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Relationship among Speed Agility and Reaction Time

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ABSTRACT

The aim of this study was to determine the relationship among reaction time (auditory and visual) and speed (50yds sprint time) and agility of physical education students. A total of 40 male physical education students with an average age, height and weight of 25.03 ± 5.34 years, 167.31 ± 15.51 cm and 57.3 ± 5.63 kg, respectively, volunteered as subject of this study. Each subject's reaction time and speed, agility were measured, and the data analyzed using Pearson's correlation and paired t tests. There were no meaningful correlations between reaction time and speed in the subjects, where as there was significant correlation between visual reaction time and agility and between speed and agility. However, there was a significant difference in between auditory and visual reaction time.

KEYWORDS: reaction time, speed, agility, physical education students

Introduction:

The important fitness component required in sports is speed, or capacity to travel or move very quickly. From a mechanical point of view, speed is expressed through a ratio between space and time. The term *speed* incorporates three elements: (1) reaction time; (2) frequency of movement per time unit; and (3) speed of travel over a given distance (Bompa 1994). Studies have revealed that reaction time is independent of speed (Paradis et al. 2004; Yakut 2004).

At present, there is no consensus in the sports science community for a clear definition of agility. Agility has classically been defined as simply the ability to change direction rapidly (Bloomfield, Ackland, & Elliot, 1994; Clarke, 1959; Mathews, 1973), but also the ability to change direction rapidly and accurately (Barrow & McGee, 1971; Johnson &Nelson, 1969). In more recent publications, some authors have defined agility to include whole-body change of direction as well as rapid movement and direction change of limbs (Baechle, 1994; Draper & Lancaster, 1985).

Reaction time is the interval between the onset of a signal (stimulus) and the initiation of a movement response (Magill 1998). For about 120 years, the accepted figures for mean simple reaction times for college-age individuals have been about 190 ms (0.19 sec) for light stimuli and about 160 ms for sound stimuli (Galton, 1899; Fieandt *et al.*, 1956; Welford, 1980; Brebner and Welford, 1980). The pioneer reaction time study was that of Donders (1868). He showed that a simple reaction time is shorter than a recognition reaction time, and that the choice reaction time is longest of all. Laming (1968) concluded that simple reaction times averaged 220 ms but recognition reaction times averaged 384 msec. Simple reaction time shortens from infancy into the late 20s, then increases slowly until the 50s and 60s, and then lengthens faster as the person gets into his 70s and beyond (Welford, 1977; Jevas and Yan, 2001; Luchies *et al.*, 2002; Rose *et al.*, 2002; Der and Deary, 2006). Luchies *et al.* (2002) also reported that this age effect was more marked for complex reaction time tasks, and Der and Deary (2006) concurred. Bellis (1933) reported that mean time to press a key in response to a light was 220 ms for males and 260 ms for females; for sound the difference was 190 ms (males) to 200 msec (females). In comparison, Engel (1972) reported a reaction time to sound of 227 ms (male) to 242 ms (female).

With this backdrop, the researcher made an attempt to examine if there is any relationship among speed, agility and reaction time of the students pursuing B.P.Ed program.

Methods:

Subjects

The subjects in this study were 40 male physical education students. The age, height and weight of the subjects of the present study were 25.03 ± 5.34 years, 167.31 ± 15.51 cm and 57.3 ± 5.63 kg respectively.

Procedure

Data were collected in the laboratories at the Department of Physical Education, Jadavpur University, Kolkata. The body weights and heights of the subjects were measured with portable weighing machine and stadiometer. 50yds sprint and 10 x 4yds shuttle run were conducted in the field to measure the speed and agility of the subjects respectively. Visual and auditory reaction times for both hands were measured using Online Reaction Time Test.

Data analysis

Data were statistically analyzed with the paired *t* test to make a comparison and Pearson's Product Moment Correlation test to find out the relationship. Significance was set at the $p < 0.05$ level.

Results and Discussion:

Subjects' mean age, height and body weight were 25.03 ± 5.34 years, 167.31 ± 15.51 cm and 57.3 ± 5.63 kg respectively (Table 1). There was a significant difference between the auditory and visual reaction times (Figure 1). Subjects' scores for visual reaction time of the right hand (VRTRH), visual reaction time of the left hand (VRTLH), auditory reaction time of the right hand (ARTRH), and auditory reaction time of the left hand (ARTLH) were 269.68±49.97ms, 252.81±31.17ms, 302.26±35.38ms, and 296.53±26.54 respectively. Reaction time is dependent on several factors like arrival of the stimulus at the sensory organ, conversion of the stimulus by the sensory organ to a neural signal, neural transmissions and processing, muscular activation, soft tissue compliance, and the selection of an external measurement parameter .There were no significant correlations between the reaction time and speed of the subjects (Table 2).These results have similarity with the results of the study conducted by Senel,O., and Eroglu, H. (2006) conducted a study on 104 elite male soccer players to find out the relationship between speed and reaction time and he reported that were no meaningful correlations between reaction time and speed in the subjects but their auditory reaction times were significantly better than their visual reaction times. For the present study there was a positive correlation between the speed and agility ($p < 0.05$). In other words, the greater the speed, the more will be the agility and viceversa. Moreover, there was a statistically significant positive correlation between the auditory reaction times for left hand and right hand ($p < 0.05$).....

Table 1. Physical Profiles, Performance of Speed (50yds), Agility (10 x 4yds) and Reaction Time of the 40 Male Physical Education Students.

Prameters	Mean±SD
Age (years)	25.03 ± 5.34
Height (cm)	167.31 ± 15.51
Weight(kg)	57.3 ± 5.63
Speed(s)	6.74 ± 0.29
Agility(s)	10.02 ± 0.38
VRTRH(ms)	269.68±49.97
VRTLH(ms)	252.81±31.17
ARTRH(ms)	302.26±35.38
ARTLH(ms)	296.53±26.54

VRTRH=Visual Reaction Time of the Right Hand; VRTLH = Visual Reaction Time of the Left Hand; ARTRH =Auditory Reaction Time of the Right Hand; ARTLH = Auditory Reaction Time of the Left Hand;

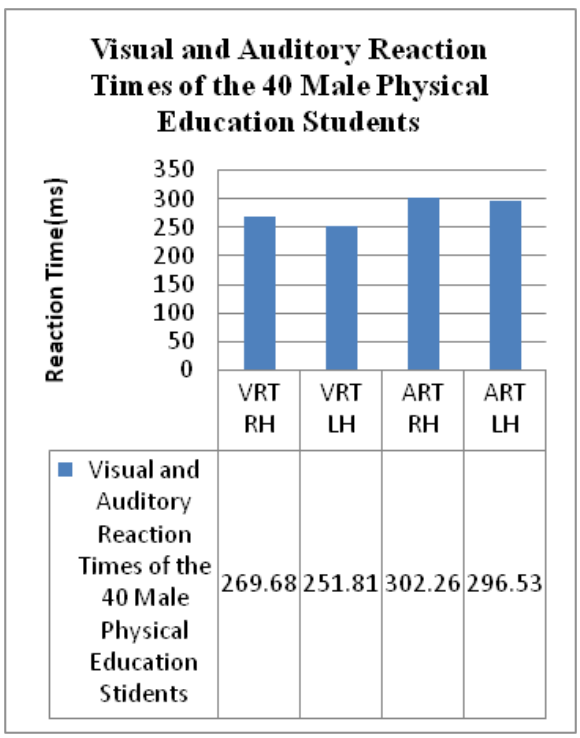


Fig 1. Visual and Auditory Reaction Times of the 40 Male Physical Education Students.

Table 2. Pearson's Correlations among the Parameters in the 40 Male Physical Education Students

	Speed (50yds)	Agility (10 x 4yds)	VRTRH	VRTLH	ARTRH	ARTLH
Speed (50yds)		0.748*	-0.023	0.059	-0.057	-0.082
Agility (10x 4yds)	0.748*		-0.354*	0.146	0.066	-0.183
VRTRH	-0.023	-0.354*		0.078	-0.085	-0.073
VRTLH	0.059	0.146	0.078		-0.017	-0.369*
ARTRH	-0.057	0.066	-0.085	-0.017		0.450*
ARTLH	-0.082	-0.183	-0.073	-0.369*	0.450*	

*$p < 0.05$. VRTRH = visual reaction time of the right hand; VRTLH = visual reaction time of the left hand; ARTRH = auditory reaction time of the right hand; ARTLH = auditory reaction time of the left hand.

Conclusion:

After analysis of data following conclusions were drawn:

a) No significant correlation was found between the reaction times and the speed of the physical education students who participated in this study.

b) There was a positive correlation between the speed and agility and also there was a positive relationship between auditory reaction times for left hand and right hand for the subjects of the present study.

c) There were significant differences between the audio and visual reaction times of the subjects.

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