

Exploring the effect of emotions on logical reasoning in Indian adolescents

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ABSTRACT

Emotion and logical reasoning are closely interlinked and are found to influence each other. Adolescence happens to be a time, where emotions are evidenced to impact strongly the rational logical reasoning process. This research is an attempt to explore this phenomenon in the adolescent individuals living in Delhi-NCR. The approach to examine this relationship is by exploring the impact of influence on the emotional state of adolescents and its impact on their performance of logical reasoning tasks. For this study, we employed the use of Positive and Negative Affect Scale (PANAS) for measuring the emotional state of the participants. Post this initial test the participants were required to attempt an IQ test, to which manipulated feedback was provided, followed by another administration of PANAS questionnaire. Then an administration of logical reasoning task was asked to be performed, to which their performance was noted. It is hypothesized that; the current mood state will not play any role in performance on the logical reasoning task. Such a study is unique as the relationship has not been closely explored in Indian Context. The findings have important implications for educators and practitioners in building interventions and understanding the dynamic interplay of emotions and reasoning in contextual setting

Keywords: Logical reasoning, Emotion, Intelligence, Adolescents, Performance, PANAS.

Emotions play a major role in influencing daily life and our routines. If we observe the way we request for favors from our parents, we generally tend to approach them when they are in a happy mood. This is because we anticipate the granting of requests due to their being in a positive frame of mind. Mood states are a dynamic yet integral part of our lives where we observe the expressed emotions of others around us and constantly make inferences from them. We tend to take ill-thought out and impulsive decisions, when we are angry or hurt, as evidenced by the attempt to suicide cases, which generally are results of a prolonged state of mental distress. The common image of impaired reasoning due to emotional distress is that of adolescent individuals indulging in unsavory, antisocial and possibly dangerous tasks. The teenage years have been long presumed to be characterized by rash decisions and compromised reasoning skills. Multiple researches point towards the impact of environmental changes, physical changes and biological changes

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Received: September 11, 2020; Revision Received: September 21, 2020; Accepted: September 27, 2020

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leading to this kind of impaired reasoning skills. In addition to this, due to the ongoing brain development which occurs during adolescence, the emotion regulation capability of adolescent individuals has been found to be less than optimal.

The influence of emotions on intelligence, decision making and reasoning has been well researched, an articulated and significant link exists between the impact of emotions and reasoning skills. Emotions and reasoning have been found to be entangled with each other, with each influencing the other. However, the ties between the two, although deeply explored, still remains, ambiguous to a great extent. Emotions, depending upon the context and effectiveness, facilitate reasoning as well as, impeded effective reasoning. In our research, we have attempted to understand the relationship between emotions and reasoning. Our research work is heavily influenced by Jung, Wranke, Hamburger and Knauff (2014)'s study on exploring the links between emotions and logical reasoning.

They explored the relationship between emotion and reasoning by experimenting on young adults (19-30). One of the four experiments they conducted is as follows, the experiment included a mood test (German version of PANAS) followed by a manipulated intelligence test, where false feedback was given to participants and they were segregated into 3 groups namely, positive(good performers- provided with positive feedback), neutral (average performers- provided with neutral feedback), negative (poor performers- provided with negative feedback). Post which the same mood test is taken to see if the manipulation of mood happened accurately and finally the reasoning test (Wason's Selection Task) was actually evaluated to find the effect of manipulated mood on reasoning.

We went through the same process but the IQ test and the reasoning test we used were different. Our sample was from the age range of 16-20 (adolescents).

LITERATURE REVIEW

Nadine Jung, Christina Wranke, Kai Hamburger, and Markus Knauff (2014) is the base paper of our research. They studied the effect of emotion on reasoning and the results of their many experiments show that neither positive nor negative emotion rather neutral emotions have a significant amount of effect on reasoning. Their participants were young adults and were not from a psychology background.

Channon 134 and Baker (1994) They explained how depressed people are unable to use performance strategies, which further describes the effect of mood on performance and reasoning. They made 2 groups both having depressed participants as well as control groups; group A was given performance strategies (strategy aid) to deal with situations and problems whereas group B was not given any strategy (no strategy aid). The result shows that the depressed participants of both the groups underperformed in comparison to the control group. 12 depressed and 12 control participants were randomly allotted to the strategy aid group (A) whereas 11 depressed and 11 control participants were allotted to the no strategy aid group (B). The tasks used in the research were multiple scheduling tasks, response suppression task and memory for categorized words task. The results of the study were consistent with the theories and depression models.

Kensinger, Elizabeth A. Corkin, Suzanne (2003) The study proved through an experiment that mood has an influence on our working memory. Tasks like backward word span and alphabetical word span were administered to test the working memory based on emotionally negative and neutral words. The study included 30 participants who were young adults age

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ranging from 19-25 years. The tests used in the experiment were self-ordered pointing, backward and alphabetical word span and n-back test. The result also explains that the emotional inclination because of the content affects the working memory too. It also shows how emotional content has more effect on working memory than long term memory.

Bower, (1981) Proves how we majorly remember experiences which are congruent to our emotions, we identify with people we think are feeling or living similar situations like us. This is known as the mood congruency; this very effect was studied on the participants. This study also explains the state-dependent memory retention, which is the process where people tend to remember the memory or incident at a later stage when they feel or are exposed to a similar emotion they felt in the original situation.

Jennifer S. Lerner (2014) Explains the role of emotions in decision making. It explains how powerfully emotions and our feelings influence our decisions based on 8 major domains namely, Integral Emotions, Incidental Emotions, Emotional Valance, Content of Thought, Depth of Thought, Goal Activation, Interpersonal Decision Making and Reduction of unwanted effects of emotion. This review paper explored the last 35 years of work on emotions effect on decision making, studying different models and theories that establishes a positive relationship between emotion and decision making.

(Barrett and Salovey,2002; Chater and Oaksford, 2001 Damasio, 1998; Ekman and Davidson,1994) Their empirical research was dedicated to examine or explore the effect of emotion on logicity. They used deductive reasoning in their experiment to arrive at a logical conclusion by applying one or more premises. It has become clear that human performance is affected by a number of factors, related to the content or context of the rules, that are not relevant within a logical system.

De Jong, Haenen, Schmidt, and Mayer (1998) this research studies the effect of fear and danger (negative emotions) on hypochondriac patients. It studies a total of 54 participants in which 27 are hypochondriac patients and 27 control group. Wason's selection task was administered to examine reasoning in anxiety-related disorders, patterns of reasoning related to the threat. The research and the experiment could not prove any significant finding or result, but does agree to the theory of emotions affecting the reasoning.

CJ Beukeboom, GÈR Semin (2005) This study explains how the mood depicts the understanding of our behavior. Participants mood was manipulated and then they were asked to re-describe their day to day behavior. It was recorded that positively manipulated mood participants re-described the situations based on "why" terms whereas negatively manipulated mood participants described situations based on "how" terms. This study was done on 56 undergraduate students. This was a computer-mediated study. The participants were first shown short films to induce happy and sad mood then they were given a mood confirming test which was followed by the behavior re-description questionnaire.

CJ Beukeboom, GR Semin (2006) This research proves how positive mood induces global processing style of explaining social events whereas negative mood induces analytical processing style of explaining social events. 58 undergraduate students were the participants in the study. The mood-state was first manipulated and then an autobiographical event was asked to be described by the participants.

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Blanchette (2006) the research focused on determining the effect of emotions on interpretation and logic through different experiments on 32 students and staff of the University of Manchester. The results proved that emotions have no effect on interpretation whereas they have some amount of effect on logic.

Bethany Lavins (2011) This empirical study was performed to find out the effect of emotional or neural content on logical reasoning related to the same content. The sample consisted of 25 under graduation students from Ohio State University. Results proved that reasoning was stronger in emotional content as compared to neural content.

METHODOLOGY

Participants

1. The sample consisted a total of 60 adolescents from school and colleges. Ranging from 16 to 20 years of age; the mean age is 17 years; male-18, female-42.
2. The sample was of class 11th students. Official permission was taken from the head of the department and the principal of the organization.
3. DAV Public School, Sector 14, Faridabad and Manav Rachna International Institute of Research and Studies, Faridabad were the organizations from where the data was collected.

Design and Material

First, the mood-state of participants were measured with the help of Positive and Negative Affect Schedule (PANAS). They were instructed to record their responses based on how they have been feeling in the past week. We termed this test as PANAS-1 for the experiment the test took about 3-4mins to complete.

Next, a general intelligence test was constructed and administered, comprising of 12 verbal ability questions; 10 quantitative ability questions and 8 general awareness questions, total 30 Multiple Choice Questions. Students were provided with manipulated scores and feedback which segregated them into 3 groups of positive; negative and neutral based on the manipulated marks assigned to them. Marks were assigned randomly, mixing all kinds of students in each group. The feedback played the role of inducing the manipulated mood, the low scorers were humiliated in front of the class by an authoritative figure which produces the feeling of shame and sadness; the high scorers were praised and labeled as students who really work hard and are intelligent which tends to produce feelings of happiness and proud. Then these students were given the PANAS again to check if the manipulated feedback induced the required mood-state, we label this test as PANAS-2. This time students were instructed to record the responses based on their current mood-state.

Finally, the reasoning test was given which comprised of 30 general reasoning multiple choice questions taken from the internet. This is our main test which tests for the effect of emotion on reasoning, as we had segregated them into 3 groups, the performance of these groups when compared gives us the result about which mood state is likely to perform better at reasoning.

The participants had no clue about the process of the experiment as it was a single-blind experiment. They were told that a workshop to assess their cognitive skills has been arranged and the feedback and debriefing were done by a teacher/professor to gauge the participants.

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Procedure

First, we developed a rapport with our participants, 30 in one session. They were told that a workshop regarding cognitive skills has been arranged for them where they will be given a series of tests and detailed feedback will be provided according to their performance.

They were given instruction to read the questions thoroughly and that there were no right or wrong answers for the mood test, they are supposed to fill them according to what they feel; they were also asked to not cheat and do their own tests so that better feedback about their cognitive abilities can be provided to them; if they have any queries they can ask us.

They were given the PANAS 1, with the instruction to record their responses based on how they have been feeling in the past week. Followed by the intelligence test, no gap was given in-between these tests.

False scores were given to the participants for their intelligence test, as they were randomly segregated into 3 groups, the high scorers were given positive feedback and praised in front of all the students; average scorers were given neutral feedback and asked to try hard the next time; low scorers were given negative feedback and scolded and humiliated in front of all the participants. This was done to induce negative or sad mood in low scorers; positive or happy mood in high scorers and nor happy or sad mood in neutral scorers. The feedback was given by their own teacher/professor so that it leaves an impact on the participants.

Now, the PANAS 2 was administered, this time the participants were instructed to record the responses based on how they are feeling at present, this was conducted to check if the manipulation of mood happened successfully and the required mood was induced as expected.

Finally, the participants were given the reasoning test which took about 30 mins to finish, participants were seen taking it more seriously.

After all the tests were taken the participants were debriefed about the experiment, everything was explained in detail with everyday examples for them to understand better about the role of emotions and their effect on reasoning. They were clearly explained how the feedback and scores they obtained in the intelligence test were false and manipulated therefore they should not consider them as important for their future or personality.

RESULTS

The mean of manipulated intelligence scores and reasoning scores of each group.

Manipulated (/60) (Positive)	Manipulated (Neutral)	Manipulated (Negative)	/30 (Positive)	(Neutral)	(Negative)
INTELLIGENCE SCORES	INTELLIGENCE SCORES	INTELLIGENCE SCORES	REASONING SCORES	REASONING SCORES	REASONING SCORES
40	30	12	12	13	2
42	28	8	13	11	12
48	26	12	16	9	12
42	28	10	17	12	6
44	24	12	18	14	16
44	28	8	8	15	15
43	32	14	16	10	11
46	30	8	16	14	13
42	32	10	17	18	14

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Manipulated (/60) (Positive)	Manipulated (Neutral)	Manipulated (Negative)	/30 (Positive)	(Neutral)	(Negative)
44	32	6	13	14	16
46	9	8	14	7	15
44	30	10	17	11	16
42	28	4	12	9	8
40	28	10	16	15	12
44	24	14	17	15	14
42	24	12	18	9	14
42	30	14	19	9	15
40	28	8	15	10	13
42	26	8	13	11	12
42	22	8	13	11	10
44	24	14	14	16	15
43	26.80952381	10	14.95238095	12.04761905	12.42857143

Anova applied to calculate the significance of the 3 groups.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Rows	334.56	19	17.60842105	1.797405109	0.038413458	1.725029095
Columns	3488.66	4	872.165	89.02750692	6.72599E-28	2.492049297
Error	744.54	76	9.796578947			
Total	4567.76	99				

Interpretation

In our research, we first did an assessment of the present mood state using the Positive and Negative Assessment Scale. This scale was administered on the sample of 60 school going students of the age 14-15 years and they were asked to indicate their current mood state on the scale. After administering the scale, we gave an intelligence test to the sample. This test consisted of questions on reasoning skills and general knowledge in order to measure their intelligence. After the sample completed the test and submitted it, we randomly gave manipulated results to the sample and physically divided them into three groups based upon the manipulated results. We strongly praised the group of individuals whom we deemed to be intelligent, gave no feedback to the group whom we decided should get neutral scores and strongly belittled the group of students whom we decided should get a negative score. After this, we once again administered the PANAS and asked the students to indicate how the emotions they are currently experiencing. Once the participants had indicated their emotions, the test on reasoning was administered on them. It was on this final test; we tried to assess if the influence of manipulating the mood of the participant reflected upon the performance on the test of reasoning.

The individuals belonging to group 1, were the students who were praised and given positive reinforcement after performing on the intelligence test, obtained a mean score of 36.63 on the positive emotion section of PANAS and a mean score of 19.05 in the negative emotion section of PANAS. They obtained a mean score of 14.95 on the reasoning test which was administered after giving praise.

The individuals belonging to group 2, were the students who were not praised and not given any kind of feedback on their performance on the intelligence test, scored a mean score of 28.57 on the positive emotion section of PANAS and a score of 23.33 in the negative emotion section of PANAS. They obtained a mean score of 12.04 on the reasoning test which was administered after giving no feedback.

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The individuals belonging to group 3, were the students who were criticized, belittled and scolded after performing on the intelligence test, scored a mean of 25.48 on the positive emotion section of PANAS and a score of 25.33 in the negative emotion section of PANAS. They obtained a mean score of 12.42 on the reasoning test which was administered after giving praise. From the means, we can observe that feedback does play a role in influencing the performance on the reasoning test of the sample.

In order to assess whether the manipulation of mood, as attained by providing positive, negative and no feedback to the participants does indeed influence the reasoning skills of the individuals, we carried out an ANOVA test, where we found significant difference appearing in the performance on reasoning test between the three groups. Thus, we reject our null hypothesis that there will be no difference in the reasoning skills of the three groups receiving three different kinds of feedback which would induce within them three separate kinds of mood. Same could be corroborated by the average scores which were have obtained in the three separate groups.

Hypothesis

1. Ho: Different mood states will not play any role in the reasoning performance of adolescents.
2. HA: Different mood states affect the reasoning performance of adolescents.

CONCLUSION

The research suggests that mood state or emotion affects the reasoning of adolescents. In addition, it was also found that feedback, be it negative or positive, has an effect on the performance of an individual. In the case of the average group, who were given no feedback, scored the lowest, thus reconfirming that feedback too has an effect on performance. This successfully concludes that there is a clear effect on reasoning and performance which has a direct link to the mood, be it positive or negative. The results, however always depend on the sample size and the diversity of the given group, which is determined by the individuals present in the sample size. For this research, only adolescents have been selected and tested on and considered in its sample space. The results might differ if we change our sample to different age groups or a randomized group of individuals consisting of people of all ages with regards to false feedback and negative moods.

REFERENCES

- Barrett and Salovey (2002); Chater and Oaksford (2001) Damasio (1998); Ekman and Davidson (1994) The effect of emotion on interpretation and logic in a conditional reasoning task. *Memory & Cognition* 34, 1112–1125
- Bethany Lavins (2011) Emotion's Effect on Reasoning with Quantifiers. Honours Thesis, Ohio State University.
- Blanchette (2006) The effect of emotion on interpretation and logic in a conditional reasoning task. 34, *Memory & Cognition*.
- Bower, (1981) Mood and Memory. Vol 36, American Psychological Association.
- Channon 134 and Baker (1994) Executive function in depression: the role of performance strategies in aiding depressed and non-depressed participants. *Journal of Neurology, Neurosurgery & Psychiatry* 1999;66:162-171.
- CJ Beukeboom, GÈR Semin (2005) Mood and representations of behaviour: The how and why. *Cognition and Emotion*, Psychology Press, 19 (8).
- CJ Beukeboom, GÈR Semin (2006) How mood turns on language. *Journal of Experiment Social Psychology*

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- De Jong, Haenen, Schmidt, and Mayer (1998) Hypochondriasis: the role of fear-confirming reasoning. *Behaviour Research and Therapy*, 36(1):65-74
- Jennifer S. Lerner (2014) Emotion and Decision Making. *Annual Review of Psychology*.
- Kensinger, Elizabeth A. Corkin, Suzanne (2003) Effect of Negative Emotional Content on Working Memory and Long-Term Memory. Vol 3, American Psychological Association.
- Nadine Jung, Christina Wranke, Kai Hamburger, and Markus Knauff (2014) How emotions affect logical reasoning: evidence from experiments with mood-manipulated participants, spider phobics, and people with exam anxiety. *Front Psychol.* 2014; 5: 570.

Acknowledgement

We would like to extend our utmost gratitude to Head of the Department of Faculty of Behavioral and social sciences, Manav Rachna International Institute of Research and Studies- Dr. KM Tripathi and Professor Ms. Shatarupa Chakraborty for their constant support and guidance throughout the research.

Conflict of Interest

The author declared no conflict of interest.

How to cite this article: Verma L.& Dubey P. (2020). Exploring the effect of emotions on logical reasoning in Indian adolescents. *International Journal of Indian Psychology*, 8(3), 1961-1968. DIP:18.01.204/20200803, DOI:10.25215/0803.204