

Analysis of the Effect of Progressive Speed Training on Tribal and Non-tribal School Boys

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Abstract: Sprint training should start at the early stages of the athletes considering the importance of it as one of the most important motor abilities to achieve the best performance of the athlete at the desired age. The study aims to identify the progression of progressive speed training basis on the duration of training of the Santali tribe and Bengali high school boys. Subjects were Santali tribe and Bengali adolescent schoolboys and their ages ranged between 13 to 15 years selected from Bankura District of West Bengal, India. These two groups were further divided into control and experimental groups and in each of the groups, there were 20 students. Initially, 4 weeks of uniform conditioning training was given to all groups before the pretest T1 was conducted. Further, consecutively 3 more post-tests (T2, T3, & T4) were conducted after every 4 weeks providing progressive speed training. In the descriptive part Mean trimming was revealed. For the comparison of performed Tests timing, MANOVA, ANOVA, and LSD post hoc test were employed. The result of the study reveals that Non-tribal (Bengali) and Tribal (Santali) adolescent schoolboys responded positively with the designed progressive speed training. This progression of sprint test timing took place progressively over time on the Bengali and Santali boys distinctly within the groups. Progression of Bengali boys took place from Test 1 to Test 2 numerically but not statistically, which is the dissimilarity in the process of progression of speed ability with the Santali boys. It is concluded that alike progressive speed training is equally effective for the Santali tribe and Bengali schoolboys but the progression of Bengali Boys begins a bit slower in the early stages than the Santali tribe in the sprint ability.

Keywords: Progressive Sprint Training, Santali, Bengali, Adolescent

1. Introduction

To bring the athletes to the topmost position in a competition Coaches need to take cutting edge preparation in training in this 21st century of the advanced technological era. The prime need of all sports is to develop all the motor abilities of the athletes including speed for maximum output of their sports performance. To keep own athletes edge over the competition, developing their sprinting ability has enormous importance [1]. The higher velocity of a sprint only can be attained by multiplying stride frequency with stride length [2]. For the improvement of sprinting speed, both aspects must be improved [3]. In addition, reaching the utmost velocity as fast as possible is another essential ability of the player that also needs to address properly [4]. Stride length in sprinting is a

mechanical issue of Biomechanics that depends greatly on skeletal and postural structure and economic use of these [5]. The myocellular foundation of the muscles is a determinant factor for success in high-level sprint competition [6].

Many pieces of research took place on sprint training because it is one of the vital capabilities that determine the better performance of most sports [7]. There are a large number of established training methods available to the knowledge base of the science of sports training to augment the sprinting ability of the players [8–10]. Developing sprinting ability is a lifelong process and growth, maturity, training, and the aging process are the determinant factor [7, 11, 12]. By ensuring proper recovery in the long term progressive loading training, it is only possible to achieve and sustain performance [13], this type of training reduces the risk of injury and further development of performance.

There is a great danger of injury if the loading process takes place faster than adaptation and increased illicitly [14].

Each population groups vary according to their body structure, mass, growth, and figure [15]. These differences exist in different ethnic groups due to the genetic and environmental mysterious amalgamation [16]. The major three distinguishable races are Mongoloid or Asiatic, Caucasian or White, and Negroid or Black [17]. These groups stand alone based on their different traits. Differences within a racial group do not limit themselves [18–21] but also distinct features of anthropology and morphology are evidenced in its subdivisions [22]. Designing a uniform standard for all racial groups and their subdivisions is an unrealistic approach [23].

Santali population anthropologically belongs to the Proto-Australoid group [24]. The Santali population is short in height, skin color is dark brown to nearly black, the head is dolichocephalic, the nose is broad & flat and depressed at the root, hair is wavy and/or curly, and supraorbital ridges are prominent [25]. Bengali people originated from an Indo-Aryan ethnic group [26]. Some other findings also suggest that genetic traces exist in the Bengali population of Proto-Australoids, Mongoloids, and Caucasoids, these influences shaped Bengali as broad head, dark in complexion, plentiful hair on the face, built with medium stature, medium nose [27]. Therefore, it is clear that there is a difference in anthropology and morphology between Santali and Bengali populations though they share the same land as habitant. Thus, the purpose of the study is to identify whether there is

any difference in response to the progressive speed training between Bengali and Santali adolescent boys. The study aims at identifying the progression of progressive speed training basis on the duration of training of the Santali tribe and Bengali young boys.

2. Method and Materials

2.1. Selection of Subject

Subjects racially belong to the Bengali and Santali tribe. These two groups were further divided randomly into control and experimental groups. In each group, there were 20 students and altogether 80 students for 4 groups in the study. The age range of the students was 13 to 15 years. The speed training was administered in the year 2018 for subsequent data collection.

Training Protocol

Firstly, the stratified sampling method was adopted for strata school students into Bengali and Santali Tribe. Secondly, the random sampling method was adopted on both the primary groups to subdivide into control and experimental groups. All the selected students have been given identical 4 weeks of conditioning training of general nature, then their performance in 60 meter sprint test was recorded. Further, 4 weeks of progressive speed training have been given on experimental groups only in 3 spells and then after every spell of training same test was repeated on the experimental and control groups to collect time data.

Table 1. Pre Test Conditioning Training for All for 4 Weeks.

Components	Activity	Time	Repetition	Total Time
Activation	Jogging	2 min.		
	Medium Pace Run	2 min.		
	Free-hand Exercise			8 min.
	Rotational Exercise	1 min.		
	Stretching Exercise	1 min.		
Acceleration Races	Short Sprint (with active rest)	2 min.		
	30-meter dash (with active rest)	8 min.	6 times	8 min.
	Quadriceps And Calf Muscle Exercise (with active rest)			(5+5+5)=1
	(i) One leg hopping			
	(ii) Two-leg hopping			
Strength Training	(iii) Box jump	5 min		5 min.
	(iv) Running with high knee action			
	(v) Forward, backward and sideward running			
	Abdominal muscle exercise (with active rest)			
	(i) Sit-ups			
	(ii) Flutter kicks	5 min.		
	(iii) Squats			
	(iv) Bicycle crunches			
	Burpee exercise (with active rest)			
	(i) Jumping jack			
Agility Training	(ii) Frog jump	5 min.		
	(iii) Spot jump			
	(iv) Hop squat burpee			
	(i) Shuttle run (with active rest)	4 min.	2 times	8 min.
Flexibility Exercises	(ii) Potato run (with active rest)	4 min.	1 time	
	(i) All variety stretching exercises (with active rest)	4 min.		8 min.
Cardio-vascular Endurance Training	(ii) Stretching exercises with a partner (with active rest)	4 min.		
	Continuous run and Interval run	13 min.		13 min.
Grand Total Time of Conditioning Program				60 min.
Deactivation				15 min.
Grand Total Session Time				75 min.

Table 2. Progressive Speed Training Schedule.

Week	Preparatory phase (General warming-up)	Specific Warming up				
		Speed Training Item (General)	Frequency Repetition	Duration	Active Rest	Total Duration
1 st - 4 th	10 min.	10 Items: Jump Squat, Jump Lunges, Lateral Bound, A Skips, Reverse Lunge Knee Drive, Tuck Jump, High Knees, Heel Flicks, Kneeling Jumps, and Calf Jumps.	One time each	5 min. (Each item 30 sec.)	4 min. 30 sec.	19 min. 30 sec.
5 th - 8 th	10 min.	Do	Two times each	10 min. (Each item 30 sec.+ 30 sec.)	4 min. 30 sec.+ 1 min.+ 4 min. 30 sec. = 10 min.	30 min.
9 th - 12 th	10 min.	Do	three times each	15 min. (Each item 30 sec.+ 30 sec.+ 30 sec.)	4 min. 30 sec.+ 1 min.+ 4 min. 30 sec.+ 1 min.+ 4 min. 30 sec.= 15 min. 30 sec.	40 min. 30 sec.

Table 2. Continued.

Week	Specific speed training program		
	Day-1	Day-2	Day-3
1 st - 4 th	80-meter run,	(30 meter run x 3 time) x 2 repetition.	(80 meter run x 3 time) x 1 repetition.
	90-meter run,	(50 meter run x 2 time) x 2 repetition.	(90 meter run x 2 time) x 1 repetition.
	110-meter run,	(80 meter run x 2 time) x 1 repetition.	(110 meter run x 2 time) x 1 repetition.
	120-meter run and 150-meter run. (Walk back recovery 70%-80% intensity).	(Walk back recovery 60%-80% intensity).	(120 meter run x 1 time) x 1 repetition. (Walk back recovery 60%-80% intensity).
5 th - 8 th	(30 meter run x 3 time) x 3 repetition.	110-meter run,	(60 meter run x 2 time) x 2 repetition.
	(40 meter run x 2 time) x 3 repetition.	90-meter run,	(80 meter run x 1 time) x 2 repetition
	(50 meter run x 1 time) x 3 repetition.	80-meter run,	(90 meter run x 2 time) x 1 repetition.
		90-meter run and 110-meter run. (Sub maximum effort).	(Sub maximum effort).
9 th - 12 th	(30 meter run x 3 time) x 4 repetition.	80-meter run,	(60 meter run x 2 time) x 2 repetition.
	(40 meter run x 3 time) x 4 repetition.	90-meter run,	(80 meter run x 3 time) x 1 repetition.
	(50 meter run x 2 time) x 2 repetition.	110-meter run and 120-meter run.	(90 meter run x 2 time) x 1 repetition.
	(Full effort).	(Maximum effort).	(Maximum effort).

2.2. Materials

For the collection of the timing as data of 60 meter (m) speed test standard stopwatch was used, to record the given performance score sheets, and a well-marked track on the grass field were used too for data collection.

2.3. Scoring Method

Timekeepers had been given sufficient enough practice to familiarize themselves with the stopwatch operation well before data collection. Participants took the required individual warm-up time before the 60-meter speed test. They had been given enough verbal and practical demonstration of the test and motivation before taking the test. The timing of a single trial was recorded as a test score.

2.4. Statistical Procedure

In the descriptive statistics, Mean valued has been revealed to see numerical differences. To establish the differences in the performances one-way MANOVA & ANOVA, and LSD

as a post hoc test has been employed. The level of significance was $\alpha = 0.05$.

3. Analysis of Data and Results

3.1. Analysis of Data

Bar Chart Figure 1 of 60-meter Sprint test mean timing for numeric interpretation of four tests within each group shows that in the Experimental groups' tests timings sharply decline that means performance improved as non-tribal (Bengali) Experimental mean timing T1, T2, T3, & T4 are 9.95, 9.47, 9.00 & 8.61 respectively, and tribal (Santali) Experimental mean timing T1, T2, T3, & T4 are 10.03, 9.52, 8.99 & 8.26 respectively. On the other hand, in both the Control groups slightly performance decline that the mean timings of the tests more or less increased with slight fluctuation as non-tribal Control mean timing 10.09, 10.20, 10.27 & 10.24 successively of T1, T2, T3, & T4, and tribal Control mean timing 10.06, 10.19, 10.18 & 10.24 successively of T1, T2, T3, & T4.

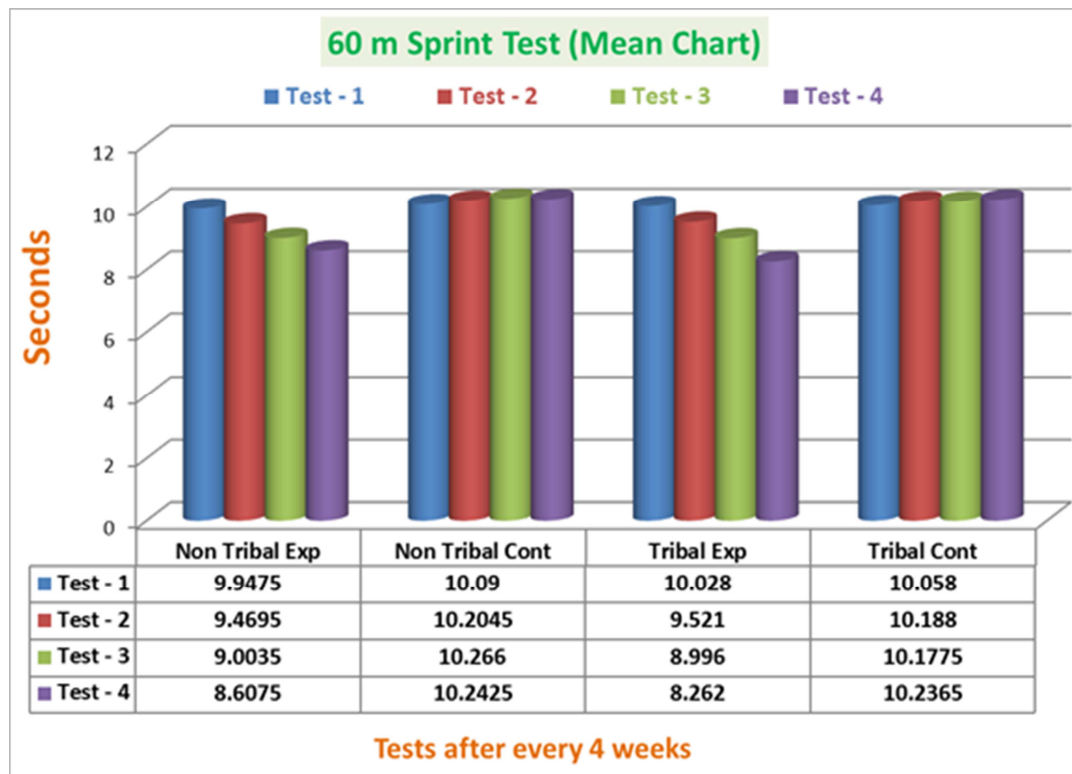


Figure 1. 60 m Sprint Test Mean Chart within the Groups.

Table 3. MANOVA Test Table of 60 m Sprint Test among the Groups.

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power ^d
Intercept	Pillai's Trace	.999	20467.394 ^b	4.000	73.000	.000	.999	1.000
	Wilks' Lambda	.001	20467.394 ^b	4.000	73.000	.000	.999	1.000
	Hotelling's Trace	1121.501	20467.394 ^b	4.000	73.000	.000	.999	1.000
	Roy's Largest Root	1121.501	20467.394 ^b	4.000	73.000	.000	.999	1.000
Between Tests	Pillai's Trace	.612	4.804	12.000	225.000	.000	.204	1.000
	Wilks' Lambda	.395	6.777	12.000	193.431	.000	.266	1.000
	Hotelling's Trace	1.513	9.037	12.000	215.000	.000	.335	1.000
	Roy's Largest Root	1.501	28.150 ^c	4.000	75.000	.000	.600	1.000

a. Design: Intercept + Between Tests
b. Exact statistic
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. Computed using alpha = .05

The result of MANOVA Table 3 describes that there was a statistically significant difference in the four groups together, non-tribal Control & Experimental, and tribal Control & Experimental pretest in 60 m Sprint test performance after every four weeks of speed training, on the combined dependent variable, Pillai's Trace = .612, $F(12, 225) = 4.804$, $p < .001$, partial $\eta^2 = .204$, observed power = 1.00. Based on

the result, evidence was enough to reject the null hypothesis and conclude that tests combined significantly differed based on the type of tests conducted. The effect size of the test was large. Cohen (1962, p 368) suggests that effect size: small = .01, medium = .06, and large = .14 [28, 29]. The observed power was 1.00, demonstrating that there was a 100% possibility that the outcome could have come out significant.

Table 4. ANOVA Tests of Between-Subjects Effects.

Source	Dependent Variable	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power ^e
Between Tests	Non-tribal Exp.	3	6.720	4.686	.005	.156	.880
	Non-tribal Cont.	3	.122	.241	.867	.009	.094
	Tribal Exp.	3	11.400	30.770	.000	.548	1.000
	Tribal Cont.	3	.115	.403	.751	.016	.127
Error	Non-tribal Exp.	76	1.434				
	Non-tribal Cont.	76	.505				
	Tribal Exp.	76	.371				
	Tribal Cont.	76	.285				

e. Computed using alpha = .05

Table 4 describes that each ANOVA was tested with the Bonferroni method at $\alpha = .05$ level. Results confirmed that there was enough evidence to reject the null hypothesis for Non-tribal Experimental and tribal Experimental groups' post-tests. Non-tribal Experimental Group: $F(3, 76) = 4.686$, $p > .001$, partial $\eta^2 = .156$, observed power = .880. Tribal Experimental Group: $F(3, 76) = 30.770$, $p < .001$, partial $\eta^2 = .548$, observed power = 1.000. The effect size of both the Experimental groups was large for all post-test

ANOVAs. Statistically, significant differences exist among the dependent variables' scores of both tribal and Non-tribal Experimental Groups. The observed power of .880 & 1.000 respectively for the Non-tribal Experimental group and tribal Experimental group indicated that there were 88%, & 100% chances that the result could have come out significant for all analyses. On the contrary, no statistically significant differences have been reported in both control groups.

Table 5. Multiple Comparisons among Dependent Variables within the Test, LSD.

Dependent Variable	(I) Between Tests	(J) Between Tests	Mean Difference (I-J)	Std. Error	Sig.
Non-tribal Exp.	Test 1	Test 2	.4780	.37872	.211
		Test 3	.9440*	.37872	.015
		Test 4	1.3400*	.37872	.001
	Test 2	Test 1	-.4780	.37872	.211
		Test 3	.4660	.37872	.222
		Test 4	.8620*	.37872	.026
	Test 3	Test 1	-.9440*	.37872	.015
		Test 2	-.4660	.37872	.222
		Test 4	.3960	.37872	.299
	Test 4	Test 1	-1.3400*	.37872	.001
		Test 2	-.8620*	.37872	.026
		Test 3	-.3960	.37872	.299
Non-tribal Cont.	Test 1	Test 2	-.1145	.22472	.612
		Test 3	-.1760	.22472	.436
		Test 4	-.1525	.22472	.499
	Test 2	Test 1	.1145	.22472	.612
		Test 3	-.0615	.22472	.785
		Test 4	-.0380	.22472	.866
	Test 3	Test 1	.1760	.22472	.436
		Test 2	.0615	.22472	.785
		Test 4	.0235	.22472	.917
	Test 4	Test 1	.1525	.22472	.499
		Test 2	.0380	.22472	.866
		Test 3	-.0235	.22472	.917
Tribal Exp.	Test 1	Test 2	.5070*	.19248	.010
		Test 3	1.0320*	.19248	.000
		Test 4	1.7660*	.19248	.000
	Test 2	Test 1	-.5070*	.19248	.010
		Test 3	.5250*	.19248	.008
		Test 4	1.2590*	.19248	.000
	Test 3	Test 1	-1.0320*	.19248	.000
		Test 2	-.5250*	.19248	.008
		Test 4	.7340*	.19248	.000
	Test 4	Test 1	-1.7660*	.19248	.000
		Test 2	-1.2590*	.19248	.000
		Test 3	-.7340*	.19248	.000
Tribal Cont.	Test 1	Test 2	-.1300	.16885	.444
		Test 3	-.1195	.16885	.481
		Test 4	-.1785	.16885	.294
	Test 2	Test 1	.1300	.16885	.444
		Test 3	.0105	.16885	.951
		Test 4	-.0485	.16885	.775
	Test 3	Test 1	.1195	.16885	.481
		Test 2	-.0105	.16885	.951
		Test 4	-.0590	.16885	.728
	Test 4	Test 1	.1785	.16885	.294
		Test 2	.0485	.16885	.775
		Test 3	.0590	.16885	.728

Based on observed means.

The error term is Mean Square (Error) = .285.

*. The mean difference is significant at the .05 level.

Table 5 Explains that each comparison was made with LSD method at $\alpha = .05$ level of significance. LSD

comparisons illustrates an interesting result that in the post test 60 m Sprint Non-tribal Experimental group significant statistical differences have been made in the comparison between Test-1 ($M = 9.95$) with Test- 3 ($M = 9.00$) & Test- 4 ($M = 8.61$), Test- 2 ($M = 9.47$) & Test- 4 ($M = 8.61$), Further, in the 60 m Sprint Tribal Experimental group statistically significant differences have been observed in the comparison of Test-1 ($M = 10.03$) with Test- 2 ($M = 9.52$) & Test- 3 ($M = 8.99$) & Test- 4 ($M = 8.26$), Test- 2 ($M = 9.52$) & Test- 3 ($M = 8.99$) & Test- 4 ($M = 8.26$), Test- 3 ($M = 8.99$) & Test- 4 ($M = 8.26$). In contrast, no statistical significant difference is observed in the tests' scores within the control groups.

3.2. Results

60 m sprint test timing persistently decreased that mean performance improved for both the experimental groups of the Bengali and the Santali tribe. On the other hand, control groups of the Santali tribe and Bengali students almost slightly progressively increased test timing that means performance decreased progressively in the 60 m sprint test. Further, resolute of the progressive speed training reflected on experimental groups as all the test scores differ significantly with each other within the experimental groups of Santali tribe and Bengali adolescence schoolboys with an exception between Test-1 & Test-2 of the Bengali students although numeric progress is evidenced.

4. Discussions

60 m sprint test timing persistently decreased that mean performance improved for both the experimental groups of the Bengali and the Santali tribe. The phenomenon of progression of continuous performance of sprint test timing most probably has resulted in both the experimental groups of the Santali and Bengali students due to the positive effect of progressive speed training. As well planned long-term progressive loading training ensures performance development and sustainability [13]. The distinct nature of speed performance development takes place due to the racial differences that exist between these two groups [16], though they inhabit the same geographic area. The racial groups and even sub-divisions of these racial groups respond differently with speed training [23]. Since distinct features of anthropology and morphology are evidenced among the major racial divisions and in subdivisions of these [22]. Bengali people originated from an Indo-Aryan ethnic group [26] and genetic traces exist in the Bengali population of Proto-Australoids, Mongoloids, and Caucasoids [27]. In contrast, the Santali tribe anthropologically belongs to the Proto-Australoid group [24]. This racial difference might have played a role differently in the pattern of speed development. On the other hand, control groups of the Santali tribe and Bengali students almost slightly increased test timing progressively that the mean performance of the 60 m sprint test timing progressively decreased. Among the students of control groups of tribal and non-tribal students almost continuous

deterioration in test performance phenomenon occurred may be due to not to receive any training persistently after conditioning training as their counterparts. Reasons may be the same as described for the result of significant difference in the improvement of the speed test performance within the experimental groups and not becoming statistically significant difference within the control groups of both the groups of Santali tribe and Bengali adolescent boys. The reason to display different patterns in the development of sprint performance in the experiment groups may be due to a few racial differences that exist between the Bengali and Santali tribe [24, 26, 27]. As scientific progressively loaded speed training only ensure improvement of performance [7, 11, 12, 30], leading to the assumption that control groups successively lose their performances in the mean values over the time as they were withdrawn from the training after the conditioning program despite no significant statistical difference was evidenced.

5. Conclusion

Alike progressive speed training is equally effective for the Santali tribe and Bengali schoolboys but the progression of Bengali Boys begins a bit slower in the early stages than the Santali tribe in the sprint ability.

6. Recommendation

The findings of the present study would help Physical Education Teachers and Coaches to provide progressive speed training to Bengali and Santali tribe schoolboys and understanding their unique performance development phenomenon. Further research on the same topic with larger sample size and the cohort of different age groups may reveal better perception as the populations of these two ethnicities are large enough.

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