

ORIGINAL ARTICLE

AUDIO- VISUAL REACTION TIME IN INDIAN CLASSICAL SINGERS

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ABSTRACT

Introduction: Audiovisual Reaction Time involves the time period taken for the response to auditory or visual stimuli which depends on the intactness of the sensory and the motor system.

Objective: The present study was aimed to evaluate the effect of singing on audio visual reaction time.

Method: Visual choice reaction time for red, green and yellow light and auditory choice reaction time for high and low frequency sounds was measured with digital display audio visual reaction time machine (model No RTM 608 Medicaid: Ambala, India). Audio visual reaction time of students who are learning Indian classical vocal music in Shimla degree colleges were compared with normal age and sex matched controls.

Results: It was found that visual as well as auditory choice reaction time was significantly lower in singers as compared to normal controls.

Conclusion: Impact of singing /music is on basic sensory processing, so music training to individuals having slower reaction time can be applied.

Keywords: Choice Reaction Time, Audio Reaction Time, Visual Reaction Time, Indian Classical Singers and Normal Controls

INTRODUCTION

Reaction time is the elapsed time between the presentation of a sensory stimulus and appearance of appropriate voluntary response under the condition that the subject has been instructed to respond as rapidly as possible.¹ Reaction time is crucial for our everyday lives and requires intact sensory skills, cognitive processing and motor performance.²

Reaction time is of three types simple reaction time, recognised reaction time and choice reaction time.³ Simple reaction time involve one stimulus and one response. Choice reaction time is (CRT) tasks require distinct responses for each possible class of stimulus. In choice reaction time experiments, there are multiple stimuli and multiple responses and subject must give a response that corresponds to the stimulus.⁴ It was reported that the time for motor preparation (e.g., tensing muscles) and motor response was the same in all three types of reaction time tests, implying that the differences in reaction time are due to processing time.⁵

Reaction time depends on various facilitatory and inhibitory factors and facilitatory factors include

alertness, training, strength of stimuli and concentration. It determines the alertness of a person because how quickly a person responds to a stimulus depends on reaction time.

Reaction time must be lesser in certain occupation e.g. Driver, Sportsmen, pilots, military people, doctors, nursing staff, security guards. Singing involves the reactions to change with change in rhythm and notes. So singers may also have altered reaction time as they are involved in daily practice of singing and in the present study, audio visual choice reaction time is compared between singers and non singers.

METHODOLOGY

This study was conducted in Research lab of Physiology department of Indira Gandhi Medical College Shimla and total 80 subjects were involved which are divided into two groups. Group 1 having 40 students who have been learning vocal music for minimum two years durations in Rajkiya Kanya Maha Vidalya and Sanjouli degree college of Shimla. In group 2 40 normal aged and sex matched control was taken.

Subjects were selected on the basis of following inclusion criteria.

Patients in age group of 16 to 30 years, non alcoholic and non-smoker subjects having normal vision, had no abnormality or injury in the upper limbs, were not suffering from psychiatric disorder; not involved in any other sports activities which may improve visual reaction time were included in this study.

After taking informed consent, reaction time was measured with digital display audio visual reaction time machine (model No RTM 608 Medicaid: Ambala, India). The instrument has a resolution of 0.001 second. The machine has three light stimuli: red, green and yellow and three auditory stimuli; low, medium and high pitched sound

Tests were performed in adequate light and in silent atmosphere in research lab. Subjects were made fully aware about the procedure and also given adequate practice session before measuring the actual reaction time. Subjects were asked to keep their dominant hand at equal distance from all the keys and press the specific marked key for particular stimulus and choice reaction time was measured.

Visual reaction time (VRT): Light stimulus for yellow red, and green colour was displayed randomly and subjects were asked to respond by pressing the knob of digital display apparatus for switching off the given coloured light . Reaction time in milliseconds displayed on apparatus was recorded. Three readings were recorded for each colour and lowest of the three readings was taken as the value for reaction time task for that colour. The readings of yellow, red and green colour were denoted as VRTY, VRTR and VRTG respectively.

Auditory reaction time: Auditory stimulus for high and low pitch sound was randomly presented to the subjects by the observer. Subjects were asked to respond by pressing knob of digital display apparatus for turning off the produced sound . Reaction time in milli second displayed on the apparatus was recorded .Three readings were recorded for each sound stimulus and lowest of three readings was taken as reaction time value for that stimulus. The readings for low and high pitch sound were denoted as ARTL and ARTH respectively.

Statistical methods: Data is represented as mean ± standard mean deviation and statistical analysis was done using student t test and the p value for significance was considered at 0.05.

RESULTS

In the present case control study, the mean age group of cases and control are 21.67 and 19.27 years respectively. In study and control group, the number of males were 21 and 22 respectively and number of females were 19 and 18 respectively.

The present study have shown that the subjects who are practising daily for Indian classical singing have lower visual reaction time for yellow, red and green colour as that of age matched normal subjects and values are statistically significant (p=.000, .30 and .000 respectively) .

The value of auditory choice reaction time for lower and high frequency is also found to lower in singers as compared to the normal subject (p=.001 and .002 respectively)

Table 1: Audio Visual Reaction Time of Cases and Controls

Parameters	Cases	Controls	p-Value
No of subjects	40	40	-
Age (years)	21.67	19.27	-
Male(n)	21	22	-
Female(n)	19	18	-
VRTY (mean ± std deviation)	447.63± 60.29	496.15± 51.458	0.000
VRTR (mean± std deviation)	476.25±52.73	489.68±62.22	0.30
VRTG (mean± std deviation)	379.78±54.28	430.88±47.72	0.000
ARTL (mean± std deviation)	419.55±83.86	486.00±83.86	0.001
ARTH (mean± std deviation)	440.40±97.49	502.85±77.79	0.002

DISCUSSION

Reaction time measurement is an indirect index of processing capability of central nervous system and simple means of determining sensory motor association and performance of an individual.⁶

The findings of present study have shown that Indian classical singers have better visual choice reaction time than that of normal non singer subjects. The

difference in visual choice reaction time value is statistically significant which justifies the shorter reaction time in practising singers than in the control group which reflects the improvements in processing. Reasons of such observations is that reaction time depends upon various facilitator factors such as practice, alertness, concentration and sports activity.

It has been observed by Brouziyne M that mental practice can effectively cause motor improvement

and performance⁷. Singing can be compared with physical activity as students are doing daily practice of singing for 2-4 hours. It has been already observed that reaction time improves in various sports activities such as playing of badminton⁸ and table tennis⁹ and basket ball.

As regard to auditory reaction time the singers can well differentiate between the sounds of higher and lower frequency sound as compared to normal subjects. Singers may be facilitated by their skill development due to daily practice with sounds.

In previous study on simple reaction time, It was observed that auditory reaction time is lesser than visual reaction time¹¹ but the present study on choice reaction time have shown longer auditory reaction time which suggest that it is easier to identify the colours due to prolonged familiarity of years as compared to differentiation of sounds of different frequency to whom subjects were familiarised only at the time of recording reaction time

CONCLUSION

The study results indicated that visual choice reaction time and auditory choice reaction time was significantly lower in trained singers as compared to normal subjects. Impact of singing /music is on basic sensory processing, so music training to individuals having slower reaction time can be applied.

REFERENCES

1. Teichner WH . Recent Studies of simple reaction. *Psychol bull*1954 ; 51:128-149.
2. Mohan M, Thombre DP, Das AK, Subramanian N , Chandrasekar S. Reaction time in clinical diabetes mellitus. *Ind J Physiol Pharmacol* 1984; 28: 311-314
3. Welfrod.A.T.1980. Choice Reaction time: Basic concepts. In A.T. Welford (Eds).*Reaction Times Academic Press*.New York,pp 73-128
4. Miller J. O and Low K , “Motor processes in simple, go/no-go, and choice reaction time tasks: a psychophysiological analysis,” *Journal of Experimental Psychology: Human Perception and Performance*, vol. 27, no. 2, pp. 266–289, 2001.
5. H. Baayen and P. Milin, “Analyzing reaction times,” *International Journal of Psychological Research*, vol. 3, no. 2, pp. 1–27, 2010.
6. Das S, Gandhi A, Modal S. Effect of premenstrual stress on audio visual reaction time & rveenaudiogram. *Ind J Physiol Pharmacol* 1997; 41 : 67-70 .
7. Brouziyne M, Molinaro C. Mental imagery combined with physical practice of approach shots for golf beginners. *Percept Mot Skills* 2005;101:203-11
8. Bhabhor MK , Vidiya K , Bhanderi P, Dodhia S ,Kathorotia R, Joshi V.A. Comparative study of visual reaction time in table tennis players and healthy controls . *Ind J Physiol Pharmacol* 2013 ; 57(4): 439-42 .
9. Jain Aditya, Bansal Ramta, KumarAvnish, and Singh KD. A comparative study of visual and auditory reaction times on the basis of gender and physical activity levels of medical first year students. *Int J Appl Basic Med Res*. 2015 May-Aug; 5(2): 124–127
10. Ghuntla TP, Mehta HB, Goghala PA and Shah CJ. Comparative study of visual reaction time in Basket ball players and healthy controls. *NJIRM* 2012 ; 3(1): 49-51 .
11. Skeleton jose and Kumar Praveen Gideon. Comparison between Auditory and visual simple reaction times. *Neuroscience & medicine*. 2010 ;1:30-32.