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Influence of Varying Approach Distances on Long Jump Performance in Early Adolescent Beginners

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Abstract
This cross-sectional experimental study investigated the impact of varying approach-run distances (15 m, 20 m, 25 m, 30 m, and 35 m) on long jump performance among 146 novice early adolescents (aged 11–14 years; 75 boys, 71 girls) with no prior formal training in long jump or athletics. Participants from schools in Nadia district, West Bengal, India, performed randomized long jump trials from each distance following a standardized warm-up. Jump distances were measured from the take-off board to the nearest landing mark in the sand pit. Results showed no statistically significant differences in performance across the five approach distances for any age group or sex ($p > 0.05$), with mean jump distances remaining largely stable. Boys consistently outperformed girls, reflecting typical sex differences in strength and power, but both groups exhibited similar patterns of minimal variation. Small, non-significant improvements were observed at 20 m for boys, suggesting this distance may offer an optimal balance of acceleration and control. The findings indicate that beginner early adolescents achieve sufficient approach velocity with shorter run-ups (15–20 m) and do not benefit from longer distances due to limitations in technique, neuromuscular control, stride regulation, and maintenance of speed. These results support the use of shorter approach runs in youth training and physical education to prioritize rhythm, take-off mechanics, and consistency over maximal run-up length, particularly in resource-limited settings.

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1. Introduction

The coordinated interaction of multifactorial influence of speed, strength, and technique, makes the long jump one of the most multifaceted events within athletics concerning young learners. The approach is the most critical phase because it determines the horizontal speed that the athlete must transfer to the jump at take-off. The research conducted in the fields of sprinting and jumping is often analogous to one another and suggests that, all else being equal, the more rapid the approach run, the more effective the take-off, and the greater the distance that will be achieved. However, early adolescent novices have less proficiency than a trained adult athlete at accelerating, stride regulation, and stability with a consistent approach to different distance take-off boards. Therefore, the question for coaching and talent development of this age is how to determine an appropriate approach length. Research on motor development indicates that youths between the ages of 12 to 14 have a rapid development in coordination, balance, and neuromuscular factors. These aspects determine how well young athletes can attain and maintain near-maximal speed over a distance. Children and adolescents have also been shown to reach peak speed (or maximum velocity) considerably earlier than adults. This can happen anywhere between 15 to 30 meters, depending on the level of training and maturation of the individual.

However, beginners may not significantly increase their long jump performance with increased run-ups due to increased run-up length potentially affecting the athlete's rhythm, level of fatigue, and stride length during the last few steps prior to take-off. The availability of facilities and school environments impacts the ability to train the approach-run effectively. In particular, but not limited to, developing countries schools do not have adequate run-up run ways and marked jump zones, which results in students not having the opportunity to engage in structured long jump training. This lack of opportunity to train the jump has developed the need for data to set an appropriate and reasonable approach distance for very young jumpers. Determining the set approach for jumpers needs to be based on performance. Jumpers has the potential to assist the teacher in developing a curriculum that is of high quality, safe and efficient, especially in settings where space and time for instruction are limited. Evidence of the mechanics of the long jump has focused overwhelmingly on the highly trained and elite athlete. This evidence gap becomes even greater when the athlete is early adolescence and in the stages of developing fundamental movement skills. The performance of the study that has been uploaded is of boys and girls during the ages of 12 to 14 years and indicates that the approach distance has a performance affecting variable (in both genders) even when the athlete is a novice. This evidence is suggestive and begs for evidence showing appropriate, performance increasing, variable control.

Assessing how different distances of approaches affect this age group may present more precise models of skills progression, minimized potential of injury, and encouraged effective participation in school sports. This study aims to examine how different distances of approaches affect first time jumpers in the age group of early adolescents. Performances of jumpers are evaluated on varying increments of distances of approaches to determine controlled technique, moderated speed, and optimal revised metrics of jumping. This research seeks to enhance teaching practices in elementary physical education, develop age-appropriate training manuals, and advance the study of developmental biomechanics in the jumping events.

Methodology

Study design: The current study utilized a cross-sectional experimental design to assess the impact of different running approach distances (15m ± 1m, 20m ± 1m, 25m ± 1m, 30m ± 1m, 35m ± 1m) on the performance of the long jump in novice adolescents. Participants did a series of long jump trials from each of the approach distances to facilitate a direct comparison of performance across different run-up lengths.

Participants: The study included 146 boys and girls aged 11-14 years from different schools in the Nadia district of West Bengal. All participants were novices and did not have formal training in long jump. Ethical clearance was obtained from the schools, and informed consent was sought from the parents or legal guardians. Approval to participate in the study was obtained from the children verbally. The physical activities were of low risk, and were reported to the participants as activities typically undertaken in school, at a physical education class. Participants were informed that the data collected during the study would be kept confidential, and that they could withdraw from the study at any time without any negative consequences.

Inclusion and exclusion criteria: The participants were included in the study if they were between 11 and 14 years of age, enrolled in a school in the Nadia district of West Bengal, were able to perform basic locomotor skills, and did not have any prior specialized training in long jump or athletics. The ineligibility criteria included recent injuries or health conditions that could limit participation in physical activity, receipt of long jump formal coaching in the past, or the inability to complete the jump trials due to tiredness or other physical discomforts.

Procedure of data collection: The standardized long jump pit and landing board set up on the school ground was used for all the data collection. All subjects participated in the same loosening up with a light jog, dynamic stretches, and two practice run-throughs of the approach with no jump to ensure they could all do warm up for safety and reliability the same. The distance achieved was the primary long jump outcome to be calculated for five different approach-run lengths. Each of the runs was randomized to the relative field order to limit the impact of tiredness, motivation, and learning during their performance. For each jump from a set field distance, the subjects were instructed to attempt their jump at their own comfort rhythm and take-off technique without supervision moderating their jumping.

The investigator made sure the runway was clear and the conditions were good at all times during the testing. Following each valid jump, the distance was documented to the nearest centimeter using a measuring tape from the take-off board to the closest marked landing position in the sand. If a jump was ruled a foul, the participant was given one more chance to re-jump, but if the second jump also resulted in a foul, no distance mark was given. All jump assessments were executed within the frameworks of established standards and jump assessments were executed within established frameworks, where fairness, reliability, and participant safety were prioritized.

Statistical analysis: The data were divided by age groups and by sex. For each distance of the jump, the mean and the standard deviation of the distances were calculated to define the specific performance trends. Inferential statistics has been used for further analysis. The level of significant for the study set at $p<0.05$ and the analysis were performed using Jamovi (2.6.19) statistical software.

Results

The study examined long jump performance across five approach distances among early adolescent boys and girls.

Table 1: Demographic characteristics of participants according to their age groups

Age Gr.	Sex	Height (cm)	Body mass (kg)
11-12 years	Boys (n=25)	149.2± 2.7	40.1±3.5
	Girls (n=25)	147.9±2.1	39.2±3.1
12-13 years	Boys (n=25)	154.3±2.4	43.7±2.8
	Girls (n=24)	152.2±3.0	42.8±3.4
13-14 years	Boys (n=25)	158.9±3.1	48.0±3.3
	Girls (n=22)	155.1±3.4	46.1±3.7

Table 2: Long jump performance across different approach-run distances in early adolescent beginners

Age Gr.	Sex	15 m	20 m	25 m	30 m	35 m	p value
11-12 years	Boys	3.5±0.22	3.55±0.16	3.56±0.24	3.56±0.26	3.57±0.24	0.17
	Girls	2.45±0.27	2.5±0.3	2.47±0.28	2.48±0.3	2.46±0.31	0.32
12-13 years	Boys	3.55±0.44	3.66±0.51	3.56±0.53	3.63±0.58	3.62±0.6	0.44
	Girls	2.49±0.33	2.5±0.34	2.46±0.25	2.49±0.31	2.51±0.36	0.39
13-14 years	Boys	3.55±0.44	3.66±0.51	3.56±0.53	3.63±0.58	3.62±0.6	0.52
	Girls	2.49± 0.21	2.5±0.34	2.46±0.25	2.49±0.31	2.51±0.36	0.48

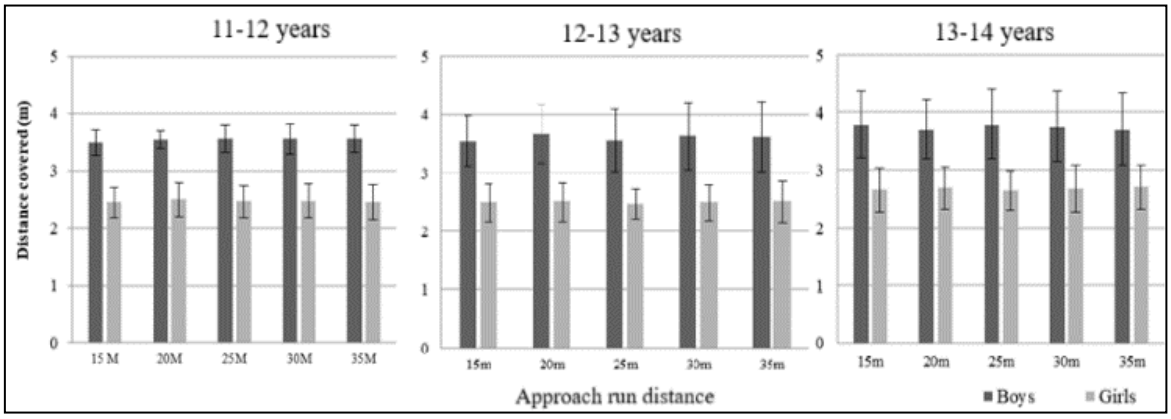

Fig 1: Graphical representation of long jump performance across different approach-run distances in early adolescent beginners

Across all age groups, boys recorded greater jump distances than girls. Performance patterns showed small variations across the five approach distances, indicating that increasing run-up distance did not lead to major improvements among early adolescent beginners. These patterns are consistent with the raw dataset provided in the study. Across age groups, increasing approach distance from 15 m to 35 m produced only small changes in jump performance. The largest improvements occurred at 20 m for boys in all age groups, but the changes were minor. Girls showed stable performance with no meaningful variation across distances. These results suggest that early adolescent beginners may reach adequate approach speed before 20 m, and extending the run-up may not improve performance significantly.

Discussion

This study aimed to investigate the impact of different approach-run distances on the long jump of early adolescents aged 11 to 14 years. The results indicated that the long jump distances did not differ significantly on the five approach distances and remained the same for all age and sex groups. This consistency in performance suggests that for jumpers at this age and level of experience, there is no increase in performance with a longer approach. The patterns exhibited suggest that young adolescent athletes have the ability to achieve sufficient approach speed, but have not developed the technique or neuromuscular control to take advantage of longer distances. Boys across all age groups jumped further than girls, which is consistent with sex differences in strength, power, and physical development during the adolescent years (Singh, 1984) [1]. However, both boys and girls demonstrated the same pattern across different approach distances, which suggest that the absence of sex differences in performance is due to age and technique. There were minor differences in performance between the 15 and 35 m distance for both groups, and there were no distances that demonstrated a consistent or significant advantage. These results suggest that early adolescents do not seem to be able to translate prolonged approach runs over a horizontal distance into higher velocity or more effective mechanics during take-off. The slight performance improvement noted at 20m for boys may suggest that this distance may provide an optimal balance between attainable acceleration and controllable approach speed. Prior studies indicate that longer approach runs should be expected to yield greater run-up velocities at take-off for long jumpers. However, beginners often cannot achieve optimal rhythm, alignment, and stability at a faster cadence (Bridgett *et al*., 2002) [3]. Bridgett and Linthrone (2006) [5] demonstrated that improvements in run-up speed yield longer jumps primarily when the athlete has sufficient take-off and are able to vertically impulse off the board at take-off. In contrast, novice athletes are likely to lose optimal take-off mechanics, due to the speed of their approach run, thereby losing the expected advantages of longer approach run.

The girls in the present study demonstrated particularly stable performance across all distances, with jump distance means showing virtually no variation. This pattern aligns with previous findings indicating that younger or less experienced athletes tend to optimize rhythm and accuracy at shorter

approach lengths due to developing speed endurance and coordination (Panteli *et al*., 2011) [6]. Bradshaw and Aisbett (2006) [4] noted the importance of visual and proprioceptive control in the closing few strides, pointing out that novice athletes step to a consistent rhythm and use their peer athletes' step cues to pattern their foot placement at the take-off board. If the approach length is longer than the athlete's ability to maintain controlled acceleration, these processes can break down and further advancement in jump performance is unlikely. The lack of significant differences among the five approach distances may also be due to the early adolescent physiology. In this age, athletes have been shown to have low anaerobic power and decreased ability to maintain near-maximal sprint speed for prolonged distances (Sahin, 2014) [8]. Therefore, longer approaches may result in early deceleration or a break in posture during the last few strides, which leads to loss of horizontal speed at take-off. Hussain *et al*. (2011) [7] expresses that body factors such as body position, braking forces, angle of take-off, etc. could be more impacting on long jump elite than maximal speed in an approach. The present findings agree with (2011) suggesting that beginners with higher developed technique skills should not be losing from performance jumping with increased volume in approach run. The results indicate that an approach distance of about 15–20 m is sufficient for optimal performance for beginner early adolescents. Lengthier distances add increased complexity of an approach, less consistent jumping, more room for an approach run, and less meaningful increments in distances of jump. These results coincide with fundamental principles of training stating that rhythm, biomechanics of take-off, and coordination should be developed before advancing to longer and more difficult approach runs (Singh 1984) [1]. Across all groups, the results were the same. The findings further reveal that over physical development and age, technical ability and developmental readiness is the most important. Noteworthy is that only with distance in approach run is not important for beginners long jump to be successful. Stability in jump and motor control of body is however, more important during early developed ages.

The findings suggest that educators and coaches should consider refining the length of run-up distances for beginner jumpers. The study states that an approach runway of about 20 m together with a 7 m landing pit (standard landing pit: 9m), making a total distance of approximately 30m, provides a practical and effective layout for long jump practice in institutional settings. Instruction should focus on controlled acceleration, take-off mechanics, and milestones of consistent foot-stride patterns prior to extending run-up distances. Coaches and physical educators must learn to value the modification of technical skills like stride control, final step visual cuing, and take-off mechanics above simply trying to run faster by lengthening the approach. Planned training should focus on the coordinated and aligned movements of the body, features that build proprioceptive awareness and foot control, and that consider the approach parameter to the individual's level of maturity so as to enhance self-confidence, minimize fouls, and guide consistent technical improvement. Future studies may consider the influence of more skill progression, strength gain, and specific biomechanics training on the distance from which jumpers' run-up before run-up distance is advantageous for performance.

Conclusion

The study concluded that designated and varied distances of approach runs did not result in a significant change in the performance of the long jump of beginners in early adolescence. This finding illustrates the point that increased distances of approach do not result in improved performance, particularly among inexperienced athletes. Since they are able to achieve an adequate approach velocity with shorter distances and often do not have the adequate technique to maintain take-off control with additional velocity. This result shows that rhythm, technique, and controlled acceleration are more important in this age group, more so than approach length, in determining performance. In its entirety, the study endorses the implementation of shorter, more approachable fit-reach distances in the training of youth while simultaneously emphasizing the value of technique-centered coaching, appropriately matched to the developmental stage of young adolescents.

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