivalry (RM).

The scale was administered in English because students showed adequate levels of proficiency in this foreign language. For each student, the mean scores for the task- and ego-climate dimensions and their subscales were estimated and used for further analysis.

The Physical Activity Enjoyment Scale (PACES) (Kenzierski & De Carlo, 1991), adapted in Italian by Carraro, Young, and Robazza (2008), was used to assess students’ perceptions of fun and enjoyment in physical education lessons. The scale consists of 16 items that identify a positive scale (i.e., nine items) and a negative scale (i.e., seven items). Students responded to each item on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). The positive and negative global values for each student were estimated by summing the scores of the respective items. The validity and reliability of the Italian version was previously verified in young children and adolescents (Carraro et al., 2008).

**Data Analysis**

The questionnaires’ data were preliminarily checked to verify the criteria related to the participation during the instructional periods and the assessment sessions. Later, data were checked for missing values and for the normal distribution assumption required for further analysis. Because normality was verified through a Kolmogorov–Smirnov test, parametric tests were used. For each group and subscale, the internal consistency was verified by means of Cronbach’s alpha. According to Nunnally’s (1978), a .70 criterion cut-off was considered acceptable for this measure. A student t-test for independent samples was used for assessing the scores of the two groups for each instrument.

If the comparison was statistically significant, the effect size was estimated by means of Cohen’s d, and was interpreted with the following criteria: small = 0.20 to 0.49, moderate = 0.50 to 0.79, and large >0.80 (Cohen, 1988). The 95% confidence interval (95%CI) for each effect size estimate was also provided because it allows a more meaningful interpretation of results. The analyses were performed by means of R for Mac OS X, and the alpha test was set to 0.05.

**Results**

Data screening revealed that two students failed to meet the criteria discussed in the previous section (i.e., an 85% presence during the training and presence in both assessment sessions), and two students were univariate outliers. As no other violations were verified, the data of these participants were removed, and parametric analyses were carried out by considering 77 students (i.e., 40 in the TGM group and 37 in the TG group).

Descriptive statistics (means and standard deviation) and Cronbach’s alpha coefficients for all measures are shown in Table 1.
Table 1. Descriptive statistics and Cronbach’s alpha coefficients for enjoyment and motivational climate scores.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>TGM [n=40]</th>
<th></th>
<th></th>
<th>TG [n=37]</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment (Positive Scale)</td>
<td>36.10</td>
<td>5.15</td>
<td>0.91</td>
<td>30.28</td>
<td>4.95</td>
<td>0.91</td>
</tr>
<tr>
<td>Enjoyment (Negative Scale)</td>
<td>9.95</td>
<td>3.06</td>
<td>0.89</td>
<td>13.62</td>
<td>5.63</td>
<td>0.90</td>
</tr>
<tr>
<td>Task climate</td>
<td>4.09</td>
<td>0.57</td>
<td>0.88</td>
<td>3.72</td>
<td>0.72</td>
<td>0.92</td>
</tr>
<tr>
<td>Cooperative Learning</td>
<td>4.17</td>
<td>0.70</td>
<td>0.82</td>
<td>3.59</td>
<td>0.69</td>
<td>0.71</td>
</tr>
<tr>
<td>Important Role</td>
<td>4.00</td>
<td>0.76</td>
<td>0.83</td>
<td>3.69</td>
<td>0.80</td>
<td>0.84</td>
</tr>
<tr>
<td>Effort/Improvement</td>
<td>4.19</td>
<td>0.50</td>
<td>0.75</td>
<td>3.81</td>
<td>0.79</td>
<td>0.88</td>
</tr>
<tr>
<td>Ego climate</td>
<td>1.94</td>
<td>0.59</td>
<td>0.86</td>
<td>2.25</td>
<td>0.76</td>
<td>0.90</td>
</tr>
<tr>
<td>Punishment for mistakes</td>
<td>1.72</td>
<td>0.54</td>
<td>0.72</td>
<td>2.13</td>
<td>0.88</td>
<td>0.80</td>
</tr>
<tr>
<td>Unequal Recognition</td>
<td>1.65</td>
<td>0.62</td>
<td>0.84</td>
<td>2.14</td>
<td>0.92</td>
<td>0.89</td>
</tr>
<tr>
<td>Intra-team member rivalry</td>
<td>2.77</td>
<td>0.76</td>
<td>0.51</td>
<td>2.72</td>
<td>0.81</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Note: M: Mean; SD: Standard Deviation

Only intra-teammember rivalry resulted above the Nunnally’s cut-off criterion, but this measure already resulted in a scale with the lowest level of consistency for a previous study (Newton et al., 2000). Table 2 shows the result of dimension comparisons between instructional programs.

Table 2. Comparison of enjoyment and motivational climate scores between the instructional programs.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>d</th>
<th>95%CI for d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment (Positive Scale)</td>
<td>4.84</td>
<td>75</td>
<td>&lt;.001</td>
<td>-1.14</td>
<td>[-1.64, -0.64]</td>
</tr>
<tr>
<td>Enjoyment (Negative Scale)</td>
<td>-3.53</td>
<td>75</td>
<td>&lt;.001</td>
<td>0.84</td>
<td>[0.35, 1.32]</td>
</tr>
<tr>
<td>Task climate</td>
<td>2.58</td>
<td>75</td>
<td>0.01</td>
<td>-0.59</td>
<td>[-1.04, -0.13]</td>
</tr>
<tr>
<td>Cooperative Learning</td>
<td>3.67</td>
<td>75</td>
<td>&lt;.001</td>
<td>-0.84</td>
<td>[-1.30, -0.37]</td>
</tr>
<tr>
<td>Important Role</td>
<td>1.77</td>
<td>75</td>
<td>0.08</td>
<td>-0.40</td>
<td>[-0.85, 0.05]</td>
</tr>
<tr>
<td>Effort/Improvement</td>
<td>2.50</td>
<td>75</td>
<td>0.01</td>
<td>-0.57</td>
<td>[-1.20, -0.11]</td>
</tr>
<tr>
<td>Ego climate</td>
<td>1.97</td>
<td>75</td>
<td>0.01</td>
<td>0.45</td>
<td>[0.00, 0.90]</td>
</tr>
<tr>
<td>Punishment for mistakes</td>
<td>-2.49</td>
<td>75</td>
<td>0.01</td>
<td>0.57</td>
<td>[0.11, 1.02]</td>
</tr>
<tr>
<td>Unequal Recognition</td>
<td>-2.73</td>
<td>75</td>
<td>&lt;.01</td>
<td>0.62</td>
<td>[0.16, 1.08]</td>
</tr>
<tr>
<td>Intra-team member rivalry</td>
<td>0.30</td>
<td>75</td>
<td>0.76</td>
<td>-0.01</td>
<td>[-0.51, 0.37]</td>
</tr>
</tbody>
</table>

Note: t: student’s t measures, df: degree of freedom, p: p-values, d: Cohen’s d; 95%CI: 95% interval confidence.

Students involved in the TGM instructional program provided the highest scores for the positive scale of PACES and for some dimensions related to the task-climate measured through PMCQS-2. Specifically, the task-climate score and the subscales Cooperative Learning and Effort/Improved resulted in a significant difference between groups, and the effect size analysis revealed moderate to large effects for the students involved in TGM group. On the contrary, the students involved in the TG group provided the highest scores for the negative scale of PACES and for some dimensions related to the ego-climate dimension measured through PMCQS-2. In detail, the scores of the ego-climate measure and the subscales Punishment for Mistakes and Unequal Recognition for the students of TG were significantly higher than the TGM students’ scores, and the effect size analysis revealed effects from low to moderate.

Discussion

The purpose of the current study was to investigate the effect of a TGM instructional plan on the affective domain of learning in high school students enrolled in physical education classes. A traditional technical-focus teaching strategy was used as a comparison condition. According to the approach provided in similar studies (McNeill & Fry, 2011), we analysed data acquired at the end of the two proposed teaching strategies. Student affective characteristics were assessed in terms of perceived motivational climate and enjoyment. It was hypothesized that a mastery-oriented motivational climate and a high level of enjoyment were related to the participants who followed the TGM lesson plan. Although volleyball is one of the sports included in PE curriculum worldwide, there are limited references about the use of the TGM to teach volleyball in school.
Based on teaching-learning processes, where drills and skills were taught in decontextualized settings. This evidence agrees with what was highlighted in a previous study by Chiva-Bartoll and colleagues (2018), where a similar hypothesis was accepted because there were significant differences regarding the progression of motivational climate when comparing a GCA approach with a skill-based, teacher-centred approach. In detail, the study suggested that the implementation of a unit based on a hybrid model (i.e., cooperative learning and teaching games for understanding) for teaching sports was successful in terms of the task-involved motivational climate. On the contrary, the teaching unit based on the traditional approach did not show this effect. These results are in line with those provided in this study.

Fernández-Rio et al. (2017) found similar results in a study comparing the effects of two instructional approaches, Sport Education (SE) and Direct Instruction (DI), on students’ psychological responses. The results of this study showed an increase in students’ intrinsic motivation, autonomy, competence, relatedness, interest, social responsibility, social relationship, and cooperative learning after experiencing SE. Participants significantly increased their intrinsic motivation only after experiencing the SE Model. Students in the DI group did not show any significant difference after the intervention program.

Spittle and Byrne (2009) also verified that a group of Australian boys and girls who experienced SE were more capable of maintaining higher levels of intrinsic motivation than the group who followed the traditional curriculum. González-Cutre and colleagues (2011) investigated the effects of a GCA instructional plan on enjoyment, motivation, perceived effort, and perceived competence. Specifically, the authors exaggerated the concept of cooperative learning and a task-involved motivational climate in their experimental lesson plans. Students in the intervention group reported improvements in their task climate perception, mastery approach orientation, and intrinsic motivation. Cooperative learning was found to be a valid teaching strategy for guiding the student to meet the achievement of social, motivational, and affective goals (Prieto & Nistal, 2009), and its relation with the TGM was positively outlined in a previous study (Dyson, Griffin, & Hastie, 2004).

By specifically examining the current PMCSQ-2 measures, we found significant differences between groups regarding the evolution of task-involved and ego-involved dimensions. Specifically, the task-climate scores of the students involved in the TGM lessons demonstrated positive and significant differences versus the scores of TG students for Cooperative Learning and Effort/Improvement subscales, respectively, but not for the Important Rule subscale. These results were in accordance with other studies, such as those conducted by Ames (1992), Treasure (1993), Gray and colleagues (2009), and Chiva-Bartoll and colleagues (2018). Moreover, Báguena, Sevil, Julián, Murillo, and García (2014) highlighted a greater perception of task-involvement among those students who had implemented a volleyball unit through an approach related to the TGfU model and to specific strategies for target areas. Their findings are in accordance with those presented in this paper. Anyway, by considering the confidence intervals of the relevant Cohen’s measures, we can assert that the amplitude of these measures changes in a wide range that not include the null-value, since the effects can be considered of interest but with moderate level of accuracy.

On the contrary, students of technical group rated high scores in the ego-climate dimension, with Punishment for Mistakes and Unequal Recognition scores that were significantly different from the scores of the TGM group. These results agree with the evidence provided by Gray and colleagues (2009), who compared the effects of a teaching approach based on games and another approach based on the development of basketball skills. The author found that the task-involved motivational climate was higher in the experimental group, while the ego-involved climate was higher in the other group.

As stated above, the analysis of 95% confidence interval for Cohen’s measures lead us to interpret the effect of interest but with moderate level of accuracy (i.e., the ranges of the relevant measures are not narrow). Further support for the results provided in this study were given by Hohengasser (2014), who proposed a hybrid teaching model based on the fusion of the teaching games for understanding (TGfU) and the sports education models (SEM). He addressed the motivational climate created in agreement with the variables provided with the TARGET model (Task, Authority, Recognition, Grouping, Evaluating, Time), and the results indicated a high post-test mastery motivational climate and a high post-test level of physical activity enjoyment. Accordingly, the current results revealed that students involved in the TGM group experienced increases in their levels of enjoyment and perceived a motivational climate focused on improving their levels of task-related competences. These results agree with others obtained in previous research (Alexander et al., 1998; Browne et al., 2004; Wallhead & Ntoumanis, 2004), where the participants reported that they had experienced greater enthusiasm and enjoyment after a GCA unit. The current results and the previously cited evidences reinforce the same basic idea: students found the instructional plans based on games and sport-related features more interesting than the plans based on teaching-learning processes, where drills and skills were taught in decontextualized settings.
The main criticism of this study is the lack of pre-post analysis because it limits our analysis to the univariate perspective. Furthermore, a second limit is the lack of re-test data for providing a longitudinal time analysis. In this respect, further study will be conducted to obtain data to provide a more adequate contextualization of the current results to the multidimensional perspective of the learning process.

**Conclusion**

The provided results support the need to choose an adequate teaching approach for developing physical education lessons within a context where students perceive a motivational climate oriented to improve personal levels of knowledge and expertise throughout a cooperative and peer-support method. In this respect, the use of the TGM as a model for designing and providing teaching-learning processes aimed to support a task-oriented motivational climate linked to a context characterized by high levels of enjoyment. Indeed, if a teaching process meets the previous circumstances, students may reach physical education achievement linked to the affective domain, such as high levels of intrinsic motivation, satisfaction and low levels of stress and tension. Furthermore, the use of a game-centred approach seems to avoid the risk of an ego-oriented motivational climate. Thus, students will be oriented to improve their knowledge and expertise in a positive and developmentally adequate perspective. Finally, if teachers will use the TGM for their lessons, they can easily provide a teaching–learning context oriented to guide students towards well-being behaviours.

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**Author contributions**

F.S.: Conceptualization, Methodology, Data curation, Writing-Review & Editing, and Supervision.

M.B.: Conceptualization, Investigation, Formal Analysis, Writing-Original Draft Preparation.

R.S.: Conceptualization, Methodology, Formal Analysis, Writing-Original Draft Preparation.

M.L.: Conceptualization, Writing-Review & Editing, and Supervision.

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