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**Original**

## EL TIEMPO DE REACCIÓN EN RELACIÓN A LA NATURALEZA DE LOS ESTIMULOS Y A LA EDAD EN HOMBRES JÓVENES

## REACTION TIME WITH RESPECT TO THE NATURE OF STIMULUS AND AGE OF MALE SUBJECTS

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**ABSTRACT**

In the field of games and sports an athlete requires to react to different types of stimuli according to the nature of situation. A number of studies have been conducted in the psycho-physiological area to analyze the variation in reaction time with change in the nature of stimulus. According to the findings the reaction time of an individual varies with change of nature of stimulus. Present study was planned as an extension of such effort to analyze the change in reaction time using three different types of stimulus – visual, auditory, and tactile. A total of 800 male subjects of 05 to 70 years of age were selected as subjects. They were divided into 16 equal sized age groups. The reaction time was measured by digital electronic reaction timer by using auditory, visual, and tactile signals as stimulus.

Results showed that the mean values of auditory reaction time were the lowest and the tactile reaction time was the highest for all age groups. The results also indicated that the reaction time decreased with increase of age up to 21-25 year and thereafter the reaction time increased with increase of age. The trend of change in reaction time with age for all the three stimuli was similar. The results have been supported by other research studies.

**Key words:** Reaction time, Auditory Stimulus, Visual Stimulus, Tactile Stimulus.



## INTRODUCCIÓN

Reaction time has become an important topic of research for experimental psychologists since middle of 19<sup>th</sup> Century. The researchers have identified different types of reaction time such as simple reaction time (Luce, 1986), recognition reaction time (Welford, 1980) and choice reaction time (Donders, 1868). Research studies have been conducted to analyze the influence of different factors on reaction time of an individual like nature of stimulus (Galton, 1899; Woodworth and Schlosberg, 1954; Brebner and Welford, 1980); stimulus intensity (Froberg, 1907; Wells, 1913; Pieron, 1920; Luce, 1986); influence of age (Welford, 1977; Jevan and Yan, 2001; Luchies et al., 2002) and sex (Bellis, 1933; Engel et al., 1972), and personality type (Nettelbeck, 1973, Brebner, 1980, Lenzenweger, 2001).

Physical education and sports also has special consideration for reaction time. In most of the situations the performance of games and sports is directly or indirectly influenced by reaction time of the individual. Accordingly, studies have been conducted to analyze the effect of physical training on reaction time (Sander, 1998; Ando et al., 2002 and Rogers et al., 2003), effect of fatigue (Welford, 1968 and 1980); and physical fitness (Welford, 1980) on reaction ability of an individual.

Present study was planned to analyze the influence of nature of stimulus and age on reaction time. The results would help (i) to identify which of auditory, visual and tactile stimuli could produce quickest reaction and (ii) to understand at which age an individual could produce quickest reaction. This would be very helpful to select individuals for different positions on the basis of age and to design training for different sports on the basis of nature of stimulus.

## METHODS

A total of 800 male subjects taking 50 from each of sixteen age groups of 05 to 07 yrs, 08 to 10 yrs, 11 to 12 yrs, 13 to 15 yrs, 16 to 17 yrs, 18 to 20 yrs, 21 to 25 yrs, 26 to 30 yrs, 31 to 35 yrs, 36 to 40 yrs, 41 to 45 yrs, 46 to 50 yrs, 51 to 55 yrs, 56 to 60 yrs, 61 to 65 yrs and 66 to 70 yrs. were randomly selected as subjects.

Three different types of stimuli were used to measure the reaction time. These were visual stimulus, auditory stimulus, and tactile stimulus. Reaction time was measured by a multipurpose digital electronic reaction timer capable of measuring reaction time for one hundredth part of a second.

The subjects were tested for reaction time in the afternoon between 4-6 p.m. At first the subjects of a group were assembled in a place and clearly informed about the purpose of the study. Later on, the method to measure reaction time was explained. The visual stimulus was used at first to measure reaction ability. It was followed by the auditory stimulus and at last the tactile stimulus.

The collected data were statistically analyzed using ASP software. For descriptive statistics Mean and Standard deviation were computed. Analysis of variance was done to test the significance of the inter group variation. Post hoc test was also conducted to find out the exact location of the inter group variation.

## RESULTS AND DISCUSSION

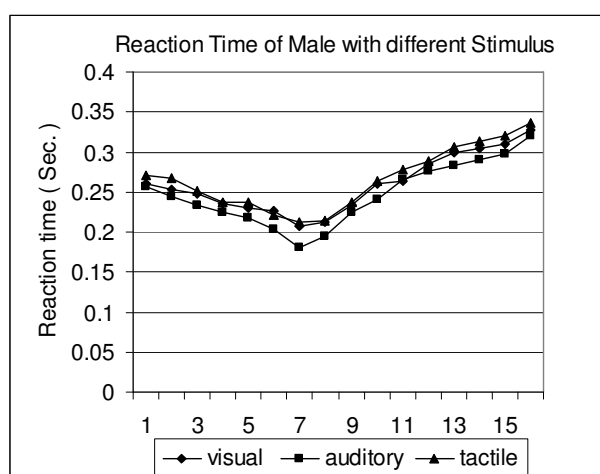
The mean values of reaction time for different age groups of subjects for three different types of stimuli have been presented in Table 1.



Gr. No.	Age Group (year)	Reaction Time (sec.)		
		Visual	Auditory	Tactile
I	05-07	0.260 ± 0.040	0.256 ± 0.040	0.270 ± 0.044
II	08-10	0.253 ± 0.040	0.245 ± 0.034	0.267 ± 0.041
III	11-12	0.248 ± 0.038	0.233 ± 0.028	0.252 ± 0.037
IV	13-15	0.236 ± 0.036	0.225 ± 0.034	0.237 ± 0.034
V	16-17	0.230 ± 0.035	0.217 ± 0.032	0.238 ± 0.032
VI	18-20	0.227 ± 0.036	0.204 ± 0.035	0.221 ± 0.050
VII	21-25	<b>0.207 ± 0.037</b>	<b>0.181 ± 0.034</b>	<b>0.213 ± 0.033</b>
VIII	26-30	0.213 ± 0.033	0.195 ± 0.024	0.214 ± 0.032
IX	31-35	0.234 ± 0.040	0.225 ± 0.043	0.238 ± 0.040
X	36-40	0.260 ± 0.033	0.240 ± 0.034	0.264 ± 0.033
XI	41-45	0.263 ± 0.040	0.265 ± 0.040	0.277 ± 0.038
XII	46-50	0.285 ± 0.034	0.276 ± 0.038	0.289 ± 0.037
XIII	51-55	0.300 ± 0.036	0.283 ± 0.035	0.307 ± 0.029
XIV	56-60	0.305 ± 0.038	0.290 ± 0.040	0.313 ± 0.036
XV	61-65	0.309 ± 0.036	0.297 ± 0.036	0.320 ± 0.036
XVI	66-70	0.328 ± 0.039	0.320 ± 0.035	0.336 ± 0.037

**Table 1:** Mean and SD of Reaction Time of three different Stimuli for Male Subjects

It is seen from the table that the mean values of reaction time was different for different forms of stimulus. The mean values were lowest for auditory stimulus and highest for tactile stimulus for all the sixteen different age groups. So, it is understood that the reaction time against auditory stimulus was quickest and that for tactile stimulus was the slowest (Fig. 1).



**Fig. 1:** Indicates the variation in reaction time with respect to the nature of stimulus for male subjects

It is clear from the figure that the auditory stimulus produced quickest reaction and the tactile stimulus produced the slowest one for different male age groups. Of course, the difference between visual and tactile stimuli was very small.

The statistical significance of mean difference in reaction time for different stimuli was analyzed by the method of Analysis of Variance. Table 2 shows the results.

Gr. No.	Age group	F - value	Probability
I	05 - 07	1.57	0.21
II	08 - 10	4.71	0.01*
III	11 - 12	4.44	0.01*
IV	13 - 15	1.76	0.17
V	16 - 17	5.11	0.007*
VI	18 - 20	6.09	0.002*
VII	21 - 25	12.05	0.00001*
VIII	26 - 30	6.21	0.002*
IX	31 - 35	1.41	0.24
X	36 - 40	7.34	0.0009*
XI	41 - 45	1.69	0.18
XII	46 - 50	1.66	0.19
XIII	51 - 55	6.69	0.001*
XIV	56 - 60	4.68	0.01*
XV	61 - 65	4.85	0.009*
XVI	66 - 70	2.33	0.10

**Table 2:** ANOVA for the Mean Values of Reaction time with Different Types of Stimuli

It is clear from the table values that in ten out of sixteen age groups, the differences among mean values of reaction time with three different types of stimuli were statistically significant. Results of the post hoc test indicated that the mean value of reaction time with auditory stimulus was significantly lower than those of both visual and tactile stimuli.



Similar results have been reported by Welford (1980) and Galton (1899). As per their report the mean auditory reaction time varied from 140 to 160 ms, whereas the mean value of visual reaction time varied from 180 to 200ms. As the explanation it was mentioned that the auditory stimulus took 8 to 10 ms to reach the brain (Kemp et al., 1973) but the visual stimulus takes 20 to 40 ms for that (Marshall et al., 1943).

The table values also indicate a definite pattern of change in reaction time with respect to age. The mean reaction time decreased with increase of age up to the level of 21-25 years. The mean reaction time became the minimum at this period. After that, the mean reaction time increased gradually with increase of age. This pattern of change in reaction time was same for all the three types of stimuli.

This result of the present study was supported by the findings of a number of previous studies of similar nature. Welford (1977), Jervas and Yan (2001), Luchies et al. (2002) and Rose et al. (2002) studied the change in reaction time with respect to age and found that from infancy to late 20s the reaction time shortened to indicate the increase of reaction ability with increase of age. After that the reaction time had been reported to gradually increase up to the age of 60s and thereafter the reaction time was found to increase very rapidly.

## CONCLUSIONS

Within the limitation of the present study following conclusions were drawn:

- a) The auditory stimulus produces quicker reaction than both of visual and tactile stimuli.
- b) The visual stimulus is better in producing quicker reaction than the tactile stimulus.
- c) The reaction time decreases with the increase of age up to the age of 21-25 years.

- d) The reaction time becomes lowest showing quickest reaction ability of an individual during 21-25 years of age.

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