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Original Research Article

Comparison of Heart Rate Variability in Type 'A' and Type 'B' Personality Subjects

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Abstract: Personality and heart rate variability (HRV) each are strong predictors of well-being, particularly cardiac health and longevity. The present study compares the changes in HRV during resting state in the Type 'A' and Type 'B' personalities. The personality of subjects is chosen according to Glazer questionnaire. In each of these two groups 30 males were taken. After general interview of these subjects, HRV was recorded during resting state. Present study observed a statistically highly significant LF: HF ratio and Heart rate more in Type 'A' personalities than the Type 'B' personalities. So it can be concluded from this study that Type 'A' personalities has more sympathetic activity than Type 'B' personalities.
Keywords: Personality, cardiovascular risk, Heart Rate Variability

INTRODUCTION

Personality is defined as a set of characteristics or traits that drive individual differences in human behaviour. These traits may depend on brain structures and neural mechanisms [1]. There is a strong link between personality and health—physical health in general and cardiac health in particular. Personality influences the perception of stress by an individual both in everyday social interactions [2] and when faced with major life challenges [3].

The Type 'A' individuals are more prone to stress and present a higher chance of suffering from mental disorder on account of the pressure of stressful events. Type 'A' personality subjects are more vulnerable to cardiovascular disease (heart attack, stroke, hypertension etc.). Those in the Type ' B' category on the other hand reveal a greater capacity to cope with potentially stressful situations, consequently reducing their risk of becoming ill [4].

The heart rate variability is measured of the variability of beat-to-beat intervals, and is an indicator of health and well-being and can be used in the general population [5]. The heart have a basic underlying rhythm and this rhythm is affected by the inhibitory influence of the parasympathetic nervous system (PNS) and the excitatory effect of the sympathetic nervous system (SNS). The average heart rate of 70 - 80 beats/min reflects a relative balance between the action of the two components of the autonomic nervous system (ANS), the PNS and the SNS. In short term recordings of HRV, the ratio of low to high frequency (LF: HF ratio) is a useful indicator of the relative balance between the activity in the sympathetic and parasympathetic systems.

The HRV has been proposed as a robust, non – invasive and sensitive tool to study the influence of both sympathetic and parasympathetic systems on the heart [6]. Personality affects the individual's emotional state, autonomic stability, and capacity to self-regulate stress, as well as health behaviour and response to medical treatments. Thus, the present study was designed to study the influence of personality type on HRV.

MATERIAL AND METHODS

This comparative study was conducted in the Department of Physiology, S.M.S Medical College, Jaipur (Rajasthan). After taking approval from Institutional Ethical Committee SMS Medical College, Jaipur and informed consent from participants, the present study was carried out by dividing the subjects in the Type 'A' and Type 'B' personalities which was based on Glazer questionnaire. In each of these two groups 30 males were taken. Participants were asked to answer 20 questions and each question has two polar answers. The subject had to choose proximity to his answer in terms of numbers from 1 to 7. Then the numbers of all the answers were added. After that, the personality was classified according to their total score.

Type 'A' personality having 80 to 140 total scores
Type 'AB' personality 60-79 total scores
Type 'B' personality <59 total scores [7]
Type 'AB' personality was excluded from the study.

The general information like relevant history, age and anthropometric measurements (height, and weight) were recorded for all the selected subjects. Body mass index (BMI) was calculated by weight (in kg) divided by the square of height (in meter) (Quetelet's Index) [8].

After selection of subject according to personality, the exact recording procedure was explained to the subjects and necessary instructions were given to the subjects, that to avoid food preceding two hours before HRV testing; coffee, nicotine or alcohol not be taken 24 hours prior to the testing and wear loose and comfortable clothing.

All subjects, who came to our laboratory for HRV recording, first we gave rest to him for 15 minutes at laying state. Room ambient temperature was maintained between 24-25ºC. Subjects were instructed to breathe quietly during the entire recording period with closed eyes and to avoid talking, moving hands, legs and body, coughing during test and sleeping. The baseline HRV during resting state was recorded for 5 minutes for short term analysis of HRV. The assessment of HRV recording was done for 5 minutes by CANWin Windows based Cardiac Autonomic Neuropathy Analysis System (version 1.0).

The socioeconomic status was assessed by chi-square test. Student's unpaired "t" test was used to compare means of HRV data of Type 'A' and Type 'B' personalities. The statistical tests were done with the help of statistical software Primer version 6. For significance p value <0.05 was considered significant.

RESULTS

Both the group i.e. Type 'A' personality subjects and Type 'B' personality subjects were comparable in age and BMI. The mean age (in years) of Type 'A' personality subjects and Type 'B' personality subjects was 23.73 ± 2.96 v/s 24.50 ± 3.49 (p=0.361). Likewise, BMI (kg/m^2) for Type 'A' was 24.12 ± 1.75 and for Type 'B' it was 23.79 ± 1.47 (p= 0.432). Both the group were also well comparable in socioeconomic status (p = 0.922). (Table- 1)

The heart rate, LF (sympathetic component) and LF: HF ratio (sympatho-vagal balance) is increased high significantly in Type 'A' than Type 'B' personality group subjects, during resting state. While the HF (parasympathetic component) is decreased (P<0.001) in Type ' A' than Type'B' personality subjects. (Table -2)

Table -1: Socioeconomic status of Type 'A' and Type 'B' personality subjects

S. No.	Socioeconomic Status	Type 'A' personality (n=30)		Type ' B' personality (n=30)	
		No.	(%)	No.	%
1	**Class 1**	16	53.33%	17	56.66**%**
2	**Class 2**	8	26.66%	10	33.33**%**
3	**Class 3**	5	16.66%	2	6.66**%**
4	**Class 4**	1	3.33%	1	3.33**%**
5	**Total**	30		30	

Chi-Square Test=1.538 at 3 DF ***Non Significant (p = 0.922)

Table-2: Comparison of HRV variables in Type 'A' and Type 'B' personalities during resting state.

S. No.	HRV Variable	Type 'A'(n=30)	Type 'B'(n=30)	Significance
1	**Heart Rate (beats/minute)**	84.77± 0.90	77.04 ±1.18	p<0.001*
2	**LF (nu)**	72.94 ± 3.82	68.9 ± 3.38	p<0.001*
3	**HF (nu)**	27.06 ± 3.82	31.11 ± 3.38	p<0.001*
4	**LF:HF ratio**	2.77 ± 0.54	2.25 ± 0.36	p<0.001*

*Highly significant (p<0.001), n= number of subjects

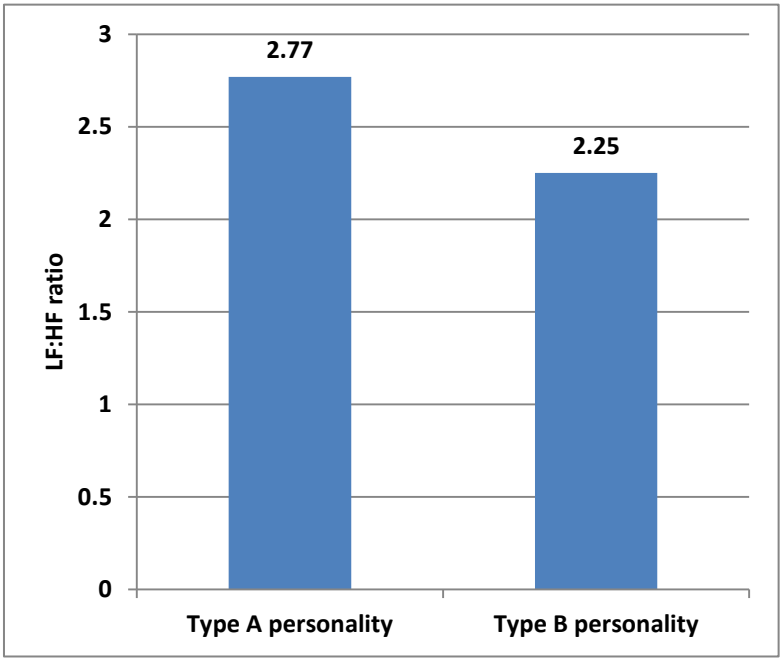

Fig 1: LF: HF ratio during resting state in Type 'A' and Type 'B' personality subjects

DISCUSSION

In the present study mean heart rate for Type 'A' personality is 84.77± 0.90 and for Type 'B' is 77.04 ±1.18 beats/minute at resting state. Contrast to present study, Simrankaur *et al.;* [9] found mean heart rate (beats/minute) for Type 'A' personality is 74.50 ± 10.15 and for Type 'B'personality is 83.5 ± 11.37 beats/minute.

The baseline LF: HF ratio in Type 'A'personality is 2.77 ± 0.54 and Type ' B' personality is 2.25 ± 0.36 in this study. While in observation of Simran kaur *et al.;* in [9] mean LF: HF ratio in Type 'A' personality is 1.09 ± 0.69 and for Type ' B' personality is 1.23 ± 0.74. In our study both personalities Type 'A' and Type 'B' have elevated baseline sympathetic-vagal balance (LF: HF) in comparison to Simran Kaur *et al.;* In present study Type ' A' personality have more elevation of sympathetic component (LF) than Type ' B' personality subjects during resting state, when it compared to Simran Kaur *et al.;* findings, in which Type 'B' personality have raised sympathetic (LF: HF) ratio than Type 'A' personality subjects.

Sympathetic activation is contributed possibly by Psychological characteristics and behavioural response of an individual [10, 11]. These behavioural responses are regulated by central control mechanisms, which are linked closely to brain stem centers that modulate autonomic outflow [12]. The central control mechanism of brain of individual personality depends on both genetic and environmental factors [13]. The enzyme catechol O-methyltransferase (COMT) and monoamine oxidase A (MAOA) is encoded by COMT gene and MAOA genes and these genes are associated with the anger, aggression, and hostility components of the Type 'A' personality. These enzymes inactivate neuro-transmitters dopamine, serotonin, and norepinephrine.

A single nucleotide polymorphism (SNP rs4680) due to Guanine to Adenine substitution in the COMT gene results in the replacement of the amino acid valine (Val) by methionine (Met) at position 158 of the catechol O-methyltransferase. The protein with a Met at position 158 has a reduced activity, by this norepinephrine being broken down more slowly leads to prolonged activation of the sympathetic nervous system root cause of the aggression, anger and hostility components of the Type 'A' personality [14-16]. People with 3 or less of a 30-bp(base pair) repeat have a lower level of monoamine oxidase A activity, have a higher risk of being aggressive, a typical behaviour pattern of the Type ' A' personality [17-19].

The cell membrane protein neuregulin-1 interacts to tyrosine kinase receptors to cause alteration in cell functions. Normally NRG1 reduces excessive beta-adrenergic stimulation while increasing parasympathetic activity. Variation in gene neuregulin-1 also causes sympathetic stimulation in Type 'A' personality subjects [20].

Social factor affect personality by interacting with other person in his group .Culture of any society determines behaviour and personality of an individual; all the social norms are followed by an individual which will make good personality. All the feelings, emotions, idea, attitudes, habits and behaviour, as well as body structure, are the result of physical environment to which an individual belongs. Environmental factors have an important role in the formation of personality which is changeable according to situations. Personality is not the result of only one factor but many factors contribute to it [21].

All these genetic and environmental factor may result in increased sympathetic activity that leads to increased heart rate and increased LF: HF ratio in Type ' A' personality subjects during resting state.

CONCLUSIONS

In present study we found baseline difference of sympatho-vagal balance in both personality subjects during resting state. Type 'A' personality have raised heart rate and sympathetic component of autonomic nervous system at resting state. So they are more prone to future consequences of various diseases.

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