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EMOTIONAL INTELLIGENCE AND LOGICAL REASOING ABILITY –A CORRELATIONAL STUDY

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ABSTRACT:

The present study focuses on the interplay between emotional quotient and reasoning ability of an individual. Emotions are an indivisible part of a human being and so is his ability to reason for situations and events around him. Why is it that when we feel bored, the task at hand seems tedious and hectic, full of hurdles, and when we are happy no task is monumental or impossible. This study attempts to highlight the inter-operation of emotions which influence our reasoning capacity to understand and draw logical inference of the task. To quantify emotions, a test was administered to identify their emotional quotient and the subjects were later categorised into high and low categories respectively. And then their brain activities were studied to understand the connection between them. How high and Low EQ subjects responded were recorded using an Electroencephalogram (EEG) machine. And after using relevant statistics, it was concluded that there is significant and positive correlation between a person's emotional quotient and reasoning ability.

INTRODUCTION:

The term "Emotional Intelligence" has been used occasionally since mid-twentieth century. The literary novel of Jane Austen's Pride and Prejudice refer to various characters exhibiting this quality (Van Ghent 1953, p. 106-107). Scientific references date to the 1960s. For example, emotional intelligence was mentioned in relation to psychotherapy treatments (Leuner 1966) and to promoting personal and social improvement in general sense (Beasley 1987, Payne 1986). During the 1980s, psychologists opened themselves to the idea of multiple intelligences (Gardner 1983, Sternberg 1985). Simultaneously, research on emotion and on the interaction of emotion and cognition were on the rise. It was in the midst of such lively inquisitiveness that scientific articles on EI first began to appear (Mayer et al. 1990, Salovey & Mayer 1990). Interest in studying EI grew dramatically throughout the late 1990s, mostly due to popularisation of the topic (Goleman 1995). With the terms newly found cachet, and with the excitement surrounding the identification of a potential new intelligence, many used the term-but often in markedly different ways. So, what does "emotional intelligence" really mean? By 2007, the number and kind of concepts of EI equalled the number and kind of people inquisitively employing EI. Some researchers defined EI as – an ability to reason about emotions; others compared the concept to a list of traits such as achievement motivation, flexibility, happiness and self-regard. Still others found the addition of such traits, which seemed to be ad hoc, to be troubling, and wondered whether a theoretically sound concept of EI could be defined (Locke 2005). A scientific concept such as EI arises in the context of associated scientific terms and their meanings. Cronbach & Meehl (1955) referred to this context as a nomological network-a system of meanings with which most scientists are familiar and that have been established because of their utility. For the term "Emotional Intelligence" to be valid, it must fit with such a network of concepts (or provide a rationale for why it does not). We begin by examining some concepts that are closely related to EI and then consider how EI might fit within this nomological network. View and definitions of human mental abilities and Intelligence- Intelligence is a type of mental ability that concerns the handling of – and reasoning about – information of various sorts (Caroll 1993, Spearman 1927, Sternberg & Detterman 1986). The information involved can be very specific (relations among auditory frequencies) or very general (strategic planning). Often, these abilities are described as falling along a hierarchy from simple perceptual processes and information processing to higher and more general forms of problem solving (Caroll 1993). Intelligence may be defined as a mental ability or set of mental abilities that allow the recognition, learning, memory for and capacity to reason about a particular form of information, such as verbal information. The view of intelligence is like a general descriptive term referring to a hierarchy of mental abilities. At the lowest level of this hierarchy are basic, discrete, mental abilities.

These include, for example the ability to recognize words and their meanings in the verbal area, or, as another instance, to see how puzzle pieces fit together in the perceptual realm, or to understand how objects are rotated in space. At a middle level of hierarchy are broader, cohesive group of abilities. These abilities include verbal-comprehension intelligence – a group of abilities focused on understanding and reasoning about verbal information, and, as a second example, perceptual-organizational intelligence – a group of abilities focused on recognizing, comparing, and understanding perceptual patterns. At the highest level of the hierarchy, general intelligence or 'g', involves abstract reasoning across all such domains.

View and definitions of Emotions- As an emotion emerges, it entails coordinated changes in physiology, motor readiness, behaviour, cognition and subjective experience (Izard 1993, Parrott 2002, p.342; Simon 1982). For example, as a person becomes happy, he/she may experience lower blood pressure and greater motor readiness in approaching others; he/she also may smile, think happy thoughts and feel good on the inside. These emotional reactions arise in response to perceived or actual changes in the person's environment. The definitions of both intelligence and emotion are consistent with longstanding – we would say, consensual – approaches in their respective disciplines, but there are alternative views of both concepts (Averill & Nunley 1993, Kleinginna&Kleinginna 1981, Sternberg 1985, Sternberg & Detterman 1986). For example, some views of intelligence divide the concept into a crystalized, learned portion, including especially verbal aspects, and into a fluid portion that involves on-the-spot reasoning and emphasizes perceptual-organizational and spatial skill. Alternative views of emotions exist as well. Acknowledging such complexities, we continue to examine how intelligence and emotion might connect with EI in a conceptual network. Emotion can be defined as an integrated feeling state involving psychological changes, motor-preparedness, cognitions about actions, and inner experiences that emerge from an appraisal of the self or situation

From a psychological standpoint, reasoning can be defined as the set of mental processes used to derive inferences or conclusions. Reasoning aids in generating new knowledge and in organizing existing knowledge, making it more usable for future mental work. Reasoning is therefore a pivot to many forms of thought such as scientific, critical, and creative thinking, argumentation, problem solving, and decision making. Each of these more complex forms of thought can employ inductive, deductive, and abductive reasoning which are described below.

Induction – Inductive reasoning is implicative; it generates new knowledge. Inductive reasoning supports inferences but does not guarantee that the inferences are true. Vickers (2006) characterizes inductive reasoning as "contingent" (i.e., dependent on past experiences and observations). There are many forms of inductive reasoning such as enumerative induction and analogical reasoning. The best-known form is enumerative induction in which the general properties of a class are inferred from a specific set of empirical observations. For example, upon observing that all the birds in the neighbourhood have wings and fly, a person infers that all birds have wings and fly. Generalizations of this kind, although very common in human reasoning, are clearly flawed (ostriches and penguins are birds and have wings, but do not fly). The preceding example illustrates a general epistemic problem with inductive inferences, which philosophers refer to as the problem of under determination.

Analogical reasoning is another form of inductive reasoning that is important in generating new knowledge. Analogical reasoning involves the transfer of knowledge elements and the relationships among themselves (e.g., object properties and property relations such as correlated features) from a well-known domain, a "base," to an unknown or partially known domain, a "target" (see Gentner, Holyoak, &Koikinov, 2001). For example, the analogy of a biological cell as a factory allows people to transfer knowledge about how a factory works (it has parts that are specialized to perform certain tasks and that operate together for optimum functioning of the whole) to understand how a cell works. Analogical reasoning is often used in instruction to help student understand new concepts by analogical transfer from more familiar concepts (Clement, 1993; Baker & Lawson, 2001, Thagard, 2006). Inductive reasoning presumes principles of regularity or continuity in the world that allow the drawing of inferences about new instances from past experience. Induction plays a role in concept formation and concept learning in every domain of knowledge from natural language to science.

Deduction – Deduction is the processes of inference which guarantees logically valid conclusions from a set of premises. In other words, assuming that the premises are correct, the conclusions deduced from these premises must also be correct. Transitive inferences of the kind described earlier (Jane is taller than Mary; Mary is taller than Jill; therefore, Jane is taller than Jill) are one form of deductive inference. Deduction is a constituent of many

varieties of cognitive performance such as text comprehension, scientific and mathematical reasoning, and argumentation. Deduction also plays an important role in categorical reasoning. If, for example, scientists were to discover the remains of a hitherto unknown animal in permafrost, conduct DNA analysis on the remains and conclude that the animal was a mammal. they could then deduce that this previously unknown species had defining mammalian characteristics (e.g., it gave birth to its young and had body hair). One of the main cognitive functions of deductive reasoning is to organize knowledge in ways that allow one to derive nearly similar conclusions from sets of premises.

Abduction – The term abduction was coined by Charles Peirce (1839–1914) to refer to a third mode of inference that was distinct from induction and deduction and played a crucial role in scientific reasoning and discovery. Abductive reasoning is a form of reasoning in which individuals start by attending to a particular phenomenon hypothesize their observation. The process is often called inference to the best explanation (Lipton, 1961; Thagard & Shelley, 1997). Many causal inferences are abductive in nature. An example of abductive reasoning would be an inquiry of car crash where investigators try to reconstruct what happened from forensic evidence (e.g., patterns of damage to a car and its surroundings, physiological and toxicological data of the driver and passengers). From the forensic data, they reconstruct the most plausible or likely explanation for the crash.

REVIEWS

AN EEG CASE STUDY OF ARITHMETICAL REASONING BY FOUR INDIVIDUALS VARYING IN IMAGERY AND MATHEMATICAL ABILITY: IMPLICATIONS FOR MATHEMATICS EDUCATION

-Mark Rousell.(2012)

The main issue of interest here is whether individuals who differ in arithmetical reasoning ability and levels of imagery ability display different brain activity during the conduct of mental arithmetical reasoning tasks. This was a case study of four participants who represented four extreme combinations of Math's –Imagery abilities: ie., low-low, high-high, high-low, low-high respectively. As the Ps performed a series of 60 arithmetical reasoning tasks, 128-channel EEG recordings were taken and the pre-response interval subsequently analysed using EGI GeosourceTMsoftware. The P who was high in both imagery and maths ability showed peak activity prior to response in BA7 (superior parietal cortex) but other Ps did not show peak activity in this region. The results are considered in terms of the diverse routes that may be employed by individuals during the conduct of arithmetical reasoning tasks and the possible implications of this for mathematics education.

HOW EMOTIONS AFFECT LOGICAL REASONING: EVIDENCE FROM EXPERIMENTS WITH MOOD-MANIPULATED PARTICIPANTS, SPIDER PHOBICS, AND PEOPLE WITH EXAM ANXIETY.

-Nadine Jung (2014)

Recent experimental studies show that emotions can have a significant effect on the way we think, decide, and solve problems. This paper presents a series of four experiments on how emotions affect logical reasoning. In two experiments different groups of participants first had to pass a manipulated intelligence test. Their emotional state was altered by giving them feedback, that they performed excellent, poor or on average. Then they completed a set of logical inference problems (with if p,then q statements) either in a Was on selection task paradigm or problems from the logical propositional calculus. Problem content also had either a positive, negative or neutral emotional value. Results showed a clear effect of emotions on reasoning performance. Participants in negative mood performed worse than participants in positive mood, but both groups were out performed by the neutral mood reasoners.

METHODOLOGY

Problem: To find out the correlation between Emotional Quotient (EQ) and Reasoning Ability (RA).

Objective: To study the relationship between Emotional Quotient and Reasoning Ability.

Hypothesis: There is positive and significant correlation between Emotional Quotient and Reasoning Ability.

Sample: The sampling method used here is purposive random sampling. A total of 4 subjects were selected by administering an EQ test and categorised into having high or low EQ. The EQ test used was developed by Dr. Dalip Singh and Dr. N KChadha – know Your: Emotional Quotient Test'.

Variable: Independent Variable – Emotional Quotient
Dependent Variable – Reasoning Ability.
Control Variable – Time (5 min) for solving DBDA- RA test

Operational Definition: The scores obtained will define the correlation between Emotional Quotient and Reasoning
ability

Research Design: This research is based on Experimental Research design. An Experiment is a study in which a treatment, procedure, or program is intentionally introduced and a result or outcome is observed.

Research Tool: The research was conducted by using an EEG machine. A Computerised test was prepared of the DBDA [David's Battery of Differential Abilities]–Reasoning Ability test. The subject was made to solve the DBDA-RA test, and the results are recorded using the machine.

Data Collection: The data was collected with the help of EEG (Electroencephalogram) machine. Thesubject was given DBDA-RA test to solve while wearing the machine to record hisbrain activity. As the subjectsolved the test, EEG activity was recorded. Therecorded signals were then processed and relative statistics was used to draw the necessary inference.

RESULT AND DISCUSSION

Statistical analysis: The method of calculations used here is Chi-Square test as this research is based on experimental design with a small sample population, a non-parametric test has been used. A slightly different measure of association is the contingency coefficient. This is another Chi-square based measure of association, and one that also adjusts for different sample sizes.

2x2 contingency table 1: Alpha Wave values

High EQ	3.51	2.50
Low EQ	4.94	9.46

Chi-Square $X^2 = 1.067$

Contingency Coefficient C = 0.45

2x2 contingency table 2: Beta Wave values

High EQ	3.16	1.93
Low EQ	4.44	7.96

Chi-Square $X^2 = 0.727$

Contingency Coefficient C = 0.40

	Chi – Square '$X^{2'}$	Coefficient 'C'	Degree of Freedom 'df'
Alpha Values	1.067	0.45	3
Beta Values	0.727	0.40	

Interpretation:-

The obtained Value of Chi score for alpha is 1.067 and beta is 0.727. But the correlational values of alpha – '0.45' and beta - '0.40' show differently. The correlation is significant for both – alpha and beta values. This means that the two variables Emotional Quotient and Reasoning Ability are significantly correlated.

Hence the hypothesis is accepted that there is positive and significant correlation between Emotional Quotient and Reasoning Ability.

Discussion: The reason for such a correlation can be a small sample population. But as the earlier research suggests, there is significant effect on logical reasoning when subjects are exposed to emotional states. Research conducted by Nadine Jung (2014) states that the emotional states tend to affect the logical reasoning ability of an individual when he is subjected to different emotional states. This study was carried out on individuals who had high Emotional Quotient, but were not subjected to any emotional states during the analysis of Reasoning Ability test. Yet it seems that there is no correlation between the Emotional Quotient and Logical Reasoning Ability of an individual. On the contrary, as shown in table 1, the beta values of subjects 1 and 2, who happen to have low EQ, are higher as compared to the subjects 3 and 4 who have high EQ. It can be inferred that solving analytics and arithmetic problems has nothing to do with a person's emotional quotient. It would be surprising to know that the area of brain related to carry out tasks pertaining to analytics is the frontal lobe (see image 1), and the same is used for analysing emotions too. As it is seen that beta and alpha waves were supposed to be prominent (see

image 2), but on the contrary, they seem to dormant and less active. Theory states that, the brain waves, beta and alpha show increased activity while engaged in processing of mental activities. The correlational statistics conclude that there is significant and positive correlation between Emotional Quotient and Reasoning Ability of an individual.

CONCLUSION: There is positive and significant correlation between Emotional Quotient and Reasoning Ability

LIMITATIONS:-

1. The sample of the study was too small.
2. The experimental environment was not fully controlled, which resulted in too many artefacts, affecting the accuracy of the data.
3. Factors of age, gender, socio-economic status, educational background, residence (Urban/Rural),profession were not taken into account.

SUGGESTIONS:-

1. The research can also be conducted into other areas.
2. The study can also be done by taking large sample size – upto 30 subjects.
3. It is also possible to test the Stress induced while solving the test by using the EEG machine
4. It is possible to test the other factors using this method and procedure.

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