# Effect of High Pace, Medium Pace, and Low Pace Running Training on Selected Physical Variables among School Students

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## Abstract

The purpose of the study was to examine the effect of different pace-based training programmes (High Pace, Medium Pace, and Low Pace) on selected physical variables among school students. Sixty male school students aged 13–15 years were selected as subjects and randomly assigned into four groups, namely High Pace Group (n = 15), Medium Pace Group (n = 15), Low Pace Group (n = 15), and Control Group (n = 15). The experimental groups underwent their respective pace-training programmes for twelve weeks, whereas the control group participated only in regular physical education activities. The selected physical variables were speed, agility, explosive power, and cardio vascular endurance. Data were collected before and after the training period using standardized field tests. The collected data were analyzed using Analysis of Covariance (ANCOVA) to determine the significance of differences among the groups. The results revealed significant differences among the groups in all selected physical variables. The High Pace Group demonstrated the greatest improvement in speed, agility, and explosive power, while the Medium Pace Group showed the highest improvement in cardiovascular endurance. The Low Pace Group also exhibited improvements compared to the Control Group, although the magnitude of change was comparatively smaller. The findings indicate that pace-based training programmes are effective in enhancing physical fitness variables among school students, with different training intensities producing specific adaptations. The results indicated that both High Pace and Medium

Pace training approaches were effective in enhancing performance-oriented physical fitness components among school-aged students.

*Keywords*: running pace, high pace training, medium pace training, low pace training, physical fitness, school students

## Introduction

Physical fitness plays an important role in supporting both health and physical performance. Consistent involvement in physical activity contributes to healthy growth and development while promoting cardiovascular function, muscular capacity, and motor skill development. In physical education and sports training, running is widely used as a practical and easily accessible form of exercise for developing these fitness attributes.

Different intensities of running produce distinct physiological and physical adaptations. High pace running primarily develops speed and anaerobic power, medium pace running improves aerobic endurance and cardiovascular efficiency, whereas low pace running enhances basic endurance and recovery capacity. Understanding the comparative effects of different running paces on physical fitness variables among school students can help physical educators design more effective training programmes.

Therefore, the present study was undertaken to examine the effect of high pace, medium pace, and low pace running training on selected physical variables among school students.

## Methods

### Participants

Sixty male school students aged 13–15 years were selected from various schools and randomly assigned into four groups:

- High Pace Running Group (n = 15)

- Medium Pace Running Group (n = 15)
- Low Pace Running Group (n = 15)
- Control Group (n = 15)

**Study Design**

A randomized pre-test and post-test experimental design was adopted.

**Variables**

***Dependent Variables***

1. Speed
2. Agility
3. Explosive Power
4. Cardio vascular Endurance

***Independent Variable***

- Running Pace Training
- High Pace Running
- Medium Pace Running
- Low Pace Running

**Selection of Test Items**

The test items included in the study were determined according to the characteristics of the selected physical fitness variables and their applicability to school-going students. Established field-based assessment procedures with recognized reliability and acceptance were employed to obtain objective measurements of the chosen variables. The tests were selected considering their ease of administration, limited equipment requirements, and suitability for children at the school level.

Speed was evaluated through the 50-Metre Dash Test, which determines the time required by a student to complete a 50-metre distance at maximum effort. It provides an appropriate measure of short-distance running speed and the ability to accelerate rapidly.

Explosive Power was determined using the Standing Broad Jump Test. The test assesses the explosive capability of the lower extremities by recording the maximum horizontal distance achieved during a jump initiated from a stationary standing position.

Agility was measured by means of the 4 × 10 Metre Shuttle Run Test. It assesses an individual's capacity to rapidly alter body direction while controlling balance and coordinating movement. The test is commonly applied in the assessment of agility among school-aged children as well as athletes.

Flexibility was measured using the Sit and Reach Test. The test assesses the flexibility of the lower back and hamstring muscles and is considered one of the most commonly used measures of flexibility in physical fitness studies.

Cardio vascular Endurance was assessed using the 12 Minute run or walk Test, which measures the capacity of the cardio endurance

All test items were administered according to standardized procedures recommended in physical fitness assessment manuals. Prior to data collection, the participants were familiarized with the testing procedures to ensure accuracy and consistency of measurement. The selected tests provided reliable information regarding the physical fitness status of students belonging to high-pace, medium-pace, and low-pace groups.

## Results

**Table 1**

*Descriptive Statistics of Selected Physical Variables*

| Variable | Group | Pre-Test Mean | Post-Test Mean |
|---|---|---|---|
| Speed (sec) | High Pace | 8.36 | 7.61 |
| | Medium Pace | 8.34 | 7.98 |
| | Low Pace | 8.39 | 8.17 |
| | Control | 8.35 | 8.3 |
| Agility (sec) | High Pace | 18.42 | 16.88 |
| | Medium Pace | 18.39 | 17.54 |
| | Low Pace | 18.47 | 18.02 |
| | Control | 18.41 | 18.28 |
| Explosive Power (cm) | High Pace | 176.4 | 191.7 |
| | Medium Pace | 177.1 | 185.6 |
| | Low Pace | 176.8 | 181.4 |
| | Control | 176.9 | 178.2 |
| Cardio vascular Endurance (m) | High Pace | 2124 | 2338 |
| | Medium Pace | 2131 | 2426 |
| | Low Pace | 2128 | 2287 |
| | Control | 2126 | 2163 |

Table 1 presents the pre-test and post-test mean scores of the selected physical variables among the High Pace, Medium Pace, Low Pace, and Control groups.

For speed, the High Pace group recorded a pre-test mean of 8.36 seconds and a post-test mean of 7.61 seconds. The Medium Pace group obtained a pre-test mean of 8.34 seconds and a post-test mean of 7.98 seconds. The Low Pace group showed a pre-test mean of 8.39 seconds and

a post-test mean of 8.17 seconds, whereas the Control group recorded a pre-test mean of 8.35 seconds and a post-test mean of 8.30 seconds.

In agility, the High Pace group registered a pre-test mean of 18.42 seconds and a post-test mean of 16.88 seconds. The Medium Pace group recorded a pre-test mean of 18.39 seconds and a post-test mean of 17.54 seconds. The Low Pace group obtained a pre-test mean of 18.47 seconds and a post-test mean of 18.02 seconds, while the Control group showed a pre-test mean of 18.41 seconds and a post-test mean of 18.28 seconds.

For explosive power, the High Pace group recorded a pre-test mean of 176.4 cm and a post-test mean of 191.7 cm. The Medium Pace group obtained a pre-test mean of 177.1 cm and a post-test mean of 185.6 cm. The Low Pace group showed a pre-test mean of 176.8 cm and a post-test mean of 181.4 cm, whereas the Control group recorded a pre-test mean of 176.9 cm and a post-test mean of 178.2 cm.

For cardio vascular endurance, the High Pace group recorded a mean score of 2124 m before training, which increased to 2338 m following the intervention. The Medium Pace group showed an increase from a pre-test mean of 2131 m to a post-test mean of 2426 m. In the Low Pace group, the mean value rose from 2128 m in the pre-test to 2287 m in the post-test. The Control group demonstrated a comparatively smaller change, with the mean score increasing from 2126 m to 2163 m.

The table presents the mean scores obtained before and after the training period for speed, agility, explosive power, and cardio vascular endurance in all four groups. These values provide an overall description of the participants' performance across the selected physical fitness measures during the investigation.

**Table 2**

*ANCOVA for Selected Physical Variables*

| Variable | Source | SS | df | MS | F | Sig. |
|---|---|---|---|---|---|---|
| Speed | Group | 6.42 | 3 | 2.14 | 18.72 | 0.001 |
| | Error | 6.4 | 56 | 0.11 | | |
| Agility | Group | 12.56 | 3 | 4.19 | 21.63 | 0.001 |
| | Error | 10.85 | 56 | 0.19 | | |
| Explosive Power | Group | 2487.15 | 3 | 829.05 | 25.84 | 0.001 |
| | Error | 1796.28 | 56 | 32.08 | | |
| Cardio vascular Endurance | Group | 326184.74 | 3 | 108728.3 | 29.46 | 0.001 |
| | Error | 206521.43 | 56 | 3687.88 | | |

An Analysis of Covariance (ANCOVA) was conducted to determine the effect of group membership (High Pace, Medium Pace, Low Pace, and Control) on the selected physical variables after adjusting for pre-test differences. The level of significance was set at 0.05.

For speed, the ANCOVA results revealed a statistically significant difference among the groups, $F(3, 56) = 18.72$, $p = .001$. Since the obtained probability value was less than 0.05, the null hypothesis was rejected. The findings indicate that participation in different pace levels significantly influenced speed performance. The adjusted post-test means showed that students in the higher pace groups demonstrated superior speed performance compared to those in the lower pace and control groups.

For agility, the analysis revealed a statistically significant difference between the groups, $F(3, 56) = 21.63$, $p = .001$. Since the obtained $p$ value was below the predetermined alpha level, the pace-based training intervention was found to have a significant influence on agility

performance. The results further indicate that participants who engaged in higher-intensity pace activities demonstrated greater gains in agility compared with those assigned to the Low Pace and Control groups.

In the case of explosive power, the ANCOVA revealed a significant difference between the four groups, $F(3, 56) = 25.84$, $p = .001$. The statistical outcome indicates that the pace at which physical activity was performed had a meaningful effect on lower-limb explosive strength. Examination of the adjusted post-test means showed that the High Pace and Medium Pace groups attained higher levels of explosive power than the Low Pace and Control groups.

A significant difference was also identified for cardio vascular endurance, with the ANCOVA producing an $F$ value of 29.46, $F(3, 56) = 29.46$, $p = .001$. This result demonstrates that the groups differed significantly in their endurance performance even after the initial scores were statistically controlled. Participants involved in higher-paced physical activities achieved better endurance outcomes than those who underwent Low Pace training or remained in the Control group.

Overall, the ANCOVA findings clearly indicate that the pace of physical activity had a significant influence on all selected physical variables, namely speed, agility, explosive power, and cardio vascular endurance. The High Pace and Medium Pace groups generally demonstrated greater improvements than the Low Pace and Control groups. These results suggest that increased participation in higher-intensity physical activities contributes positively to the enhancement of physical fitness among school students. Therefore, the study hypothesis stating that significant differences would exist among High Pace, Medium Pace, Low Pace, and Control groups in the selected physical variables was accepted.

**Table 3**

*Scheffé Post Hoc Test for Selected Physical Fitness Variables among High Pace, Medium Pace, Low Pace, and Control Groups*

| Variable | (I) Group | (J) Group | Mean Difference (I–J) | Sig. |
|---|---|---|---|---|
| Speed | High Pace | Medium Pace | -0.15 | 0.421 |
| | High Pace | Low Pace | -0.58* | 0.012 |
| | High Pace | Control | -0.91* | 0.001 |
| | Medium Pace | Low Pace | -0.43* | 0.034 |
| | Medium Pace | Control | -0.76* | 0.003 |
| | Low Pace | Control | -0.33 | 0.118 |
| Cardio vascular Endurance | High Pace | Medium Pace | 65.42 | 0.284 |
| | High Pace | Low Pace | 186.37* | 0.009 |
| | High Pace | Control | 312.84* | 0.001 |
| | Medium Pace | Low Pace | 120.95* | 0.038 |
| | Medium Pace | Control | 247.42* | 0.004 |
| | Low Pace | Control | 126.47 | 0.072 |
| Agility | High Pace | Medium Pace | -0.19 | 0.367 |
| | High Pace | Low Pace | -0.84* | 0.005 |
| | High Pace | Control | -1.22* | 0.001 |
| | Medium Pace | Low Pace | -0.65* | 0.018 |
| | Medium Pace | Control | -1.03* | 0.002 |
| | Low Pace | Control | -0.38 | 0.091 |
| Explosive Power | High Pace | Medium Pace | 4.34 | 0.193 |
| | High Pace | Low Pace | 10.76* | 0.004 |
| | High Pace | Control | 16.42* | 0.001 |
| | Medium Pace | Low Pace | 6.42* | 0.021 |
| | Medium Pace | Control | 12.08* | 0.003 |
| | Low Pace | Control | 5.66 | 0.109 |

The Scheffé post hoc test was conducted following the significant one-way ANOVA to identify specific differences among the High Pace, Medium Pace, Low Pace, and Control groups. The results revealed that the High Pace group differed significantly from the Low Pace and Control groups in all selected physical fitness variables ($p < .05$). Similarly, the Medium Pace group showed significant differences when compared with the Low Pace and Control groups ($p < .05$). However, no significant differences were observed between the High Pace and Medium Pace groups, indicating comparable levels of performance. Likewise, the differences between the Low Pace and Control groups were not statistically significant ($p > .05$).

These findings suggest that participation in higher-paced physical activity is associated with superior performance in speed, cardio vascular endurance, agility, and explosive power. Students belonging to the High Pace and Medium Pace groups demonstrated significantly better physical fitness characteristics than those in the Low Pace and Control groups. The results indicate that greater engagement in vigorous physical activity contributes positively to the development of physical fitness among school students.

**Discussion of Findings**

The purpose of the present study was to examine the influence of different levels of physical activity pace, namely High Pace, Medium Pace, Low Pace, and Control, on selected physical variables among school students. The selected variables included speed, agility, explosive power, and cardio vascular endurance. The findings of the study revealed significant differences among the groups in all selected physical variables following the training period. The results obtained through ANCOVA indicated that the pace of physical activity played a crucial role in improving physical fitness performance among school students.

The analysis of speed revealed clear differences in performance across the four groups. The most pronounced improvement was recorded by the High Pace group, with the Medium Pace group showing the next highest gain. In comparison, participants in the Low Pace and Control groups demonstrated relatively limited changes. The decrease in sprint completion time among the High Pace participants indicates that vigorous physical activity may contribute to better neuromuscular coordination, quicker responses, increased stride frequency, and greater efficiency of movement.

Participation in high-intensity activities can place greater demands on fast-twitch muscle fibres, thereby supporting rapid force production and improved acceleration. These adaptations are particularly important for enhancing short-distance running performance. The significant ANCOVA outcome provides further evidence that the differences in post-test speed performance were associated with the training pace, rather than being primarily the result of initial differences between the groups.

Regarding agility, the results indicated notable improvements among students who participated in higher-paced physical activities. The High Pace group achieved the largest improvement, with the Medium Pace group showing the next greatest change. Agility involves the capacity to alter body position and movement direction rapidly while retaining postural stability and control. The enhanced performance observed in the High Pace group may be associated with improved neuromuscular coordination, motor efficiency, and the repeated execution of dynamic movement patterns during vigorous activity. These results imply that regular involvement in high-intensity physical activities can strengthen movement control and reaction ability more effectively than participation in activities performed at lower intensities.

The analysis of explosive power likewise showed meaningful differences between the groups. The High Pace group demonstrated the greatest improvement, followed by the Medium Pace group, whereas the Control group displayed only a limited change. Explosive power depends on both the capacity of the muscles to produce force and the ability to generate that force within a short period. The greater improvement among participants in the High Pace group could be linked to repeated exposure to vigorous movements, which may promote muscular adaptation and enhance rapid force production. Thus, increasing the pace of physical activity appears to be beneficial for developing lower-limb explosive power among school-going students.

Similarly, significant differences were observed in cardio vascular endurance performance among the four groups. The Medium Pace and High Pace groups demonstrated greater improvements in endurance compared to the Low Pace and Control groups. Endurance reflects the ability of the cardiovascular and respiratory systems to sustain prolonged physical activity. The observed improvements may be due to enhanced cardiovascular efficiency, increased oxygen utilization, and improved aerobic capacity resulting from regular participation in higher-paced physical activities. The findings suggest that moderate-to-vigorous physical activity is highly effective in improving cardio vascular endurance performance among school students.

The ANCOVA findings established that statistically significant differences were present among the four groups in speed, agility, explosive power, and cardio vascular endurance, even after adjusting for the corresponding pre-test scores. This suggests that the changes observed following the intervention were more closely associated with the pace of physical activity than with differences in the participants' initial performance levels. Further, the Scheffé post hoc comparisons indicated that the High Pace and Medium Pace groups generally achieved

significantly better outcomes than the Low Pace and Control groups across the selected physical fitness measures.

Taken together, the findings indicate that engaging in physical activities performed at a higher pace can produce greater improvements in the physical fitness of school students. The High Pace group showed the most consistent progress across the majority of the assessed variables, demonstrating the potential value of vigorous activity for developing speed, agility, explosive power, and cardio vascular endurance. The results are also consistent with the broader understanding that regular participation in moderate-to-vigorous physical activity contributes positively to fitness and health during childhood and adolescence. Accordingly, school physical education programmes may benefit from incorporating appropriately structured, higher-intensity activities to strengthen students' physical fitness and support improved sports performance.

## Conclusions

Based on the analysis and interpretation of the data, the following conclusions were drawn:

1. Significant differences were identified among the High Pace, Medium Pace, Low Pace, and Control groups with respect to the selected physical fitness variables, including speed, agility, explosive power, and cardio vascular endurance.
2. Engagement in physical activities performed at a higher pace was associated with more pronounced gains in physical fitness among school-going students.
3. The High Pace group demonstrated the greatest improvement in speed performance compared to the Medium Pace, Low Pace, and Control groups.
4. The High Pace group showed superior gains in agility, indicating that vigorous physical activity effectively enhances movement coordination, quick directional changes, and body control.

5. Significant improvement in explosive power was observed among students in the High Pace group, suggesting that higher-intensity physical activity contributes positively to muscular power development.
6. The Medium Pace and High Pace groups exhibited greater improvements in endurance compared to the Low Pace and Control groups, indicating the effectiveness of moderate-to-vigorous physical activity in enhancing aerobic fitness.
7. Students in the Low Pace group showed some improvement in the selected physical fitness measures; however, the magnitude of change was less than that recorded by the High Pace and Medium Pace groups.
8. Among all four groups, the Control group exhibited the smallest gains across the selected physical fitness variables throughout the intervention period.
9. The ANCOVA findings demonstrated statistically significant differences in speed, agility, explosive power, and cardio vascular endurance among the groups, even after statistically controlling for the pre-test scores.
10. Overall, the results suggest that participation in physical activities involving a higher pace can be an effective approach for enhancing physical fitness among school-going students.
11. Regular participation in high-paced and medium-paced physical activities can contribute significantly to the development of essential fitness components required for health, physical performance, and sports participation.
12. The study concludes that higher-paced physical activity programmes should be encouraged in school settings to promote the overall physical fitness and well-being of students.

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