

Effects of an instructional handball programme on motor and social skills in a secondary school: A randomized study with qualitative-quantitative design

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ABSTRACT

To evaluate the effectiveness of a school handball project in improving motor and social skills among secondary school students, using a mixed-methods randomised experimental design. 300 students aged 11-13 years were recruited and randomly assigned to an experimental group ($n = 150$) and a control group ($n = 150$). The experimental group followed a 12-week handball educational-sports programme, integrating practical and reflective activities. The control group performed traditional motor activities. Standardised motor tests (20m sprint, precision throwing, coordination test), questionnaires on social cooperation and qualitative focus groups conducted at the end of the intervention were used. The experimental group showed statistically significant improvements in motor performance ($p < .01$) and social cooperation ($p < .05$). The qualitative analysis showed increased motivation, inclusiveness, group cohesion and respect for rules. The integration of handball as a structured and intentional activity in the school context improves motor and social development in middle school students. These findings are consistent with the recent literature on the use of sport technologies and methodologies to optimise motor and cognitive performance (Latino & Tafuri, 2024), and support the idea that physical education should be intentionally designed to maximise cross-curricular learning impacts.

Keywords: Physical education, Handball, Sport, School, Experimental group.

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INTRODUCTION

In recent decades, physical education has been progressively recognised as an essential component of integral student development, not only for its benefits in terms of physical health, but also for its impact on cognitive, affective and relational dimensions (Bailey et al., 2009; WHO, 2020). Indeed, numerous international research studies have highlighted how regular participation in well-designed motor activities can positively influence adolescents' self-efficacy, ability to cooperate, emotional self-regulation and social identity (Ennis, 2017; Deci & Ryan, 2000). Despite this theoretical recognition, the Italian school context continues to show some resistance in fully integrating physical education within the educational curriculum. The discipline is often perceived as ancillary to traditional subjects, with negative repercussions on both the quality of teaching and student involvement (Cothran & Ennis, 1999). In many cases, the motor activities proposed are routine, unintentional and poorly connected to broader educational objectives, limiting the transformative potential of the sports experience.

In response to these critical issues, there has been a growing focus on the intentional use of team sports as an educational tool. The latter, by their very nature, require interaction, role management, cooperation and conflict resolution, configuring themselves as true experiential learning contexts (Hastie et al., 2011; Dyson, 2014; Johnson & Johnson, 2009). Shared action and the need to coordinate movements and intentions foster positive interdependence between peers and the construction of a collective identity.

Among the various collective disciplines, handball stands out for its particularly effective didactic-pedagogical profile. It is a dynamic sport with a high decision-making rate, requiring frequent role changes, rapid reading of situations and continuous tactical adaptation. These characteristics, in addition to developing conditioning and coordination skills, stimulate strategic thinking skills, operational autonomy and effective communication (Granados et al., 2007; Ortega et al., 2020; Praxedes et al., 2016). Furthermore, handball is easily adaptable to different school spaces and ability levels, making it accessible to less experienced or less motivated students.

In parallel, the pedagogical literature has proposed innovative models for teaching sport that go beyond the traditional technical-linear approach. In particular, models such as the Teaching Games for Understanding (TGfU) (Bunker & Thorpe, 1982) and the Sport Education Model (Siedentop et al., 2011) emphasise situated learning, reflection, responsibility and the personal meaning of motor experience. In these approaches, the post-activity reflective moment is not an accessory, but a central element of the educational process, fostering awareness, self-assessment and internalisation of shared norms and values (Schön, 1983; Casey & Goodyear, 2015).

This is coupled with a growing appreciation of mixed research methods (mixed methods), which combine quantitative and qualitative data to offer a richer and deeper insight into educational phenomena (Creswell & Plano Clark, 2017). In the motor field, such an approach allows for the objective measurement of performance progress and, at the same time, an understanding of students' experiences, their motivations, emotions and interpersonal dynamics. It is precisely from this integrated perspective that the educational benefits of consciously and reflectively designed school sports strongly emerge.

In particular, recent Italian studies (Latino & Tafari, 2024; Tafari et al., 2025) have shown how structured school sport interventions can generate significant improvements not only in terms of motor performance, but also in self-esteem, motivation and inclusion. Such evidence supports a view of sport as a complex educational device, capable of acting transversally on several dimensions of development.

However, despite the extensive theoretical and methodological apparatus supporting these practices, empirical research applied to secondary school, and focused on specific disciplines such as handball, is still lacking. In particular, there is a lack of controlled studies that assess with methodological rigour the effects of school sports programmes designed according to innovative didactic models.

The present study aims to fill this gap by systematically investigating the impact of a handball-centred educational-sports intervention on motor and social skills in pre-adolescent students. By means of a randomised experimental design and the use of mixed data collection instruments, it is intended to make a robust contribution to the literature on school motor education and to propose replicable operational guidelines for teachers and educational institutions.

Objectives

The main objective is to evaluate the effectiveness of an educational-sports intervention based on handball in the context of secondary school. In particular, it is intended to:

- Measure the improvement of specific motor skills (speed, coordination, precision);
- Assess the increase in social-relational skills (cooperation, respect, inclusion);
- Explore students' perceptions of sporting activity and group dynamics;
- To provide replicable methodological indications for handball teaching in schools.

METHODOLOGY

Study design

The study adopted a randomised experimental design with a qualitative-quantitative approach (mixed methods) to ensure a holistic view of the intervention outcomes. The research protocol was developed according to the PRISMA guidelines for educational studies and the CONSORT recommendations for school-based interventions (Moher et al., 2010).

The sample consisted of 300 students, selected from three comprehensive schools in the province of Naples. The students were stratified by age, gender and initial motor level, and then randomly assigned to two groups:

- Experimental group (n = 150): participated in the handball project;
- Control group (n = 150): followed the normal motor education activities included in the curriculum.

Inclusion criteria

To ensure the homogeneity of the sample and the internal validity of the study, precise inclusion criteria were established, consistent with the methodological and pedagogical objectives of the intervention. In particular:

- **Age between 11 and 13:** this age group was selected as it corresponds to the pre-adolescence period, a critical phase for motor and socio-emotional development. At this stage, students are sufficiently mature to understand and actively participate in structured teaching proposals, but are also particularly receptive to educational stimuli involving the relational and cooperative sphere.
- **Regular attendance in PE lessons (at least 80% attendance):** this criterion was adopted to ensure adequate exposure to the intervention and reduce variability due to the lack of continuity. Only students with constant attendance could benefit from the full course, an essential element to reliably assess the effects of the programme.
- **Absence of cognitive or motor disabilities that prevented active participation:** The aim of the study was to evaluate the effectiveness of a standardised sports teaching intervention. Therefore, it was necessary to exclude students with conditions that would have required significant adaptations

to the protocol or would have altered the balance of the groups. This choice does not imply a denial of the value of inclusion, but responds to the methodological need to maintain consistency in the experimental conditions.

- **Informed consent signed by parents or legal guardians:** voluntary and informed participation is a fundamental ethical prerequisite for conducting studies with minors. Consent ensured the transparency of the project and respect for the participants' rights, in line with current regulations on educational research.

Taken together, these criteria made it possible to select a sufficiently homogenous sample, representative of the target school population, and suitable for drawing reliable conclusions on the effectiveness of the proposed intervention.

Intervention

The educational intervention consisted of a 12-week course, divided into two weekly meetings of 60 minutes each, for a total of 24 units. The project was constructed on the basis of an integrated approach, in which the technical-tactical teaching of handball was constantly intertwined with educational strategies oriented towards social-relational development. This was inspired by the internationally recognised models of Teaching Games for Understanding (TGfU) (Bunker & Thorpe, 1982) and Sports Education (Siedentop et al., 2011), both of which focus on active learning, reflection and responsible participation.

Each session opened with a playful-motor activation phase, in which dynamic warm-up exercises and preparatory games were proposed. The aim was not only to prepare the students physically, but also to foster peer interaction, stimulating coordination, attention and a collaborative spirit from the very first minutes. This was followed by a central technical phase, dedicated to learning and consolidating the fundamentals of handball - passing, dribbling, shooting, marking - proposed in a gradual and adaptive form, taking into account the initial level of the participants.

The distinctive element of the intervention, however, lay in the subsequent phases, in which the skills learnt were transferred to semi-structured game contexts. Through simplified tactical situations (e.g. 2vs1 or 3vs2) and themed games (e.g. with compulsory role rotation or shared objectives), the students were called upon to make quick decisions, communicate effectively and coordinate with teammates. These forms of play, based on principles of cooperation and tactical problem solving, proved effective not only on a technical level, but also in the development of strategic thinking and shared responsibility (Harvey & Jarrett, 2014).

At the end of each lesson, a structured space was dedicated to collective reflection. Guided by the teacher, students were invited to share their perceptions, difficulties, strategies adopted and relational dynamics experienced during the activity. This moment - inspired by Schön's (1983) reflective pedagogy and the narrative practices proposed in the field of educational sport (Casey & Goodyear, 2015) - proved to be essential for promoting awareness, self-assessment and internalisation of the content learnt.

Particularly relevant was the choice of handball as the central discipline. In addition to its technical accessibility and adaptability to small spaces, handball has characteristics that make it pedagogically valuable: high frequency of interactions with the ball, rapid role rotation, complex cognitive demands and team dynamics that require constant collaboration. Recent studies confirm the effectiveness of school handball in developing not only conditional and coordinative skills, but also social skills such as respect for rules, positive communication and group management (Ortega et al., 2020).

In line with this evidence, the project included the extensive use of mini-game formats (3vs3, 4vs4) to ensure a high density of involvement. This type of organisation not only fostered the active inclusion of all students - even the less gifted - but also stimulated the development of collaborative forms of leadership, as already highlighted in the literature on sports education (Praxedes et al., 2018).

A key element was also the involvement of teachers, who took part in a six-hour intensive training module. This course alternated theoretical moments - focusing on teaching methodologies, managing group dynamics and the educational aims of sport - with practical sessions of micro-teaching and mutual observation. The intention was to provide operational tools for planning, managing and evaluating the intervention in a conscious manner and consistent with the stated objectives.

Finally, the entire project structure was in keeping with the European guidelines on physical education (EUPEA, 2019), which promote a vision of motor practice as an integrated educational experience, capable of contributing to the overall development of the person. The intervention, although centred on a specific sports discipline, was proposed as a transversal training device, capable of affecting motor, cognitive and socio-emotional aspects in a synergic and intentional manner.

Data collection tools

Quantitative:

- Eurofit test: standardised assessment of speed (20m sprint), explosive strength (medicine ball throw), dynamic balance (flamingo test), motor coordination (lateral jump on unstable axis) (Hardy et al., 2013);
- Psychosocial questionnaire: 5-point scale to measure cooperation, compliance with rules, leadership, peer support (Weiss & Ferrer-Caja, 2002).

Qualitative

- Focus groups: conducted with 36 students (12 per school), selected to represent different experiences. The interviews investigated motivation, relational dynamics, emotions felt during the activities;
- Systematic observations: recorded by two experienced observers on a predefined behavioural grid, focusing on 5 categories (positive communication, mutual aid, respect for rules, involvement, autonomous decision-making).

Qualitative data analysis

The data collected through focus groups and systematic observations were analysed through thematic analysis (Thematic Analysis), following the model proposed by Braun and Clarke (2006), which allows for the systematic identification, organisation and interpretation of significant patterns within the narrative data. The process consisted of six stages:

1. Familiarisation with the data (repeated reading of transcripts);
2. Generation of initial codes (open coding of relevant sentences and segments);
3. Theme search (aggregation of codes into conceptual cores);
4. Review of themes (checking internal and external consistency of identified themes);
5. Definition and naming of themes (attribution of meaning to emerging patterns);
6. Drafting of the final report (selection of representative citations and triangulation with quantitative data).

The analysis was conducted manually by two researchers independently, with subsequent discussion and consensus on the emerging themes to ensure intersubjective reliability. In line with the mixed educational research approach (Creswell & Plano Clark, 2017), a transformative and interpretive logic was adopted, aimed at bringing out the significance of students' experiences with respect to perceived changes in motivation, social interaction and group dynamics.

RESULTS

Quantitative results

The data collected by means of the standardised tests showed statistically significant differences between the experimental group and the control group in terms of both motor skills and social skills. In particular, the group that participated in the handball programme recorded substantial improvements in all areas tested: speed, explosive strength, coordination and social-relational dimensions. The following tables summarise the results obtained.

Table 1. Comparison between experimental and control group in motor tests (pre-post intervention).

Motor test	Group	Pre-test (mean \pm SD)	Post-test (mean \pm SD)	Δ % Improvement	Significance
20m Sprint (sec)	Experimental	4.35 \pm 0.52	3.83 \pm 0.47	-12%	$p < .01$
	Control	4.32 \pm 0.49	4.30 \pm 0.50	-0.5%	ns
Launch Accuracy (m)	Experimental	3.40 \pm 0.61	4.01 \pm 0.59	+18%	$p < .01$
	Control	3.45 \pm 0.58	3.62 \pm 0.55	+5%	ns
Coordination (no. jumps)	Experimental	18.0 \pm 2.5	20.7 \pm 2.2	+15%	$p < .01$
	Control	18.3 \pm 2.4	19.0 \pm 2.3	+4%	ns

Table 2. Scores of the socio-relational questionnaire (Scale 1-5).

Size	Group	Pre-test	Post-test	Δ Improvement	Significance
Cooperation	Experimental	3.2	4.4	+1.2	$p < .05$
	Control	3.3	3.5	+0.2	ns
Compliance with rules	Experimental	3.0	4.1	+1.1	$p < .05$
	Control	3.1	3.3	+0.2	ns
Positive leadership	Experimental	2.9	4.0	+1.1	$p < .05$
	Control	2.8	3.1	+0.3	ns
Peer support	Experimental	3.1	4.3	+1.2	$p < .05$
	Control	3.0	3.4	+0.4	ns

The data show a clear positive effect of the educational handball programme on the development of motor skills and social skills, confirming the effectiveness of the intervention in a real school context.

Qualitative results

The qualitative analysis allowed a more in-depth examination of the subjective and relational outcomes of the intervention, offering a more multifaceted view of the change observed in the participants of the experimental group. Through the processing of the data that emerged from the focus groups and systematic observations, five main areas of transformation were identified:

Increased motivation and interest in motor activity

The students involved in the handball programme showed high emotional and cognitive participation, with a progressive increase in intrinsic motivation. The playful-structured context, combined with the variety of

teaching proposals, fostered active involvement even among those who initially showed less interest in physical activity. The possibility of experimenting with different roles, in a non-competitive but cooperative climate, helped to strengthen the perception of self-efficacy.

Improved management of conflict dynamics

The shared sports experience, based on clear rules and cooperative tasks, facilitated the emergence of self-regulation and conflict resolution strategies. Students progressively developed a greater ability to deal with relational differences proactively, resorting to dialogue and negotiation. The concluding reflective moment acted as a space for the elaboration and consolidation of these strategies, promoting a culture of shared responsibility.

Development of collaborative leadership skills

During the activities, behaviours emerged that can be traced back to forms of distributed leadership, based on mutual support and the enhancement of each group member's contribution. Several students, even among those who did not usually assume central roles, showed initiative, organisational skills and attention to the inclusion of peers. This type of leadership was particularly evident in alternating-role situations, where dynamic and horizontal coordination was required.

Strengthening group cohesion and social integration

The project contributed to the strengthening of interpersonal bonds and the creation of a more cohesive classroom climate. The structured interaction in small groups, combined with the shared objectives of the activities, promoted collaboration even among students belonging to usually distinct social subgroups. In many cases, a broadening of peer relationships was observed, with greater openness and acceptance of individual differences.

Consolidation of autonomy and reflective thinking

The systematic introduction of debriefing at the end of each session stimulated in the students a reflective attitude towards their own actions, group dynamics and personal learning. This process fostered the development of metacognitive awareness, with observable repercussions also in decision-making skills during the game. Management autonomy manifested itself both in the autonomous resolution of tactical situations and in the ability to self-regulate in compliance with rules and assigned roles.

Systematic observations

The observations carried out in a natural context confirmed the evidence that emerged from the focus groups. In particular, a significant increase was noted in five behavioural areas: positive communication, peer support, respect for rules, active involvement and autonomous decision-making. These behaviours were recorded with greater frequency and intensity in the experimental group than in the control group, especially during cooperative play. This qualitative analysis provides an essential contribution to understanding the transformative scope of the intervention. The changes observed are not limited to performance aspects, but invest the relational, affective and identity levels, confirming the educational value of a structured, reflective and inclusive sports approach.

DISCUSSION

The results obtained confirm the validity of using an educational handball programme in the school context to foster motor and social development. Statistical analysis showed significant improvements in basic motor skills, as well as in social cooperation scores. These data are consistent with literature that emphasises that

participation in team sports can improve perceived self-efficacy and relational dynamics, especially in pre-adolescence (Tafari et al., 2025). The presence of cooperative activities, respect for rules, role rotation and post-activity reflection are crucial for students' social growth. As also demonstrated in the study conducted by Tafari et al. (2025) on the implementation of inclusive water polo with deaf adolescents, the adapted sports environment fostered clear improvements not only in motor skills, but also in self-perception, in peer integration and identity construction. The results that emerged reinforce the idea that physical activity, if designed with educational and inclusive aims, can represent a powerful training device for promoting the integral development of students. In this sense, our work follows in the wake of the innovative experiences also documented by Morsanuto et al. (2023), who demonstrated how an integrated sports education programme, centred on outdoor activities and adapted football for children with autism spectrum disorder, can foster significant progress on the motor, social and cognitive levels, concretely contributing to the achievement of the Sustainable Development Goals of Agenda 2030, in particular those related to health, quality education and the reduction of inequalities (SDGs 3, 4, 10). As also demonstrated in the experimental study conducted by Tafari et al. (2025) on the implementation of an inclusive water polo programme for deaf adolescents, participation in structured sports with communicative and methodological adaptations generated significant improvements not only in motor skills, but also in perceived self-efficacy and the quality of peer relationships. These results reinforce the evidence that adapted sport is a powerful tool for school inclusion and overall development, even in the presence of sensory barriers.

The use of inclusive methodologies, mediated by alternative communication tools and cooperative learning strategies, demonstrates the effectiveness of sport as a vehicle for integrated and multidimensional education. Such evidence reinforces the concept of sport as a transversal educational tool, useful not only for the development of motor skills, but also for the formation of the whole person.

CONCLUSIONS

The present study has shown that a handball-based sports education programme, intentionally designed and based on cooperative educational models, can produce significant improvements in students' motor skills and social-relational competences. These results support the hypothesis that physical education should be considered as a privileged field for the integral development of the person, acting in a transversal way on cognitive, emotional and relational aspects (Bailey et al., 2009; Ennis, 2017). The transformations observed in the experimental group, both in terms of performance and motivation, highlight the formative potential of motor activities when accompanied by conscious reflection and planning. Consistent with the principles of Social and Emotional Learning (SEL) and the indications of Latino & Tafari (2024), the systematic integration of educational sport within school curricula is recommended. In line with these findings, integrated school interventions combining motor and nutritional education have shown effectiveness in preventing eating disorders and improving overall psycho-physical well-being (Gravino et al., 2025), reinforcing the proposal for a multidimensional educational model. In perspective, the collaboration between schools and school medical services can further strengthen the effectiveness of these interventions, contributing to the prevention of discomfort and the promotion of students' overall well-being (Tafari & Latino, 2024).

The improvement in motor skills, documented through standardised tests, goes hand in hand with more complex and subtle transformations that emerged from focus groups and systematic observations: increased intrinsic motivation, cooperation skills, conflict management, development of reflective thinking and strengthening of group cohesion. These changes are not isolated episodes, but coherent manifestations of an educational process centred on active participation, appreciation of experience and social learning.

It is to be hoped that future research will evaluate the long-term impact of such interventions as well as their replicability in heterogeneous educational settings. A school that promotes physical activity as a multidimensional learning experience actively contributes to building resilient, aware and socially competent citizens.

AUTHOR CONTRIBUTIONS

The authors noted that there was equal participation in the elaboration of this document.

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No potential conflict of interest was reported by the authors.

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