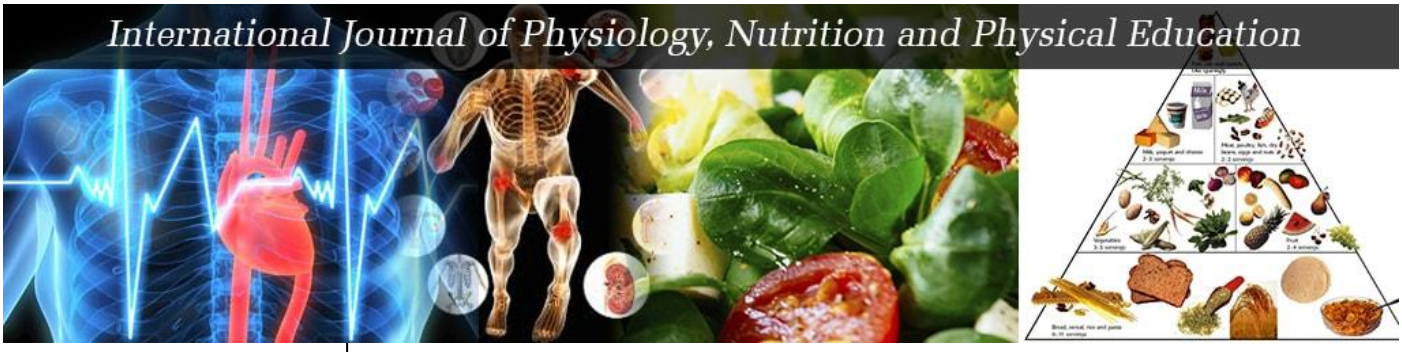

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Effects of core strength training on cycling speed in university level cyclists

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Abstract
Study Aim: To explore the effects of 6-week core strength training on Cycling Speed in University Level Cyclists.
Methods: Thirty Male Cyclists, University level, of Guru Nanak Dev University, Amritsar between the age group of 18-28 years (Mean ± SD: age 20.733 ± 1.910 yrs), body height (165.233 ± 6.404 cm) and body mass (62.146 ± 3.657 kg) volunteered to participate in the study. This study is designed as a retrospective cross-sectional study. Cycling speed was measured by 40 Meter Cycle Sprint Test.
Statistical Analyses: Statistical analyses were performed using the Statistical Package for the Social Sciences for Windows version 16.0 software (SPSS Inc., Chicago, IL). Data is expressed as the mean ± SD. Paired sample t-test was used to compare the means of the Pre-Test and the Post-Test. The level of significance was set at 0.05.
Results: Significant differences were found in Cycling Speed in the Experimental Group subjected to 6-week core strength training. However, no significant changes were observed in the Control Group at the end of 6-week duration.

Keywords: Cyclist, cycling speed, core strength

Introduction
The core has been defined in many ways. Some define it as the whole of the trunk including all muscles that crosses the hip and shoulder. Others have defined it as the lumbopelvic region where everything above the pelvis and below the sternum is considered as core musculature [1, 2, 3].

The core stability is comprised of the lumbopelvic-hip complex. It is the capacity to maintain equilibrium of the vertebral column within its physiologic limits and this is achieved by reducing displacement from perturbations and maintaining structural integrity [4, 5, 6, 7].

Cycling is a relatively low impact exercise involving less eccentric muscle actions, thus induces less muscle and soft tissue damage [8, 9]. Sprint cycling training has been found to improve both aerobic and anaerobic performance during cycling tests. The majority of studies have used thirty-second Wingate cycling sprint as the training protocol to train different populations [10, 11, 12, 13].

To date, there has been inadequate study showing the effect of core strength training on Cycling Speed. Therefore, the purpose of this study was to examine the effects of 6-week core strength training on Cycling Speed in University Level Cyclists.

Material and Methods
Subjects
Thirty, University level Male Cyclists of Guru Nanak Dev University, Amritsar between the age group of 18-28 years (Mean ± SD: age 20.733 ± 1.910 yrs), body height (165.233 ± 6.404 cm) and body mass (62.146 ± 3.657 kg) volunteered to participate in the study. The subjects were purposively divided into two groups:

- Group-A: Experimental (N_1=15)
- Group-B: Control (N_2=15)

Distribution and demographics of subjects are presented in Table-1.

Table 1: Distribution and Demographics of Subjects (N=30) (i.e., Experimental Group (N_1=15) and Control Group (N_2=15)).

Variable (s)	Sample Size (N=30)		
	Total N=30	Experimental Group (N_1=15)	Control Group (N_2=15)
Age (yrs)	20.733 ± 1.910	21.066 ± 1.830	20.4 ± 1.992
Body Height (cm)	165.233 ± 6.404	164.133 ± 7.140	166.333 ± 5.601
Body Mass (kg)	62.146 ± 3.657	61.4 ± 3.004	62.893 ± 4.181

*N; sample size, yrs; years, cm; centimeters, kg; kilograms.

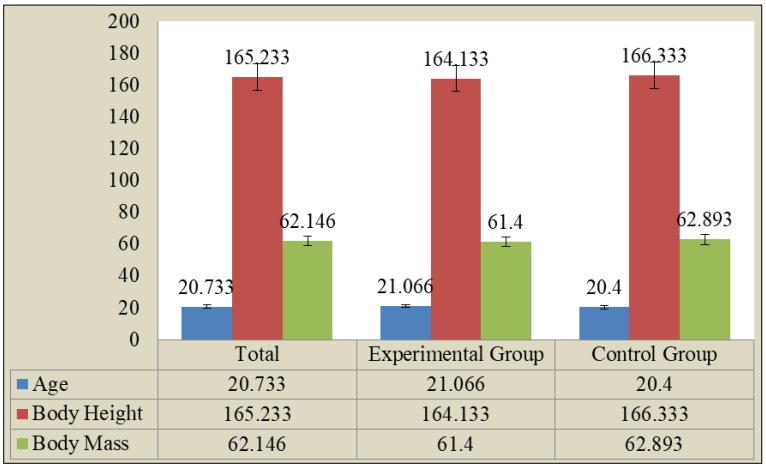

Fig 1: Distribution and Demographics of Subjects (N=30) (i.e., Experimental Group (N_1=15) and Control Group (N_2=15)).

Methodology

This study is designed as a retrospective cross-sectional study. Cycling speed was measured by 40 Meter Cycle Sprint Test [14]. The test commence with a Standing start position in which the subject start with his feet on the pedals, the front bike wheel at the 40m marker, with someone holding the subject and bike up. The subject rides as fast as possible. The subject starts after the command "one, two, three, go!" with the tester also starting stopwatch on the signal 'go'. The tester stops the stopwatch when the subject's front wheel crosses the finish line. The fastest time for standing start should be recorded to the nearest second.

The subjects from Group-A: Experimental were subjected to a 6-week core strength exercise training, 3 days a week for six weeks [15].

Statistical Technique

Statistical analyses were performed using the Statistical Package for the Social Sciences for Windows version 16.0 software (SPSS Inc., Chicago, IL). Data is expressed as the mean ± SD. Paired sample t-test was used to compare the means of the Pre-Test and the Post-Test. The level of significance was set at 0.05.

Results

Table 2: Descriptive statistics (Mean & Standard Deviation) and paired sample t-test of Experimental Group (N_1=15)) for Cycling Speed.

Cycling Speed					
Group	Number	Mean	Standard Deviation	Variance	t-value
Experimental (Pre-Test)	15	6.976	0.552	0.305	7.635
Experimental (Post-Test)	15	5.77	0.411	0.169	

A glance at Table-2 shows the Mean and Standard Deviation values of Cycling Speed of Experimental Group for Pre-Test (6.976 ± 0.552) and Post-Test (5.77 ± 0.411) respectively. In group (Experimental) the calculated *t* exceeds the critical value (7.635>2.145), so the means are significantly different for the selected degree of freedom and level of significance.

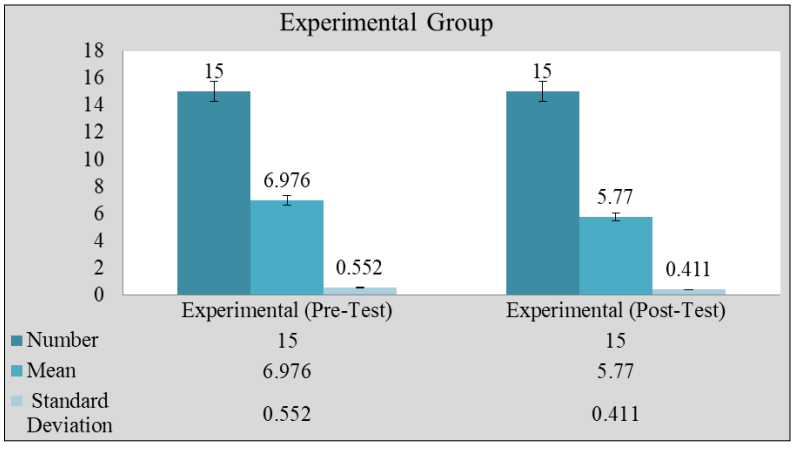

Fig 2: Descriptive statistics (Mean & Standard Deviation) of Experimental Group (N_1=15)) for Cycling Speed.

Table 3: Descriptive statistics (Mean & Standard Deviation) and paired sample t-test of Control Group (N_2=15)) for Cycling Speed.

Cycling Speed					
Group	**Number**	**Mean**	**Standard Deviation**	**Variance**	**t-value**
Control (Pre-Test)	15	6.851	0.734	0.539	1.1642
Control (Post-Test)	15	6.832	0.730	0.533	

A glance at Table-3 shows the Mean and Standard Deviation values of Cycling Speed of Control Group for Pre-Test (6.851 ± 0.734) and Post-Test (6.832 ± 0.730) respectively. In group (Control) the calculated *t* doesn't exceeds the critical value (1.1642<2.145), so the means are not significantly different for the selected degree of freedom and level of significance.

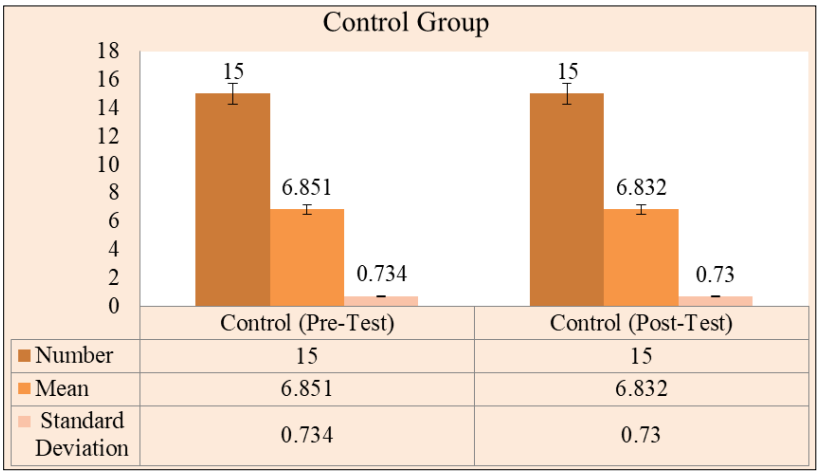

Fig 3: Descriptive statistics (Mean & Standard Deviation) of Control Group (N_2=15)) for Cycling Speed.

Discussion

The purpose of the current study was to explore the effects of 6-week core strength training on Cycling Speed in University Level Cyclists. The results of the present study indicate that significant differences were found in Cycling Speed in the Experimental Group subjected to 6-week core strength training. However, no significant changes were noted in the Control Group at the end of 6-week duration. The increments in cycling performance as observed in Experimental group could be attributed to the benefits of core strength training. According to Lee [18] core stability refers to control of the system which permits adequate transfer of forces and subsequent movements in an effortless manner. Because of varied demands placed on the body as a result of different sporting activities, a well-trained core is a necessity to reduce the risk of injury as well as to optimize the sports performance. This could be achieved by core exercises including a combination of dynamic movements with resistance. This would increment both strength and stability of the core thus providing a platform for enhanced athletic performance [16, 17].

Conclusion

This paper explored the effects 6-week core strength training on Cycling Speed in University Level Cyclists. Significant differences were found in Cycling Speed in the Experimental Group subjected to 6-week core strength training. However, no significant changes were noted in the Control Group at the end of 6-week duration.

From the findings of this study, it may be concluded that core strength training is a useful tool for the enhancement of cycling performance as is evident by the significant differences observed in the experimental group.

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