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SHORT COMMUNICATION

Effect of Age on Audio-Visual and Whole Body Reaction Time

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Abstract: *Objectives:* With advancing age the incidence of falls and thereby morbidity goes on increasing. One important aspect of increase in the incidence of these mishaps may be the effect of age on reaction time. *Background:* Hence, the present study was undertaken to study the effect of advancing age on auditory, visual and whole body reaction times. *Method:* 120 Normal healthy male subjects were distributed in four groups according to age and their Audio-Visual and whole body reaction time were found out with the help of Audio-Visual reaction time apparatus, whole body reaction time apparatus and Digital chronoscope. *Results:* Assessed by using "ANOVA" single factor analysis test. It was found that audio-visual reaction time and whole body reaction time increases as the age advances and delayed average audio-visual and whole body reaction time is significantly different among different age groups. Effect of ageing on the myelination of neurones may be the possible cause for this observation. *Conclusion:* Delayed Audio-Visual and whole body reaction time in these subjects suggests that that they should be more cautious during general movements as well as during driving. Also, more stringent tests should be taken for driving license renewal in higher age groups.
Keywords: Reaction time, Audio-Visual reaction time, Whole body reaction time.

Introduction

An animal's ability to cope with the environmental changes for the maintenance of homeostasis depends on the integrity of cell communication and responses given by the various systems in terms of sensory perception and motor response [1]. Time response is supposed to be the best factors for the management of homeostasis which we call as reaction time [2].

Audio-Visual reaction time is the speed, with which a person can respond to an auditory stimulus and visual stimulus respectively [3]. Whole Body Reaction Time determines the time taken by an individual for moving the whole body in various directions [4]. In the present investigation it was tried to find out the Audio-Visual and whole Body reaction time among non-athletes and in those who are not involved in any active sports [5]. The effect of advancing age on Audio-Visual and whole Body reaction time was also investigated to make comparisons amongst different age groups.

Material and Method

The present study was undertaken after getting approval from Institutional Human Ethical Committee. For the study, 120 normal healthy male subjects were taken and they were categorised into 4 groups according to their age as follows.

Group	Age (yrs)	Sample size
I	20-29	30
II	30-39	30
III	40-49	30
IV	50-59	30

The Audio-Visual and whole body reaction time was found out in all the subjects with the help of

- *Audio-Visual reaction time apparatus.*
- *Whole body reaction time apparatus.*
- *Digital chronoscopes*.

All the subjects included in the study were non-alcoholic, non-diabetic, having normal vision and hearing acuity and had no clinical evidence of any CNS disease and had perfect sense of physical, mental and psychological well-being. They were not on any medication therapy or placebo treatment. The Auditory and visual reaction time was measured by reaction time instrument i.e. "Audio-visual reaction time apparatus" by "Anand Agency" Pune. It had a display accuracy of 0.001 sec. The instrument is specially designed to measure response time in milliseconds. It had two modes of providing stimulus- Audio and visual. Auditory reaction time was recorded for low [click] and high [tone] frequency sound stimuli. Visual reaction time was recorded for green and red light which served as stimuli.

As soon as the stimuli was perceived by the subject, they responded by pressing the response switch. The display indicated the response time in milliseconds. After familiarising the subject with the instrument and after repeated practise, three readings for each parameter were noted. The interval between the stimuli was randomly varied from 2-5 seconds. The least reading of three was taken as the value for reaction time task and was noted in the subject's record profile. The whole Body reaction time apparatus was used for determining the time taken by the subject to move his body in various directions is response to visual stimuli. Whole body reaction time apparatus consisted of stimulus display box, chronoscopes and foot switches. After familiarising the subject with the instrument and after repeated practise, the subject was asked to move a step immediately in response to blinking of the arrow on the display box and the time taken to lift the leg in response to stimulus and the time taken to keep the leg in appropriate direction was measured with the help of Digital chronoscopes. Thus, time taken by the subject to initiate an action, to complete the action and thus duration of action itself was found out. Three reading each direction was taken randomly with 2-5 sec. inter stimulus interval and the least time for initiating the action and completing the action was found out.

Result

Table No. 1 shows average visual and auditory reaction time in milliseconds recorded in the four age groups. The results were assessed by using "ANOVA" single factor analysis test. The average visual reaction time increased as the age advances.

Table-1: Visual and Auditory Reaction Time							
Parameter	Hand	Light	Mean reaction time in milliseconds				
			Group I	Group II	Group III	Group IV	P value
VRT	Right	Red	126.83	142.97	148.63	179.83	<0.0001*
		Green	127.6	144.13	146.67	182.3	<0.0001*
ART(click)	Right	Eyes open	126.13	137.4	144.9	182.43	<0.0001*
		Eyes closed	128.8	146.87	145.93	189	<0.0001*
ART(tone)	Right	Eyes open	128.7	144.17	146.7	185.7	<0.0001*
		Eyes closed	128.87	149	149.87	189.8	<0.0001*
VRT-Visual Reaction Time; ART-Auditory Reaction Time; *-Highly Significant							

This is true for both green as well as red light and this increase is seen across all the four age groups. This difference was found to be statistically significant. The auditory reaction time in response to click showed an increase from group I through group IV. This finding was consistent with subject's eyes open as well as closed. Similar findings were obtained for auditory reaction time in response to tone with both eyes open and closed. There was a statistically significant increase in auditory reaction time (P<0.001).

Table-2: Whole Body Reaction Time						
Movement	Action	Mean reaction time in milliseconds				
		Group I	Group II	Group III	Group IV	P value
Right side	Initiation	0.397	0.447	0.517	0.57	<0.0001*
	Completion	0.743	0.82	0.923	0.98	<0.0001*
	Duration	0.346	0.373	0.407	0.43	<0.0001*
Left side	Initiation	0.393	0.453	0.513	0.57	<0.0001*
	Completion	0.737	0.833	0.91	1.01	<0.0001*
	Duration	0.343	0.38	0.397	0.44	<0.0001*
Front	Initiation	0.407	0.473	0.513	0.61	<0.0001*
	Completion	0.774	0.87	0.937	1.06	<0.0001*
	Duration	0.34	0.397	0.423	0.45	<0.0001*
Back	Initiation	0.483	0.54	0.59	0.687	<0.0001*
	Completion	0.857	0.977	1.037	1.18	<0.0001*
	Duration	0.374	0.437	0.447	0.5	<0.0001*
*-Highly Significant						

Table No. 2 shows the time taken for initiation and completion for an action in a particular direction in all four age groups. The difference between the two values is the whole body reaction time for that movement. It was assessed for four movements viz; to right side, to left side, to front and to the back. The comparisons amongst the four age groups was done using ANOVA" single factor analysis test. In younger age groups (Group I and II) there was rapid initiation and quick completion of action, effectively the whole body reaction time was less in younger age groups as compared to the older age groups.

Taking into consideration the direction of the movement, the quickest initiation and completion was for the movement on left side, consequently the whole body reaction time was minimum for movement on the left. The time required for initiation and completion of movement was maximum for movement towards back. Hence, this movement displayed the maximum whole body reaction time.

Discussion

Reaction time is an important component of motor movements. It is one of the important methods to study a person's central information processing speed and fast coordinated peripheral movement response. Audio-visual reaction time is the time taken by an individual to react to an auditory or visual stimulus respectively. Whole body reaction time determines the time taken for moving the whole body in various directions in response to visual stimuli. It can be of crucial value in activities like driving and is an important quality of a sportspersons. As table 1 depicts, the average audio-visual reaction time increases as the age advances. This finding is consistent in all the age groups selected in the present study. Our finding is consistent with observations of Javas.s and J.H Yang who studied effect of ageing on cognitive functions. [6] Nettelbach T et al [7] who studied factors affecting reaction time reports similar findings. In our study as shown is table 2, whole body reaction time increased significantly in older age groups. The possible reasons for this delay in response could be many folds.

1) Axonal degeneration and axonal shrinkage occurring with advancing age. This not only prolongs mental processing time but also decreases speed of conduction of neurons.
2) Loss of co-ordination with advancing age due to inability to maintain fine balance between agonists and antagonists muscles especially during rapid movements.
3) There may be decrease in motor skills with increase in age.

All these factors lead to increase in audio-visual and whole body reaction time as the age advances. The practical implication of this finding is that elderly people need to be more cautitious during general movements as they are unable to react quickly in an unforeseen emergency. Also, more stringent tests should be applied for driving license renewal in higher age groups to prevent possible mishaps.

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Age differences in reaction time. More generally, how does adult age affect RT? Information processing takes longer (Cerella; Salthouse) and its duration becomes more variable (Allen, Kaufman, Smith, and Propper) with increasing age.Â However, the effect of number of options is much reduced by extensive practice and by elimination of coding requirements, for example, using a tactual signal to the finger. Also, if options permitting simultaneous response of several fingers are allowed, RT does not increase greatly with an enormous increase in the number of possible patterns.Â reaction time Your hand accidentally touches the hot plate of an oven and is withdrawn immediately. A young child runs out in front of your car and you hammer on the brakes. Audio-visual reaction time â€“ Measurement of reaction time is a simple test which is measured by â€˜audiovisual reaction time apparÂ atusâ€™ (Anand agency, Pune). Reaction time is a commonly used paraÂ meter for measuring implicit learning. In measurement of reaction time subject was asked to respond by pressing the button as soon as he had received the stimulus in the form of sound or light.Â The subjects were supervised by study observer whole night so as to ensure 12 hours of abstinence. Every day only one studentâ€™s audiovisual reaction time readings were taken after keen supervision. Statistical analysis.Â Effect of age, gender and body mass index on visual and auditory reaction times in Indian population. Indian Journal of Physiology and Pharmacology. Reaction Time Test. When the red box turns green, click as quickly as you can. Click anywhere to start.Â Scores in this test are faster than the aim trainer test, because you can react instantly without moving the cursor. This is discused in further detail on the the statistics page. While an average human reaction time may fall between 200-250ms, your computer could be adding 10-50ms on top. Some modern TVs add as much as 150ms! If you want, you can keep track of your scores, and see your full history of reaction times. Just perform at least 5 clicks and then save. Audio vs Visual Reaction Times. Numerous studies (included cited study below) have concluded that the mean auditory reaction time is faster than the mean visual reaction time. This means you will react faster to a sound than you would a light. The short explanation is that sound takes less time to reach the brain than does visual information. The study concluded a mean 331 millisecond reaction time for sound vs. a mean auditory reaction time of 284 milliseconds. Age.Â Times can vary depending on your operating system, CPU, audio card and device. A standard delay compensation has been built into the test, but your results will vary. Disclaimer. Note: This auditory test is primarily meant for fun. Simple vs. Recognition vs. Choice Reaction Times. 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.Â At the risk of being politically incorrect, in almost every age group, males have faster reaction times than females, and female disadvantage is not reduced by practice (Noble et al., 1964; Welford, 1980; Adam et al., 1999; Dane and Erzurumlugoglu, 2003). Bellis (1933) reported that mean time to press a key in response to a light was 220 msec for males and 260 msec for females; for sound the difference was 190 msec (males) to 200 msec (females).Â 2002. Practice effects on reaction time for peripheral and central visual fields.