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STUDY OF RAJA YOGA MEDITATION ON VISUAL REACTION TIME IN TYPE II DIABETIC SUBJECTS

Physiology

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ABSTRACT

Reaction time is the easiest methods of assessing the sensory and motor performance of an individual. It is an indicator of performance in surgeons, sports personnel etc. Reaction time is prolonged in Type 2 Diabetes Mellitus (T2DM) and hypothyroidism patients. Yoga and meditation can improve the reaction time. Hence, this study was undertaken to see the effect of meditation on visual reaction time and blood glucose level in T2DM.

Material and Methods: The study was carried out in three groups:- Group I: 30 Non diabetic- non meditators, Group II: 30 diagnosed patients of Type II Diabetes for more than 5 yrs - non-meditators, Group III: 30 diagnosed type II Diabetic patients of for more than 5 yrs and practicing Raja yoga meditation for more than 5 yrs. Their blood glucose level and visual reaction time was recorded.

Results: The observations revealed that diabetic meditators reacted faster as compared to diabetic non-meditators for visual stimuli (red and green light). Blood glucose level and glycated hemoglobin levels were significantly lower in diabetic meditators.

Conclusion: Raja yoga Meditation results in decreased mental fatigability, improve the sensory motor performance. Thus shows optimistic effects on many factors important in DM2 management and anticipation, including glycaemic control.

KEYWORDS

Raja Yoga Meditation, Diabetes mellitus, visual reaction time, Glycaemic status.

INTRODUCTION

The need of the hour is holistic health. Health as defined by WHO encompasses not only physical but also mental & social well being. The paradigm has now shifted from curative to precautionary measures. Anand (1) has stated that "The ultimate aim of medical sciences is the achievement of optimum physical & mental health for the individual. The ultimate aim of yogic practices is also same namely - physical & mental well being." Yoga therapy is a relatively novel and its emerging clinical description falls within the broad category of mind body medicine, whose growth is consistent with the growing popularity of yoga in the west and the increasing world wide use of Alternative medicine. Yoga practice, due to its psycophysiological effects, has become an effective primary or adjunct therapeutic intervention. Numerous studies are available on yogic asanas & pranayam, and on Rajayoga meditation. Rajayoga, which is the ancient yoga of India, had gone into oblivion in the recent past, and is now, once again is being revived experiencing its great healing result of body and mind. It subsumes within itself the rudiments of all methods of yoga and confers the accomplishment of all of them naturally and easily, using one very effortless method which anyone can learn.(2)

Reaction time is a useful index to study the ability of central nervous system. Reaction time is prolonged in Type 2 Diabetes Mellitus (T2DM) and hypothyroidism patients.(3,4) Better reaction time means better performance in surgeons, sports personnel and other skilled workers.(5) Most commonly used tests were auditory reaction time, visual reaction time.

The present study was undertaken to study the effect of raja yoga meditation training on visual reaction time.

MATERIAL AND METHODS

The present study was carried out in Department of Physiology. After approval from institutional ethics committee written informed consent was obtained from all the participants of the study. The sample size needed to be was calculated to 30 per group considering the mean ± S.D. of the parameters with α Error (%) -5%, Power - 80%, ½ sided test -2.

Participants were asked to report in the Dept of physiology at 9:00 am. The participants were divided into three groups (n= 30).Group I: Healthy participants (nondiabetic, nonmeditators) were selected randomly from the non teaching staff of the institution. Group II: Non-meditators, diagnosed Type II DM for more than 5 yrs visiting diabetic OPD of our institute. Group III: Diagnosed type II DM for more than 5 yrs. and practicing Raja yoga meditation for one hour every morning for more than 5 years, at the local Bramhakumari center (Mahal), Nagpur. Participants with history of sports training, previous experience of yoga, history of hearing disability, musculoskeletal disorder, hypertension, type I DM, history of major surgery in the recent past, smoking, alcohol consumption and non-vegetarian diet, pregnant and lactating women were not included in the study.

The participants were asked to remain fasting for 10-12 hours. After detailed history and clinical examination anthropometric parameters were recorded. Fasting blood sample was collected. Post prandial blood sample was collected 2 hours after meal on the same day. Fasting blood sugar (FBS) and postprandial blood sugar (PPBS) was quantitatively estimated using semiauto

analyzer (Transasia, ERBA, Chem-5 plus). For auditory reaction time-Apparatus used in this study was the portable simple audiovisual timer or 'Response Analyzer' by INCO "Yantra Shilpa" Systems, Pune. Mean and Std. deviation was calculated using SPSS software. One-way analysis of variance was performed to find the significance between the means. In addition, Bonferroni test of multiple comparisons was used to identify pairs in which means were significantly different.

OBSERVATIONS AND RESULTS

Table 1: Group wise comparison of Anthropometric parameters

Variables	Group I (n=30) (mean ±SD)	Group II (n=30) (mean ±SD)	Group III (n=30) (mean ±SD)	P value I Vs. II	P value I Vs. III	P value II Vs. III
Age (Yrs)	51.43 ±5.39	50.33 ±6.21	53.23 ±5.43	1.000	0.672	0.155
Height (cms)	157.71 ±6.20	158.58 ±6.68	157.16 ±6.20	1.000	1.000	1.000
Weight (kgs)	64.16 ±7.22	66.06 ±11.00	66.16 ±9.77	1.000	1.000	1.000

p<0.001 very highly significant, p<0.01 highly significant, p<0.05 significant, p>0.05 non significant

The differences in mean age, height and weight of all participants were not statistically significant (p>0.05) Table 1.

The mean value of FBS, PPBS and glycated hemoglobin were significantly higher in diabetics as compared to controls (p<0.05), but

these values in yoga practitioners was significantly lower than in non-practitioners ($p<0.05$). Table 2

Table 2: Comparision of Glycemic status in groups (Mean±SD)

Variables	Group I (n=30) (mean±SD)	Group II (n=30) (mean ±SD)	Group III (n=30) (mean±SD)	P value I Vs. II	P value I Vs. III	P value II Vs. III
FBS (mg/dl)	85.83±8.12	160.66±33.0	132.75±36.43	0.000	0.000	0.001
PPBS (mg/dl)	120.93±8.79	263.8±35.29	198.47±40.11	0.000	0.000	0.000
GHb (%)	-----	8.13 ± 0.82	7.2 ±2.00	----	-----	0.030

$p<0.001$very highly significant, $p<0.01$ highly significant, $p<0.05$ significant, $p>0.05$ non significant

The mean value of the reaction time for RL and GL were significantly high in diabetic non-meditators as compared to controls ($p<0.05$) and significantly low in diabetic meditators as compared to diabetic non-meditators. There were no significant differences in the mean values of RL and GL between Control and diabetic meditators. Table 3

Table 3: Group wise comparison of visual reaction time

Variables	Group I (n=30) (mean ±SD)	Group II (n=30) (mean ±SD)	Group III (n=30) (mean ±SD)	p-value I Vs. II	p-value I Vs. III	p-value II Vs. III
RL (Sec)	0.162±0.020	0.202±0.044	0.164 ± 0.046	0.000	1.000	0.001
GL (Sec)	0.161±0.026	0.196±0.039	0.164 ± 0.024	0.000	1.000	0.000

$p<0.001$ very highly significant, $p<0.01$ highly significant, $p<0.05$ significant, $p>0.05$ non significant
RL- Red light, GL-Green light

As shown in the table, it was observed that the reaction time for RL and GL were significantly high in group II as compared to group I.

It was observed that there were significant low values of reaction time for HFS, LFS, RL and GL in Group III as compared to Group II.

There were no significant difference in the mean values of RL- Red light, GL-Green light between Group I and Group III.

DISCUSSION:

Reaction time is a useful index to study ability of central nervous system. Raja yoga meditation training enhances alert responses to visual signals. Yoga training improves the attention, cognitive abilities and strength of the central nervous system. It has been reported that yoga training augment the human performance including CNS processing.(6)

Decrease in Reaction time indicates an improved sensory motor performance and enhanced processing ability at the primary thalamocortical level of central nervous system. This may be due to greater arousal, faster rate of information processing, improved concentration and/or an ability to ignore extraneous stimuli. Similar findings were reported by Udupa KN et al (7), Malathi A et al (8), Madanmohan et al (9), Borkar AS et al (10) and Madanmohan et al (11) where they reported yoga produces a significant decrease in visual and auditory reaction time. In 2009 N.V.V.S. Narayana (12) observed significant ($p<0.01$) effect of yoga on visual reaction time. In 2010 Biswas D. A. (13) observed significant ($p<0.05$) change in auditory reaction time after 4 weeks of Yoga. Visual reaction time declined significantly ($p<0.01$) after 4 weeks of Rajyoga Meditation in healthy volunteers.

Lutz A et al (14) observed that 3 months of meditation training reduced variability in attentional processing of target tones, as indicated by both enhanced theta-band phase consistency of oscillatory neural responses over anterior brain areas and reduced reaction time variability. Some of the transient changes in brain activity due to meditation include bursts of oscillations and increases in global frontocentral coherences, especially in the lower frequency range. (i.e. alpha and the theta) Meditators have been found to self-induce gamma-band oscillations and phase

synchronization during meditation, especially in the frontoparietal areas, which signifies an attentive brain. These changes in brain activity and cognitive processes appear beneficial, thus improving overall cognitive functioning. (15)

Malathi Parulkar (8) reported reduction in auditory & visual reaction time after yoga training, Madanmohan et al (9) also reported that yoga practice for 12 weeks results in significant reduction in visual & auditory reaction times in the normal adult male volunteers. Jansi Rani N & Sridevi documented that practice of yoga reduces anxiety & increases alertness & attention which can improve the subjects performance in the reaction time experiment. (16,17) The link between mind & the body has been scientifically related. The role of limbic system of the brain in regulating the homeostatic condition in the body by influencing the visceral mechanism through the automatic nervous outflow & endocrine secretions are now well known. The proper conditioning of the nervous system can maintain the normal homeostasis. The process of mental relaxation may thus be expected to produce such conditioning. (18,19)

Yoga is involved in restoring the under activity of the parasympathetic nervous system (PNS) and gamma amino-butyric acid (GABA) systems. The restoration may be partly by stimulation of vagal nerves.(20) A single-photon emission computed tomography (SPECT) study demonstrated that the yoga training programme increased the Cerebral Blood Flow (CBF) and the changes in particular appear to have a greater impact in right hemispheric function, particularly in the frontal lobes.21 Now, it can be emphasized that the improvement on reaction time may be related to the above facts.

Yoga of long duration affects the hypothalamus, which leads to reduction in sympathetic tone and peripheral resistance. With regard to the central nervous system as seen by 'effective reaction time', the Relaxation Response activates areas in the brain responsible for emotion, attention, motivation and memory (eg. anterior cingulate, hippocampal formation, amygdala) and may also control the autonomic nervous system. (22,23)

CONCLUSION

To conclude, our study shows that Raja yoga meditation training is emerging as a widely practiced complementary and integrative therapy. This paper brings to light the utility of yoga as a non-invasive means of treating various diseases and improving the overall quality of life.

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