

Effects of 12-Week Jump Rope Training on Cardiovascular Fitness and Motor Coordination in Children

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Article Info	Abstract
Article type: Research Article Article history: Received 17 March 2026 Received in revised form 18 May 2026 Accepted 03 June 2026 Available online 29 June 2026 Keywords: Physical Fitness, Motor Skills, Child, Jump Rope, Exercise Therapy.	Introduction: Cardiovascular fitness and motor coordination are fundamental to children's physical development, yet many school-age children fail to meet recommended activity levels. Jump rope training is a practical, engaging, and developmentally appropriate intervention that may improve both fitness and coordination. Objective: To examine the effects of a 12-week jump rope training program on cardiovascular fitness and motor coordination in children. Method: A quasi-experimental study was conducted with 80 children (ages 8-10 years) assigned to either an intervention group (n=40) or a control group (n=40). The intervention consisted of three 30-minute jump rope sessions per week for 12 weeks, incorporating progressive aerobic and coordination exercises. Cardiovascular fitness was assessed using the 20-meter shuttle run. Motor coordination was measured using the Körperkoordinationstest für Kinder (KTK). Data was analyzed using ANCOVA. Results: Children in the jump rope group demonstrated significant improvements in cardiovascular fitness compared to controls (PACER laps: $F=102.3$, $p<0.001$; VO_2 max: $F=98.7$, $p<0.001$). Motor coordination also increased significantly (KTK score: $F=83.4$, $p<0.001$). Control participants showed minimal changes. Conclusions: A 12-week jump rope training program significantly enhances both cardiovascular fitness and motor coordination in 8-10-year-old children. Jump rope represents a practical, efficient intervention for promoting holistic physical development and supporting healthy activity habits in school-age populations. Cite this Article: Zehsaz, F. (2026). Effects of 12-Week Jump Rope Training on Cardiovascular Fitness and Motor Coordination in Children. <i>Physical Activity in Children</i>, 3(1), 30-36. https://doi.org/10.22034/pach.2026.576041.1082

1. Introduction

Cardiovascular fitness and motor coordination are critical components of physical development in school-age children. Adequate cardiovascular fitness supports not only cardiometabolic health but also academic performance, attention, and overall well-being (1,2). Children with higher levels of cardiorespiratory endurance demonstrate better executive function, memory, and classroom engagement, highlighting the cognitive and psychosocial benefits of cardiovascular health beyond its physiological effects (3-5). Similarly, motor coordination underpins participation in sports, physical activity adherence, and the development of fundamental movement skills, which are foundational for lifelong engagement in physical activity (6). Poor motor coordination during middle childhood has been associated with lower levels of physical activity, higher risk of obesity, and reduced self-confidence in sports participation, suggesting that early intervention to enhance motor competence is crucial for overall child development (7,8). Despite these known benefits, a growing body of research indicates that many children aged 8-10 years fail to meet recommended daily levels of moderate-to-vigorous physical activity, which may compromise cardiovascular health and delay the

acquisition of motor skills (9,10). This highlights the need for effective, engaging, and developmentally appropriate interventions targeting both cardiovascular and motor outcomes in this age group.

Importantly, cardiovascular fitness and motor coordination are not independent developmental characteristics but are closely interconnected. Children with better motor coordination are often more willing and able to participate in physical activities, which can contribute to improved cardiovascular fitness over time. Conversely, higher levels of cardiovascular fitness may enable children to engage more effectively in movement-based activities that promote motor skill development. Previous research suggests that motor competence and physical fitness may influence one another through reciprocal relationships during childhood, creating positive developmental cycles that support health, physical activity participation, and functional performance (6-8). Therefore, interventions that simultaneously target both cardiovascular fitness and motor coordination may provide greater developmental benefits than programs focusing on either outcome alone.



Jump rope training is a simple, accessible, and cost-effective physical activity that has demonstrated positive effects on cardiovascular endurance, muscular endurance, and motor coordination (11,12). Jump rope involves rhythmic movement, timing, balance, and bilateral coordination, engaging both fine and gross motor skills simultaneously. Its dynamic nature requires children to integrate visual, proprioceptive, and vestibular inputs to maintain rhythm, adjust jump height, and coordinate arm and leg movements, making it an ideal activity for enhancing neuromuscular control (13,14). Additionally, jump rope combines aerobic exercise with complex motor skill practice, allowing for simultaneous improvements in cardiorespiratory fitness and coordination, which is often difficult to achieve with traditional single-focus interventions (15,16). The portability, low cost, and minimal space requirements make jump rope training particularly suitable for school, home, or community-based programs, allowing for scalable interventions in diverse settings.

The rationale for using jump rope training can be framed through developmental, motor learning, and physiological perspectives. From a developmental standpoint, middle childhood represents a critical period for refining fundamental movement skills and establishing lifelong patterns of physical activity (17). Children between 8- and 10-years' experience rapid improvements in neuromuscular control, balance, and strength, providing an optimal window to enhance coordination and motor skill proficiency (18). Motor learning theories, including the dynamic systems and constraints-led approaches, suggest that repetitive, task-specific practice promotes skill acquisition by enabling children to adapt movements to changing demands and environmental constraints (19,20). Jump rope training exemplifies this approach by requiring continuous adaptation to timing, speed, and rhythm, thereby strengthening coordination, timing, and motor planning. From a physiological perspective, cardiovascular training principles indicate that regular aerobic exercise improves stroke volume, cardiac output, and maximal oxygen uptake ($\text{VO}_2 \text{ max}$), which collectively enhance endurance and exercise capacity (21,22). Jump rope, when performed at moderate-to-vigorous intensity, provides a highly effective cardiovascular stimulus that can be sustained for short bursts or extended periods, supporting both aerobic conditioning and metabolic health in children.

Empirical evidence supports the benefits of jump rope training in children. Short-term interventions have reported improvements in cardiorespiratory fitness, agility, balance, and overall coordination (11,13,14,23). For example, studies implementing 6–8 week jump rope programs observed significant increases in $\text{VO}_2 \text{ max}$, vertical jump height, and agility test performance (16,23). Moreover, jump rope training has been linked to enhancements in bilateral coordination, reaction time, and timing accuracy, suggesting that it strengthens both general motor competence and task-specific skills (11,15).

Although these findings are promising, several important gaps remain in the literature. Most previous studies have focused primarily on either cardiovascular outcomes or motor skill outcomes, with relatively few investigations examining both domains simultaneously. In addition, many available studies

have employed short intervention periods, small samples, or broad age ranges, limiting understanding of how structured jump rope training influences cardiovascular fitness and motor coordination during the important developmental period of middle childhood. Consequently, the combined effects of a longer-duration jump rope intervention on these interrelated outcomes remain insufficiently understood.

Despite these promising results, few studies have simultaneously examined cardiovascular and motor coordination outcomes in children aged 8–10 years over longer, structured interventions. Understanding the combined impact is essential for designing efficient, engaging, and developmentally appropriate exercise programs that maximize both cardiovascular and motor skill development.

Therefore, the present study was conducted to address this gap and provide evidence regarding whether a structured 12-week jump rope training program can simultaneously improve cardiovascular fitness and motor coordination in children. Such evidence is important because schools, community organizations, and health professionals require practical, low-cost, and scalable interventions that can efficiently promote multiple aspects of physical development. Given declining physical activity levels among children worldwide and growing concerns regarding physical fitness and motor competence, identifying effective interventions that target both outcomes represent an important public health and educational priority.

The present study aims to investigate the effects of a 12-week jump rope training program on cardiovascular fitness and motor coordination in children aged 8–10 years. By employing a structured, progressive program, we aim to determine whether regular jump rope practice can lead to meaningful improvements in aerobic capacity, endurance, and coordination compared to a control group maintaining their usual physical activity routines. We hypothesize that children participating in the jump rope intervention will demonstrate significant improvements in cardiovascular fitness, measured through standard aerobic tests, and enhanced motor coordination, assessed via validated skill-based measures, relative to controls.

2. Methods

2.1. Study Design

This study employed a quasi-experimental, pre-post intervention design to examine the effects of a 12-week jump rope training program on cardiovascular fitness and motor coordination in children aged 8–10 years. Participants were assigned to either a jump rope intervention group or a control group maintaining usual physical activity. Assessments were conducted at baseline and immediately after the 12-week program.

2.2. Participants

A total of 80 children (ages 8–10 years) were recruited from two primary schools. Inclusion criteria were age between 8 and 10 years, no musculoskeletal or neurological disorders that would limit participation in physical activity, and the ability to attend three

weekly training sessions. Exclusion criteria included chronic illnesses, recent injuries, or participation in other structured physical training programs. Participants were divided into intervention ($n = 40$) and control ($n = 40$) groups, balanced for age and sex. Parental consent and child assent were obtained prior to participation, and the study was approved by the Institutional Review Board following ethical guidelines for research with minors.

2.3. Intervention: 12-Week Jump Rope Program

The jump rope training program was designed to improve cardiovascular fitness and motor coordination through structured and progressive exercises, conducted three times per week for 30 minutes per session. Each session consisted of a 5-minute warm-up with light jogging and dynamic stretching, 20 minutes of jump rope exercises including basic jumps, alternating foot jumps, double-under, and combination sequences, followed by a 5-minute cool-down with stretching and mobility exercises. Intensity was gradually increased over the 12 weeks by extending jump duration, increasing exercise complexity, and adjusting rest intervals. Sessions were supervised by trained instructors to ensure proper technique, engagement, and safety, while the control group continued their usual physical activity routines without additional structured exercise.

2.4. Measurements

2.4.1. Cardiovascular Fitness

Cardiovascular fitness was assessed using the 20-meter shuttle run test (PACER), a validated measure of aerobic endurance in children, with outcomes including the total number of laps completed and the estimated $\text{VO}_2 \text{ max}$ ($\text{mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) calculated from PACER performance (24).

2.4.2. Motor Coordination

Motor coordination was evaluated using the Körperkoordinationstest für Kinder (KTK), which includes balance beam walking, hopping on one leg, lateral jumping, and shifting platforms, with a total motor coordination score computed according to standardized procedures, where higher scores indicate better coordination performance (25).

2.4.3. Covariates

Demographic and anthropometric data were collected, including age (years), sex, and height and weight for body mass index (BMI) calculation.

2.5. Procedure

The study procedure involved a baseline assessment in which all participants completed the PACER and KTK tests prior to the intervention. The jump rope training program was then implemented during school hours or immediately after school, with sessions supervised by trained instructors and attendance and compliance carefully monitored. Following the 12-week program, post-intervention assessments were conducted within one week, repeating the PACER and KTK tests.

2.6. Statistical Analysis

Data were analyzed using SPSS Version 28. Descriptive statistics summarized participant characteristics, baseline cardiovascular fitness, and motor coordination scores. Independent-samples t-tests assessed baseline equivalence between groups, while paired-samples t-tests evaluated within-group pre- to post-intervention changes. Analysis of covariance (ANCOVA) was used to compare post-intervention outcomes between intervention and control groups, controlling for baseline scores, age, sex, and BMI. Effect sizes were calculated using Cohen's d for t-tests and partial η^2 for ANCOVA, and statistical significance was set at $p < 0.05$.

3. Results

3.1. Participant Demographics

A total of 80 children participated (40 in the jump rope intervention, 40 in the control group). The mean age was 9.2 ± 0.7 years, with 42 boys (52.5%) and 38 girls (47.5%). Baseline characteristics, including age, sex, BMI, cardiovascular fitness, and motor coordination scores, were similar between groups (Table 1), indicating successful group equivalence prior to the intervention.

Table 1. Baseline Participant Characteristics

Variable	Jump Rope ($n = 40$)	Control ($n = 40$)	p
Age (years), mean $\pm$ SD	9.3 ± 0.7	9.1 ± 0.7	0.28
Boys, n (%)	21 (52.5)	21 (52.5)	1.00
BMI (kg/m^2), mean $\pm$ SD	17.9 ± 2.1	18.1 ± 2.0	0.63
PACER Laps, mean $\pm$ SD	28.5 ± 5.4	28.2 ± 5.7	0.79
Motor Coordination Score, mean $\pm$ SD	88.6 ± 9.2	87.9 ± 8.8	0.74

3.2. Descriptive Statistics: Cardiovascular Fitness and Motor Coordination

Table 2 and Figure 1 summarizes pre- and post-intervention outcomes. Children in the jump rope

group showed marked improvements in both cardiovascular fitness and motor coordination, whereas control children exhibited minimal changes.

Table 2. Pre- and Post-Intervention Outcomes

Measure	Jump Rope-Pre	Jump Rope-Post	Control-Pre	Control-Post
PACER Laps	28.5 ± 5.4	37.8 ± 6.0	28.2 ± 5.7	29.1 ± 5.9
Estimated $\text{VO}_2 \text{ max}$ ($\text{mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)	42.8 ± 4.6	50.2 ± 5.1	42.5 ± 4.7	43.0 ± 4.9
Motor Coordination Score	88.6 ± 9.2	97.5 ± 8.5	87.9 ± 8.8	88.3 ± 9.0

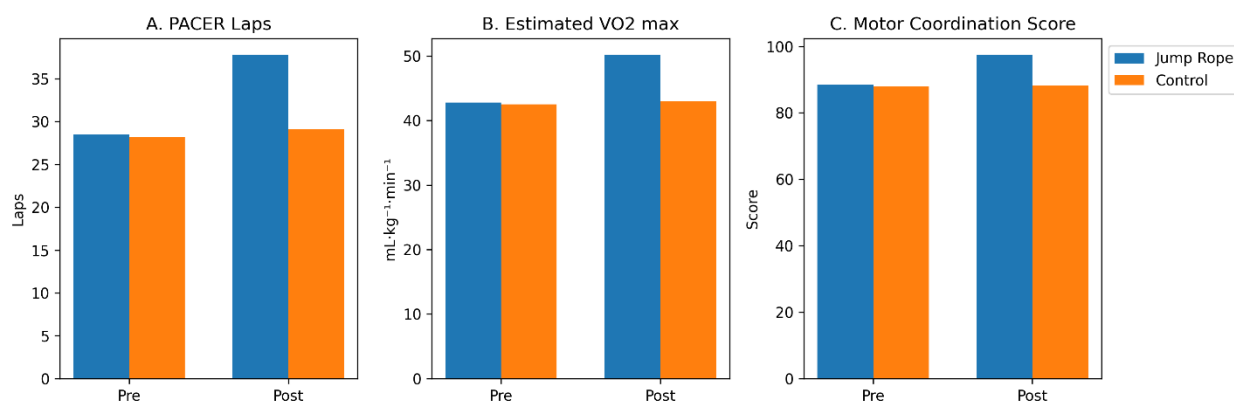


Figure 1. Effects of the 12-Week Jump Rope Intervention on Cardiorespiratory Fitness and Motor Coordination. Panel A illustrates changes in PACER laps, Panel B presents estimated VO₂max, and Panel C shows motor coordination scores for the Jump Rope and Control groups at pre- and post-intervention.

3.3. Pre-Intervention Equivalence

Independent-samples *t*-tests confirmed no significant baseline differences between groups for PACER laps ($t(78) = 0.27$, $p = 0.79$), VO₂ max ($t(78) = 0.25$, $p = 0.80$), or motor coordination score ($t(78) = 0.34$, $p = 0.74$).

3.4. Effects of Jump Rope Training

The jump rope group demonstrated significant improvements in cardiovascular fitness and motor coordination following the 12-week program. Paired-samples *t*-tests revealed a significant increase in PACER laps ($28.5 \rightarrow 37.8$; $t(39) = -11.2$, $p < 0.001$, Cohen's $d = 1.77$) and estimated VO₂ max ($42.8 \rightarrow 50.2$ mL·kg⁻¹·min⁻¹; $t(39) = -10.6$, $p < 0.001$, Cohen's $d = 1.68$), whereas the control group showed minimal, non-significant changes in PACER laps ($28.2 \rightarrow 29.1$, $p = 0.32$) and VO₂ max ($42.5 \rightarrow 43.0$, $p = 0.40$). Similarly, motor coordination improved significantly in the jump rope group, with KTK composite scores increasing from 88.6

to 97.5 ($t(39) = -9.4$, $p < 0.001$, Cohen's $d = 1.49$), while the control group showed no significant change ($87.9 \rightarrow 88.3$, $p = 0.56$).

3.5. Between-Group Comparisons

ANCOVA, controlling for baseline scores, age, sex, and BMI, revealed significant post-intervention differences between groups (Table 3). The jump rope group outperformed the control group on all outcomes, with adjusted post-intervention means showing higher PACER laps (37.9 ± 5.8 vs. 29.0 ± 5.8 ; $F = 102.3$, $p < 0.001$, partial $\eta^2 = 0.57$), greater estimated VO₂ max (50.3 ± 5.0 vs. 43.1 ± 4.9 ; $F = 98.7$, $p < 0.001$, partial $\eta^2 = 0.55$), and improved KTK motor coordination scores (97.6 ± 8.3 vs. 88.4 ± 9.1 ; $F = 83.4$, $p < 0.001$, partial $\eta^2 = 0.52$). These results indicate that the jump rope intervention produced large, statistically significant improvements in both cardiovascular fitness and motor coordination compared with the control condition.

Table 3. Post-Intervention ANCOVA Results

Outcome	F	p	Partial η^2	Adjusted Group Means $\pm$ SD
PACER Laps	102.3	<0.001	0.57	Jump Rope: 37.9 ± 5.8 Control: 29.0 ± 5.8
Estimated VO ₂ max	98.7	<0.001	0.55	Jump Rope: 50.3 ± 5.0 Control: 43.1 ± 4.9
Motor Coordination Score	83.4	<0.001	0.52	Jump Rope: 97.6 ± 8.3 Control: 88.4 ± 9.1

4. Discussion

This study investigated the effects of a 12-week jump rope training program on cardiovascular fitness and motor coordination in children aged 8–10 years. Overall, the intervention led to substantial improvements in both cardiovascular endurance and motor coordination compared to a control group maintaining usual activity. These findings suggest that jump rope training is an effective, practical, and developmentally appropriate exercise modality for school-age children. More importantly, the findings contribute to the growing body of literature emphasizing that simple, low-cost physical activity interventions can simultaneously enhance multiple dimensions of physical development during childhood. By examining both cardiovascular fitness and motor coordination within the same intervention, the present study provides a more comprehensive understanding of the developmental benefits of jump rope training.

The first key finding was that jump rope training significantly enhanced cardiovascular fitness, as evidenced by improvements in PACER laps and estimated VO₂ max. Children in the intervention group demonstrated an average increase of 9.3 PACER laps and 7.4 mL·kg⁻¹·min⁻¹ in VO₂ max, whereas control children showed negligible changes. These results are consistent with previous studies showing that structured jump rope interventions improve aerobic endurance such as VO₂ max and running capacity and cardiovascular efficiency in children (11,12,26). From a theoretical perspective, these improvements can be explained by physiological and motor development frameworks (21,22). Repetitive, high-intensity jumping challenges the cardiovascular system, stimulating cardiac output, stroke volume, and oxygen transport, which supports aerobic adaptations. Developmentally, middle childhood is a period of rapid cardiovascular maturation, and structured, progressive aerobic activity such as jump rope can accelerate improvements in endurance capacity while supporting overall health (18,19).

The magnitude of improvement observed in the present study suggests that jump rope training may be particularly effective because it combines aerobic exercise with high levels of participant engagement. Unlike some traditional endurance activities, jump rope requires continuous attention, rhythm, and movement control, potentially increasing exercise adherence and exercise intensity. This may help explain why significant cardiovascular gains were achieved within a relatively short intervention period. The findings therefore support previous recommendations that physically active games and skill-based aerobic activities may provide more attractive alternatives to conventional endurance training for children (11,12,26).

The second significant finding indicated a notable enhancement in motor coordination among participants in the jump rope group. Improvements were evident in areas such as balance, agility, and bilateral coordination, highlighting the diverse motor challenges presented by jump rope activities. These results are consistent with previous studies that have shown jump rope training to be effective in boosting fundamental movement skills and neuromuscular coordination such as balance, timing, and coordination in children (11,23,26,27). From a motor learning standpoint, jump rope serves as a highly specific, repetitive, and feedback-oriented activity (19,20). This repeated practice not only fortifies neuromuscular pathways but also enhances proprioception and refines motor planning. Developmental theories indicate that this stage is particularly conducive to solidifying coordination patterns, and the rhythmic, bilateral aspects of jump rope offer a potent stimulus for acquiring motor skills (18,19).

The present findings extend previous research by suggesting that the benefits of jump rope training are not limited to task-specific performance. Rather, improvements in balance, agility, and coordination indicate broader neuromuscular adaptations that may transfer to other physical activities and sports. This interpretation is consistent with motor learning theories, which propose that repeated exposure to coordinated movement patterns strengthens movement efficiency and motor control. Consequently, jump rope training may provide an effective foundation for the development of more advanced movement skills during later stages of childhood.

The findings collectively suggest that jump rope training effectively improves both cardiovascular fitness and motor coordination, thereby fostering physiological and motor development during middle childhood. This dual advantage underscores the practicality of jump rope as an exercise method that integrates aerobic conditioning with coordination training. Such insights are particularly significant for school-based programs, where time and resources are often constrained.

An important observation emerging from the present findings is the potential relationship between improvements in cardiovascular fitness and motor coordination. Previous research has suggested that children with better motor competence are more likely to participate in physical activity, while greater physical fitness may facilitate more effective movement performance (6-8). The simultaneous improvements observed in both domains support the possibility of a reciprocal relationship, whereby gains

in coordination enhance participation and movement efficiency, while improvements in cardiovascular fitness increase the capacity to engage in physical activity. Although this relationship was not directly examined in the present study, it represents an important area for future investigation.

When considered alongside existing evidence, the present study strengthens support for the use of jump rope training as a practical intervention in physical education and youth fitness programs. Unlike specialized exercise programs that require substantial equipment, facilities, or financial investment, jump rope training is inexpensive, portable, and easy to implement. Therefore, the findings have direct relevance for schools and community organizations seeking effective strategies to promote children's physical development.

Several important limitations must be acknowledged. Firstly, the quasi-experimental design restricts the ability to draw causal conclusions, as children were assigned to groups based on their classes rather than through random selection. Secondly, the intervention's duration of 12 weeks raises questions about the long-term retention of any observed benefits. Additionally, the relatively small sample size, sourced from only two schools within a single region, may hinder the broader applicability of the findings. Future research should focus on assessing the long-term impacts, utilizing larger and more diverse samples across multiple sites, and exploring the integration of jump rope training with other physical education programs. Furthermore, future studies should investigate the mechanisms underlying the observed improvements and determine whether changes in motor coordination mediate improvements in physical activity participation and cardiovascular fitness over time. Nonetheless, the study offers compelling evidence that jump rope serves as an accessible, cost-effective, and developmentally suitable method for improving cardiovascular fitness and motor coordination in children. Educators and physical activity professionals are encouraged to incorporate brief, structured jump rope sessions into school curricula or after-school initiatives to foster comprehensive physical development.

4.1. Conclusion

This study demonstrated that a 12-week jump rope training program significantly improved cardiovascular fitness and motor coordination in children aged 8-10 years. The findings provide evidence that jump rope training is an effective and practical intervention capable of simultaneously promoting aerobic fitness and motor skill development during an important stage of childhood growth.

One of the major benefits of this research is that it identifies a low-cost, accessible, and easily implemented activity that can be used in schools, community programs, and recreational settings to support children's physical development. Given increasing concerns regarding declining physical activity levels among children, the findings offer valuable guidance for educators, coaches, health professionals, and policymakers seeking efficient strategies to improve youth fitness and movement competence.

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Ethical Considerations: The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki, with due consideration for the rights, safety, dignity, privacy, and well-being of all participants. Appropriate ethical standards were maintained throughout participant recruitment, data collection, intervention procedures, and the management of participant information. Written informed consent was obtained from the parents or legal guardians of all participants prior to their participation in the study. Age-appropriate assent was also obtained from the participating children.

Data Availability: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Conflicts of Interest: The author declares that there is no conflict of interest.

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