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The Effect of Cooperative Learning-Based Physical Activity on Quality of Life in Male Students: A Quasi-Experimental Study from Iran



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A B S T R A C T

Objective: In the 21st century, students face unprecedented challenges, highlighting the need for innovative educational approaches that promote holistic development and quality of life (QoL). Cooperative learning (CL), with its emphasis on positive interdependence and social interaction, presents a promising alternative to traditional, competitive physical education (PE) methods. However, the specific effects of structured CL-based physical activity on the multi-dimensional QoL of elementary students, particularly from both child and parent perspectives, remain underexplored. To the best of our knowledge, this study is the first to examine the effect of a cooperative learning-based physical activity program on the multidimensional quality of life of elementary school students using a dual informant (child and parent) perspective. This study aimed to investigate and compare the effects of a structured CL-based physical activity program versus a traditional PE approach on the QoL of elementary school male students.

Methods and Materials: A quasi-experimental design with a pre-test/post-test control group was employed. Forty 5th-grade male students (Mean age = 10.4 years) from Kermanshah, Iran, were selected through stratified random sampling and randomly assigned to either a CL intervention group (n=20) or a traditional instruction (TI) control group (n=20). Both groups participated in 14 sessions (45 minutes each, twice a week) of their respective programs. The Pediatric Quality of Life Inventory (PedsQL) was used to assess QoL dimensions (physical, emotional, social, and school functioning) from both student and parent perspectives before and after the intervention. Data were analyzed using Analysis of Covariance (ANCOVA) after confirming its statistical assumptions in SPSS version 27.

Findings: The CL intervention resulted in statistically significant improvements in all QoL domains from the students' perspective (physical, emotional, social, and school functioning; $p < 0.05$) compared to the TI group. Furthermore, from the parents' perspective, significant improvements were observed in the physical and social domains of their children's QoL ($p \leq 0.05$).

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Conclusion: A structured cooperative learning approach in physical education is significantly more effective than traditional methods in enhancing the multidimensional quality of life of elementary school students. Integrating CL into school PE curricula is recommended as a sustainable strategy to foster students' physical, psychosocial, and educational well-being, aligning with the holistic goals of 21st-century education.

Keywords: *Cooperative Learning, Physical Education, Quality of Life, PedsQL, Elementary School Students*

1. Introduction

Quality of Life (QoL) is defined as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, and needs (World Health Organization) (1). This definition emphasizes the multidimensional nature of QoL and indicates that personal perception of life circumstances plays a fundamental role in determining its level. Despite differences in defining this concept, there is a general consensus among experts that QoL is a multidimensional, dynamic, and context-dependent concept (2).

QoL is increasingly recognized as a multidimensional construct encompassing physical, psychological, and social dimensions, and has become a central focus in educational and health sciences (3). In the 21st century, students face unprecedented challenges such as academic pressures, technological advancements, sedentary lifestyles, and psychosocial stress, highlighting the necessity for innovative educational approaches. In this regard, the United Nations, in its Sustainable Development Goals (SDGs), particularly Goal 4 (SDG4), emphasizes "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all." This global agenda directly links education to enhancing QoL, reducing inequalities, and empowering the new generation to face 21st-century challenges (3, 4). On the other hand, the sociological approach, particularly in the form of Social Learning Theory (SLT), views QoL as the result of social interactions and learning processes. In this view, learning is defined as relatively permanent changes in behavior formed through reinforcement, practice, observation, and modeling. Accordingly, QoL is not only a product of individual characteristics but also the result of social actions and environmental responses experienced throughout life. In SLT, through direct experience or observation of others' behavior, individuals identify patterns that lead to positive outcomes and reinforce them in their own behavior. Conversely, behaviors with negative consequences are abandoned. This process of social learning plays a

significant role in shaping behavioral patterns related to QoL (5, 6).

In this framework, physical education (PE) and sports activities in schools can play an important role in achieving sustainable development goals, as they not only promote physical health but also provide opportunities for developing social skills, emotional regulation, and increasing self-confidence (7). However, the method of delivery and the way these opportunities are created have different effects. Traditional PE teaching approaches have often emphasized competitive learning, where individual achievement and competition are the core of instruction (8, 9). Although competition can enhance motivation and skill acquisition, excessive reliance on competitive structures may increase stress, reduce inclusivity, and weaken students' perceived QoL (10). In fact, competitive learning environments, while effective in enhancing performance, can cause anxiety and reduce social cohesion among adolescents (10, 11).

In recent decades, extensive research has confirmed the positive effects of physical activity on physical health (8, 11). However, the specific mechanisms by which the structure of physical education (cooperative vs. competitive) impacts the holistic quality of life of students remain poorly understood (9, 12). Although CL has been extensively studied for its academic and social benefits (13, 14), its differential impact on the multi-dimensional QoL (physical, emotional, social, and school functioning) of elementary students particularly from the perspective of dual informants (child and parent) has not been clearly established (15, 16). This gap is further compounded by three critical limitations in the existing literature: first, most studies have focused on narrow outcomes such as motor skills or academic performance, neglecting the holistic construct of QoL as defined by the World Health Organization (4, 17); second, research utilizing dual perspectives to validate improvements in QoL is scarce (18, 19); and third, the majority of CL research originates from Western educational contexts (12, 20), leaving its applicability in Eastern societies such as Iran largely unexplored. Iran, as a society with strong collectivist traditions where group harmony and interdependence are inherently valued, provides a unique cultural context in which CL interventions may yield distinct

or amplified effects on students' perceived well-being (13, 21-23).

When Physical activities are designed and implemented within a CL framework, they can yield different effects. Social Interdependence Theory indicates that in CL, the structure of positive interdependence among members promotes promotive interaction, greater effort towards learning, and positive social relationships (13, 23). CL, as the practical application of this theory in education, by fostering individual accountability and group processing, not only enhances academic performance but also strengthens mental health, social cohesion, and self-efficacy. These outcomes are directly linked to QoL indicators, as QoL is a combination of mental health, social relationships, and satisfaction with individual performance. Participation in group physical activities not only improves physical and mental health but also increases feelings of satisfaction, self-efficacy, and meaning in life (12). Therefore, it is plausible that CL based on positive interdependence simultaneously promotes learning and improves QoL at both individual and collective levels (24, 25).

From a psychological perspective, optimal QoL results from personality development and individual competencies (17). CL, by providing opportunities to experience success, strengthen self-confidence, and self-acceptance, can enhance components such as autonomy, environmental mastery, and positive relationships with others. Furthermore, this approach, by reducing anxiety, depression, and social isolation, contributes to improving the psychological dimensions of QoL (24-27). From a sociological perspective, QoL is shaped within the context of social interactions. CL, utilizing processes such as observation, modeling, and social reinforcement, helps individuals learn effective behavioral patterns in PE environments. This process increases social capital, strengthens a sense of solidarity, and enhances social participation, all of which are key factors in improving QoL (24, 25, 27).

When students participate in group activities and experience a sense of belonging to a community, they gain a deeper understanding of human values, cooperation, and responsibility. This experience can lead to the enhancement of physical, psychological, social, and spiritual dimensions of life and strengthen inner satisfaction and peace. This approach, by creating a space for interaction, support, and growth, can enhance subjective well-being, life satisfaction, and more active participation in society among individuals and groups (26-28).

CL is based on five essential elements: positive interdependence, individual accountability, promotive interaction, interpersonal and small group skills, and group processing (14, 29). Collectively, these elements strengthen teamwork, empathy, and responsibility, and enhance educational and psychosocial outcomes. Empirical studies in the field of PE have consistently shown that CL promotes social integration, intrinsic motivation, and a positive attitude towards physical activity (30). Furthermore, interventions based on CL have been associated with improved psychosocial functioning and enhanced QoL of students and are considered efficient alternatives to competitive models (29, 31, 32).

Therefore, CL in physical activities can be considered a bridge between theory and practice—a bridge that is rooted, on one hand, in principles of social and cultural psychology and, on the other, brings tangible outcomes in improving students' QoL (32). This theoretical framework shows that learning and growth do not occur in an individual vacuum but are shaped within the context of human and social interactions, and cooperative physical activities can simultaneously promote cognitive, social, and emotional growth.

Since the early 2000s, a growing number of research articles have examined various aspects of using CL, securing the place of this learning model in PE (15). In the field of PE, the most recent systematic reviews have shown positive outcomes of CL in four domains: physical, cognitive, social, and emotional learning (12, 33). Research in this area has demonstrated benefits in improving social/motor skills (20, 33), social skills (34-36), emotional skills (16, 37), developing social skills and improving relationships among students (35, 38, 39), and motivating students to perform motor exercises (40).

Various CL techniques have been developed over the past century. Each method has unique features for enhancing student learning. While these cooperative techniques may differ in structure, form, and effect, a common thread for increasing students' social development runs through all of them. Some well-known scientific and practical methods include: Think-Pair-Share, Pairs-Check-Perform, Tip-Tip-Coach, Numbered Heads Together, Student Teams-Achievement Divisions (STAD), Jigsaw, Group Investigation, Learning Teams, and Team-Game-Tournaments (TGT) (32).

For elementary school students, a developmental stage characterized by identity formation, peer influence, and high sensitivity to social comparison, CL provides a supportive

environment that fosters inclusivity, mental health, and collective responsibility. Researchers believe that creating a balance between these two approaches is essential to prepare students to face the complex challenges of the 21st century (41).

Given the increasing emphasis on holistic education and documented evidence about the benefits of CL in PE, the present study examines the effect of CL-based physical activity on the QoL of 10- and 11-year-old male students. The research hypothesis is that participation in structured cooperative physical activity programs leads to significant improvement in the physical, psychological, and social dimensions of QoL compared to traditional competitive approaches.

2. Methods and Materials

2.1 Study Design and Participants

This study employed a quasi-experimental design with a pre-test and post-test and a control group. The statistical population comprised fifth-grade male students in District 1 of Kermanshah, Iran. Given the nature of the intervention and to ensure sample homogeneity, a stratified random sampling method was employed based on the socio-economic status of the schools' catchment areas (low, medium, and high). From each stratum, one school was randomly selected, and participants were subsequently recruited. From this framework, 40 male students (mean age: 10.4 ± 0.09 years) who met the inclusion criteria (physical health, no regular participation in organized sports outside school, and no prior experience with cooperative learning in physical education) were selected. To determine the adequate sample size, an a priori power analysis was conducted using GPower software (Version 3.1). Based on a moderate expected effect size ($f = 0.25$) derived from prior studies on cooperative learning and psycho-social outcomes (42), an alpha level of 0.05, and a desired power ($1-\beta$) of 0.80, the analysis indicated a minimum total sample size of 34 participants. To account for potential attrition, 40 students were initially enrolled. All participants were physically healthy, and written informed consent was obtained from their parents. Participants were then randomly assigned to two equal groups ($n=20$ each): (1) a traditional physical education group and (2) a Cooperative Learning (CL) group (32, 41). An introductory session was held to explain the research procedure, pre-test/post-test protocols, and training processes to both groups.

2.2 Data Collection

Ethical approval for this study was obtained from the Research Ethics Committee of Urmia University (Code: IR.URMIA.REC.1404.009). One week prior to the intervention, an orientation session was conducted to explain the programs, potential benefits and risks, and the correct execution of exercises. Participants were assured of data confidentiality and their right to withdraw at any stage. Prior to the educational interventions, a pre-test was administered to all subjects using the Pediatric Quality of Life Inventory (PedsQL) (19). Both groups then engaged in 14 training sessions (45 minutes each; twice per week) following their specific protocols (32, 39). To control for teacher effects, all sessions were supervised by trained research assistants who were not involved in the initial sampling process, ensuring consistent implementation. Additionally, parents were asked to ensure that children did not participate in structured physical activities outside the school program during the study period. Twenty-four hours after the final session, a post-test was administered to all participants.

2.3 Pediatric Quality of Life Inventory (PedsQL)

In the present study, the Pediatric Quality of Life Inventory (PedsQL) was used to assess health-related QoL in children (43). This standard instrument consists of 23 items that evaluate QoL across four main dimensions: Physical Functioning (8 items), Emotional Functioning (5 items), Social Functioning (5 items), and School Functioning (5 items)(40). This questionnaire is designed in two versions: child self-report (for ages 5 to 18) and parent proxy-report. The use of both versions allows for a comparison of the child's and parent's perspectives on QoL (44).

Scoring: Responses are collected based on a five-point Likert scale (from 0 = "Never" to 4 = "Almost always"). Given that the questionnaire items are reverse-coded—for instance, statements such as "It is hard for me to run" or "I worry about what will happen to me"—lower scores correspond to a higher QoL. Specifically, the items reflect negative aspects, such that higher mean scores indicate greater impairment in QoL. Consequently, a higher QoL is represented by lower average scores on the questionnaire. (43).

Validity and Reliability: Numerous psychometric studies have confirmed the appropriate validity and reliability of this questionnaire in various populations. In validated research, the content validity of the entire instrument was reported as

0.84, and for the Physical Functioning, Emotional Functioning, Social Functioning, and School Functioning subscales as 0.80, 0.86, 0.83, and 0.88, respectively. Furthermore, the construct validity of the questionnaire has been favorably evaluated, with all items demonstrating acceptable factor loadings (above 0.40) on their respective factors. The internal reliability of the instrument is also confirmed. Cronbach's alpha coefficient for the entire questionnaire has been reported as 0.82, and the range of alpha coefficients for the subscales varies between 0.65 and 0.77(40). A positive and significant correlation between child and parent version scores, as well as an appropriate correlation between the total score and subscales ($r > 0.7$), is further evidence of the instrument's convergent reliability and validity (18). Given its proven psychometric properties and widespread use in clinical, physical education, and sports science research, the PedsQL was selected as a valid tool for assessing children's QoL in this study.

2.4 Training Protocols

The two protocols were designed to reflect distinct pedagogical approaches in Physical Education:

2.4.1 Traditional Learning Group

This protocol followed a teacher-centered structure focusing on direct instruction, individual exercises, repetition of basic motor skills (e.g., fitness drills, sports techniques), and individual performance assessment, based on established models (45). Each session included warm-up, direct skill demonstration and practice, and cool-down, with minimal structured peer interaction.

2.4.2 Cooperative Learning Group

This protocol adopted a student-centered approach based on structured small-group activities (32, 39). It incorporated key CL structures such as Jigsaw, Teams-Games-Tournaments (TGT), and Think-Pair-Share. Sessions emphasized positive interdependence, individual accountability, face-to-face promotive interaction, and group processing, following standard CL models (42, 46). The detailed session-by-session content for both groups is presented in Table 1 to ensure replicability.

Table 1. Intervention Protocol

Lesson Title	Instruction Type	Lesson Title	Instruction Type	
Introduction to Organization, Grouping, Rules, and Regulations	Cognitive Domain (Knowledge)	Icebreaker (Small-Group Interpersonal and Teamwork Skills)	Linguistic Communication - Sense of Initiative and Entrepreneurial Spirit - Cultural Awareness and Expression	1
Physical Fitness – Cardiovascular Endurance (General Endurance)	Psychomotor	"Getting to Know Each Other" (Positive Interdependence)	Linguistic Communication - Sense of Initiative and Entrepreneurial Spirit - Cultural Awareness and Expression	2
Objectives of Physical Education (Affective Dimensions of P.E.) Acquaintance with All kinds of sports	Affective - Cognitive	"We Need Cooperation" (Group Processing)	Personal and Group Cohesion & Participation in Cooperative Activities The Need for Synchronized Collaboration with Others	3
Recognition of Motor Abilities (How far/high can I jump, how far can I throw, how fast/smoothly can I run)	Psychomotor	Introduction, Trust-building, and Self-awareness (Promotive Face-to-Face Interaction).	Verbal and Non-verbal Communication to obtain diverse and authentic responses, relying on working with others as a means to achieve group cohesion	4
Fundamental Movements: Striking/Kicking with Hands and Feet	Psychomotor	Introduction, Trust-building, and Self-awareness (Individual and Group Accountability).	Expression and working in a coordinated and efficient manner	5
Simple Badminton Serve	Psychomotor	Locomotor Skill (Flight and Landing) (Cooperative Structure: Rally Coach, Numbered Heads)	Students will master four types of jumps: 2 feet–1 foot; 1 foot–2 feet; vertical jump; horizontal jump.	6
Physical Fitness (Muscular Strength)	Psychomotor	Physical Fitness (Collective Group Score)	Hoping, Ball Passing, Shuttle Run, horizontal jump, Jump Rope, Sit-Ups, Group Selection	7
Badminton Forehand	Psychomotor	Striking with Various Body Parts	Striking with the instep, head, knee, and inside of the foot	8

		(Cooperative Structure: Jigsaw)		
Chest pass in basketball	Psychomotor	Challenging Physical Conditioning (Cooperative Structure: Learning Teams, Think-Pair-Share)	Warm-up and Cool-down and Their Importance; Active Participation in Group-Initiated Physical Challenges	9
Physical Fitness (Muscular Endurance)	Psychomotor	Striking with the Foot (Cooperative Structure: Jigsaw)	Striking with the inside, outside, and instep of the foot	10
Receive in basketball	Psychomotor	Triangle Passing Drill (Cooperative Structure: Learning Teams, Team Rally and Numbered Heads)	Accurate Passing and Support (Four players in a square, three versus one. Three players work in the corners and sides of the square)	11
Physical Fitness (Flexibility)	Psychomotor	Physical Activity Cycle (Comprehensive Group Processing: What happened? (Describe the training.) So what? (How does this advance your goals?) Now what? (How will you adapt your teaching for the next lesson?))	Horizontal Jump, Dip Movement, Shuttle Run, Sit-Ups, Step Test, Jump Rope, Hula Hoop, Group Selection	12
Badminton Backhand	Psychomotor	Gymnastics Routine (Cooperative Structure: Think, Pair, Explain, Perform, and Learning Teams) Group Processing: What happened? (Describe the training.) So what? (How does this advance your goals?) Now what? (How will you adjust your teaching for the next lesson?)	Creating a short individual routine/sequence that begins and ends in the designated group position	13
Basketball Dribbling	Psychomotor	Team Tournament Team Game Tournaments Tournament Motto: Winning isn't everything; it's the only thing.	Closing of the Training Protocol Team Sprint and Student-Selected Station Competitions under Teacher Supervision	14

2.5 Data Analysis

Preliminary analyses confirmed that all statistical assumptions were met. The distribution of the data was determined to be normal based on the results of the Shapiro-Wilk test ($p > .05$). Furthermore, the Levene's test yielded a p -value greater than .05, indicating that the variances were

homogeneous. Additionally, the assumption of homogeneity of regression slopes was confirmed, as the p -value was also greater than .05. Consequently, the data were deemed suitable for the intended parametric analyses. To analyze between-group effects, Analysis of Covariance (ANCOVA) was used. The significance level for all tests was set at $P \leq 0.05$. All statistical analyses were performed using SPSS software version 27.

Table 2. Descriptive Statistics of Research Variables by Group

Group	Variable	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	Δ Mean
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Cooperative Learning	Physical Functioning (Parent)	4.40 ± 2.54	2.40 ± 2.26	2.00 **
	Emotional Functioning (Parent)	4.10 ± 2.05	3.35 ± 2.32	0.75
	Social Functioning (Parent)	2.45 ± 2.48	0.70 ± 0.80	1.75 **
	School Functioning (Parent)	3.50 ± 2.91	3.05 ± 1.85	0.45
	Physical Functioning (Child)	7.10 ± 2.02	1.80 ± 1.40	5.30 **
	Emotional Functioning (Child)	2.95 ± 1.93	1.00 ± 1.17	1.95 **
	Social Functioning (Child)	2.15 ± 1.42	0.75 ± 0.85	1.40 **
	School Functioning (Child)	4.90 ± 2.49	1.15 ± 1.84	3.75 **
Traditional Instruction	Physical Functioning (Parent)	3.65 ± 2.72	4.55 ± 2.54	- 0.90
	Emotional Functioning (Parent)	3.55 ± 2.46	4.30 ± 2.20	- 0.75
	Social Functioning (Parent)	2.05 ± 2.58	2.70 ± 2.49	- 0.65 *
	School Functioning (Parent)	3.80 ± 4.25	3.60 ± 2.85	0.20
	Physical Functioning (Child)	6.05 ± 4.61	4.80 ± 3.19	1.25
	Emotional Functioning (Child)	3.20 ± 3.04	3.00 ± 2.13	0.20
	Social Functioning (Child)	2.00 ± 2.05	2.45 ± 1.54	- 0.45
	School Functioning (Child)	3.75 ± 3.18	3.35 ± 2.52	0.40

Note. Lower scores (Means) indicate better quality of life. Δ(Delta) scores were calculated as Pre-test minus Post-test; positive values indicate improvement. Significance of change scores was tested using paired-samples t-tests: * $p < .05$, ** $p < .01$.

3. Results

The mean and standard deviation of age for the Cooperative Learning group were 10.35 ± 0.25 years and for the Traditional Instruction group were 10.5 ± 0.04 years, respectively. Table 2 presents the descriptive statistics of the research variables Shapiro-Wilk test and Levene's F test were conducted to examine the normality of data distribution and the homogeneity of variances. The results of both tests indicated that the calculated Sig value for all research variables was greater than 0.05. Therefore, the assumptions

of normality of distribution and homogeneity of variances were met. Consequently, to examine the effect and compare the two methods on the components of Quality of Life, Analysis of Covariance (ANCOVA) was used, and post-tests were compared while controlling for (fixing) pre-test scores. The assumption of homogeneity of regression slopes was tested and confirmed prior to conducting ANCOVA, ensuring that the relationship between the covariate (pre-test score) and the dependent variable was consistent across all groups.

Table 3. Results of the analysis of covariance (ANCOVA) comparing quality of life subscale scores (parent and child reports) between groups

Source	Dependent Variable	Mean Square	F	sig	Partial Eta Squared
Pre-Test	Physical Functioning (Parent)	8.39	1.71	0.20	0.054
	Emotional Functioning (Parent)	6.80	1.67	0.21	0.053
	Social Functioning (Parent)	41.44	17.56	0.001	0.369
	School Functioning (Parent)	1.09	0.21	0.647	0.007
	Physical Functioning (Child)	40.63	9.72	0.004	0.245
	Emotional Functioning (Child)	7.09	2.84	0.103	0.086
	Social Functioning (Child)	2.24	1.56	0.222	0.049
	School Functioning (Child)	4.98	0.96	0.335	0.031
Group	Physical Functioning (Parent)	49.78	10.16	0.003**	0.253
	Emotional Functioning (Parent)	4.85	1.19	0.283	0.038
	Social Functioning (Parent)	44.42	18.82	0.001**	0.385
	School Functioning (Parent)	5.80	1.14	0.295	0.036
	Physical Functioning (Child)	98.89	23.65	0.001**	0.441
	Emotional Functioning (Child)	33.78	13.52	0.001**	0.311
	Social Functioning (Child)	24.78	17.19	0.001**	0.364
	School Functioning (Child)	51.12	9.86	0.004**	0.247

Note. Significance levels: ** $p < .01$.

The results of the Analysis of Covariance (ANCOVA) indicate that the group effect on the Quality of Life components from the parents' perspective was significant for Physical Functioning ($\eta^2 = 0.25$; $P = 0.003$; $F = 10.16$) and

Social Functioning ($\eta^2 = 0.39$; $P = 0.001$; $F = 18.82$), and non-significant for Emotional Functioning ($\eta^2 = 0.04$; $P = 0.283$; $F = 1.19$) and School Functioning ($\eta^2 = 0.04$; $P = 0.295$; $F = 1.14$). Regarding the Quality of Life components

from the students' perspective, the group effect was significant for all components: Physical Functioning ($\eta^2 = 0.44$; $P = 0.001$; $F = 23.65$), Social Functioning ($\eta^2 = 0.31$; $P = 0.001$; $F = 13.52$), Emotional Functioning ($\eta^2 = 0.36$; $P = 0.001$; $F = 17.19$), and School Functioning ($\eta^2 = 0.25$; $P = 0.004$; $F = 9.86$). Considering the means, Cooperative Learning not only had a positive effect on the physical, emotional, social, and school components from the students'

perspective, but was also effective on the physical and social components from the parents' perspective. Therefore, it can be stated that, based on these findings, it can be argued that Cooperative Learning leads to an improvement in students' Quality of Life; such that the improvement in their physical and social functioning was noticeable even from the parents' viewpoint.

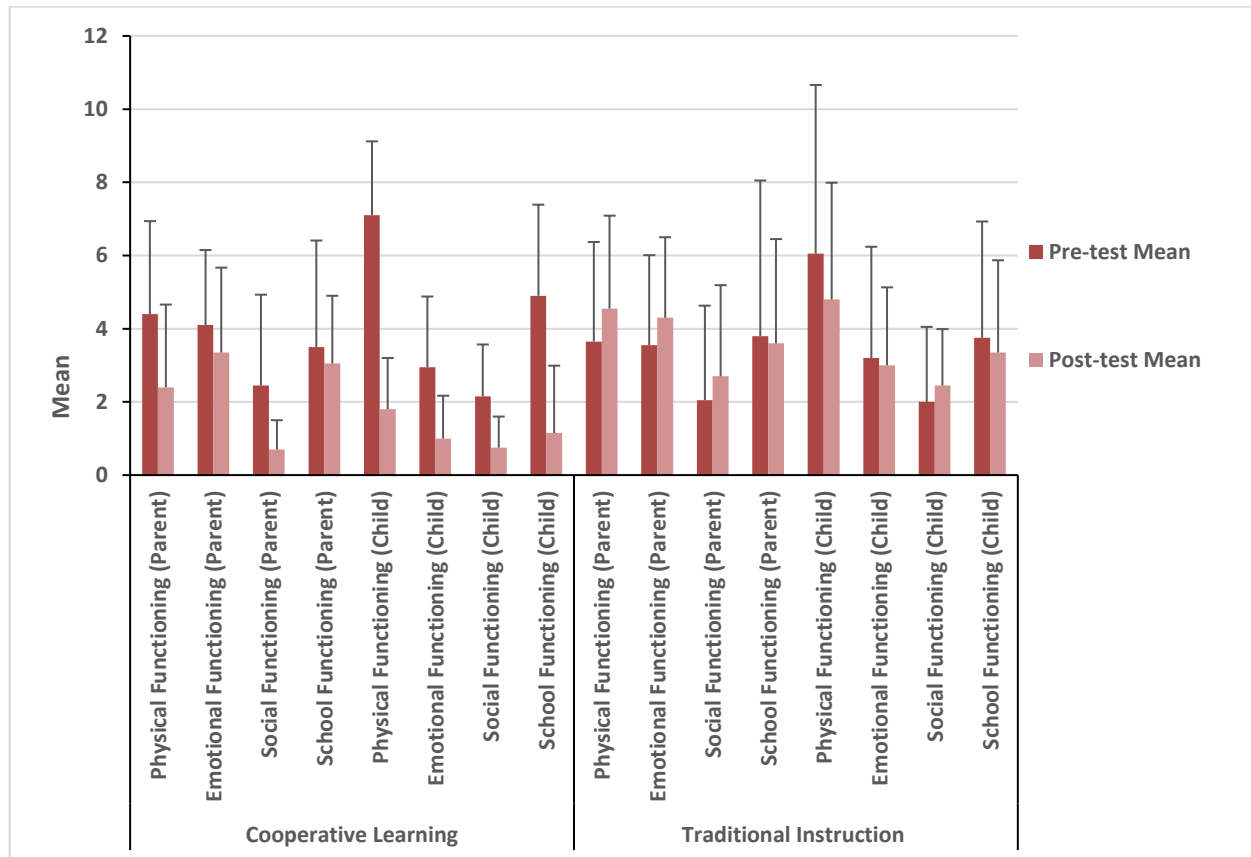


Figure 1. Comparison of Physical, Emotional, Social and School Functioning scores between the CL and TI groups before and after the training program.

4. Discussion

The present study was conducted with the aim of investigating the effect of a physical activity program based on the CL model on QoL of fifth-grade male elementary school students. The findings provide preliminary evidence that the CL-based intervention, compared to the traditional approach, had a significant and superior effect on improving various dimensions of students' QoL in this specific sample. Improvement was observed not only from the students' own perspective across all dimensions (physical, emotional, social, and school functioning) but also, notably, from the parents' perspective, where significant progress in the physical and social dimensions of their children was

reported. However, it is important to note that from the parents' perspective, the intervention did not yield statistically significant changes in the emotional and school-related dimensions of QoL, a point that warrants further discussion regarding the differential perception of changes by parents versus children (18, 19, 43, 44).

These results are in line with theoretical foundations and previous findings. In the CL model, an active and central role is assigned to the student, and the teacher, instead of one-way knowledge transmission, takes on the role of facilitator and guide of constructive interactions. This shift in focus, accompanied by emphasis on learners' individual characteristics and educational context, is considered a main

strength of modern educational approaches. Such an environment not only facilitates deeper learning of educational content but also simultaneously provides a platform for the development of social skills and the enhancement of well-being and QoL indicators (21, 22, 47).

The CL model in physical education integrates two parallel missions: education for sport (development of motor ability and sports culture) and education through sport (development of life skills and personality). Skills such as collective decision-making, autonomy, responsibility, and social solidarity, which are strengthened through cooperative structures, attest to this successful integration (21). Abundant research evidence indicates that CL can contribute to the holistic development of children and adolescents in the areas of physical competence, social adequacy, cognitive skills, and emotional maturity (20, 48).

A key question raised by these findings is how CL translates into improved QoL. The superior improvement in physical functioning observed in this study can be attributed to specific mechanisms inherent in the CL model. Firstly, the structure of positive interdependence ensures that every student must participate for the group to succeed, thereby increasing overall physical activity levels and motor engagement compared to traditional settings where some students may remain passive (10, 14, 29). Secondly, peer modeling within cooperative groups allows students to observe and imitate skilled movements and strategies demonstrated by their teammates, facilitating motor skill acquisition in a supportive context (5, 35, 49). Thirdly, the reduction of performance anxiety in a non-competitive, collaborative environment may encourage students to take healthy risks and engage more fully in physical tasks, leading to greater perceived physical competence (11, 36, 50).

The finding of this study regarding the significant difference in the improvement of social skills (as part of QoL) between the cooperative and traditional groups, both from the parents' and students' perspectives, is consistent with the results of numerous studies (25, 51). In the experimental group, social skills showed significant growth, while no noticeable change was observed in the control group (51, 52). Statistical analyses after controlling for the pre-test effect also confirmed the sustained superiority of the cooperative group. Post-hoc tests showed that education-related QoL and social relationships improved significantly more in this group. Therefore, it can be argued that, within this sample, CL appears to be a more efficient tool than traditional methods for strengthening interpersonal skills

and the perceived QoL of elementary school students. The mechanism for this social enhancement is clear: CL mandates face-to-face interaction, requiring students to communicate, negotiate, and resolve conflicts to achieve shared goals. This constant, structured practice in social engagement directly fosters the competencies measured by the social functioning dimension of QoL (23, 34, 42).

Regarding the non-significant findings reported by parents in emotional and school functioning, several interpretations are possible. Parents may be less sensitive to subtle, short-term changes in their child's internal emotional state or academic engagement that occur primarily within the school context. It is plausible that these changes require a longer intervention period or more time to generalize to the home environment before becoming noticeable to parents. Alternatively, the items on the parent-report questionnaire pertaining to these domains may capture behaviors less frequently exhibited or observed at home. Such discrepancies between child and parent reports are well-documented in the literature on pediatric QoL assessment (18, 19, 43, 44).

Educational and social QoL, based on satisfaction with the learning environment, quality of interactions, and a sense of belonging to the group, flourishes well in a cooperative space. In this space, positive interdependence, mutual support, and face-to-face interactions increase psychological safety, satisfaction, and cognitive-emotional engagement (53). This finding supports socio-cognitive theories that emphasize the role of group interactions in psychosocial health development (5, 6). In these environments, students, in addition to strengthening social competencies, experience the learning process as a rich and meaningful part of their collective life (26, 54). In contrast, the traditional method, with its emphasis on individual competition and a centralized teacher-centered structure, does not provide much opportunity for the formation of such rich and positive relationships (10, 11, 50).

The results of this study are consistent with numerous studies that have shown CL, through strengthening relationships, creating a supportive environment, and meeting basic psychological needs, leads to increased QoL, intrinsic motivation, active participation, academic achievement, emotional intelligence, and holistic development of students in physical education (53, 55). These findings from our specific sample of fifth-grade boys emphasize the importance of integrating social and emotional dimensions alongside cognitive and motor dimensions in education and suggest that CL may act as a

comprehensive approach towards enhancing the quality of the education system (56). From this perspective, designing curricula based on group interaction and cooperation not only helps the balanced growth of learners but can also contribute to creating healthy, dynamic, and effective schools (57, 58).

5. Conclusion

In conclusion, this study provides initial evidence supporting the efficacy of a CL-based physical activity program for enhancing the QoL of fifth-grade male students, particularly in physical and social domains as perceived by both children and their parents. The findings suggest that the structured social and physical engagement inherent in CL offers a promising pedagogical strategy for schools. However, these results should be considered preliminary, given the study's limitations, including its specific sample (demographics, age, gender) and intervention duration. The non-significant findings from parent reports on emotional and school functioning highlight the need for multi-informant assessments and longer-term follow-ups in future research (18, 19, 43, 44).

These results have important implications for policymakers, curriculum planners, and physical education instructors. Investing in the expansion and institutionalization of cooperative approaches in schools, especially in physical education, could be an effective step towards potentially improving students' QoL, enhancing social capital, and contributing to the broader educational goals of the school in the 21st century (3, 56). It is suggested that future research investigate the long-term effects of these interventions and their application in different age and gender groups to determine the generalizability of these findings.

6. Limitations and Implications

The authors acknowledge several methodological limitations that warrant careful consideration when interpreting the findings. First, while the sample size was a priori justified by power analysis, the relatively small cohort (N=40) restricts statistical power and increases the risk of Type II error. This is particularly relevant for parent-reported outcomes, where non-significant findings in emotional and school functioning may reflect insufficient sensitivity rather than true absence of effect. Second, the sample was restricted to 10–11-year-old male students from a single urban district in Iran, which substantially limits

generalizability to female students, other age groups, and diverse cultural or educational contexts. Third, the Fourteen-week intervention duration may be inadequate for detecting changes in all quality of life domains, especially those requiring longer-term consolidation or generalization to home settings. Fourth, although attempts were made to control for extraneous variables (e.g., monitoring outside-school activities, controlling for teacher effects, and using stratified sampling), potential confounding factors such as socioeconomic status, personality traits, prior team sport experience, and motivation could not be fully controlled due to the quasi-experimental design. These limitations suggest that findings should be interpreted with caution and warrant replication in more diverse and larger populations.

Despite these limitations, the findings carry important practical and policy implications. The significant improvements across multiple quality of life domains particularly physical and social functioning support embedding cooperative learning structures into physical education curricula. Educators and curriculum designers should consider shifting from traditional, teacher-centered models toward collaborative strategies that foster both motor competence and psychosocial well-being. At the policy level, integrating cooperative learning aligns with Sustainable Development Goal 4 by promoting inclusive, equitable, and holistic learning environments. Physical education, when deliberately structured around cooperative principles, can serve as a vehicle for achieving these broader educational objectives.

Future research should address the identified limitations through several specific avenues. Larger, more diverse samples (including female students and varied age groups) are needed to establish generalizability. Longitudinal designs with follow-up assessments at multiple time points (e.g., six and twelve months post-intervention) would help determine whether improvements are sustained over time. Studies should also examine transfer effects on academic performance, classroom behavior, and mental health outcomes. Additionally, investigating the role of teacher training and implementation fidelity, alongside qualitative exploration of students' lived experiences, would provide valuable insights for scaling up cooperative learning approaches in real-world educational settings. Future studies might also employ more rigorous experimental designs to better control for potential confounding variables and employ more sensitive measures for parent-reported outcomes to detect potentially subtle changes in emotional and school functioning.

Authors' Contributions

The authors contributed equally to the design, implementation, and writing of the research sections.

Declaration

During the preparation of this manuscript, ChatGPT (OpenAI) was used solely for English-language editing, grammar correction, and improvement of readability. It was not used for study design, data generation or collection, statistical analysis, or scientific interpretation of the findings. All AI-assisted text was critically reviewed and approved by the authors. The authors take full responsibility for the accuracy, originality, and integrity of the manuscript.

Transparency Statement

The data analyzed in the present study are available from the corresponding author upon reasonable request, subject to data-protection and ethical regulations.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

Adherence to Research Ethics Principles: This article is derived from the first author's doctoral dissertation in motor behaviour at the Faculty of Sports Sciences, Urmia University. In an effort to uphold ethical principles, the collection of information was only initiated subsequent to the obtaining of consent from participants. The participants were also assured about the confidentiality of their personal information and the presentation of results without disclosing their names and identification details.

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