



Assessment of Stress Parameters and Cognitive Functions in Different IQ-EQ Groups

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Abstract

There is individual variation in response to same type of stress depending on the IQ-EQ level. Stress affects various parameters of higher mental functions such as attention, concentration, decision making, learning and memory. Even the cognitive functions vary depending upon the variation in general and emotional level of a person. This study was conducted on thirty-five healthy male volunteer students chosen randomly and after taking consent. The subjects were divided into four groups depending upon their IQ-EQ level. Parameters of stress and cognitive functions were assessed between groups. Significant differences in four groups were found for handgrip, ASS and serum cortisol. Low IQ high EQ and low IQ low EQ groups were most stressed out.

Key Words

Intelligence quotient, Emotional quotient, Attention concentration span, Recent memory, Isometric handgrip

Introduction

Human intelligence is the intellectual prowess of humans which is marked by high cognition, motivation and self-awareness (1). Study of intelligence is a dynamic field which is continuously evolving, expanding and gaining utmost importance. Several external environmental factors have been developed to enhance intelligence such as seminars, educational programs, coaching, training etc., still very little is known about causes of inter-individual difference in intelligence and how many factors conglomeration are operating for development, organization and execution of intelligence (2).

Emotional intelligence is the ability to recognize emotions, reason with emotions and emotion related information, and processing emotional information. Higher emotional intelligence is positively correlated with better social relations and highly emotionally intelligent individuals are perceived more positively by others. They have better family and intimate relationships, better academic achievements, better social relations during work performance and in negotiations and better psychological wellbeing (3). There are four basic levels of emotional intelligence. First and the most basic level

involves awareness of emotions, which is developed in early childhood. Next level comprises mental processing of emotions and the ability to incorporate emotional experiences into general awareness. At the third level, the individual is able to understand and reason about emotions; including how and why they develop. The fourth level involves the most highly developed ability, to manage and regulate emotions (4).

Stress is any external factor that disrupts homeostasis. Both the stressful life events and daily life stresses have deleterious and cumulative effects on human body and brain functions (5). Several studies have shown bad effects of stress on various parameters of higher mental functions such as attention, concentration, learning, and memory (6). There are five types of stresses namely- acute time limited stress (involve short term challenges), brief naturalistic stress (an event that is normal but nevertheless challenging), stressful event sequence (that continue to yield stress into the immediate future), chronic stress (exposure to long term stressor) and distant stress (that is not immediate) (7).

The ultimate function of the brain is cognition (8). It is the mental process of acquiring knowledge and

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understanding through thoughts, experiences and senses. It encompasses many aspects of intellectual functions and processes such as attention, formation of knowledge, memory and working memory, judgement and evaluation, reasoning, problem solving, decision making and production of language (9).

General and emotional intelligence determines an individual's capacity to handle day to day circumstances. It is correlated with better social and family relations, better academic performance and better psychological wellbeing. Is IQ and EQ of a person responsible for handling daily stresses? Does IQ and EQ level of an individual beneficial for him in cognitive tasks? To answer these intriguing questions, present study was designed to know the effect of an individual's IQ-EQ level on parameters of stress and cognitive functions.

Material and Method

The study was conducted on 35 healthy male volunteers (age 20 – 30 years; mean \pm SD, 24.42 \pm 1.6). Subjects with past or present significant history, psychiatric illness, CNS disorder, drug or alcohol abuse and any other known medical conditions were excluded. Only male subjects were chosen because females have different levels of stress and stress reactivity during different phases of menstrual cycle.

Ethical clearance for the study was taken from the Institutional Ethics Committee of Government Medical College, Jammu (J&K). The subjects were called and briefed about study with the help of subject information sheet and informed written consent for participation in the study was taken. Each subject served as his own control. Only educated volunteers were chosen for the reasons that adequate educational background is required for filling of questionnaires and visual time reaction measurements. All the experiments were done in forenoon to minimize the diurnal variations in cortisol level.

In the present study, parameters assessed were IQ, EQ, chronic stress, acute stress, cognitive tests (memory test and attention concentration) and stress related parameters (handgrip, serum cortisol).

Scales used were Wechsler Adult Performance Intelligence Scale, Indian adaptation version (10) for IQ; N.S. Schutte Emotional Intelligence Scale (11) for EQ; Acute stress questionnaire (12) for acute stress and Sheldon Cohen Perceived Stress Scale (13) for chronic stress. For assessing cognitive functions, Stroop colour word test and PGI memory test were used. Serum cortisol, a well-known biochemical marker of stress and

IHG, measure of sympathetic system outflow(handgrip dynamometer used) were used for stress assessment.

Statistical Analysis

To compare IQ-EQ groups, Bartlett's test for equal variance with posthoc analysis (Bonferroni) was used. The results were computed as significant at $p < 0.05$ level (*), more significant at $p < 0.01$ level (**) and highly significant at $p < 0.001$ level (***)

Results

IQ score of 35 subjects during first phase ranged from 84-125 with mean of 110.02 \pm 10.35. EQ score ranged from 98-151 with mean of 128.28 \pm 13.77. On the basis of IQ and EQ score, the subjects were divided into four groups (median split method) as follow:

- Group 1: High IQ High EQ n= 11
- Group 2: Low IQ High EQ n= 9
- Group 3: High IQ Low EQ n= 10
- Group 4: Low IQ Low EQ n= 5

The mean values of IQ and EQ in four groups were (Table 1).

Based on IQ-EQ grouping, parameters were assessed between groups such as handgrip, acute stress reactivity, chronic stress reactivity, serum cortisol, memory test (recent memory test, attention concentration score, attention concentration time) and Stroop test (Table 2 a-d).

Table 1: Grouping According to Median IQ (110)and EQ (127) Scores.

Group Name	Number of subjects	IQ	EQ
Group 1: High IQ-High EQ	11	117.5 \pm 6.1	142.4 \pm 6
Group 2: Low IQ-High EQ	9	99.3 \pm 6.5	133.0 \pm 6.6
Group 3: High IQ-Low EQ	10	116.8 \pm 3.3	117 \pm 7.8
Group 4: Low IQ-Low EQ	5	99.2 \pm 6.1	111.2 \pm 7.5

IQ: intelligence quotient; EQ: emotional quotient

Discussion

Different level of GI and EI affects the stress response differently in different individuals. Generally, all stressful events create certain category of emotions that vary in intensity and may have effects on cognition and performance. In the present study, significant differences

Table 2 (a): Handgrip and Serum Cortisol

Group Name	Handgrip	p value	S. Cort	p value
Group 1: High IQ High EQ	20.36 ± 1.96	1:2 = 0.003** 1:3 = 0.00***	8.30 ± 0.30	1:2 = 0.00*** 1:3 = 0.00***
Group 2: Low IQ High EQ	23.33 ± 1.73	1:4 = 0.00*** 2:3 = 0.0008***	18.96 ± 0.92	1:4 = 0.0004*** 2:3 = 0.00***
Group 3: High IQ Low EQ	27.20 ± 1.93	2:4 = 0.00*** 3:4 = 0.02*	12.51 ± 0.74	2:4 = 0.00*** 3:4 = 0.00***
Group 4: Low IQ Low EQ	30.40 ± 2.60		9.99 ± 1.01	

IHG: Isometric handgrip (mm Hg), S. Cort: Serum cortisol (µg/dl)

Table 2 (b): Acute and Chronic Stress Value

Groups	ASS	p value	PSS	p value
Group 1 High IQ High EQ	28.63 ± 4.84	1:2 = 0.03* 1:3 = 0.008*	12.54 ± 6.93	1:2 = 0.11 1:3 = 0.003**
Group 2: Low IQ High EQ	39.77 ± 14.41	1:4 = 0.00*** 2:3 = 0.57	17.66 ± 2.00	1:4 = 0.005** 2:3 = 0.16
Group 3: High IQ Low EQ	42.80 ± 13.66	2:4 = 0.00*** 3:4 = 0.00***	22.20 ± 4.77	2:4 = 0.12 3:4 = 0.67
Group 4: Low IQ Low EQ	71.40 ± 4.45		23.80 ± 11.87	

ASS: Acute stress score, PSS: Perceived stress score

Table 2 (c): Memory Test

Group Name	Memory Test			Groups	p Value		
	RMT	Attention Concentration			RMT	AC	
		Score	Time			Score	Time
Group 1: High IQ High EQ	18.50 ± 1.03	40.00 ± 8.70	198.10 ± 1.77	1:2 1 3	0.00*** 0.00***	0.058 0.88	0.00*** 0.00***
Group 2: Low IQ High EQ	24.00 ± 1.68	34.22 ± 4.17	206.10 ± 2.64	1:4 2:3	0.00*** 0.004**	0.001* 0.08	0.00*** 0.46
Group 3: High IQ Low EQ	25.90 ± 1.51	39.60 ± 6.60	205.16 ± 2.67	2:4 3:4	0.00** 0.00***	0.06 0.001*	0.07 0.017*
Group 4: Low IQ Low EQ	30.44 ± 0.80	27.20 ± 2.86	208.98 ± 4.63				

RMT: Recent memory time (in seconds); AC: Attention concentration, ACS: Attention concentration score, AST: attention concentration time (in seconds)

in four groups based on IQ-EQ were found for handgrip, ASS and serum cortisol. Chronic stress reactivity exhibited significant differences between group 1:3 and 1:4 and among other groups, results were non-significant. Stroop test and memory test exhibited both significant and non-significant results between various subtests.

Present study reported significant changes between

four groups in handgrip values (DBP was measured). Previous studies reported that lower IQ raises the risk of heart diseases including alteration in both systolic and diastolic BP; that was used in isometric handgrip measurement in present study (14). Emotionally intelligent people have better results with lowering of blood pressure (15).

Table 2 (d): Stroop Test

Group Name	Stroop Test						Group	p Value					
	Neutral		Interference		Facilitation			Neutral		Interference		Facilitation	
	Score	Time	Score	Time	Score	Time		Score	Time	Score	Time	Score	Time
Group 1: High IQ High EQ	65.18	944.18	74.27	872.72	79.18	692.54	1:2	0.83	0.0008***	0.33	0.60	0.23	0.63
	±	±	±	±	±	±	1:3	0.63	0.04*	0.84	0.13	0.04*	0.06
	6.88	163.07	5.93	111.30	3.70	66.85	1:4	0.01*	0.005	0.24	0.56	0.26	0.07
							2:3	0.80	0.11	0.26	0.34	0.44	0.18
Group 2: Low IQ High EQ	65.77	757.44	72.55	894.66	77.44	719.33	2:4	0.01*	0.91	0.72	0.88	0.89	0.17
	±	±	±	±	±	±	3:4	0.007**	0.21	0.19	0.51	0.61	0.77
	4.63	82.26	3.08	96.33	1.94	139.09							
Group 3: High IQ Low EQ	66.50	841.70	74.66	936.60	76.26	795.40							
	±	±	±	±	±	±							
	5.08	74.87	2.00	78.05	3.31	123.50							
Group 4: Low IQ Low EQ	56.80	764.20	71.80	902.60	77.11	814.40							
	±	±	±	±	±	±							
	8.98	57.89	1.30	77.08	4.02	137.04							

Present study reported highly significant changes in various IQ-EQ groups in their serum cortisol response to stress. Results from similar studies indicate that EI influences stress response in some students but not in others that may be due to the study methods and EI measures used or may reflect the complexity of group assessment (16).

Present study reported highly significant difference between groups 1:4, 2:4, 3:4 in their acute stress scores. Significant changes were also reported between 1:2 and 1:3. Similar studies have reported negative relationship between acute stress and performance IQ (17). Studies report that individuals with high level of EQ experienced lesser traumatic stress. Emotional intelligence may lead to positive effect by acting as stress buffer. It minimizes the acute stress experienced in demanding situation (18).

Significant differences were observed between group 1:3 and 1:4 in their chronic stress level. Studies report that it of utmost importance to encode errors of reward prediction (with levels of fluid intelligence) more strongly when life experiences are mainly adverse (19). Studies also show that enhanced EI may help diminish burnout development when chronic stress is experienced (20).

Present study reported highly significant differences in RMT between groups 1:2, 1:3, 1:4 and 3:4. Also, significant differences were found between groups 2:3 and 2:4.

Similar studies reveal robust correlation between fluid

intelligence and working memory (21). Cobo (22) reported that emotional intelligence benefits working memory capacity.

Highly significant difference was observed between groups 1:2, 1:3 and 1:4 in their ACT. Significant changes were observed between groups 3:4 in their ACS and ACT while significant changes were observed in ACS in group 1:4. Studies reported that intellectually gifted individuals can better concentrate their attention, better restraint their impulses, perform better, have better sensitivity and have better ability to distinguish a target from distractors than intellectually average individual (23). Studies assessing the role of emotional intelligence on cognitive processes report that EI, as measured by performance-based ability model, plays a significant role in cognitive processes when emotion is implicated in the task (24).

Present study reported significant and non-significant changes in various subtests of Stroop test between four IQ-EQ groups. The studies reported that people with higher IQ resolve Stroop test better. Also, people who exhibit more emotion regulation are less impulsive when responding to Stroop test (25).

Limitations of the Study

The present study was performed with small sample size for assessing the difference in four IQ-EQ groups on stress parameters and cognitive functions. The results of the study maybe specific to the type of subject chosen



and individual variation in genetic make up to handle stressful situations. However, the study gave us important insight into the fact about the most stressed out groups and variations in stress parameters and cognitive functions depending on IQ and EQ of the individual. Further studies need to look at cognitive effects and stress response in larger number of subjects.

Conclusion

Low IQ high EQ group recorded highest cortisol level. Low IQ low EQ group reported highest handgrip and ASS values. It can be inferred that both these groups were most stressed out. The ability to manage emotions allows people to reduce the tension between the desire to do right and the motivation to serve their self-interest.

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