Original Article

ISSN: 2349 - 4891

International
Journal of Recent Research and Applied Studies
(Multidisciplinary Open Access Refereed e-Journal)

Effect of Various Hill Running on Stride Frequency

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Received 16th December 2014, Accepted 22nd January 2015

Abstract

The main aim of the study was to find out the effect of various hill running namely uphill, downhill and combined uphill and downhill running training on stride frequency. To achieve the purpose of this study, sixty students were selected from Departments of Physical Education& sports Sciences, Annamalai University, Tamilnadu State, India. The selected subjects age ranged from 18 to 25 years. Further they divided in to four groups. The uphill training, downhill training and combined training modules selected as independent variable and stride frequency was selected as dependent variable. The hill training period was delimited to twelve weeks in which uphill training with 3°inclination, downhill training with 3°declination and combined uphill and downhill training were given to the all there experimental groups separately and control group did not participate in any special training programme. In this study random group design was used. The selection of subjects, allotment of groups as control and experimental groups were done randomly. Data were collected before and after training programme on stride frequency. The collected data were statistically treated by using ANCOVA, and 0.05 level was fixed as a test the significance. When the obtained 'F' ratio was significant, Scheffe's post hoc test was used to find out the significant paired mean differences in all the cases, 0.05 level of confidence was fixed to test the significance, the results indicates that the uphill running, downhill running and combined running programme significantly improved stride frequency as compared to control group. But it was found that no significant variation in stride frequency among all the three experimental groups.

Keywords: Uphill Running, Downhill Running, Combined Running and stride frequency.

Introduction

The first recorded hill running took place in Scotland. King Malcolm Canmore organised a race in Braemar in 1040 or perhaps as late as 1064, reputedly to find a swift messenger. This event appears to have been a precursor to the Braemar Gathering. According to Dintiman and Ward, (2003) the running speed, stride rate, stride length, stride time, contact time, flight time and selected postural characteristics of the sprinting action were analysed unsurprisingly, it was discovered that running speeds were 9.2% faster during downhill and 3.0% slower during uphill sprints, compared with horizontal sprint running. During downhill and uphill sprint running, stride length was the main contributor to change in running speed. This increased by 7.1% for downhill sprinting and was associated with significant changes in posture at touchdown and take-off. Higdon and Hal (1992) acknowledged "Uphill intervals can be used to improve your form." "Downhill runs can teach relaxation and improve leg speed and stride." Miller and Thomas, (2002) "Steep uphill repeats (emphasize) explosive push-off...proper arm swing...form and quickness." "Gentle downhill repeats (teach) a faster than normal turnover rate" Jeff Galloway adds: "Pushing up the incline builds the lower leg muscles. With power there, one can develop a more efficient push-off, better running posture, and more strength in legs."

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Methodology

The purpose of the study was to find out the effects of various hill running such as uphill, downhill and combination of uphill and downhill running programme on stride frequency.

Subjects

To achieve the purpose of this study, sixty men students from Departments of Physical Education & sports Sciences, Annamalai University, Tamilnadu State, India, were randomly selected as subjects and their age ranged from18 to 25 years. The selected subjects were divided into four groups of 15 each. Group I underwent uphill running programme, Group II underwent downhill running programme, Group III underwent combined running programme and Group IV served as control and did not undergo any special training programme.

Variables

The uphill, downhill and combination of uphill and downhill running treatments were selected as independent variables and stride frequency was selected as dependent variables for this study.

Training Programme

The interventional treatment for experimental group-I underwent uphill running with 3°inclination, experimental group-II underwent downhill running with 3°declination and experimental group-III underwent combined running with3°inclination and 3°declination. The experimental period was for twelve weeks. On every day of the training session and the training schedule were done approximately from forty-five to sixty minutes. These included 1minute rest between the repetitions, 5 minutes rest between the set, warming up and cool down also. Group-IV was instructed not to participate in any special training programme and requested to do regular work throughout of the study. Prior to and after the training period the subjects were tested on stride frequency and it was measured by sprinting speed test.

Load Dynamics

The initial intensity of training for uphill and downhill running was fixed at 70% of the group's personal best performance. The training intensity for each distance was calculated based on the time taken to perform the particular training distance. For combined running training, the uphill and downhill running were combined and the distance was reduced to half i.e. 30 meters for each uphill and downhill so as to meet the criteria of equal distance of 60 meters.

The 70% of intensity progressively an over load the 5 repetition X 3 sets programs was implemented during I to III week. Thereafter 10 % of load was increased and maintained 4 repetition X 3 sets for IV to VI weeks. For the VII to IX weeks 10 % of load was increased and maintained 3 repetition X 3 sets than the 10 % of load was increased and maintained 2 repetition X 3 sets for X to XII weeks. The sets and repetitions. The subjects were placed under active rest in between repetitions and complete recovery between the sets and it was increased once in three weeks by 10%.

Results of the Study

Stride Frequency

The data collected during pre and post-tests among uphill running, downhill running, combined running groups and control group on stride frequency have been analysed statistically and the results are shown in table-I.

Table I. Analysis of covariance for pre- and post-test data on stride frequency among uphill, downhill, combined running groups and control group

	Uphill Running Group	Downhill Running Group	Combined Running Group	Control Group	SOV	Sum of Squares	df	Mean Squares	'F' ratio
Pre-Test									
Mean	4.102	4.131	4.121	4.112	B:	0.007	3	0.002	0.072
S.D	0.20	0.20	0.15	0.17	W:	1.843	56	0.033	
Post-Test									
Mean	4.259	4.293	4.373	4.141	B:	0.420	3	0.140	4.18*
S.D	0.16	0.17	0.22	0.17	W:	1.876	56	0.034	
Adjusted Post-Test									
Mean	4.271	4.281	4.370	4.144	B:	0.387	3	0.129	9.10*
					W:	0.781	55	0.014	

** Significant at 0.05 level of confidence.*
df-degrees of freedom; SD-Standard Deviation; S.O.V.-Source of Variance. B-Between; W-Within
The table value required for significance at 0.05 level with df 3 & 56, and 3 & 55 are 2.776 and 2.78 respectively.

As shown in Table-I, the pretest mean on stride frequency of uphill running group is 4.102 with standard deviation ± 0.20, downhill running group is 4.131 with standard deviation ± 0.20, combined running group is 4.121 with standard deviation ± 0.15 and control group is 4.112 with standard deviation ± 0.17. The obtained 'F' ratio 0.072 is less than the table value of 2.776 required for df 3 and 56 at 0.05 level of significance. It is inferred that there is statistically no significant variation among experimental groups and control group before the commencement of training programme.

The results presented in Table-1, the post test mean on stride frequency of uphill running group is 4.259 with standard deviation ± 0.16, downhill running group is 4.293 with standard deviation ± 0.17, combined running group is 4.373 with standard deviation ± 0.22

and control group is 4.141 with standard deviation ± 0.17. The 'F' ratio of 4.18 arrived at by the statistical calculation is higher than the table value of 2.776 required for df 3 and 56 at 0.05 level of significance. It reveals that all the four groups have demonstrated significant variations on stride frequency at the end of training programme. The adjusted post test mean on stride frequency of uphill running group is 4.271, downhill running group is 4.281, combined running group is 4.370 and control group is 4.144, which resulted with an 'F' ratio of 9.10 and it is higher than the table value of 2.78 required for df 3 and 55 at 0.05 level of significance. It is found that significant differences exist among the four groups on stride frequency after adjusting the initial mean differences on the post-test means. In order to determine which of the paired means have significant differences, Scheffe's test was computed and it is presented in table-II.

Table II. Scheffe's test for the differences between the adjusted post-test paired means of stride frequency

Adjusted Post-Test Means				Means Differences
Uphill Running Group	**Downhill Running Group**	**Combined Running Group**	**Control group**	
4.271			4.144	0.127*
	4.281		4.144	0.137*
		4.370	4.144	0.226*
4.271		4.370		0.099
	4.281	4.370		0.089
4.271	4.281			0.010

** Significant at 0.05 level.*
The confidence interval required for significance at 0.05 level is 0.123.

An examination of the table-II indicates that the adjusted post-test mean difference between control group and uphill running group, control group and downhill group and between control group and combined group consisting of uphill and downhill running are 0.127, 0.137 and 0.226 respectively which are higher than the confidence interval value of 0.123 at 0.05 level of significance. It is inferred that the twelve weeks of uphill, downhill and combined running programme have significantly improved stride frequency in three experimental groups as compared to the control group.

Table-II also shows the mean difference between uphill running group and combined running group is 0.099, downhill running group and combined running group is 0.089 and uphill and downhill running groups is 0.010 which are lower than the confidence interval value 0.123 at 0.05 level of significance. The result reveals that all the three experimental groups have no significant changes in stride frequency among the experimental groups.

Discussion on Findings

The results proved that the adjusted mean difference between uphill running group and control group is 0.127, downhill running group and control group is 0.137 and between combined running group and control group is 0.226. It was found that all the three experimental running programme treatments such as uphill running, downhill running and combined running groups significantly improved stride frequency as compared to control group. The results shows that the mean difference between uphill running group and combined running group is 0.099, downhill running group and combined running group is 0.089 and uphill and downhill running groups is 0.010 The result reveals that there was no significant changes among the experimental groups in stride frequency.

The findings of speed parameter of this study was in agreement to the findings of Kristine and Claire (2011) the hill running (3°uphill and 3°downhill) changed stride frequency systematically. Paradisis, et al., (2009) who reported that the effects of 8 week sprint running training on sloping surfaces (3°) (uphill-downhill) improved step rate.This study is also in agreement with the findings of Paradisis, et al., (2006) who stated that the effects of 6 week sprint running training on sloping surfaces (3°) (uphill-downhill) improved step rate of physical education students. This study is again in agreement with the findings of Paradisis and Cooke (2001) detailed the effects of sprint running on (a) uphill at 3°, (b) downhill at 3° and (c) horizontal. The uphill-downhill running improved step rate male students.

Conclusions

It was concluded that the uphill running, downhill running and combined running programme significantly improved stride frequency as compared to control group. It was found that no significant variation in stride frequency among all the three experimental groups.

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