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PHYSICAL EDUCATION

EFFECT OF DIFFERENT SLOPING SURFACE RUNNING ON ACCELERATION SPEED

Dr. K. SEKARBABU

Assistant Professor, Department of Physical Education & Sports Sciences, Annamalai University, Chidambaram, Tamilnadu, India.

Abstract

The purpose of this study was to compare the effect of different sloping surface such as uphill, downhill and combined running programme on acceleration speed. Total 60 male students were selected randomly as subjects from Departments of Physical Education & sports Sciences, Annamalai University, Tamilnadu State, India. The age group of the subjects was between 18-25 years. The subjects were divided into four groups, each group consisting of 15 subjects. Group-1 undergone uphill running, Group-2 was undergone downhill and Group-3 undergone combined uphill and downhill running. The Group-4 was Control Group and did not participate in any specific training. The experimental groups were undergone training for three alternate days in a week for totally 12 weeks. This study was restricted to selected sprint variable such as Acceleration Speed. Acceleration speed was tested by sprinting speed test. The data were examined by applying analysis of Covariance and the level of significance was set at 0.05 levels. Based on the analysis of statistical results, it was clearly evident that uphill running, downhill running and combined running programmes gave the similar result that is improved acceleration speed when compared to control group. There were significant result were found between experimental groups. The combined running programme significantly improved acceleration speed as compared to uphill running and downhill running groups. Downhill running programme significantly improved acceleration speed as compared to uphill running group.

Keywords: Uphill Running, Downhill Running, Combined Running and acceleration speed.

INTRODUCTION

Hill running has a strengthening effect as well as boosting athlete's speed and is ideal for those athletes who depend on high running speeds - football, rugby, basketball, cricket players and even runners. To reduce the possibility of injury hill training should be conducted once the athlete has a good solid base of strength and endurance.

The running uphill is the easiest, than running on the flat surface, and the most difficult is downhill running varies. In this kind of running runner can't do most of the things, which one have a luxury to do in running on the flat surface. The hill doesn't allow us to over-stride, or land on the heel, or do a push off as it is very costly for muscles and the whole body. The runners have to increase the stride frequency due to the reduction of the stride length (shortening the steps) and the necessity to maintain a stable speed or pace of running. In uphill running runners have to be in the same leaning forward position as on the flat course, but have to run with shorter steps and a bit higher stride frequency, and still have to keep their body weight on the balls of the feet and pull the feet from the ground under the hips. One's runner may feel as if they are leaning more, but it is just their feeling coming from the degree of inclination of the hill. On a steeper hill they have an even stronger leaning forward feeling.

Speed is one of the important fundamental motor qualities. The speed factors which determine success in almost every sports and games and more among athletes. It is very important as a means of all round development of an individual. Exercises and training have beneficial effects on the development of human organism. By practicing the basic form of motor activities improve the coordination of organism, efficient solutions of physical task in everyday life and further more to the motor development of human being.There is lot of dispute is there on developing acceleration speed, some athletes are weaker in acceleration zone, some sprinters are failed in maintaining the maximum speed, the author found a solution to solve this type of problems by a package of training to improve acceleration through the training of different sloping surface such as uphill, downhill and combined running programme.

METHODOLOGY

The purpose of the study was to find out the effect of different sloping surface such as uphill, downhill and combined running programme on acceleration speed. To achieve this purpose of the study sixty men students from Departments of Physical Education & sports Sciences, Annamalai University, Tamilnadu State, India, were selected as subject and their age ranged from 18 to 25 years. The subjects were divided into four groups randomly. The groups were named as uphill running group, downhill running group, combined running group and control group. The former

three groups underwent their respective hill running training and the last group acted as control. The subjects were compared on the effect of uphill, downhill and combined training on acceleration speed before and after respective experimental treatment.

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 acceleration speed 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%.

STATISTICAL ANALYSES

The obtained data on acceleration speed was analysed statistically by analysis of covariance (ANCOVA) and Scheffe's post-hoc test was used when the adjusted post test means were found to be significant. In all the cases, 0.05 level of confidence was fixed to test the significance and was considered as appropriate.

RESULTS

ACCELERATION SPEED

The data collected during pre and post-tests among uphill running, downhill running, combined running groups and control group on acceleration speed have been analyzed statistically and the results are shown in table-1.

TABLE-I

ANALYSIS OF COVARIANCE FOR PRE- AND POST-TEST DATA ON ACCELERATION SPEED 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	4.717	4.687	4.755	4.735	B:	0.037	3	0.012	0.326
S.D	0.180	0.174	0.210	0.210	W:	2.097	56	0.037	
Post-Test									
Mean	4.604	4.488	4.417	4.725	B:	0.822	3	0.274	6.905*
S.D	0.197	0.179	0.210	0.208	W:	2.222	56	0.040	
Adjusted Post-Test									
Mean	4.610	4.524	4.386	4.714	B:	0.865	3	0.288	105.538*
					W:	0.150	55	0.003	

** 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-1, the pretest mean on acceleration speed of uphill running group is 4.717 with standard deviation ± 0.180, downhill running group is 4.687 with standard deviation ± 0.174, combined running group is 4.755 with standard deviation ± 0.210 and control group is 4.735 with standard deviation ± 0.210.

The obtained 'F' ratio 0.326 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 acceleration speed of uphill running group is 4.604 with standard deviation ± 0.197, downhill running group is 4.488 with standard deviation ± 0.179, combined running group is 4.417 with standard deviation ± 0.210 and control group is 4.725 with standard deviation ± 0.208. The 'F' ratio of 6.905 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 acceleration speed at the end of training programme.

The adjusted post test mean on acceleration speed of uphill running group is 4.610, downhill running group is 4.524, combined running group is 4.386 and control group is 4.714, which resulted with an 'F' ratio of 105.538 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 acceleration speed 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 ACCELERATION SPEED

Adjusted Post-Test Means				Means Differences
Uphill Running Group	**Downhill Running Group**	**Combined Running Group**	**Control group**	
4.610			4.714	0.104*
	4.524		4.714	0.190*
		4.386	4.714	0.328*
4.610		4.386		0.224*
	4.524	4.386		0.138*
4.610	4.524			0.086*

** Significant at 0.05 level.*
The confidence interval required for significance at 0.05 level is 0.057.

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 0.104, 0.190 and 0.328 respectively which are higher than the confidence interval value of 0.057 at 0.05 level of significance.

It is inferred that the twelve weeks of uphill, downhill and combined running programme have significantly improved acceleration speed 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 0.224, downhill running group and combined running group is 0.138 which are more than the confidence interval value 0.057 at 0.05 level of significance. The result reveals that the combined running group has shown significant improvement in acceleration speed as compared to the uphill and downhill running groups.

The mean difference between uphill and downhill running groups is 0.086 and it is lower than confidence interval value of 0.057 at 0.05 level of significance. The result shows that the uphill running group and downhill running group have significant difference on acceleration speed among themselves.

DISCUSSION ON FINDINGS

The post hoc analysis presented in Table-2 proved that the adjusted mean difference between uphill running group and control group is 0.104, downhill running group and control group is 0.190 and between combined running group and control group is 0.328. It was found that all the three experimental running programme treatments such as uphill running, downhill running and combined running groups significantly improved acceleration speed as compared to control group. The significant difference between the means of the combined running and uphill running, combined group and downhill training group proved that combined running group was significantly better than uphill running and downhill running groups on acceleration speed.

Table-2 also resulted that the mean difference between uphill running group and combined running group is 0.224, and downhill running group and combined running group is 0.138. The result reveals that the combined running group has significant improvement in acceleration speed as compared to the uphill and

downhill running groups.

The mean difference between uphill and downhill running groups is 0.086 and the result shows that the downhill running group shows significant difference on acceleration speed as compared to uphill running group.

The findings of speed parameter of this study was in agreement to the findings of Paradisis, et al., (2009) who reported that the effects of 8 week sprint running training on sloping surfaces (3°) improved maximum running speed(MRS).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°) improved maximum running speed (MRS). 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 running speed. Ebben (2008) analyzed that the optimal slope for over speed running training improved acceleration speed by 40-yd sprints performed on hill slopes. Cissik (2005) stated that 6 week uphill-downhill running training program increased speed. Zafeiridis et al., (2005) proved that uphill-downhill running improved acceleration speed. These findings supported the findings of acceleration speed of present study.

CONCLUSIONS

It was concluded that the uphill running, downhill running and combined running programme significantly improved acceleration speed as compared to control group. Combined running programme significantly improved acceleration speed as compared to uphill running and downhill running groups. Downhill running programme significantly improved acceleration speed as compared to uphill running group.

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