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WORD COUNT 4925
TIME SUBMITTED 06-JAN-2026 10:32PM
PAPER ID 119790069

IJPESS
Indonesian Journal of Physical Education and Sport Science
p-ISSN 2775-765X | e-ISSN 2776-0200
Volume 5, No. 4, December 2025. Page. x-xx
http://journal.unucirebon.ac.id/index.php ijpess

Warm-Up Innovation with Skipping: A Comparative Analysis of the Speed of Bilingual School Students in China

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Received: 29 November 2025, Approved: 26 December 2025, Published: 30 December 2025

Abstract

Study purpose. This study aimed to explore the innovative use of skipping warm-ups to improve students' running speed in a bilingual school in China.
Materials and Methods. Using a quasi-experimental approach and a pretest-posttest design, this study involved 21 ninth-grade students, consisting of 13 girls and 8 boys. The warm-up consisted of various skipping exercises for 5 minutes, followed by a 100-meter run test.
Results. The results showed a decrease in average running time after the warm-up, but this difference was not statistically significant ($p = 0.085$). This finding suggests that while skipping exercises can improve overall physical fitness, fatigue experienced by students during the warm-up may mitigate its impact on running speed. Factors such as the short warm-up duration, high intensity, and differences in students' fitness levels were the main reasons why the results did not reach the expected significance. Furthermore, Shanghai's summer weather, high temperatures and humidity, can exacerbate fatigue levels during the warm-up, which in turn can reduce the effectiveness of physical exercise.
Conclusion. This study suggests the need to adjust the duration and intensity of training to optimize the results of warm-up exercises with skipping, as well as the importance of considering students' motivational factors in significantly increasing speed.

Keywords: Warm-up, Skipping, Running Speed, Physical Education, Chinese Bilingual School Students, Quasi-Experiment.

DOI: https://doi.org/10.52188/ijpess.v5i4.1738

Introduction

Every exercise or sport requires a warm-up to help prepare the body psychologically and physiologically before engaging in strenuous physical activity. A good warm-up increases

blood flow to the brain and heart, reduces the risk of injury, and prepares the muscles for more strenuous activity (Neves et al., 2021). Proper warm-ups can increase muscle temperature, improve blood circulation, improve neuromuscular coordination, and reduce the risk of injury. Doing the right movement is crucial for focusing on the muscle groups used in specific activities, ensuring proper movement patterns and enhancing both energy efficiency and smoothness in motion (Muhsin, 2025). It is very important for everyone to understand and actively practice proper warm-up techniques before doing any exercise, in order to maximize the benefits and prevent injury (Foss et al., 2018). Traditional warm-up techniques such as static stretching and light jogging are still used in bilingual school physical education classes in China. Although simple, this pattern is often considered boring and unable to encourage students to actively participate in learning.

Alternatively, more interactive and enjoyable warm-up methods can be applied to increase student engagement, such as games or group exercises that involve dynamic movements. By applying more interesting warm-up methods, it is hoped that students will participate more actively in sports activities and increase the effectiveness of physical education learning in schools (Kurnia & Septiana, 2020). Bilingual schools in China face a similar situation, with the Chinese physical education curriculum combining Eastern and Western educational values. Many schools continue to rely on conventional field learning methods, despite the influence of both cultures. These methods often emphasize long-established teaching methods and rely on traditional approaches, which are not entirely relevant to the physical and pedagogical needs of today's students (Qi, 2024). The lack of variation in warm-up activities is one of the main weaknesses of conventional methods (Abade et al., 2017). This often leads to monotonous and uninteresting routines. A static or limited approach to warm-ups can cause students to disengage from physical activity. As a result, this will reduce their desire to participate in physical activity as a whole (Segura et al., 2021).

The development of more dynamic methods of warm-up is essential to encourage students to participate actively and fully. One way to overcome this weakness is to use more dynamic and interactive warm-up techniques, such as skipping or jumping rope. Student boredom can be minimized by providing variety in warm-up techniques, and students will feel the benefits of a more enjoyable warm-up. For some time, skipping has been known as a type of exercise that improves coordination, agility, and endurance (Huang et al., 2022). Warming up with skipping can improve overall physical readiness and enhance motor coordination (Sinta & Pelaritanto, 2020). Skipping is an effective exercise for increasing leg muscle strength and endurance, as well as improving students' aerobic capacity (He & Liu, 2025), This technique can be an effective way to combine Western and Eastern values in sports education that is more relevant and contemporary.

Skipping is a more dynamic, cheaper, and more enjoyable alternative to traditional warm-up methods. In addition to improving muscle development and the motor nervous system, this activity also increases movement speed, making it relevant for improving sports education in bilingual schools. New skipping warm-up techniques can increase student participation in more constructive learning and sports activities. Previous studies have focused on how skipping improves cardiovascular fitness or basic motor skills. More in-depth and data-driven research is needed to understand the benefits of skipping as a coordinative activity and an innovative warm-up to enhance student speed. Speed is a crucial component of physical performance relevant to students in physical education learning (Naydenova & Nancheva, 2022). Further research is needed to investigate the potential of skipping as a means of improving physical skills in terms of speed and efficiency of warm-ups in bilingual school education settings. This condition indicates an important research gap that needs to be filled. This research is important because it can build a strong scientific basis for changing physical

education practices, especially in bilingual schools, which have so far preferred to use conventional approaches to warm-ups.

Students can significantly increase their motivation and participation in physical education if new warm-up methods involving fun activities such as skipping are used (Sarbaitinil et al., 2024). Innovations in heating can also improve one component of physical fitness, namely speed. This component is an important factor in assessing students' physical readiness and fitness, which is the main objective of the latest physical education program (Iconomescu et al., 2018). Functional dynamic warm-ups significantly increase speed in secondary school students compared to traditional warm-up methods. By activating the neuromuscular system and promoting effective coordination. This innovative approach not only improves physical readiness but also contributes to overall fitness, making it a valuable addition to adolescent physical education programs (Bauer et al., 2022).

A bilingual school curriculum that combines educational values from two different cultures requires a more adaptive, creative, and contextual approach to maximize students' motor development and fitness. This research is very important to conduct, by applying the culture of skipping, which is very popular in China and has become an important part of physical activities in schools in that country. This study aims to determine whether skipping can be a fun and dynamic warm-up method that can improve students' physical readiness and speed in bilingual schools. Skipping will be a more inventive warm-up method, which will be beneficial in Indonesia, because skipping is not as widely used as it is in China. This research is very important to produce a more relevant and effective warm-up, improve students' speed in sports, and support physical education goals in both countries.

It is very important to develop creative and entertaining warm-ups to increase students' interest in activities, so that physical education goals can be more easily achieved. In modern physical education, implementing evidence-based innovations is crucial to ensure that the techniques used are effective not only physically but also cognitively. Since bilingual school curricula combine educational values from two different cultures, there is a greater need for a more flexible, innovative, and contextual approach to maximize students' motor development and fitness goals. This research can enrich the academic literature by providing an empirical basis for the effectiveness of skipping as an alternative warm-up method to increase speed in students. This research can be a practical reference for physical education teachers to develop more creative lesson strategies that meet the needs of students in the context of bilingual schools.

Materials and Methods

Study participants

This study used a quasi-experimental approach with a pretest and posttest design in a class of ninth-grade students. The experimental group received an innovative warm-up treatment using skipping ropes, starting with a pretest or initial test, followed by the treatment, and ending with a posttest or final test. This study focused on ninth-grade students at a bilingual school in Shanghai with an English curriculum who participated in physical education classes. The sample was selected using purposive sampling, a sampling technique in which samples are selected deliberately based on specific criteria relevant to the research objectives. The sample consisted of one class that met the criteria, namely students who were healthy, active, always present, and not hindered by medical reasons. Of the total of five classes with 120 students, only one class met the criteria, consisting of 21 students (13 females and 8 males). Although the sample was limited, the purposive sampling approach ensured relevance to the research focus on active and healthy students.

Study Organization

The pretest conducted to measure speed was a 100-meter sprint, and the 100-meter posttest was used to collect data (Janjić et al., 2019). References for treatments performed by (C. Chen, 2022). The experiment began with students doing 2 minutes of independent stretching, as they already understood the sequence and benefits. Next, students used adjustable plastic skipping ropes (2.4-2.6 meters long). Students perform 4 variations of rope jumping for 90 seconds each variation, namely 2-foot jump, 1 left foot and 1 right foot, and 2-foot cross. After 3 minutes of individual jumping, the last 2 minutes are done in pairs and groups of up to 5 people by choosing 1 variation. Each student counts the number of jumps. The experiment was conducted over 12 sessions, 3 times a week. Time was recorded using a stopwatch calibrated to Coordinated Universal Time (UTC), while distance measurements were taken using a calibrated measuring device from a brand certified by the National Standards Agency (BSN) to ensure accuracy.

Statistical analysis

Data analysis using descriptive statistical tests was performed using a paired sample t-test on paired data because it came from one group or individual who was different in two conditions, processed with IBM SPSS Statistics 2025 software by Pallant, J. (2020). The purpose of this study was to determine whether there was a statistically significant difference between two measurements taken from the same group.

This study was conducted in accordance with ethical research norms in data processing while ensuring fairness and respectful treatment of all participants. The data collected in this study will be used only for research purposes and its confidentiality will be maintained. This study only relates to data provided by teachers who participated in the study with informed consent. All data collected will be treated with care and no identifying information about any participant will be published. The research process will comply with regulations applicable in China regarding personal data protection and privacy, and with international norms and standards in educational research ethics.

Results

This study aims to examine the use of skipping rope innovation as a warm-up exercise for students to improve their speed fitness components. The study was conducted in 12 sessions. In the first session, a preliminary test was administered in which participants were required to run 100 meters. In the first to fourth weeks, students were given a warm-up treatment that included skipping rope activities. In the fourth week, a follow-up treatment was given in the form of a 100-meter run. Descriptive statistics comparing the results of the initial and final tests of the 100-meter run can be found in Table 1.

Table 1. *Analisis Statistik Deskriptif*

Statistik	***Pretest***	***Posttest***
Mean	19.0267	18.3386
Median	19.0600	17.9900
Std. Deviation	3.33606	3.14620
Range	12.11	12.35
Minimum	13.59	13.69

Maximum	25.70	26.04

Note: Data collected during the pretest and posttest in 2025

The statistical table shows the average running time of bilingual school children in China before and after treatment. The data shows that the mean or average time decreased from 19.0267 seconds in the pretest to 18.3386 seconds in the posttest. The median value also decreased from 19.0600 seconds in the pretest to 17.9900 seconds in the posttest, indicating that the majority of participants experienced an improvement in running time after the treatment. Although the standard deviation decreased slightly from 3.33606 to 3.14620, indicating that the variation in time among participants was slightly lower after the treatment, the fastest and slowest time ranges increased slightly from 12.11 seconds in the pretest to 12.35 seconds in the posttest, indicating that participants improved their running times overall. Meanwhile, the minimum time in the pretest slightly increased to 13.69 seconds in the posttest. Then, the maximum time increased from 25.70 seconds to 26.04 seconds. The overall data results show that even though there were minimal differences among participants, the treatment succeeded in increasing the children's running speed.

Table 2. Normality Test

Normality Test (Shapiro-Wilk)	**Statistic**	**df**	**Sig**
Pretest	0.965	21	0.614
Posttest	0.961	21	0.534

Table 2 the Shapiro-Wilk normality test results for the 100-meter run data for bilingual school children in China show that both the pretest and posttest are normally distributed. The Shapiro-Wilk statistic value for the pretest is 0.965 and its significance is 0.614, while for the posttest the values are 0.961 and 0.534, respectively. Since the significance values for both tests are greater than 0.05, it can be concluded that the pretest and posttest data do not deviate significantly from the normal distribution. This means that the assumption of normality is satisfied, and the data can be analyzed using parametric statistical methods.

Table 3. Paired Sample T-Test Results

Variabel	**Sig. (2-Tailed)**
Pretest-Posttest	0.085

Table 3 the results of the Paired Sample T-test on the 100-meter running results of bilingual children in schools in China showed a significant value (Sig. 2 Tailed) of 0.085 for the comparison between the pretest and posttest. Although the significance value is greater than 0.05, indicating that the difference between the pretest and posttest has not reached a statistically significant level, there is evidence of an improvement in running time after treatment.

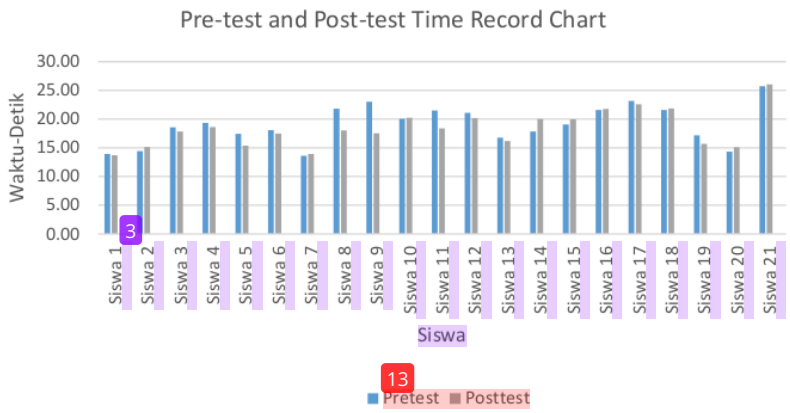

Figure 1. Pre-test and Post-test Time Record Chart

Figure 1 a comparison of the times recorded for 21 students at a bilingual school in China, with each blue bar representing the time recorded during the pretest and each gray bar representing the time recorded during the posttest. Although there was an acceleration in running time during the posttest, the difference was not significant enough to suggest that the innovation of skipping during warm-ups could increase the speed of students at bilingual schools in China.

Discussion

This study aims to determine how effective skipping warm-ups are in improving the running speed of students at bilingual schools in China. It is hoped that skipping, as a dynamic warm-up technique, can replace traditional, more static warm-up methods, such as stretching and light jogging. These methods are often considered boring and do not encourage students to exercise actively (Mustopa & Bagus Endrawan, 2022). Students experienced fatigue after performing skipping variations for five minutes, which is one reason why the results of this study were not significant. Although this duration seems short, many students became very tired after warming up because the intensity was quite high in a very short time. Since the students' bodies had already been affected by previous physical activity, this fatigue could interfere with their performance in the main activity. A study conducted by (Ohya et al., 2016) found that high-intensity exercise in a short period of time can cause fatigue, which affects performance, especially when fitness tests are conducted after warm-ups.

Body temperature and blood circulation can be quickly increased by skipping, which should prepare the muscles for further exercise (Danubisma & Dewi, 2023). By utilizing various muscle groups and performing dynamic movements, skipping can improve coordination and agility and prepare the body for more intense activities (Deng et al., 2024). This study shows that skipping makes the body more prepared, but training times that are too short and high intensity have less favorable effects.

In addition to fatigue, an important factor that could affect the results of this study is the fitness level of each individual. Not all students in the experimental group were healthy and active, but some students with higher fitness levels were able to perform high-intensity skipping exercises without significant fatigue, while students with lower fitness levels became fatigued more quickly. Given that some students still had enough energy to run well in the posttest, while others did not, this difference could lead to different results. Previous studies have shown that a person's fitness background greatly influences their response to an exercise program (Whipple

et al., 2019). This may be one reason why the findings of this study are inconsistent for the sample as a whole.

Another factor to consider is the duration and intensity of the exercise. In this study, the warm-up with skipping was performed for five minutes with a variation of ninety seconds for each movement. In many studies discussing warm-ups with skipping, the warm-up is often longer and the intensity is lower, and there is sufficient time to rest between sets of variations (Yanaoka et al., 2021). Meanwhile, in research by (Huang et al., 2022) Warm-ups involving skipping were conducted for more than ten minutes, with several rest sessions in between. The results showed that students became faster and more coordinated. Compared to that study, the time spent on this study, five minutes, was too short to maximize the benefits of warming up. In situations like this, a longer duration of 8 to 10 minutes, with more moderate intensity and more time for rest, can have a greater impact on students' physical performance.

Student motivation is a supporting factor in achieving significant speed results in warm-up exercises such as skipping. This is because motivation affects how persistently students perform exercises and how well they do them. Students with intrinsic motivation or more independent regulation appear to be more active and better at physical activities (Petros et al., 2016). During warm-ups, if students find skipping exercises tiring, monotonous, or useless, their motivation to try their best decreases. This affects the speed they can achieve. For example, research shows that student motivation affects their behavior toward physical activity and fitness. This study found that task orientation and self-goal orientation are associated with better running speed (Shen et al., 2020). Bibliometric research on physical education shows an increase in research on student motivation to participate in sports from 2016 to 2020 and finds that motivational elements such as enjoyment and independence are strongly related to students' physical learning outcomes (C. J. Chen et al., 2022). When skipping exercises are given in short bursts but at high intensity, students may not have enough motivation to perform the movements properly or maintain the ideal speed. As a result, this can lead to statistically insignificant results. In order for warm-ups such as skipping to truly improve speed, the exercise design must take motivation into account. This can be done by making the session fun, giving students choices, or creating healthy competition. This will encourage students to participate fully and do their best.

An individual's level of physical readiness and physiological adaptation greatly affects how effective the warm-up is (Pankaj & Gill, 2021). Recent studies show that a person's initial condition before exercise, including warming up with skipping, greatly affects their response to exercise. For example, (Bonafiglia et al., 2016) showed in their research that although there was an average increase in VO2max and lactate threshold after endurance training, there were significant differences between participants. This shows that, although a significant population group experienced an increase, individual responses to warm-ups and training varied greatly, and not everyone responded to training in the same way. In a meta-analysis of strength training in young athletes, (Lesinski et al., 2016) found in other studies that, although athletes' strength and agility improved, the impact on linear speed was smaller and more influenced by the athletes' initial fitness levels. This study shows that individual variability greatly affects the results of activities, and that the duration and load of training must be adjusted to the physical condition of each student. (Castro et al., 2024) In their research on metabolic components that influence exercise responses on cardiovascular fitness, they found that adaptation is highly dependent on individual metabolism and the body's ability to adjust to high-intensity exercise. This study emphasizes the importance of considering internal components such as metabolism and initial fitness when creating a warm-up program. All these results indicate that individual variability in response to skipping warm-up studies greatly influences the recorded results. To achieve better and clearly measurable results, it is important to adjust the duration, intensity,

and type of exercise according to each student's level of physical readiness, as some students tire quickly or do not adapt to warm-up variations.

Conclusions

Although the skipping warm-up technique showed an improvement in students' running speed, the improvement was not very significant. Current studies show a trend of improvement in running time, but this could be masked by the smaller sample size, limited training time, humidity and temperature in the summer, and uncontrolled external variables. Additional studies are needed to determine the possible duration and intensity of skipping that can be justified as a warm-up activity. Future studies need to include other variables that may affect the results, such as a larger sample size, stricter variable control, and intensity that meets the needs of students.

Although the skipping warm-up technique can improve students' running speed, the impact is not statistically significant enough to conclude that skipping significantly improves students' running speed in bilingual schools in China. The results of this study show that there is a trend in running times, and factors such as small samples, short training times, and uncontrolled external variables can affect the results. Skipping as a dynamic warm-up technique can still increase student engagement in physical activities and improve other aspects of fitness, such as agility and neuromuscular coordination. Additional research is needed to determine how long and how intense skipping should be as an ideal warm-up technique. Research should also evaluate other factors that may influence more significant results. Further studies involving larger samples and stricter controls could offer a clearer picture of how effective skipping is in physical education.

Acknowledgment

The author would like to thank every individual and family who has helped in the completion of this research. Without their support and contributions, this research would not have been completed successfully.

Conflict if interest

The author declares that there are no conflicts of interest related to this research.

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Cite this article as: Marvianissa, Eghie. et al. (2025). Warm-Up Innovation with Skipping: A Comparative Analysis of the Speed of Bilingual School Students in China**.** *Indonesian Journal of Physical Education and Sport Science (IJPESS)*, *5*(4), 534-544. https://doi.org/10.52188/ijpess.v5i4.1738

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