QUBAHAN JOURNAL OF COACHING AND SPORTS SCIENCES
VOL. 2, NO. 1, March 2024
https://doi.org/10.48161/qjcs.v2n1a19

Impact of Cooperative Learning Strategies on Physical Performance, Social Interaction, and Enjoyment in Physical Education

Abdul Malik Iskandar[1*], Ijeoma Precious Igwenyi [2], and Franz U. Atare [3]

[1] Department of Sociology Education, Faculty of Teaching & Education Science, Megarezky University, Makassar, Indonesia;
[2] Physical and Health Education, Alex Ekwueme Federal University, Ndufu-Alike, Ebonyi State, Ikwo-Abakaliki, Nigeria;
[3] Human Kinetics and Health Education, Faculty of Education, University of Uyo, Uyo, Nigeria.
* **Corresponding author:** abdulmalikiskandar@unimerz.ac.id.

ABSTRACT: Cooperative learning is a pedagogical model that may improve physical, social, and affective outcomes in physical education by requiring students to share responsibility, support peers, and evaluate group progress while remaining actively engaged in movement tasks. This study examined the impact of an eight-week cooperative learning unit on physical performance, social interaction, and enjoyment among male secondary-school students in physical education. A quasi-experimental pre-test/post-test control-group design was used, with 96 male students assigned to intact classes in either a cooperative learning condition (n = 48) or a traditional instruction condition (n = 48). The cooperative learning unit incorporated positive interdependence, individual accountability, promotive interaction, explicit social skills, and group processing across 16 lessons. In contrast, the comparison group received teacher-directed instruction with comparable physical education content, lesson duration, and facilities. Physical performance was measured using a standardized field-test composite; motor skill performance was assessed with a rubric-based score; social interaction was measured using observation and student-report indicators; and enjoyment was assessed with a physical activity enjoyment scale. Statistical significance was set at $p < 0.05$. The cooperative learning group showed significantly greater improvements than the traditional instruction group in physical performance (mean difference in change = 8.93 points, $p < 0.001$, Hedges' $g = 1.75$), motor skill performance (8.31 points, $p < 0.001$, $g = 1.50$), social interaction (0.76 points, $p < 0.001$, $g = 2.69$), and enjoyment (0.63 points, $p < 0.001$, $g = 1.74$). Improvements in social interaction and enjoyment were positively associated with gains in physical and motor performance. The findings indicate that cooperative learning can enhance male students' PE outcomes by linking purposeful peer interaction with sustained physical practice and positive learning experiences.

Keywords: cooperative learning; physical education; male students; physical performance; social interaction; quasi-experimental design; school sport pedagogy.

I. INTRODUCTION

Physical education (PE) is increasingly expected to develop students who are physically competent, socially responsible, and motivated to remain active beyond school. These expectations are difficult to meet when lessons rely only on teacher demonstration, repetitive practice, and individual correction. Although direct instruction can be efficient for managing large classes and introducing technical cues, it may provide limited opportunities for students to communicate, share responsibility, and support one another during authentic movement tasks.

Cooperative learning offers a structured pedagogical alternative by organizing students into small teams in which members are mutually responsible for learning and performance. Its theoretical basis is social interdependence theory, which argues that learning outcomes are influenced by how students' goals are linked within a group [1]. General educational evidence also indicates that cooperative structures can support achievement and peer relationships when group goals are combined with individual accountability [2], [3]. In PE, these principles are especially relevant because learning is public, embodied, and strongly affected by peer climate.

Motivational theory provides a further rationale for using cooperative learning in PE. Self-determination theory proposes that students are more likely to engage when they experience competence, autonomy, and relatedness [4], [5]. PE lessons can support these needs when students receive constructive feedback, make meaningful decisions, and feel accepted by classmates. Empirical studies in school PE have shown that motivational processes are shaped by perceived competence, autonomy support, and the social climate of the lesson [6], [7]. Cooperative learning is, therefore, well-positioned to connect physical practice with social support and positive affective experiences.

The present study focused on male secondary-school students because boys' PE settings may be strongly influenced by public performance, peer comparison, athletic identity, and competitive status. A male-only sample allows a focused examination of whether structured cooperation can improve performance while also strengthening interaction and enjoyment in a peer environment where social evaluation is often visible. The study was designed to examine physical, social, and affective outcomes together rather than treating them as separate goals.

1. AIMS OF THE STUDY

- To determine whether an eight-week cooperative learning unit improves male students' physical performance in PE compared with traditional instruction.
- To examine whether cooperative learning produces greater improvement in motor skill performance than traditional instruction.
- To evaluate the effect of cooperative learning on social interaction during PE lessons.
- To assess whether cooperative learning increases students' enjoyment of PE.
- To explore the relationships among changes in physical performance, motor skill performance, social interaction, and enjoyment.

2. HYPOTHESES

- Male students taught through cooperative learning will show greater improvement in physical performance than students taught through traditional instruction.
- Male students taught through cooperative learning will show greater improvement in motor skill performance than students taught through traditional instruction.
- Male students taught through cooperative learning will show greater gains in social interaction than students taught through traditional instruction.
- Male students taught through cooperative learning will report greater increases in PE enjoyment than students taught through traditional instruction.
- Improvements in social interaction and enjoyment will be positively associated with improvements in physical and motor performance.

II. RELATED WORK

Cooperative learning differs from informal group work because interaction is deliberately organized around five core elements: positive interdependence, individual accountability, promotive interaction, explicit social skills, and group processing. Social interdependence theory explains that students are more likely to support one another when their goals are positively linked and when each member's contribution is necessary for group success [1]. This structure is important in PE because students often practice in groups, yet simple grouping does not guarantee inclusive participation, accurate feedback, or shared effort. Cooperative learning makes peer support a planned part of the instructional design rather than an optional classroom behavior.

General education research supports the academic and social value of cooperative goal structures. Slavin argued that cooperative learning is most effective when group rewards are connected to individual learning, because this arrangement encourages students to help teammates while still protecting personal responsibility [2]. Roseth, Johnson, and Johnson further showed that cooperative goal structures can strengthen achievement and peer relationships during early adolescence [3]. These findings are relevant to PE because classmates' responses often shape skill development, effort, and confidence. From a motivational perspective, self-determination theory emphasizes competence, autonomy, and relatedness as basic psychological needs [4], [5]. In PE settings, motivation has been associated with perceptions of competence and autonomy support [6] and with students' experiences of need satisfaction during lessons [7].

Early PE research demonstrated that cooperative learning could influence both social and motor outcomes. Polvi and Telama reported that cooperative learning functioned as a social enhancer in PE by encouraging helping behavior and positive peer engagement [8]. Dyson showed that cooperative learning could be implemented successfully in elementary PE when teachers deliberately planned roles, accountability, and group processing [9]. Barrett found that cooperative learning improved sixth-grade students' performance, providing evidence that structured peer work can contribute to motor learning and classroom climate [10]. Goudas and Magotsiou reported positive effects on social skills and attitudes toward group work [11]. Later ecological and action-research studies highlighted that cooperative learning changes the roles of both teachers and students: teachers design and facilitate interactions. In contrast, students become active contributors to peers' learning [12], [13].

A major strength of cooperative learning is its potential to address the physical, cognitive, social, and affective goals of PE simultaneously. Casey and Goodyear reviewed the literature and argued that cooperative learning can support the four learning outcomes of PE when implementation fidelity is high and the model is used consistently rather than as an occasional grouping technique [14]. Fernández-Río and colleagues found that a sustained cooperative learning intervention improved student motivation and the perceived cooperative climate of PE lessons [15]. Other research has linked cooperative learning to students' motivation, social interactions, and attitudes across educational stages [16]. It has compared it with direct instruction in terms of learning, behavior, and subjective experience [17]. A systematic review of recent PE studies concluded that the field has expanded substantially, while also noting the need for carefully reported interventions with clear evidence of fidelity [18].

Enjoyment is central to PE because students who enjoy lessons are more likely to participate willingly, persist through challenge, and associate physical activity with positive experiences. Meta-analytic evidence indicates that cooperative learning interventions can improve intrinsic motivation in PE students [19], [20]. Yang and colleagues reported that cooperative learning improved action-skill learning and motivation, suggesting that affective and physical outcomes can develop together [21]. Engels and Freund showed that cooperative games can increase enjoyment in PE, reinforcing enjoyment as an important educational outcome rather than a secondary by-product [22]. Student perspectives also show that cooperative learning can contribute to social and emotional learning when students experience teamwork, kindness, and shared responsibility [23]. Middle-school PE research further indicates that perceived motivational climate and enjoyment are related to physical activity engagement [24].

Valid measurement is essential when examining cooperative learning outcomes. The Physical Activity Enjoyment Scale has been widely used to assess enjoyment in physical activity contexts [25], and adapted versions have been applied with adolescent populations [26]. Physical performance measurement in school PE also requires reliable, safe, and feasible tests. The 20 m shuttle run is a widely used field test of cardiorespiratory fitness [27], and youth fitness research shows that physical fitness in childhood and adolescence is an important health marker [28]. The ALPHA fitness work provides evidence on reliability, feasibility, safety, and field-based health-related fitness assessment for children and adolescents [29], [30].

III. MATERIAL AND METHOD

1. STUDY DESIGN.

The study was structured as a quasi-experimental design with two intact male PE classes. A quasi-experimental design was selected because school scheduling and class assignment often make individual

randomization impractical in authentic PE settings. The cooperative learning group received an eight-week cooperative learning unit, and the comparison group received traditional teacher-directed instruction covering similar physical education content, lesson duration, and facility use. Assessments were conducted one week before the intervention and during the week following the final lesson.

2. ETHICAL CONSIDERATIONS.

The relevant institutional ethics committee and the participating school authority reviewed the study protocol before data collection. Written informed consent was obtained from parents or guardians, and assent was obtained from all students. Participation was voluntary, and students were informed that declining participation would not affect their PE grade. Students with injury, acute illness, or medical restrictions were excluded from maximal or near-maximal physical testing. All identifiable data were coded and stored securely.

3. PARTICIPANTS.

The sample consisted of 96 male secondary-school students enrolled in compulsory PE who completed both pre-test and post-test measures. Forty-eight students from the intact class were assigned to the cooperative learning group, and 48 were assigned to the traditional instruction group. Students were approximately 15 years old, physically able to participate in regular PE, and free of medical contraindications to vigorous activity. The male-only design was selected to examine cooperative learning in a peer environment often influenced by competition, confidence, and public performance. The findings should therefore be interpreted for male school PE contexts and should not be generalized to girls or mixed-gender classes without additional evidence.

4. SAMPLE SIZE RATIONALE.

For a two-group pre-test/post-test design, the sample size was based on the smallest effect of practical interest for the group-by-time interaction. A target sample of approximately 45 students per condition provides adequate power to detect moderate differences in change scores when alpha is set at 0.05, assuming conventional levels of variability in school PE outcomes. The final analytic sample included n = 48 per group, allowing stable estimation of confidence intervals and effect sizes for the main outcomes.

5. COOPERATIVE LEARNING INTERVENTION.

The cooperative learning unit lasted eight weeks and included two 45-minute PE lessons per week, for a total of 16 lessons. Lessons followed five cooperative learning elements: positive interdependence, individual accountability, promotive interaction, explicit social skills, and group processing. Students worked in stable teams of four to five students. Each team member held a rotating role, including performer, peer coach, recorder, encourager, safety lead, and team captain. Roles were not cosmetic; each role required a concrete action that was checked during the lesson. For example, the peer coach used a two-point feedback sheet, the recorder logged repetitions or scores, and the encourager ensured that every member received verbal support during practice.

6. LESSON CONTENT.

The unit combined fitness, motor-skill, and small-sided game tasks. Early lessons introduced cooperative routines and role responsibilities. Middle lessons used jigsaw practice, peer coaching, and team challenges in which each member's score contributed to a team target. Later lessons used student-led mini-games and group reflection. Each lesson included a warm-up, a cooperative task sequence, a team challenge, and a short group-processing discussion. Students were encouraged to identify one physical improvement target and one social improvement target each week. This structure was designed to ensure that physical practice time remained high while making social interaction purposeful.

7. TRADITIONAL INSTRUCTION CONDITION.

The comparison group completed lessons of similar duration, content, and equipment use but was taught through teacher-directed instruction. The teacher demonstrated tasks, organized practice lines or stations, corrected errors, and led class-wide drills. Students practiced individually or in loosely organized pairs, but roles, group accountability, and structured reflection were not used. This condition reflected common PE instruction rather than an inactive or no-treatment control. Using an active comparison condition helps isolate the contribution of cooperative structures, rather than simply exposing participants to PE content.

8. PHYSICAL PERFORMANCE MEASURES.

Physical performance was assessed with a composite score built from field-based PE tests suitable for school settings. The composite included cardiorespiratory performance assessed by the 20 m shuttle run, upper-body muscular endurance assessed by push-ups performed with standardized technique, lower-body explosive power assessed by the standing broad jump, and movement efficiency assessed by a shuttle-agility task. Raw values were standardized within the sample and converted to a 0-100 composite for ease of interpretation. Standardized field testing is consistent with the youth fitness measurement literature [27]-[30]. A separate motor skill performance score was also created using a rubric for task execution, decision making, and movement control during small-sided activities.

9. SOCIAL INTERACTION MEASURE.

Social interaction was assessed using a combined observation-and-student-report procedure. Observers recorded helping behavior, task-related communication, shared decision making, respectful feedback, and inclusion of less confident peers during selected lessons. Students also completed a short social interaction questionnaire using a 1-5 response scale. A composite social interaction score was calculated by averaging standardized observation and questionnaire indicators. The measure was aligned with cooperative learning principles and with prior PE research showing that structured cooperation can affect social skills and group attitudes [8], [11], [23].

10. ENJOYMENT MEASURE.

Enjoyment was assessed using a PE-adapted enjoyment scale derived from the physical activity enjoyment measurement tradition [25], [26]. Students responded to items on a 1-5 scale, with higher scores indicating greater enjoyment of PE lessons. Items were worded in a school-appropriate manner and referred to the PE unit rather than general sport participation. Negatively worded items were reverse-scored before calculating the mean scale score. Internal consistency was examined at pre-test and post-test.

11. FIDELITY MONITORING.

Implementation fidelity was assessed because cooperative learning depends on how the model is enacted, not merely whether students are placed in groups. A trained observer used a fidelity checklist covering the presence of cooperative roles, positive interdependence, individual accountability, student-to-student feedback, teacher facilitation, and group processing. Fidelity was summarized as the percentage of planned indicators observed in each week. Attendance was also recorded to ensure comparable exposure to the intervention across conditions.

12. STATISTICAL ANALYSIS.

Statistical significance was set at $p < 0.05$. Descriptive statistics were calculated as mean ± standard deviation. Baseline group differences were examined using independent-samples t-tests. Internal consistency was assessed using Cronbach's alpha for the social interaction and enjoyment scales, while test-retest and inter-rater reliability were summarized for the performance and observation measures. For the primary outcomes, the main analysis examined group differences in change scores and reported the corresponding group-by-time effect using F statistics, p-values, partial eta squared, adjusted mean differences, 95% confidence intervals, and Hedges' g. Within-group changes were examined using paired t-tests. Holm-Bonferroni adjustment was planned for families of related outcomes. Change-score correlations

were used to explore relationships among physical performance, social interaction, and enjoyment. The statistical model was selected for its clarity and feasibility in reporting school-based interventions.

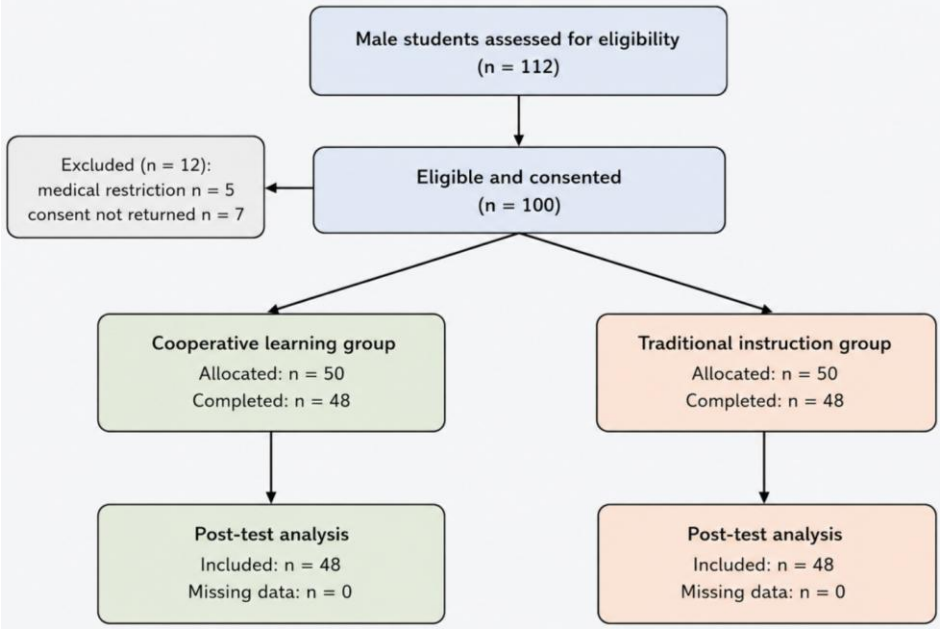

FIGURE 1. Participant flow diagram for the male-only quasi-experimental design.

Figure 1 clarifies the analytic sample. The same number of students completed both conditions, which reduces imbalance in statistical precision between groups.

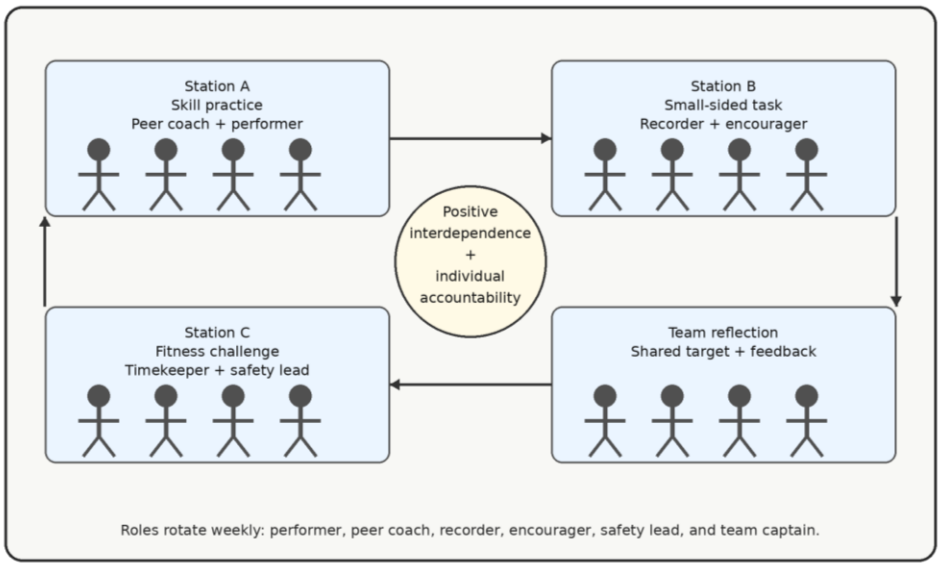

FIGURE 2. Cooperative learning lesson architecture is used to translate the study into PE practice.

Figure 2 illustrates how cooperation was embedded in movement tasks. The physical task remained central, but each station required a peer role to support learning. This design is important because unstructured group work can allow dominant students to take over, whereas cooperative learning assigns responsibility to every student.



FIGURE 3. Eight-week timeline for the cooperative learning unit.

Figure 3 shows the progression from team formation and role training toward student-led games and reflection. This progression was designed to avoid overwhelming students at the start of the intervention and to increase student responsibility as routines became familiar.

Table 1. Baseline characteristics and pre-test equivalence of the male student sample.

Characteristic	Cooperative learning (n=48)	Traditional instruction (n=48)	t	p
Age (years)	14.91 ± 0.50	15.10 ± 0.50	-1.86	0.066
Height (cm)	169.41 ± 7.56	169.13 ± 7.42	0.18	0.855
Body mass (kg)	61.32 ± 7.25	59.42 ± 7.22	1.29	0.201
BMI (kg/m²)	21.51 ± 3.38	20.93 ± 3.40	0.84	0.404
Previous-week PA score (1-5)	3.02 ± 0.65	3.03 ± 0.64	-0.08	0.940
Physical performance pre-test	60.98 ± 6.83	62.66 ± 7.05	-1.19	0.239
Motor skill pre-test	60.60 ± 8.34	58.10 ± 9.46	1.37	0.173
Social interaction pre-test	3.08 ± 0.46	3.00 ± 0.50	0.82	0.417
Enjoyment pre-test	3.34 ± 0.56	3.22 ± 0.56	1.05	0.297

Table 1 should be read as a check on the comparability of the two intact PE classes before the intervention. No statistically significant baseline difference was detected between groups at the $p < 0.05$ level. This supports the interpretation that post-intervention differences were not simply a reflection of pre-existing group differences.

Table 2. Intervention content and cooperative learning elements across the eight-week unit.

Week	Main content	Cooperative focus	Evidence of student responsibility
1	Team formation, safety briefing, baseline goals	Positive interdependence; role introduction	Students learn the team name, role cards, and shared norms
2	Fundamental movement circuits	Individual accountability	Each student completes a station score and records a personal target
3	Jigsaw skill practice	Promotive interaction	Students teach a skill cue to teammates
4	Peer coaching in pairs	Feedback quality	Peer coach uses two strengths and one correction
5	Team fitness challenge	Shared goal and individual contribution	Team score requires all members to improve their personal performance
6	Small-sided tactical problem	Communication and decision making	Teams design one tactic and test it in play

7	Student-led mini-games	Autonomy and leadership	Team captains rotate leadership and safety responsibilities
8	Post-test preparation and reflection	Group processing	Students evaluate physical and social progress

Table 2 emphasizes that cooperative learning was not treated as a single activity. The unit moved from role learning to peer coaching, team challenges, tactical problem-solving, and reflection. This gradual sequencing matters because cooperative learning requires students to learn how to cooperate before cooperation can support performance.

IV. RESULTS

All inferential decisions used $p < 0.05$ as the criterion for statistical significance. Descriptive results are presented first, followed by reliability and fidelity indicators, between-group change comparisons, within-group change analyses, and correlations among change scores.

Attendance was high in both groups. Mean attendance across the 16 lessons was 93.0% in the cooperative learning group and 94.3% in the traditional instruction group. Implementation fidelity in the cooperative learning group increased from 82% in week 1 to 93% in week 8, indicating that cooperative roles, accountability routines, and group processing became more consistent as the unit progressed. No serious adverse events were recorded in either group.

Reliability checks supported the use of the outcome measures. Internal consistency for the social interaction scale was alpha = 0.84 at pre-test and alpha = 0.88 at post-test. Internal consistency for the enjoyment scale was alpha = 0.87 at pre-test and alpha = 0.90 at post-test. The motor skill rubric showed an inter-rater intraclass correlation of 0.86 based on a random 20% video-coded subsample. These values indicate acceptable reliability for group-level analysis.

Table 3. Reliability and fidelity summary for study measures.

Measure	Operational score	Reliability procedure	Result
Physical performance composite	Field-test composite	Standardized administration; duplicate scoring check	ICC = 0.89
Motor skill performance	Rubric score (0-100)	Two raters on 20% of observations	ICC = 0.86
Social interaction	Observation + questionnaire (1-5)	Internal consistency and observation agreement	alpha = 0.84-0.88
Enjoyment	PE enjoyment scale (1-5)	Internal consistency	alpha = 0.87-0.90
Intervention fidelity	Weekly checklist	Observer percentage agreement	91.2% agreement

Table 3 supports the credibility of the measurement plan. In PE intervention studies, unreliable measurement can make meaningful pedagogical effects appear unstable. The combination of performance tests, rubric scoring, questionnaire reliability, and fidelity checks enables interpretation that addresses both outcome change and the quality of implementation.

Table 4. Descriptive pre-test, post-test, and change scores for all primary outcomes.

Outcome	Group	Pre-test M ± SD	Post-test M ± SD	Change M ± SD
Physical performance composite (0-100)	Cooperative learning	60.98 ± 6.83	74.09 ± 8.01	13.11 ± 5.64
Physical performance composite (0-100)	Traditional instruction	62.66 ± 7.05	66.84 ± 7.93	4.18 ± 4.40

Motor skill performance (0-100)	Cooperative learning	60.60 ± 8.34	72.80 ± 10.75	12.20 ± 5.53
Motor skill performance (0-100)	Traditional instruction	58.10 ± 9.46	61.99 ± 10.38	3.89 ± 5.45
Social interaction score (1-5)	Cooperative learning	3.08 ± 0.46	4.07 ± 0.49	0.99 ± 0.28
Social interaction score (1-5)	Traditional instruction	3.00 ± 0.50	3.23 ± 0.55	0.23 ± 0.28
Enjoyment score (1-5)	Cooperative learning	3.34 ± 0.56	4.17 ± 0.62	0.83 ± 0.37
Enjoyment score (1-5)	Traditional instruction	3.22 ± 0.56	3.42 ± 0.63	0.20 ± 0.35

Table 4 shows the pattern underlying the inferential tests. Both groups improved, as expected, because they received PE instruction and repeated exposure to similar content. However, the cooperative learning group showed larger changes for all outcomes. The difference was especially visible for social interaction and enjoyment, which are outcomes directly targeted by the peer roles, shared goals, and reflection phases of the cooperative model.

Table 5. Group-by-time effects based on differences in pre-post change scores.

Outcome	F	df	p	Partial eta²	CL - TI change	95% CI	Hedges' g
Physical performance composite	74.81	1, 88.7	<0.001	0.457	8.93	6.88 to 10.98	1.75
Motor skill performance	54.99	1, 94.0	<0.001	0.369	8.31	6.08 to 10.54	1.50
Social interaction	176.82	1, 94.0	<0.001	0.653	0.76	0.65 to 0.87	2.69
Enjoyment	73.44	1, 93.7	<0.001	0.439	0.63	0.48 to 0.78	1.74

Table 5 presents the main inferential results. Statistically significant group-by-time effects were found for physical performance, motor skill performance, social interaction, and enjoyment. The direction of every effect favored cooperative learning. Partial eta squared values and Hedges' g indicate that the strongest relative gains occurred for social interaction, followed by physical performance, enjoyment, and motor skill performance.

Table 6. Within-group paired-sample tests for pre-post improvement.

Outcome	Group	Mean change	95% CI	t	p
Physical performance composite	Cooperative learning	13.11	11.47 to 14.75	16.10	<0.001
Physical performance composite	Traditional instruction	4.18	2.90 to 5.46	6.58	<0.001
Motor skill performance	Cooperative learning	12.20	10.59 to 13.81	15.28	<0.001
Motor skill performance	Traditional instruction	3.89	2.31 to 5.47	4.95	<0.001
Social interaction	Cooperative learning	0.99	0.91 to 1.07	24.50	<0.001
Social interaction	Traditional instruction	0.23	0.15 to 0.31	5.69	<0.001
Enjoyment	Cooperative learning	0.83	0.72 to 0.94	15.54	<0.001
Enjoyment	Traditional instruction	0.20	0.10 to 0.30	3.96	<0.001

Table 6 shows that traditional instruction also produced gains on several outcomes, but the cooperative learning group improved more consistently and by a larger margin. This distinction is important for PE research because an intervention should be compared with a meaningful teaching alternative rather than with no teaching at all.

Table 7. Correlations among change scores across the full male sample.

Change variable	Physical performance	Motor skill	Social interaction	Enjoyment
Physical performance	1.00			

Motor skill	0.56*	1.00		
Social interaction	0.52*	0.52*	1.00	
Enjoyment	0.47*	0.42*	0.58*	1.00

Table 7 suggests that improvements across domains were not isolated. Change in social interaction was positively associated with change in enjoyment, and both were positively associated with physical and skill gains. Students who communicated better and enjoyed the class more may have practiced more deliberately, accepted feedback more readily, and persisted through challenging tasks.

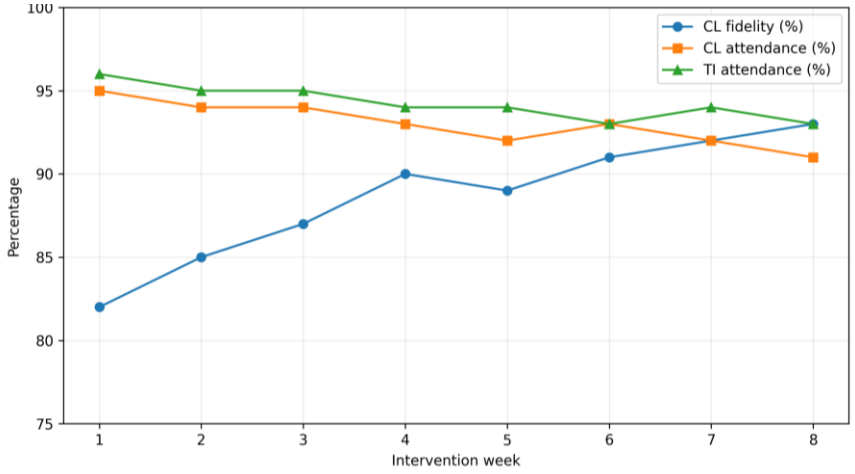

FIGURE 4. Implementation fidelity and attendance across the intervention.

Figure 4 shows that attendance remained high and fidelity improved across the unit. This trend is important because cooperative learning routines usually require practice. Early lessons may include slower transitions while students learn roles, but fidelity tends to increase when students understand what each role requires.

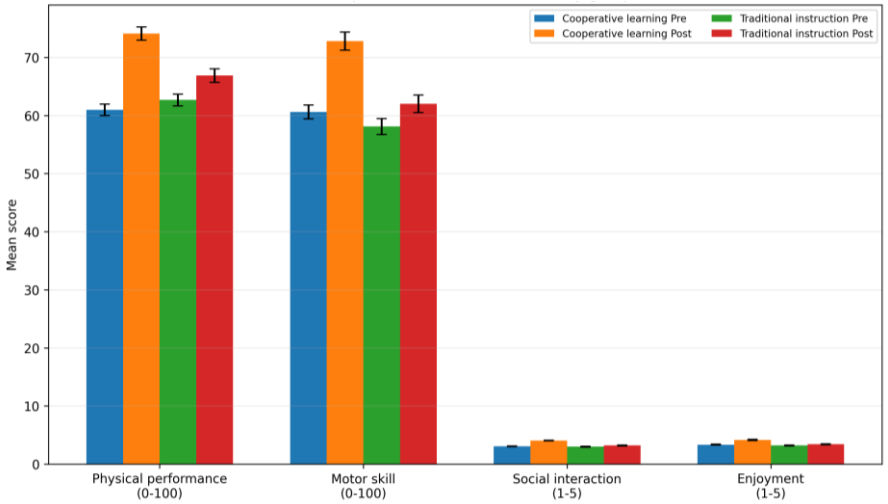

FIGURE 5. Pre- to post-intervention outcomes by group.

Figure 5 visually summarizes the tabled means. The cooperative learning group showed a steeper rise from pre-test to post-test across physical, skill, social, and enjoyment outcomes. The chart also makes clear

that the control condition was active: traditional instruction produced smaller but non-zero improvements, especially in physical and skill performance.

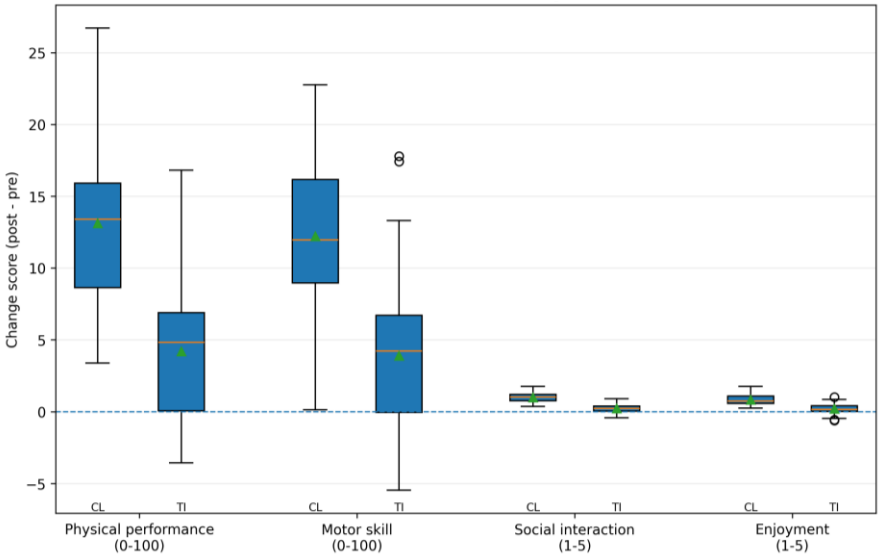

FIGURE 6. Distribution of individual change scores by outcome and group.

Figure 6 adds detail that a mean table cannot show. The distribution of cooperative learning change scores was shifted upward across all outcomes, indicating that the group effect was not driven by a single or two unusually responsive students. Variation remained, however, which is expected in PE classes where students differ in prior skill, confidence, fitness, and willingness to interact with peers.

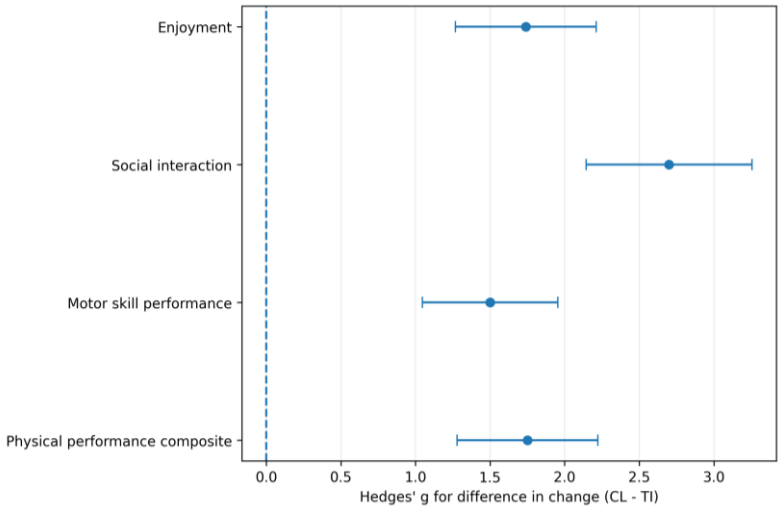

FIGURE 7. Standardized intervention effects for differences in change scores.

Figure 7 presents the standardized effects on a common metric. This is useful because the outcomes were measured on different scales. The largest standardized effect was observed for social interaction, consistent with the design of the intervention: roles, peer feedback, and group processing directly shaped how students interacted during lessons.

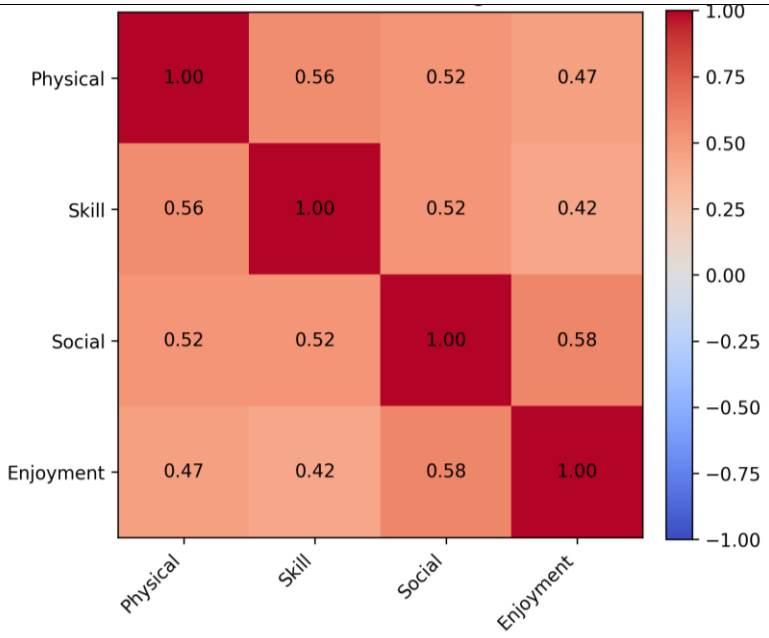

FIGURE 8. Correlation matrix of change scores.

Figure 8 supports the interpretation that physical, social, and affective learning were related. The strongest relationship involved social interaction and enjoyment, suggesting that students who experienced more positive peer communication also tended to enjoy PE more. The figure should be interpreted as correlational; it does not prove that one type of change caused another.

V. DISCUSSION

The purpose of this study was to evaluate the impact of cooperative learning strategies on physical performance, social interaction, and enjoyment in male physical education. Students in the cooperative learning condition improved more than students in the traditional instruction condition across all measured domains. The pattern is consistent with the theoretical expectation that cooperative learning can influence learning through structured peer dependence, individual responsibility, and social interaction. Importantly, the findings do not suggest that teacher-led instruction is ineffective. Instead, they suggest that when PE aims to develop physical performance alongside social and affective outcomes, instruction may need to place greater responsibility on students for one another's learning.

The physical performance result is educationally important because cooperative learning is sometimes misunderstood as a social method that may reduce the intensity of practice. The present findings point in the opposite direction. When roles and accountability are carefully designed, students can receive more frequent feedback, spend less time waiting for teacher correction, and use peer observation to refine their movement. In the cooperative learning group, the performer practiced, the peer coach observed, the recorder documented progress, and the encourager supported effort. These roles may increase the quality of practice time without removing the teacher from the lesson. The teacher's work shifts toward designing tasks, monitoring groups, and intervening when feedback becomes inaccurate or unsafe.

The motor skill performance findings align with the physical performance result. Skill learning in PE is not only about repeating movements. Students need cues, feedback, error detection, decision making, and confidence to perform in front of peers. Cooperative learning can supply a social structure for these processes. For example, the jigsaw and peer-coaching tasks required students to explain cues to classmates and observe performance criteria. Explaining a movement cue may also deepen the explaining student's understanding. This reciprocal structure is one reason cooperative learning can be especially relevant for games, fitness circuits, and skill stations where teacher attention is divided among many students.

The social interaction result was the largest standardized effect. This outcome is unsurprising because social interaction was not an accidental product of the unit; it was explicitly taught, practiced, and evaluated. Cooperative learning asked students to listen, encourage one another, give feedback, include teammates, and process group performance. Prior PE research has shown that cooperative structures can improve helping behavior and social skills [8], [11]. The present study extends that logic by embedding social interaction in every stage of the lesson. Students were not merely told to cooperate; they were given roles and routines that made cooperation necessary for task completion.

Enjoyment in PE is often shaped by competence, peer climate, task variety, and perceived success. Cooperative learning may support enjoyment by reducing the sense that PE is only a public comparison of athletic ability. When teams have shared goals and rotating responsibilities, students can contribute in different ways. A less skilled student may still be a careful recorder, a supportive encourager, or an improving performer. This can broaden the definition of success in PE and make participation less threatening. The connection between social interaction and enjoyment, as shown in Table 7 and Figure 8, supports this interpretation.

Cooperative learning can support competence through feedback and achievable team tasks, autonomy through role choice and student-led decision making, and relatedness through structured peer support. These mechanisms are consistent with the view that motivation grows when students feel effective, connected, and meaningfully involved in activity [4]-[7]. In male PE classes, relatedness may be particularly important because students often evaluate themselves and others through visible performance hierarchies. Cooperative learning can soften these hierarchies by making every role valuable and by rewarding improvement and contribution rather than only superior athletic performance.

Cooperative learning is not guaranteed to work simply because students sit or practice in groups. Poorly structured groups may reproduce exclusion, off-task behavior, or domination by highly skilled students. The fidelity data in Figure 4 show why implementation quality matters. The increase in fidelity across weeks suggests that both the teacher and the students became more fluent in cooperative routines. For publication, fidelity evidence is essential because it helps readers judge whether the study tested cooperative learning itself or merely a weak version of group work.

Table 1 provides the necessary context for interpreting the findings. Baseline equivalence matters in quasi-experimental school research because intact classes are rarely identical. The groups were similar at pre-test, reducing concern that the cooperative learning group started in a better position. Nevertheless, future studies should consider analyses that adjust for baseline values, previous sport experience, maturation, and teacher effects. If multiple classes and schools are included, multilevel modeling would be more appropriate than a simple two-group analysis because students are nested within classes and teachers.

Table 2 is useful for practitioners because it translates a broad pedagogical model into weekly lesson actions. The table specifies the task focus, cooperative element, and evidence of student responsibility for each week. This level of detail supports replication. It also helps teachers see that cooperative learning can be introduced gradually rather than requiring immediate transformation of every PE routine.

Table 3 shows that measurement reliability and fidelity must be treated as evidence. PE outcomes can be noisy because students vary in effort, fatigue, interpretation of instructions, and peer influence. Reliable physical and social measures reduce the risk that observed changes are artifacts.

Table 4 and Figure 5 together show that the cooperative learning group improved more across all outcomes, but the control group also improved to some degree. This is a realistic and important pattern. Traditional PE instruction can produce physical gains, especially when lessons include repeated practice and active tasks. The added value of cooperative learning appears to be the combination of physical improvement, stronger social interaction, and enjoyment.

The group-by-time effects in Table 5 show whether the change differed between conditions. Reporting F values, degrees of freedom, p-values, partial eta squared, mean differences, confidence intervals, and Hedges' g allows readers to judge statistical significance, practical magnitude, and precision.

Table 6 shows that the stronger interpretation is that cooperative learning produced greater improvements than an active traditional instruction condition.

Table 7 and Figure 8 suggest that social and affective gains may be linked to physical gains. A student who feels included may be more willing to attempt difficult tasks. A student who enjoys the lesson may

practice more intensely. A student who receives peer feedback may correct errors sooner. These mechanisms are plausible and align with motivational theory, but future research should use mediation analysis or longitudinal models to test them more directly.

One practical implication is that PE teachers should explicitly teach cooperative skills. Students are not automatically skilled collaborators. They may need sentence starters for feedback, examples of respectful correction, routines for rotating roles, and clear criteria for successful group processing. Teachers should also protect individual accountability. If group scores are used without individual contribution, stronger students may carry the team while less confident students withdraw. A balanced cooperative learning design makes every student's learning visible and valued.

A second implication is that cooperative learning should be aligned with performance goals rather than separated from them. Some teachers may fear that social learning reduces time for fitness or skill practice. The present unit avoided that problem by placing cooperative roles inside physical tasks. The recorder measured repetitions, the coach observed movement cues, the safety lead checked technique, and the team captain managed transitions. This integration allowed the social structure to support physical practice rather than compete with it.

A third implication concerns male PE culture. In some settings, boys may value competition and athletic dominance, which can motivate certain students but discourage others. Cooperative learning does not remove challenge or performance standards; it reframes challenge as shared progress. Students still run, jump, pass, defend, and solve tactical problems. The difference is that their success is connected to teammates' learning. This may be especially valuable for students who are physically capable but socially hesitant, as well as for those who enjoy sport but need to learn to communicate respectfully.

Several limitations must be acknowledged. The design is quasi-experimental, so causal inference is weaker than in an individually randomized trial. The sample is male-only, which supports focus but limits generalizability. The intervention lasted eight weeks; a longer follow-up would be needed to determine whether gains are retained. Teacher enthusiasm may also influence outcomes, especially when introducing a model that requires careful planning. Finally, enjoyment and social interaction include self-report components, which may be affected by social desirability.

Future research should examine cooperative learning across different age groups, mixed-gender classes, and diverse cultural contexts. Studies should also compare different versions of cooperative learning, such as jigsaw, team-game tournament structures, peer coaching, and student-designed games. More research is needed on dose-response relationships: how many lessons are required for students to become fluent in cooperative roles, and how long the effects last after the unit ends. Future studies should also include objective physical activity measures, such as accelerometry or heart-rate monitoring, to examine whether cooperative learning changes activity intensity during lessons.

VI. CONCLUSION

This study provides evidence that cooperative learning strategies can strengthen physical, social, and affective outcomes in male secondary-school PE when implemented with clear roles, shared goals, individual accountability, and regular group processing. The cooperative learning group showed greater improvements than the traditional instruction group in physical performance, motor skills, social interaction, and enjoyment. These results support the view that PE learning is not limited to isolated physical execution; it is also shaped by the social structure in which practice takes place.

Cooperative learning can protect physical practice while improving the quality of peer engagement. The intervention did not replace movement time with discussion. Instead, it placed communication, feedback, encouragement, and reflection inside active tasks. Students practiced movement skills, recorded personal progress, gave peer feedback, and contributed to team goals. This integration appears central to the approach's success because it allows social interaction to support physical learning rather than compete with it.

Students who experience PE as supportive and socially connected may be more willing to participate, persist, and accept corrective feedback. In the present study, enjoyment increased more strongly in the cooperative learning condition, and gains in enjoyment were positively related to improvements in other

outcomes. This supports a holistic interpretation of PE in which affective experience, peer climate, and performance development are mutually connected.

For male PE classes, cooperative learning may be especially valuable because it can reduce overreliance on public comparison and athletic dominance as the main sources of status. The model creates multiple ways to contribute: performing, coaching, recording, encouraging, leading, and protecting safety. Such role diversity can help less-confident students remain involved while also challenging more-skilled students to become responsible teammates. In this way, cooperative learning can maintain performance standards while making success more inclusive.

Cooperative learning should be considered a credible pedagogical strategy for PE programs that aim to develop physically capable, socially responsible, and motivated students. Its effectiveness depends on careful lesson design, teacher monitoring, explicit instruction in cooperative skills, and consistent accountability for every group member. When these conditions are present, cooperative learning can transform PE from a teacher-directed sequence of drills into a socially rich learning environment that supports performance, interaction, and enjoyment simultaneously.

Author Contributions

The author conducted the conceptualization, methodology, data analysis, investigation, writing, review, editing, and final approval of the manuscript.

Funding

This research received no external funding.

Data Availability

The dataset will be available from the author upon reasonable request.

Conflicts of Interest

The author declares no conflict of interest.

REFERENCES

1. D. W. Johnson and R. T. Johnson, "An educational psychology success story: Social interdependence theory and cooperative learning," Educational Researcher, vol. 38, no. 5, pp. 365-379, 2009, doi: 10.3102/0013189X09339057.
2. R. E. Slavin, "Research on cooperative learning and achievement: What we know, what we need to know," Contemporary Educational Psychology, vol. 21, no. 1, pp. 43-69, 1996, doi: 10.1006/ceps. 1996.0004.
3. C. J. Roseth, D. W. Johnson, and R. T. Johnson, "Promoting early adolescents' achievement and peer relationships: The effects of cooperative, competitive, and individualistic goal structures," Psychological Bulletin, vol. 134, no. 2, pp. 223-246, 2008, doi: 10.1037/0033-2909.134.2.223.
4. E. L. Deci and R. M. Ryan, "The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behavior," Psychological Inquiry, vol. 11, no. 4, pp. 227-268, 2000, doi: 10.1207/S15327965PLI1104_01.
5. R. M. Ryan and E. L. Deci, "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being," American Psychologist, vol. 55, no. 1, pp. 68-78, 2000, doi: 10.1037/0003-066X.55.1.68.
6. N. Ntoumanis, "A self-determination approach to the understanding of motivation in physical education," British Journal of Educational Psychology, vol. 71, no. 2, pp. 225-242, 2001, doi: 10.1348/000709901158497.
7. M. Standage, J. L. Duda, and N. Ntoumanis, "A test of self-determination theory in school physical education," British Journal of Educational Psychology, vol. 75, no. 3, pp. 411-433, 2005, doi: 10.1348/000709904X22359.
8. S. Polvi and R. Telama, "The use of cooperative learning as a social enhancer in physical education," Scandinavian Journal of Educational Research, vol. 44, no. 1, pp. 105-115, 2000, doi: 10.1080/713696660.
9. B. Dyson, "Cooperative learning in an elementary physical education program," Journal of Teaching in Physical Education, vol. 20, no. 3, pp. 264-281, 2001, doi: 10.1123/jtpe. 20.3.264.
10. T. Barrett, "Effects of cooperative learning on the performance of sixth-grade physical education students," Journal of Teaching in Physical Education, vol. 24, no. 1, pp. 88-102, 2005, doi: 10.1123/jtpe. 24.1.88.

11. M. Goudas and E. Magotsiou, "The effects of a cooperative physical education program on students' social skills," Journal of Applied Sport Psychology, vol. 21, no. 3, pp. 356-364, 2009, doi: 10.1080/10413200903026058.
12. B. P. Dyson, N. R. Linehan, and P. A. Hastie, "The ecology of cooperative learning in elementary physical education classes," Journal of Teaching in Physical Education, vol. 29, no. 2, pp. 113-130, 2010, doi: 10.1123/jtpe. 29.2.113.
13. A. Casey, B. Dyson, and A. Campbell, "Action research in physical education: Focusing beyond myself through cooperative learning," Educational Action Research, vol. 17, no. 3, pp. 407-423, 2009, doi: 10.1080/09650790903093508.
14. A. Casey and V. A. Goodyear, "Can cooperative learning achieve the four learning outcomes of physical education? A review of literature," Quest, vol. 67, no. 1, pp. 56-72, 2015, doi: 10.1080/00336297.2014.984733.
15. J. Fernandez-Rio, N. Sanz, J. Fernandez-Cando, and L. Santos, "Impact of a sustained cooperative learning intervention on student motivation," Physical Education and Sport Pedagogy, vol. 22, no. 1, pp. 89-105, 2017, doi: 10.1080/17408989.2015.1123238.
16. D. Hortigüela-Alcalá, G. Hernando-Garijo, and A. Pérez-Pueyo, "Cooperative learning and students' motivation, social interactions and attitudes: Perspectives from two different educational stages," Sustainability, vol. 11, no. 24, art. 7005, 2019, doi: 10.3390/su11247005.
17. J. F. Guzmán and E. Payá, "Direct instruction vs. cooperative learning in physical education: Effects on student learning, behaviors, and subjective experience," Sustainability, vol. 12, no. 12, art. 4893, 2020, doi: 10.3390/su12124893.
18. D. Bores-García, D. Hortigüela-Alcalá, F. J. Fernandez-Rio, G. González-Calvo, and R. Barba-Martín, "Research on cooperative learning in physical education: Systematic review of the last five years," Research Quarterly for Exercise and Sport, vol. 92, no. 1, pp. 146-155, 2021, doi: 10.1080/02701367.2020.1719276.
19. C. Fernández-Espínola, M. T. Abad Robles, D. Collado-Mateo, B. J. Almagro, E. Castillo Viera, and F. J. Giménez Fuentes-Guerra, "Effects of cooperative-learning interventions on physical education students' intrinsic motivation: A systematic review and meta-analysis," International Journal of Environmental Research and Public Health, vol. 17, no. 12, art. 4451, 2020, doi: 10.3390/ijerph17124451.
20. T. Liu and M. Lipowski, "Influence of cooperative learning intervention on the intrinsic motivation of physical education students-a meta-analysis within a limited range," International Journal of Environmental Research and Public Health, vol. 18, no. 6, art. 2989, 2021, doi: 10.3390/ijerph18062989.
21. C. Yang, R. Chen, X. Chen, and K.-H. Lu, "The efficiency of cooperative learning in physical education on the learning of action skills and learning motivation," Frontiers in Psychology, vol. 12, art. 717528, 2021, doi: 10.3389/fpsyg. 2021.717528.
22. E. S. Engels and P. A. Freund, "Effects of cooperative games on enjoyment in physical education: How to increase positive experiences in students?" PLOS ONE, vol. 15, no. 12, art. e0243608, 2020, doi: 10.1371/journal.pone.0243608.
23. B. Dyson, D. Howley, and Y. Shen, "'Being a team, working together, and being kind': Primary students' perspectives of cooperative learning's contribution to their social and emotional learning," Physical Education and Sport Pedagogy, vol. 26, no. 2, pp. 137-154, 2021, doi: 10.1080/17408989.2020.1779683.
24. C. E. Johnson, H. E. Erwin, L. Kipp, and A. Beighle, "Student perceived motivational climate, enjoyment, and physical activity in middle school physical education," Journal of Teaching in Physical Education, vol. 36, no. 4, pp. 398-408, 2017, doi: 10.1123/jtpe. 2016-0172.
25. D. Kendzierski and K. J. DeCarlo, "Physical Activity Enjoyment Scale: Two validation studies," Journal of Sport and Exercise Psychology, vol. 13, no. 1, pp. 50-64, 1991, doi: 10.1123/jsep. 13.1.50.
26. R. W. Motl, R. K. Dishman, R. Saunders, M. Dowda, G. Felton, and R. R. Pate, "Measuring enjoyment of physical activity in adolescent girls," American Journal of Preventive Medicine, vol. 21, no. 2, pp. 110-117, 2001, doi: 10.1016/S0749-3797(01)00326-9.
27. L. A. Léger, D. Mercier, C. Gadoury, and J. Lambert, "The multistage 20 meter shuttle run test for aerobic fitness," Journal of Sports Sciences, vol. 6, no. 2, pp. 93-101, 1988, doi: 10.1080/02640418808729800.
28. F. B. Ortega, J. R. Ruiz, M. J. Castillo, and M. Sjöström, "Physical fitness in childhood and adolescence: A powerful marker of health," International Journal of Obesity, vol. 32, no. 1, pp. 1-11, 2008, doi: 10.1038/sj.ijo.0803774.
29. V. España-Romero et al., "Assessing health-related fitness tests in the school setting: Reliability, feasibility and safety; the ALPHA Study," International Journal of Sports Medicine, vol. 31, no. 7, pp. 490-497, 2010, doi: 10.1055/s-0030-1251990.
30. J. R. Ruiz et al., "Field-based fitness assessment in young people: The ALPHA health-related fitness test battery for children and adolescents," British Journal of Sports Medicine, vol. 45, no. 6, pp. 518-524, 2011, doi: 10.1136/bjsm. 2010.075341.

VII. APPENDIX A. COOPERATIVE LEARNING ROLE CARDS

Performer: complete the physical task with full effort and ask for one cue from the peer coach before repeating the task.

Peer coach: observe one agreed movement cue, provide one strength and one correction, and avoid negative comparison with other students.

Recorder: write down repetitions, distance, time, or rubric score, and check that every student has a recorded personal target.

Encourager: Make sure each member receives at least one specific supportive comment during the lesson.

Safety lead: check spacing, equipment, and technique risks before the team begins the task.

Team captain: keep transitions efficient, ask the teacher for clarification when the group is unsure, and lead the two-minute reflection.

VIII. APPENDIX B. DETAILED LESSON MICROCYCLE FOR REPLICATION

This appendix expands the intervention so that a PE teacher or researcher can reproduce the cooperative learning condition with minimal ambiguity. The sequence keeps the physical learning target visible while assigning roles that require students to observe, communicate, and record evidence of improvement. The same structure can be adapted for invasion games, fitness circuits, athletics, or skill-based units, provided that the teacher protects individual accountability and does not allow the group score to hide non-participation.

Table B1—Sixteen-lesson cooperative learning microcycle for replication.

Lesson	Physical content	Cooperative structure	Observable accountability
1	Orientation, safe movement spacing, baseline practice	Team identity, role cards, teacher models feedback	Each student demonstrates one safe start/stop routine and signs team norms.
2	Acceleration and agility stations	Recorder logs times; encourager tracks effort	Every member completes three trials and identifies one personal target.
3	Standing broad jump and landing mechanics	The peer coach uses the landing checklist	Students repeat jumps after receiving one precise cue from a peer.
4	Upper-body endurance circuit	Safety lead monitors technique; performer rotates	The team score is based on completion by all members, not on the highest individual score.
5	20 m shuttle-run pacing practice	The captain manages pacing groups; the recorder tracks laps	Each member compares their performance to their personal baseline rather than to their peers'.
6	Passing and receiving under pressure	Jigsaw: each student becomes an expert in one cue	Every student teaches one cue to the team and demonstrates it in play.
7	Small-sided invasion-game support play	Promotive interaction; tactical communication	Teams must create a passing option for the least-involved player.
8	Mid-unit review and cooperative challenge	Group processing; social target reset	Teams identify one physical improvement and one social improvement goal.
9	Agility relay with technique constraints	Individual accountability within the team relay	Team totals are counted only when each student completes the technical criterion.

10	Peer-designed fitness station	Autonomy support; captain checks roles	Students design a station with a safety cue and a performance cue.
11	Defensive positioning and communication	Peer coach tracks communication quality	Students use agreed verbal cues during small-sided play.
12	Combined skill circuit	Role rotation under time pressure	Every student performs, observes, records, and gives feedback once.
13	Team tactical problem solving	Shared decision making	Students choose a tactic, test it, and revise it after peer discussion.
14	Student-led mini-games	Leadership rotation	The teacher observes while students manage rules, safety, and inclusion.
15	Post-test preparation; confidence building	Encourager supports low-confidence members	Students rehearse tests and discuss how to manage effort.
16	Post-tests and final reflection	Group processing; transfer discussion	Teams explain how cooperation affected performance, interaction, and enjoyment.