


Article

Effects of Verbal Interactions between Students on Skill Development, Game Performance and Game Involvement in Soccer Learning

Wissam Ben Khalifa ^{1,2,*} , Mehrzia Zouaoui ^{1,2}, Makrem Zghibi ¹ and Fairouz Azaiez ³

¹ Research Unit, Sportive Performance and Physical Rehabilitation, High Institute of Sports and Physical Education of Kef, University of Jendouba, Kef 7100, Tunisia; zouaouimehrzia@gmail.com (M.Z.); zghibimakrem@gmail.com (M.Z.)

² High Institute of Sports and Physical Education, Ksar-Saïd, Mannouba University, Mannouba 2010, Tunisia

³ GEDES Research Unit, High Institute of Sport and Physical Education of Sfax, Faculty of Arts and Human Sciences of Sfax, Sfax 3000, Tunisia; fairouz.kyranis@yahoo.com

* Correspondence: wissambenkhalfi@gmail.com

Abstract: The purpose of the study was to examine the effects of verbal interaction between students on skill development and soccer game performance within a socio-constructivist perspective and a cooperative learning model in team-sport teaching. In addition, the usefulness of open verbalization was manifested as follows: (1) a social tool for both actors (teachers and students) to collect and manage reports on their thought processes; (2) a tool to stimulate reflection and critical reflection on performance to induce transformation during game action projects. Participants were 18 boys and 12 girls aged (15 ± 0.4 years) from a Tunisian school (ninth grade). They were placed in either the experimental group (with verbal interaction) or the comparison group (without verbal interaction) and then were tested before and after a 12-lesson soccer unit (approximately two hours/week). Skill competence was assessed using three tests: a 15 m ball dribbling test, the Loughborough Soccer Passing Test (LSPT) and a shooting accuracy test. Game performance was measured using the Game Performance Assessment Instrument (GPAI) in which the outcome variables assessed included (a) decision-making (DM), (b) skill execution (SE), (c) support (S), (d) game performance (GP), and (e) game involvement (GI). While both groups showed significant improvements in their short-passing ability, no such improvements were found in dribbling and shooting. In contrast, only the verbal interaction group produced significant improvements in overall game performance. In conclusion, if the objectives of the physical education curriculum are to promote team-sport teaching methods and quality game play, and create a reflexive learner, verbal interaction may be an effective tool for developing tactical understanding through cooperative learning.

Keywords: debate of ideas; questioning; teaching games; skill execution; decision-making



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1. Introduction

One of the main strategies for improving school learning in a physical education class has been identified as increasing opportunities for discussion [1]. Discussions and the time required for face-to-face interaction allow students to solve problems and engage in thinking [2,3]. Interactions promote learning outcomes and are more task-oriented than trivial and focused on something other than the task [4]. Darnis and Lafont (2015) [3] recapitulated this main finding when they suggested that cooperative student discussions (dyadic level) about their game strategies resulted in better motor and tactical skills.

The current study centers upon the use of verbal interactions between students as a cognitive strategy during skill development and subsequent game performance. While interactions can take both verbal and non-verbal forms, verbal interaction is the primary medium of instruction in physical education classes and is often utilized by teachers and

students to discuss tactical problems and resolve potential conflicts [5]. Consequently, verbal interaction is an important part of human interaction. Such interactions can be defined as total relationships that are reached through speaking, conversation, discussion and debate of ideas [6].

Many education stakeholders have argued that students, rather than the teacher, should be the focus of the teaching/learning system [7]. Student-centered approaches reference exploratory, discovery, cooperative, active, participatory or project learning [8,9]. Despite some differences in the implementation of different student-centered frameworks, all are based on the common principle that "the only learning that significantly influences behavior is self-discovered" [10]. In this context, there are a number of common features that characterize student-centered learning strategies: (1) The decision-making responsibilities associated with the planning, implementation and evaluation of activities are transferred, at least in part, from the teacher to the student [11]. (2) The teacher usually assumes a facilitating role [12], and as facilitator, his or her role is to encourage and support the appropriation of the learning process by students. (3) Students are explicitly invited to learn from other students and to educate them through peer or small group teaching [13] and peer-to-peer working groups based on complementary interests or levels of performance [14,15]. (4) The teacher prompts students to reflect thoughtfully and creatively and challenges them to find solutions to problems they encounter [16]; in this context a current recommendation for student-centered design, for example, is that the teacher use the "questioning" tool [17,18] and debate of ideas [19]. (5) The teacher encourages students to learn more about their development and skills and, consequently, adjust their learning strategies [8].

In such a student-centered approach, students are encouraged to make sense of a new contribution in their learning. This contribution is linked to their previous knowledge and, working with their peers through sustained verbalization and debate, to building a shared understanding [6]. The use of verbalization as a cognitive strategy has its roots in the socio-constructivist approach of Russian psychologists such as [20]. The socio-constructivist approach is based on a key premise, namely, the Zone of Proximal Development (ZPD). From a theoretical point of view, Vygotsky's concept of ZPD presents a helpful means to think about the importance of language and verbal interaction in learning [17]. We use Vygotsky's notion of ZPD and the complement of the game-based approach to improve learning [21,22]. Both these theories emphasize the role of language in learning, for example, in the discussion/verbal interaction between students and between students and teachers in the game-based approach [23]. These conditions respond to Vygotsky's postulates and are adequate in our opinion to report the creation of a ZPD. Roth and Radford (2010) [24] proposed that ZPD can be considered as an interactional implementation that allows all participants to become both teachers and learners. They argued that it is useless to think of participants in terms of expert (higher skill level) and novice (low skill level) because this vision masks the fact that experts and novices must demonstrate cultural competence to participate in discussion so as to lead to learning. If knowledge is required in interaction, the learning can be multi-dimensional (take place in any direction) [6]. As a result of these theories, many authors have engaged in the search for teaching techniques aimed at putting students at the center of their own learning. Indeed, during the verbalization sequences, the spontaneous declarations of the learners convey meanings about situational state-action. These revealed meanings attributed to the state-action characterize the development of strategic and procedural knowledge that may be related to more gaming experiences of a particular activity [25].

At the pragmatic level of collective sports intervention, studies on the verbal interactions and debate of ideas have focused on two pedagogical paths, suggesting implementations of the debate of ideas at different moments of the learning process. On the one hand, Gréhaigne and Godbout (1995) [26] presented an operationalization in three stages: a first play time (action time where students are in action); a second stage for co-observation and co-evaluation; a third time for the debate of ideas. In this perspective, the time for debate

and verbal exchanges is based on the definition of social roles (e.g., observing, listening, taking the turn of speaking roles) serving as a support for co-constructions of rules of action. On the other hand, the Teaching Games for Understanding (TGfU) model was originally developed by Bunker and Thorpe (1982) [27] and offers an alternative to the technicist approach of team sports at school. From small-sided game situations, learners are invited to “appreciate the game” to conceptualize the aim, then to become aware of important tactical aspects to solve the problems posed by game competitions. To encourage the co-emergence of pragmatic concepts that are useful for the development of team sports skills, we also build on the work of Chang et al. (2006) [28]. They proposed to set up phases of exchanges, debates of ideas within the teams between game sequences. They highlighted the phenomena of extracting the rules of effective action from a dialogical and shared space of cognition within an 11-year-old team in a basketball unit.

In addition, from the dual perspective of cooperative learning and TGfU formats, Dyson and Casey (2012) [29] developed proposals for cooperative learning in team sports. Their proposals are based on the use of social roles (e.g., observers, coaches) and small group discussions to promote learning in team sports among young and novice students.

Teaching conceptions in this study are largely inspired by the work of Dyson and Casey (2016) [30] and Darnis and Lafont (2015) [3] in an integrative approach of cooperative learning, verbal interactions applied to motor learning and didactics of collective sports [31].

Numerous studies across various educational contexts have shown that when learners are encouraged to verbalize about what they learn, it improves their learning [32–34]. In previous work [31], verbal interaction and debates of ideas between peers provide the construction of action rules and information when participants are faced with a problem-solving setting allowing them to focus on specific tactical rules [3,35]. The construction of tactical skills in a specific game learning situation can be presented as implicit teaching associated with a socio-constructivist approach [3]. From this perspective, Chang et al. (2006) [28] suggested that language production about action strategies produces a positive effect on basketball learning, the construction of effective action modalities and game organization. Another study by Lafont, Proeres, and Vallet (2007) [36] reported the positive effect of verbal exchanges on interpersonal relationships and tactical acquisition and on shooting in a basketball team game among French primary school children. Following this theoretical framework, García-López and Gutiérrez (2015) [37] insisted on the need to study closely the interactions of students during group learning.

It should be noted, however, that in most of the studies conducted to date, the effects of verbal peer interaction were studied where the dyadic learning unit consisted of two students. In this study, the focus was on group learning in a more macro-analytical design (small groups of five students).

The aim of the present study was to examine the impact of including opportunities for verbal interactions between students during a unit of soccer. Specifically, it was hypothesized that students in the experimental group would achieve higher post-test performance scores in both technical skill tests and game performance measures than those in the comparison group who did not engage in verbal interaction between game sequences.

2. Method

2.1. Participants

The participants in this study were 18 boys and 12 girls (age, Mean (M) = 15.4 and Standard Deviation (SD) = 0.59; experience in football practice, M = 3.86, SD = 1.81) from one ninth-grade physical education class (60 min of effective learning, once a week) in a Tunisian school. The research was conducted in accordance with the guidelines of the Declaration of Helsinki. The participants and their parents were informed about the study details. Then the parents signed an informed consent form as the studied students were under 18. The research project was approved by the Scientific and Ethics Committee of the High Institute of Sports and Physical Education of Kef (Tunisia). The teacher

was an experienced researcher in the didactics of collective sport games and a football (soccer) specialist (football trainer certificate and practice). Before starting the study, he had experience in using cooperative learning and teaching small-sided games with different age groups in Tunisian school.

An introductory lesson was organized for team selection. As a method of team selection suggested by Siedentop (1994) [38] and recently used by Farias, Valério, and Mesquita (2018) [39], six students were elected to form a selection committee that co-operated with the teacher to compose six heterogeneous but balanced teams. Each team included the same number of girls and boys and different skill levels (from lower to higher qualified).

After this procedure, teams were randomly but equally distributed to an experimental and a comparison group learning condition. The experimental group ($n = 15$) was assigned as the “motor learning + instructions + verbal interaction” learning condition, while the comparison group ($n = 15$) was designated the “motor learning + instructions” learning condition. Students were allocated to three equal teams in each group. Each of the teams within both the experimental learning condition and comparison learning condition was comprised of five students (four players on the field and one substitute).

2.2. Pre-Intervention Phase

Before starting the intervention, both groups were invited to complete the first part of the course (eight sessions with two per week, each lasting 60 min). Each session was focused on the acquisition of technical skills (i.e., pass, dribble and shooting) and tactical skills (4 vs. 4 small-sided games at the end of the session). The small-sided game (2×6 min) put in opposition a team from the experimental group (with verbalization) and a team from the comparison group (without verbalization). This phase consisted of teacher-centered lessons, which aimed to: (1) teach the necessary declarative and procedural knowledge about appropriate tactical decisions, and (2) remedy social skills (e.g., encouragement, listening, respecting others) during the debate of ideas sequences in the experimental group. These sequences were filmed for use during the meetings (35 to 45 min after each session) with the students of the experimental group to stop in a positive climate of conversation. In this context, Soller’s (2001) [40] taxonomy of conversation skills in collaborative learning was used. The taxonomy is designed to facilitate the recognition of an active learning conversation. It introduces each learning conversation skill (Active learning, Conversation, and Creative conflict) into sub-skills (for example, Request, Inform, Acknowledge) and attributes (for example, Suggest, Rephrase, Suppose, Explain, Justify) (for more details see [41]).

2.3. Intervention Phase

All students participated in the same 12 teaching sessions. Each teaching session focused on one major operational objective to assist the students in developing their tactical understanding of offense, defense, and associated techniques within soccer using a small-sided game format (i.e., 4 vs. 4). These are listed in Table 1.

Table 1. Learning unit focused on tactical understanding for offense, defense and associated techniques within 4 vs. 4 small-sided games.

Intervention Sessions	Offensive Objectives	Defensive Objectives
1	Movement to create open passing lanes	Anticipation and cutting the trajectory of passes
2	Dealing with crosses	Occupying spaces and placement in the defensive zone
3	Progression, penetration and attacking the goal	Defensive cover
4	Using the space (width and depth) in the offensive phase	Closing down and tightening the space between players (defending space)

Table 1. Cont.

Intervention Sessions	Offensive Objectives	Defensive Objectives
5	Movement to maintain possession	Occupying spaces and placement in the defensive zone
6	Progression toward the attacking end of the field	Preventing the progression of the attack team
7	Attacking and creating numbers-up	Reducing space and seeking defensive balance
8	Building the attack from the back	Ball recovery with pressing
9	Permutation and switching position for receiving the ball	Zone marking (mark the opponent in his zone)
10	Support the player on-the ball	Covering and mobility to create numbers-up in defense
11	Maintaining possession of the ball and attacking the space in between players	Reducing and tightening the space between players
12	Offensive transition	Defensive transition

Each session was scheduled for 60 min. Lessons began with a standardized 15 min warm-up consisting of jogging, coordination movements and dynamic stretching, and ending with 4×10 m sprints. After the warm-up, each team in the experimental group played a 12 min game against a team from the comparison group (2×6 min halves + 3 min half-time). During the half-time period, the students in the experimental group engaged in three minutes of verbal interaction (play–discuss–play) while the students in the comparison group engaged in passive recovery (play–passive recovery–play) where no verbal interaction was permitted. The verbal interactions between students in the experimental group were video-recorded to ensure the participation of all students during the verbalization. The time for verbal interaction was limited to three minutes [3]. Teams rotated through a (a) warm-up, (b) play, (c) observation cycle throughout this game-play lesson segment. Figure 1 provides a graphic of the sequence of activities for each team in the experimental condition.

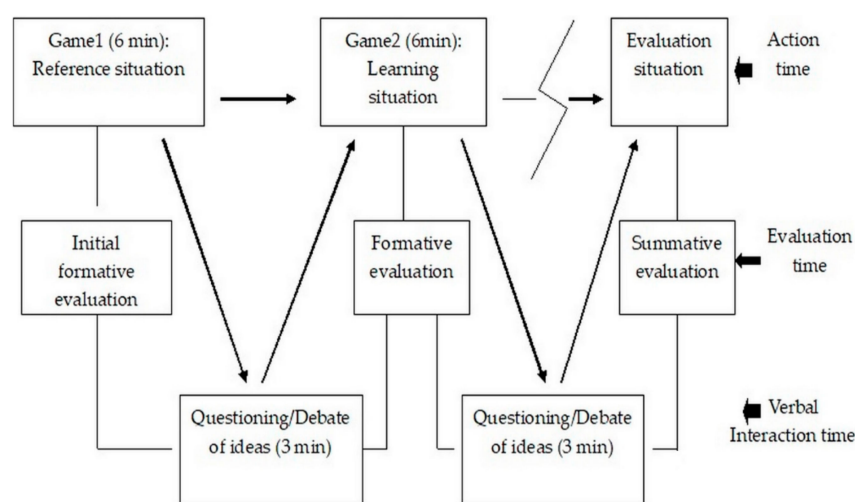


Figure 1. Structure for each team in the experimental condition.

2.4. Verbal Interaction

The use of the debate of ideas aimed to increase the level of interaction within groups during questioning episodes [19].

2.4.1. Questioning

As in Metzler's (2017) [12] tactical games model, the games concept approach was based on higher-order questioning [42]. These questions helped students reflect on information and commit it to memory; they could be used as a management tool to draw

students into the lesson and keep them focused; and they could develop thinking skills, creativity and encourage discussion/debate of ideas.

2.4.2. Debate of Ideas

By regularly offering confrontation and reflection times during the motor learning lessons, students were able to acquire an approach that would make them more aware of their actions [43]. Over time, provoking student verbalization has become an important approach in physical education, despite the fact that motor tasks are more related to perceptual-motor and intellectual characteristics [44]. In this context, Gréhaigne and Godbout (2014) [45] highlighted the interest of the debate of ideas. They defined this didactic process as a situation in which students explain and exchange ideas about the facts (tactical problems), based on observation or personal experience.

2.4.3. Tactical Problems Discussed in Debate of Ideas

The students' debate of ideas focused on the tactical problem of placement [46], the tactical problem of maintaining possession of the ball [47], identifying the particular strengths of the opposition team, an action plan to deal with these strengths in the previous game and an action plan in order to be effective in the next part of the game [19].

2.5. Intervention Validity

The teacher's role in each of the teaching sessions was to (a) present the learning objective to the entire class at the beginning of each session, and to explain how this might be realized within the small-sided games; (b) conduct and supervise the standardized student warm-up; (c) provide individual and collective instructions and feedback to each of the teams; (d) provide prompts for the students in the verbalization learning condition and facilitate the debate of ideas between these groups between game 1 and game 2; and (e) provide a recap of the lesson for the entire class.

The principal researcher accompanied the teacher to each lesson in order to validate the pedagogical approaches during the intervention phase of the study. Prior to each lesson, the researcher checked the teacher's lesson plans to ensure that session objectives, instructional cues, deductive questions and prompts for the student verbalization were present. After each lesson, the researcher discussed his observations with the teacher to ensure fidelity to the teaching sequence highlighted above.

Metzler (2017) [12] emphasized the importance of verifying that any model implemented in physical education led to the expected learning outcomes of students. Using word-for-word spreadsheets, we believe that the teacher met the requirements of how to teach games, as identified by Mitchell, Oslin, and Griffin (2013) [47], and thus had a relatively high fidelity retention [48] in the implementation of the tactical act model in games teaching. During the completion of cooperative learning (CL), the teacher ensured that the key characteristics [49] (i.e., positive interdependence: links between group members; individual accountability; face-to-face interaction: head-to-head discussion within the group; interpersonal and small group skills; group processing; small heterogeneous teams; group goals, and teacher-as-facilitator) took place along the unit.

2.6. Data Collection

Pre-and post-test data were collected during the students' regular physical education lessons.

2.6.1. Technical Skills

15-m ball dribbling. A 15-m ball dribbling test was used to assess the student's ability to control a ball while moving [50]. Each participant began 3 m behind an initial photocell gate, and after 3 m of moving in a straight line, entered a 3 m slalom-dribbling section marked by three sticks of 1.6 m height and placed at 1.5 m from each other. The ball was then kicked under a 0.5 m height hurdle placed 2 m from the third stick while the

participant crossed it. Finally, the participant freely kicked the ball toward either of two small goals placed diagonally 7 m on the left and right sides of the hurdle and ran 7 m to the finish line, where the second photocell gate was placed to stop the timer.

Loughborough Soccer Passing Test (LSPT). The modified version of the LSPT was used to measure short-passing ability. In this version, the contribution of decision-making was added to the original passing test [51,52]. LSPT total performance time (time necessary to complete the test after adjusting for penalties and/or bonus time) was selected for analysis. The LSPT has been shown to be both reliable and valid, with the detailed protocol and a schematic representation of the test available from [52] or [53]. All participants were familiarized with the LSPT during two practice sessions prior to testing.

Shooting test. To assess shooting on goal, the participants completed the Mor and Christian (1979) [54] test, which involved sending a ball through a series of circular hoops attached to each corner of the goal. The shooter started at the lower left target, proceeded to the lower right target, then aimed at the upper left target, and finished with the upper right target. The total successes of 16 trials were scored.

2.6.2. Game Performance

To measure soccer game performance, the Game Performance Assessment Instrument was used [55]. The game played during the pre-and the post-tests was a small-sided game (SSG): 4 vs. 4 players on a 20 m × 40 m pitch size [56] on an outdoor field. The objective of the participants in the assessment game format was to keep possession of the ball in order to score more goals than the opposing team and win the game. The duration of 4 vs. 4 SSG (10 min) during the pre-test and the post-test were strictly controlled. Both assessments were conducted in similar conditions and at the same time of day to limit the potential effects of circadian variation on physiological variables [57]. Moreover, the teacher offered verbal encouragement to the participants (e.g., good work, keep it up, etc.) to maintain a high work rate during the games. The teacher provided a replacement ball in cases where the ball went out of bounds to allow for an improved continuity of play [58]. Goalkeepers were excluded from the investigation, and the offside rule was not applied.

Three elements of game play from the GPAI, decision-making (DM), skill execution (SE), and support (S), were used to assess students' game performance, and these were the elements evaluated on an individual base from videotapes of game play. The DM category consisted of students making appropriate choices about what to do. For example, if a student in possession of ball decided to shoot it through an open goal or pass to an open teammate when the opportunity was suitable, the coder recorded it as appropriate. When the student passed the ball at a bad time or to a marked teammate, an inappropriate decision was recorded by the coder. The SE category included passing, dribbling and shooting skill and was assessed at each student–ball contact as an efficient or inefficient action (e.g., technique used in the game situation, such as proper gesture toward or away from the ball, changing body posture). The S category was assessed when the player was without the ball. It consisted of students calling for the ball (to be in a favorable position to receive a pass).

To assess the impact of the intervention sessions, observers coded each aspect of game performance separately (i.e., with and without the ball actions, in both attack and defense) via GPAI constructs. DM, SE and S of game performance were tallied and summed for all students both as appropriate/efficient and inappropriate/inefficient for each heading. In accordance with the recommendations of Griffin, Mitchell, and Oslin (1997) [59], performance indices for DM and SE were calculated on the basis of appropriate to inappropriate actions ratio. The decision-making index (DMI), skill execution index (SEI) and support index (SI) were calculated using the following formula: number of appropriate DM, SE or S / number of inappropriate DM, SE or S. Then, a global measurement of appropriate/inappropriate game performance (GP) and game involvement (GI) actions were also calculated by the following formulas:

$GP = (DMI + SEI + SI)/3$ and $GI = \Sigma$ (number of appropriate and inappropriate SE, DM and S).

2.6.3. Coders' Training and Reliability

Two coders (with football knowledge) belonging to the Tunisian National Observatory of Sport and having two and three years of experience in observation methodology were in charge of the analysis. As a preliminary step for observations, the coders were trained for approximately 24 h spread over two weeks to analyze decision-making and execution of pass, dribble and shot actions. The training of the coders was carried out by an expert in the methodology of observation (Tunisian Football Association). A meeting was established in advance to clarify and finalize the instrument of observation and coding criteria. Inter-coder reliability was checked via the observation of two 10-min games not used in the study. Inter-observer reliability was calculated by the formula: $\text{Agreements}/(\text{agreements} + \text{disagreements}) \times 100$, and agreement for the sampled two games was higher than the 80% set prior to data collection (89.7%). Once this value was calculated, Cohen's kappa index was used. Values greater than 0.90 for all dependent variables were obtained, and those exceeding the value of 0.81 from which adequate agreement was considered. The data thus achieved the reliability necessary for subsequent coding.

To ensure the temporal reliability of the measurement, Cohen's kappa index was used. The same coding was done twice, with a time interval of 10 days. Cohen kappa values were between 0.81 and 1.00.

2.7. Data Analysis

Statistical analysis was performed using SPSS version 24 for Windows (SPSS Inc., Chicago, IL, USA). The normality of data sets was checked using the Kolmogorov–Smirnov test, which led to the use of parametric statistics. A 2×2 repeated measures analysis of variance (ANOVA) was used to examine the effect of “teaching method” (with or without verbal interactions), “time” (pre- and post-intervention sessions) and their interaction (teaching method \times time) on each of the eight dependent variables (the skill tests of passing, dribbling, shooting, GP, DM, SE, S and GI) with a priori alpha set at 0.05.

When a significant interaction effect was found, posthoc tests were completed where Bonferroni corrections were employed to control for the multiple comparisons to protect against type-1 error. Magnitude of change expressed as Cohen's d coefficient was employed to give a rigorous judgment about the differences between the two teaching methods [60]. Effect sizes (ES) were considered trivial, small, medium and large for values of 0 to 0.20, >0.20 to 0.50, >0.50 to 0.80 and >0.80, respectively [61].

3. Results

Descriptive data generated from each of the eight dependent variables (the skill tests of passing, dribbling, shooting, GP, DM, SE, S and GI) for each of the two groups at each time point (pre- and post-intervention) are presented in Table 2, while the inferential analyses appear in Table 3.

Table 2. Statistics for skill tests, game performance, and game involvement.

Test	Experimental Group		Comparison Group	
	Pre-Test <i>M</i> \pm <i>SD</i>	Post-Test <i>M</i> \pm <i>SD</i>	Pre-Test <i>M</i> \pm <i>SD</i>	Post-Test <i>M</i> \pm <i>SD</i>
Loughborough Soccer Passing Test (LSPT) (s)	77.00 \pm 8.24	69.11 \pm 6.82	75.36 \pm 7.62	72.12 \pm 4.12
Dribbling Ball–15m (s)	9.01 \pm 2.59	8.50 \pm 2.31	10.21 \pm 2.70	9.74 \pm 2.19
Shooting	27.66 \pm 5.19	29.26 \pm 7.22	26.73 \pm 7.50	27.40 \pm 9.07

Table 2. Cont.

Test	Experimental Group		Comparison Group	
	Pre-Test $M \pm SD$	Post-Test $M \pm SD$	Pre-Test $M \pm SD$	Post-Test $M \pm SD$
Game Performance (GP)	1.89 \pm 1.18	3.08 \pm 1.92	1.77 \pm 0.76	1.79 \pm 0.83
Decision-Making (DM)	2.25 \pm 1.19	3.49 \pm 2.15	2.03 \pm 0.90	2.26 \pm 1.05
Skill Execution (SE)	1.44 \pm 1.05	2.53 \pm 2.65	1.26 \pm 0.82	1.39 \pm 1.23
Support (S)	1.97 \pm 2.27	3.22 \pm 2.49	2.01 \pm 1.73	1.72 \pm 1.66
Game Involvement (GI)	35.6 \pm 5.11	38.47 \pm 4.36	38.26 \pm 6.30	41.60 \pm 6.90

Note: M = Mean; SD = Standard Deviation.

Table 3. Statistics of the ANOVA with 2×2 repeated measures teaching method (with and without verbalization) \times time (pre and post).

Variables	Main Effect of Teaching Method		Main Effect of Time		Interaction Effect	
	F (1,14)	η^2	F (1,14)	η^2	F (1,14)	η^2
LSPT	0.09	0.00	25.75 ***	0.64 ***	8.31 *	0.37 *
Dribbling	0.44	0.03	3.44	0.19	0.50	0.03
Shooting	0.44	0.03	1.72	0.11	0.37	0.02
GP	4.10	0.22	17.06 ***	0.54 ***	13.92 **	0.49 **
DM	6.13 **	0.30 **	15.75 ***	0.53 ***	4.37 *	0.23 *
SE	5.06 *	0.26 *	4.06	0.22	5.86 *	0.29 *
S	0.93	0.06	1.84	0.11	6.83 *	0.32 *
GI	6.09 *	0.30 *	15.94 ***	0.53 ***	0.10	0.07

Note: LSPT = Loughborough Soccer Passing Test; GP = Game Performance; DM = Decision-Making; SE = Skill Execution; S = Support; GI = Game Involvement. Only significant effects are indicated, with * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

3.1. Skill Tests

For passing skills, there was a significant main effect for time and a significant teaching method \times time interaction. The post hoc tests showed that there was a significant change between pre- and post-intervention in passing skills (LSPT final time) in both groups, but times were significantly lower for the experimental group (Figure 2). No significant effects for dribbling and shooting skills were found (Table 3).

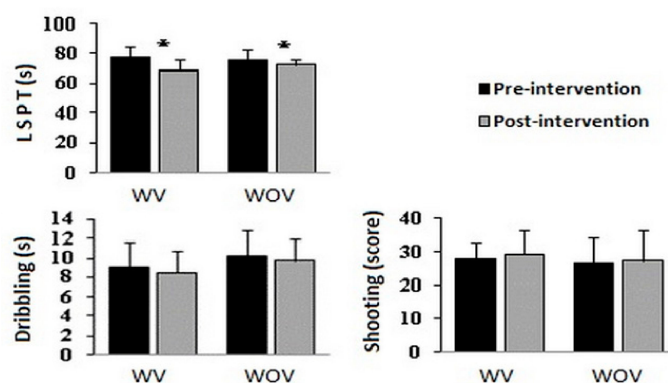


Figure 2. Mean skill tests performances both for groups with verbalization (WV) and without verbalization (WOV) teaching methods collected before (pre-intervention) and after (post-intervention). Error bars indicate within participants' standard deviation. * Denotes a significant difference between values.

3.2. Game Performance

Significant main effects for time and a significant teaching method \times time interaction were observed (Table 3). Posthoc comparisons revealed that there was a significant dif-

ference between the pre-intervention and post-intervention of game performance for the experimental group (Figure 3).

For decisions, significant main effects of teaching method was observed, while both groups improved from pre- to post-test, the experimental group had significantly greater gain scores (Table 3). Posthoc comparisons revealed that there was a significant difference between the pre-intervention and post-intervention for the experimental group (Figure 3).

For skill execution, both groups improved from pre- to post-test, the experimental group obtained significantly greater gain scores (Table 3). Posthoc comparisons revealed that there was a significant difference between the pre-intervention and post-intervention for the experimental group (Figure 3).

For support, a significant teaching method \times time interaction was observed; while both groups improved from pre- to post-test, the experimental group had significantly greater gain scores (Table 3). Posthoc comparisons revealed that there was a significant difference between the pre-intervention and post-intervention for the experimental group (Figure 3).

3.3. Game Involvement

Significant main effects for teaching method and time were observed, but no teaching method \times time interaction. Posthoc comparisons indicated a significant difference was present for both groups from pre- to post-intervention with a slight improvement of the experimental group (Figure 3).

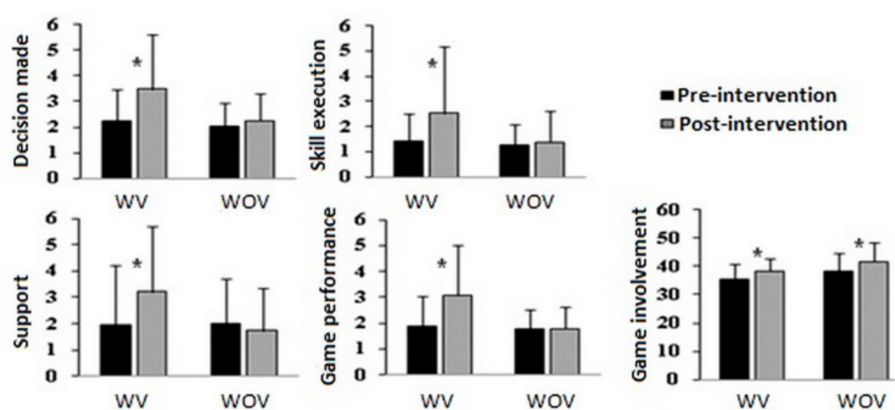


Figure 3. Game performances both for groups with verbalization (WV) and without verbalization (WOV) teaching methods collected before (pre-intervention) and after (post-intervention). Error bars indicate within participants' standard deviation. * Denotes a significant difference between pre-intervention and post-intervention values for each teaching method.

4. Discussion

The aim of the present study was to examine the impact of including opportunities for verbal interactions between students during a unit of soccer. It was hypothesized that students in the experimental group would achieve higher post-test performance scores in both technical skill tests and game performance measures than those in the comparison group who did not engage in verbal interaction in between game sequences. The discussion will first address the effects of verbal interaction opportunities on technical skills before moving onto highlight differences in game performance and game involvement measures.

4.1. The Effect of Play-Discuss-Play on Skill Tests

In terms of technical skills, the intervention of between-game discussions was particularly effective in improving the pass technical performance, but not so for dribbling and shooting. A previous study [62] suggested that these results, showing greater improvements in short-passing ability for the experimental (play-discuss-play) group, can be explained by the close association between the action of passing and the decisional compo-

ment leading to improvements in the execution of a pass during the game [63]. Indeed, a recent study [64] suggested that passing complexity resides more in deciding “who to pass to” and “when” than in the technical execution of the skill itself. An additional plausible explanation for these results may be that the content of the 12 lessons focused on passing and movement rather than on the other two technical skills of dribbling and shooting. At the same time, we cannot forget that the factor related to the quality of student practice was identified as the most crucial factor for their learning [65], although it is important to grade the importance of task organization to enable learners to accumulate high-quality repetitions, as this has been found to correlate with improved skill learning. Related to the first point, during learning sessions the frequency of shots on goal was low and unequally distributed among participants. In addition, during initial learning there may be more limitations in some technical aspects of play (i.e., dribbling and shooting) when compared to others. Finally, the dribbling test showed a lower level of reliability compared to the other technical skill tests (0.74).

4.2. The Effect of Play-Discuss-Play on Game Performance and Game Involvement

Major results of the present study showed the effect of learning in small groups, where play-discuss-play in the experimental group was more efficient, both individually and collectively, than the comparison group on the GPAI-dependent variables (i.e., DMI, SEI, and SI) post-intervention. These differences were also significant at the post-intervention assessment in terms of GP and GI for the experimental group. It is therefore assumed that the changes observed in the current study were due to the verbal interactions that were afforded to students in the experimental group.

The results of this study are one attempt to extend the application of verbal interaction in learning games at a macro-analytical level where decision-making is necessary to enhance students' game performance. The results support the socio-constructivist perspective to team-sport teaching where researchers have suggested that verbal interactions improve the construction of tactical knowledge by students and the development of their decision-making abilities [3,66,67]. Effective decision-making strategies are developed through verbal interaction in small cooperative learning groups that enable effective long-term changes in tactical behavior. Blakemore and Robbins (2012) [67] affirmed that decision-making in adolescents, like the participants in this current study, is remarkably sensitive to social contexts (verbal interactions), since it occurs in a competition game with peers. In addition, verbalization and reflection on their own performance support the need for participants to be more aware of the main informational constraints they may face in their future competitive performances [68].

Specifically, the character of content development conceptions and explicit teaching strategies ranked in priority order in the current study from the preparation phase to the end of the intervention (direct instruction, discovery-based instruction, debates of ideas), and the quality of engagement of students in problem-solving processes (e.g., identification of tactical issues and team building of tactical solutions) had an effect on game performance development. Furthermore, the evolution achieved by the experimental group through this teaching unit reflected the cognitive and situated learning processes [69]. Prior studies [70,71] argued that to have a more effective game-play, perception, understanding and reflection of learners are key elements. Progress in the ability of students in the experimental group to play team games (e.g., soccer) arose as a result of an interdependent relationship between the pedagogical conceptions used and the level of cognitive and social engagement that stems for students from subject matter [72].

In this study, a solutions-based approach to content development [73] was implemented through pre-established verbal interaction sequences (debate of ideas) at specific moments of the game [74]. This design (play-discuss-play) had a positive effect on students' decision-making, skill execution, support and game involvement but not on technical skill tests (in isolation). In this context, Farias, Mesquita, and Hastie (2019) [13] emphasized the use of guidance-based strategies to create effective instructional interactions (e.g., peer-to-

peer teaching approach). The verbal interaction sequences were solicited by questioning episodes. The prominence of a tactical questioning provided by the teacher in game-based teaching cannot be ignored or neglected; this proposal was recently evoked by Harvey, Pill, and Almond (2018) [75]. This is consistent with studies revealing that active participation of students in the analysis of tactical problems and the search for appropriate solutions or game plans through tactical questioning produces a higher rate of tactical decision-making than do teacher-centered approaches [76,77].

In our study the incorporation of verbal interaction sequences (debate of ideas) in the structure of the learning unit meant that consequently the teacher ceded his place (responsibility) to the students. Their responsibilities manifested themselves in identifying tactical problems, collectively constructing solutions to these and a more appropriate action plan to address problems and provide rules of action [3]. However, Ward (2006, p. 12) [78] stated that “students follow rules such as ‘if this ... do this or that’ ... ” Rules are particularly useful and are likely to play a vital role in social skills training and teaching tactics (Ward 2006, p. 15) [78]. In summary, in the debate-of-ideas setting, each team sets up a first action project, which is then tested in gameplay. This can in turn lead to the development of a new action plan with the implementation of links between rules of action and rules of organization of the game [26]. In doing so, students gradually gather their tactical knowledge and improve their decision-making skills.

Verbalization as a cooperative behavior can contribute to improving team coordination and effectiveness. On this point, researchers noted that effective teams are more willing to ask for and accept help and give or receive feedback [70,71]. In contrast, a lack of communication in the comparison group teams exposed them to an increasing level of abstraction and ambiguity in their monitoring of their game performances [79]. Indeed, Fiore et al. (2003) [80] affirmed that a decrease in team members’ situational awareness occurs in the absence of verbal, paralinguistic and other sensory cues.

Our data are consistent with the results found by Mesquita, Farias, and Hastie (2012) [81]. These authors noted that the teaching of a football unit in a sport education design supported by the structure of learning tasks, namely: (a) having strategic problems to solve, (b) the practice of skills in the game situations, (c) students always performing alongside their teammates, and (d) the time and space needed to think about the game, giving students a chance to improve the skills execution as well as their tactical decision-making.

Another study by Nathan and Haynes (2013) [82] showed that a Teaching Games for Understanding (TGfU) based design led to improved decision-making and skill execution related to hockey game learning, knowing that TGfU often uses questioning and discussion/debate of ideas [83,84]. Harvey et al. [84] confirmed that TGfU unit soccer revealed significant changes in game performance (skill execution and support), and overall measures of game performance (game performance and game involvement) were assessed by the GPAI in a 3 vs. 3 soccer game. A recent study aimed to analyze differences in decision-making and action execution after a program of intervention based on the TGfU model [64]. The study revealed a significant improvement in decision-making and skill execution capabilities in players aged between 10 and 11 years after 22 sessions, but not after the first 11 sessions. Our experimental design intervention included a pre-intervention phase (eight sessions) and an intervention phase (12 sessions) and the study population was 15-year-old mixed students and the majority were novice. On the other hand, the population studied by Pizarro and her colleagues were male players characterized to have expertise level in sport. Hence, it appears that males in the latest study showed high pre-test scores in offensive decision-making and skill execution (e.g., dribbling), and increasing the defensive pressure for males was not sufficient to elicit a more sophisticated game performance, which may have limited their margin of progression after 11 sessions.

Our findings are consistent with the results obtained by Práxedes et al. [85] in the Spanish sport context among young male football players (10 to 11 years old). Researchers found that after applying the intervention program based on the TGfU model and including

the application of questioning and debate of ideas (a maximum of 2 min) in a context of small-sided games (e.g., 4 vs. 4), the players in the experimental group showed better game performance (e.g., decision-making in the pass and dribbling actions), and better skill execution (e.g., in the pass action), compared with the players from the control group. These results suggest that the application of verbal interaction in a context of small-sided games must be taken into account to foster tactical training/teaching in young footballer/learners and to improve their tactical behavior.

In a comparative study of three teaching groups conducted in Belgium using a volleyball practice course among university students [86], found that the student-centered tactical questioning group had significantly improved in terms of tactical game performance (decision-making process), from pre-test to post-test (after five lessons), compared to the other two teaching groups (i.e., teacher-centered and student-centered without tactical questioning). In the current study, students appeared to benefit from the tactical awareness implemented in the student-centered cooperative learning model and the concepts of questioning and debate of ideas as they have been systematically called upon to react and reflect on their own game problems, which could have given increased meaning to the content learned. Tactical awareness in the student-centered instructional group with questioning and tactical discussion must be attributed to the active role of the students in the teaching–learning process, as the tactical awareness of the comparison group (without interaction) did not reach the student performance level of the experimental group. Therefore, the development of decision-making capacity and skill execution mastery of students is based on the development of tactical awareness [87]. The successful negotiation of the scenarios that confront students in games requires the interaction and simultaneous application of tactical awareness/knowledge, decision-making, and skill execution [88]. In other words, these three elements are inseparable [23].

Questioning and debate of ideas are useful tools to develop decision training, and they are often used with other instructional tools (e.g., video-guided debates) [89]. In any case, decision training based on questioning and debate of ideas has proved to be useful for application in sport and teaching contexts. It leads to improvements in skills execution, decision-making skills and tactical skills [83].

The two instructional groups merely differed from each other in the responsibility of the students for the teaching–learning process and the implementation of goal-oriented observations through evaluation time (e.g., formative evaluation) in each practical session during the intervention period. Therefore, qualitative goal-oriented observations and the evaluation of well-described tactical principles of team members and themselves seemed to provoke the performance advantage of the learner-oriented cooperative learning and verbal interaction (questioning and tactical discussion). As part of this idea, formative evaluation is defined “as the iterative processes of establishing what, how much and how well students are learning in relation to the learning goals and expected outcomes in order to inform tailored formative feedback and support further learning, a pedagogical strategy that is more productive when role is shared among the teacher, peers and the individual learner” [90]. Furthermore, formative evaluation and feedback among students were inherent characteristics of our design to help students take control of their own learning. Formative evaluation as a didactic strategy improves self-regulation learning [91]. Self-regulated students should be able to actively interpret external feedback, for example, from other students, in relation to their internal and shared goals [92]. Feedback construct was exclusively accentuated in the experimental instructional group with tactical questioning and debate of ideas using qualitative goal-oriented observation forms, in contrast with the comparison group. As a result, it is suggested that verbal interaction (asking tactical questions followed by a debate of ideas) regarding these perceptual observations and evaluation times (e.g., formative evaluation) helps to create a thoughtful learning environment in which decision-making and critical thinking are developed [93]. Students in the experimental group seemed to be able to use a knowledge-based heuristic, while other students’ decisions (comparison group) were based on a general heuristic of the field.

Heuristics can be described as the simple rules that humans often use to make quick and effective decisions with limited information and shared attention to achieve their goals [86].

In each lesson of this study, students practiced the main game (4 vs. 4) in which their performances and their involvement in the game were evaluated during the pre-test and post-test sessions. It was supported that this increase in playing time was advantageous to improving student game-play performance [39]. In addition, the persistent composition of students in the same teams throughout the learning unit involved their participation in the debate sequences devoted to strategy and problem-solving as a group [11,13]. In this perspective, Gréhaigne, Caty, and Godbout [6] stated that the tactical thinking inherent in regular or formal contribution to debate of ideas assists students to deepen their knowledge of the strengths and weaknesses of every member of the team and the frequency of cooperation activities and the exchange of knowledge among team members increased [94].

Regarding GI, students in both groups showed a high level of involvement from pre- to post-intervention. The GI index is calculated by summing the sums of all the tactical behaviors (numbers of appropriate/effective and inappropriate/ineffective actions) for each participant game component. Thus, using such an index in the analysis of the student's game performance and involvement may give a false reading and interpretation. For that reason, the analysis should be treated with caution unless we use their GP index score alongside that of GI [95]. Therefore, having a high GI score does not mean that the comparison group is better than the experimental group in overall game performance since GP showed high values in the second group. In this context, Memmert, and Harvey [95] stated that the use of GP is more suitable for higher levels (i.e., Grade 9) than the GI, as they seek to provide more effective choices as their understanding of the game improves and vice versa for younger students.

However, in motor learning through verbal interaction, team members treat information and make decisions according to a certain quantity and quality of information [96]. Decisions made can be converted into actions (game plan, skill execution) in later task efforts at a very slow pace. These effects need to be monitored and negotiated during verbal exchanges between students. For example, mistakes that are made in game play can be immediately discussed and negotiated by students through verbal interactions between games, offering to the two teaching actors (teacher and student) opportune circumstances for a better learning next time. If such circumstances increase, the performance will improve as a result of the provided comments. This teaching/learning process is supported by progressive and skillful instruction [97] and would include teaching strategies such as questioning [64], debate-of-ideas settings [97], or team talks [95].

The application of verbal interaction (e.g., questioning and debate of ideas) as a teaching instrument has likely had a crucial influence on the obtained findings, and its utility as a tool to enhance game performance (e.g., decision-making and execution skills) can be confirmed [98,99].

Assigning students to groups and expecting them to know how to cooperate does not ensure that this will happen. Appropriate skills for cooperative learning are important for successful group work and are not owned by everyone. Listening to each other, encouraging everyone to participate, and trying to understand each other's perspectives are examples of skills suggested by Gillies (2003) [100]. More positive views on learning outcomes from cooperative learning of older students may reflect improved skills in group work.

In particular, to use the cooperative discussion group, we took into consideration social skills (e.g., encouragement, listening, respect for others) to guide an active learning conversation (see Section 2.2, Pre-Intervention Phase). Other studies need to be more aware of the social context and the concerns and needs of their students such as preferences for working with peers, attitudes to working in groups, friendships (see [101]). This knowledge can increase the productivity of social interactions during the cooperative discussion group [89]. Moreover, students do not learn while playing or repeating technical gestures. In order to achieve the construction of meaning, it is necessary to analyze after

the fact what happened. In this case, the importance of the digital competence of teachers is specified in order to develop innovative methodologies linked to socio-constrictive education and analytically managing information in physical education class [102,103]. Methodologies associated with innovation must be an inexorable part of daily educational practice and must be supported by the use of the educational and technological resources available [104].

5. Limitations

This study is notable in that it was the first to study the effect of verbal interactions between students on skill development, soccer game performance and involvement within a socio-constructivist perspective in team-sport teaching. There are, however, some limitations, the first of which is the small sample of student participants. Future research is needed with an expanded and varied population (e.g., age, gender) to provide more generalizable results.

Another limiting aspect of this study is that its design was limited to the analysis of quantitative data. In future studies, there would be considerable value in collecting qualitative data to investigate what is specifically going on during each of the verbal sequences. However, we believe that the results of this current study are still clear, and in addition, provide evidence that support our conclusions about decisional/tactical skills learning in school context.

Based on the Cohen (1988) [60] indices, we obtained trivial-to-moderate effects for experimental group (with interaction) progression, although small effects for the learning condition. These observed effects were probably due to various factors such as the pronounced heterogeneity within the teams, the students being novice players, and the limited length of the intervention. These factors that characterize the ecological validity status seem to have mitigated the obtained effects. Furthermore, no more remarkable differences in tactical performance indices could be related to the student expertise [105]. In fact, a preliminary study has proclaimed that inexperienced players use individual actions to solve the contextual problems of the game [106].

6. Conclusions

Results from the current study provide evidence that including opportunities for verbal interactions during breaks in game play leads to positive changes in game performance, specifically by promoting the abilities to make more appropriate decisions. In turn, these decisions are transformed into effective actions on both the collective and individual levels. Learning may be regarded as a continuous dialogue, which involves students receiving feedback from and providing feedback to, other students about tactical strategy, skill execution, and purported discoveries during games. Further research may focus on generating qualitative data alongside quantitative data and examining the effect of the verbal interaction frequency on students' skills and game performance. As a conclusion, and drawing on socio-constructivist and cooperative learning settings, we suggest that through tactical team-sport teaching, the game can be considered a vital space to examine the interactive physical, social and cognitive factors of student learning.

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