Influence of mood states, group discussion, and interpersonal comparison on change in decision-making and information processing

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Abstract: This study examines the joint effects of moods and group processes on decision-making and information processing; 462 students participated from the Indian Institute of Technology Kharagpur. They reported their choices to economic gain, loss and health-risk situations, reasons for their choices, and the response times to complete the questionnaire. Then, positive and negative moods were induced, followed by a group discussion and an interpersonal comparison of the choices in four conditions. Comparison of post- and pre-test responses revealed choice polarisation and improvement in decision quality following positive-mood and negative-mood group discussion conditions. The information attributes of fluency, originality, and flexibility, and the response time are higher following a negative-mood discussion and negative-mood comparison conditions than following their counterpart conditions. Negative moods slow down thinking. When active cognitive processes are triggered through group discussion, choices polarise with information certification in interpersonal communication, and the effect of a mood degenerates gradually.

Keywords: choice polarisation; group decision-making; information attributes; information processing.

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1 Introduction

Some decisions involve the selection of one course of action among several alternatives, while others require a sequence of choices in response to a changing environment. Either individuals or groups may make such decisions. Earlier studies (Mohanty and Suar, 2013) suggest that when individuals make decisions in situations that involve financial gain and loss as well as health-risk situations, neither the positive and negative affectivity traits nor the positive and negative moods influence the decisions consistently. Rather, evidence suggests that an individual who has a negative affectivity trait and a negative mood processes information more systematically than does one who has a positive affectivity trait and a positive mood, respectively. In contrast with earlier studies, this study, as an alternative to individual decision-making, considers the joint impact of (positive and negative) moods, group discussion, and interpersonal comparison on change in decisions regarding financial gain and loss, and health-risk situations. Because information is central to decision-making, this study also tests the influence of moods and group processes on information processing.

Group decision-making has been offered a special status in society since ancient Greek civilisation, which developed democratic voting. The importance of group decision-making stems from the fact that a myriad of decisions in society are made and executed in teams, committees, task forces, business partners, juries, and families. The education board decides and structures the course curricula used to teach students. The marketing team develops strategies to market new products. Legislatures decide which bills to pass into law, and corporate boards decide which investments are necessary. In organisations, from board meetings among executives to quality circles among employees, important decisions are often made in groups.

Group decisions have several advantages over the individual's decisions. First, an individual's decision regarding an issue is likely to be based on limited information in terms of knowledge, judging consequences, and other potential outcomes. The limited information can be overcome by tapping into alternative points of views, knowledge, analysis, and understanding from group members. Second, group decision-making is an active learning process. Each member learns from others because a scope exists for receiving feedback about the decision, reducing ambiguity in it, and cross-checking it. Third, an individual may make a biased decision with subjective justification, which is likely to be scrutinised and rationalised via the alternative views of group members. Lastly, others are more likely to accept a decision arrived at through the involvement of group members, and group members will experience a sense of ownership in the decision.

Research in social psychology has demonstrated the importance of group decision-making over individual decision-making in changing attitudes, values, decisions, and judgments (Myers and Lamm, 1976; Suar, 1992). Studies in the early 1970s found that groups tend to make riskier decisions than do individuals in the context of preferences on the choice dilemma questionnaire, which was assumed to measure risk. These 'risky shift' (Stoner, 1961) findings led to many other similar studies (Myers, 1982; Suar, 1992), and further research confirms that groups make riskier as well as cautious decisions than individuals in a variety of tasks.

The systematic review of literature on risky shift, choice shift, and group polarisation (Burnstein and Vinokur, 1975; Myers, 1982; Rodrigo and Ato, 2002) has pruned the list of explanations to two theories:

a persuasive argument theory (PAT)

b social comparison theory (SCT).

In PAT, following a group discussion, the individual gains access to more information that changes his/her initial preferences (Burnstein and Schul, 1983; Bishop and Myers, 1974). In SCT, the individual compares his/her response with those of others in the group in an effort to match his/her preference with others, which could change his/her initial inclination (Baron and Roper, 1976; Cox, 2002). The former emphasises cognitive influences, while the latter focuses on normative influences.

In accordance with PAT, if two possible alternatives (say x and y) of a decision task exist, the individual retrieves images and thoughts from memory in the form of arguments in order to evaluate the alternatives. When the pool of arguments favours an alternative over another, the individual chooses that alternative. If discrepant arguments on an issue are available to the individual prior to the group discussion, the individual gains access to new arguments following the group decision. When discussants rethink the issue during/following group discussion, they gain access to many new arguments that were not available to them prior to the discussion. When all of these arguments favour an alternative following the discussion, individuals' choices are swayed in favour of that alternative.

The shift of choice following a group discussion also depends on the persuasiveness of the arguments. Persuasive arguments are novel (new), valid/logical (accepted as true and plausible), useful, convincing, and supportive of group members. Even logical arguments, being low on novelty, appear to be highly convincing, supportive, and useful to the group members during a discussion [Suar, (1992), p.141] and hence are more persuasive. Further, prior to discussions, a few individuals in the group possess more persuasive arguments that are made available to all group members during discussions. By virtue of being cogent, those arguments come to mind more frequently and try to connect to other arguments that are available in the memory. As a result, during a group discussion, group members self-generate certain arguments that were not available to them prior to the group discussion. The body language attached to arguments increases their cogency. When the number of arguments, persuasive arguments, and self-generated arguments, predominantly favour an alternation during or following a group discussion, group members are swayed in favour of that alternative only.

In SCT (Brown, 1965; Sanders and Baron, 1977), the individual compares his/her decision about an issue with those of others in the group. The fact that the individual's decision is discrepant motivates him/her to shift his/her initial response so that he/she is like the others in the group. The mean, median, and skewed distribution of the initial preferences of group members or the extreme preference of a group member during comparison defines the norm. Deviants change their preferences so that they match the norm or excel that norm slightly. This results in a change in decision. Studies confirm that when an individual compares his/her preference with the discrepant preferences of group members, he/she explores why others have taken different positions than he/she has on the same issue. The individual self-generates arguments/information to justify the preferences of others and the information helps the individual to change his/her preference following interpersonal comparison (Suar, 1998). First, while verbal, persuasive, and self-generated information causes a response shift in PAT, only the self-generated information causes such a shift in SCT. Second, while the comparison with the

extreme individual or group norm motivates one to shift choices in SCT, access to a variety of information causes the shift in PAT.

Typically, in testing PAT,

1 subjects initially make their decisions on certain issues

2 they form small groups, discuss the issues, and may arrive at a consensus

3 finally, they give their responses to the same issues.

Similar is the procedure in testing SCT, but instead of pursuing a group discussion and consensus, subjects compare their choices with those of others in the group. Given the procedural differences in testing the theories, PAT emphasises active interaction, and SCT focuses on passive interaction. PAT is characterised by more information-driven interaction and SCT by more choice-driven interaction. In addition, labour-intense interaction to obtain more rich, accurate information for making a choice will be used in PAT, while effortless interaction to gain access to more shallow, less critical information will be used for making a choice in SCT. In PAT, if someone disagrees with the group decision, active conformity pressure (group members' verbal talks with reasons will be directed toward the deviant) will motivate the deviant to comply. Contrarily, in SCT, someone who is away from the group norm may be inwardly convinced to comply with the norm. On the whole, more access to information following the discussion will result in more change of a decision than following the social comparison.

Mood states play an important role in information processing (Clore et al., 2001; Gasper and Bramesfeld, 2006; Martin and Clore, 2001; Schwarz and Clore, 1983). A positive mood provides information regarding the fact that all is well, whereas a negative mood indicates that the situation is critical and problematic (Clore and Huntsinger, 2009). This affective information alters the level at which people process information (Gasper and Clore, 2002). When a situation is perceived to be fine, people tend to think superficially and process information heuristically when making a decision or solving a problem (Vallacher and Wegner, 1989). Contrarily, when a situation is critical or problematic, people tend to think deeply and process information systematically when making a decision. Consistent with this observation, the dual force model (Fiedler, 2001), and the broaden-and-build model (Fredrickson, 2001) posit that while a positive mood processes broad, cautious information (Gasper and Bramesfeld, 2006); a negative mood processes task-focused, depth information. In contrast with a positive mood, people with a negative mood pay more attention to details and process information centrally rather than peripherally (Gasper and Clore, 2002).

When people work in groups, people rely not only on their own mood states but also on the mood states of others. If affective feelings and reactions are shared within a group of people, these shared feelings may serve in joining the individuals together (Anderson et al., 2003). However, if group members' affective feelings and reactions deviate from one another, this may actually separate individuals from one another and slow down the group members' decision-making (Anderson et al., 2003). If a positive mood encourages heuristic information processing, a discussion of group members who are in positive moods would yield less of a shift in preferences than would a discussion of members who are in negative moods (Fredrickson, 2001). Given the extent of information processing when people are in certain moods and in a group discussion or in an interpersonal comparison, we predict the following:

H_1 Individuals who have negative moods following discussion in the group will shift their initial choices more on a decision task than will

a the individuals who are in positive moods following discussion in the group

b the individuals in negative and positive moods following interpersonal comparison of choices in the group.

Decision quality (DQ) is procedural rationality and the substantive rationality in decision-making processes (Simon, 1976) for the emergence of a desirable decision. While a positive mood is associated with more shallow and less effort-intensive information processing, a negative mood is associated with more labour-intensive information processing as well as greater openness and attention to new information (Bless and Schwarz, 1999; Forgas, 1995; Schwarz et al., 1991; Forgas and George, 2001; Frijda, 1993). A positive mood as compared with a neutral or negative mood discourages careful information processing and yields less quality decisions (Mackie and Worth, 1989). Meanwhile, a negative mood as compared with a neutral mood leads to more accurate perceptions and attributions (Forgas, 1995). Individuals who are involved in a discussion engage in the deep and systematic processing of information. Following discussions among members in a group, it may occur that most of the members are convinced about a common choice, they unfreeze their initial preferences, and they reach a high-quality decision. Individuals who engage in the interpersonal comparison of choices in a group are less likely to change their choices due to the lack of scope of the active exchange of information, less thinking, and less intense information processing. These empirical analyses and arguments suggest a clear linkage with the proposition that group discussion facilitates openness, the elaborate processing of new information and perspectives, and the process of exchanging, sharing, and integrating distributed information in a group. This sort of information processing cannot be equated with self-generated or task-irrelevant information processing following the interpersonal comparison of choices. In integrating the mood states of group members with discussion and interpersonal comparison of choices, we predict that:

H_2 Individuals who have negative moods following discussion on an issue in the group will achieve higher DQ than will

a the individuals who are in positive moods following discussion in the group

b the individuals in negative and positive moods following interpersonal comparison choices in the group.

The variability in cognitive parameters, such as fluency, originality, and flexibility, are useful for assessing information processing. Fluency is the production of ideas, alternatives, or solutions. It has been shown that individuals who are in negative moods engage in critical thinking and produce more useful ideas because they have less confidence in their own choices when making decisions (Edwards and Weary, 1993). Contrarily, individuals who are in positive mood states are less fluent due to superficial thinking on the problem domain. Original information is described as unique, surprising, wild, unusual, unconventional, novel, or revolutionary. Individuals who are in a group and have negative (positive) moods are more (less) likely to describe their own decisions, to receive feedback from others, and to develop unique ideas (Edwards and Weary, 1993). With flexibility, individuals think on the same problem from varied perspectives in order to choose an alternative. Flexible thinking stimulates changes in ideas,

viewpoints, approaches, and perspectives of a situation (Clore et al., 2001). Individuals who are in negative moods are likely to display more flexibility than are individuals who are in positive moods because the former are less sure and confident in their decisions than are the latter. A group-induced response shift occurs following a group discussion because certain verbal, persuasive, and self-generated arguments that not all group members initially know are introduced to group members during/following a discussion in the group. Contrarily, individuals only gain access to self-generated arguments following interpersonal comparison. On the basis of discussion, we propose:

H_3 Individuals who are in negative moods following a discussion on an issue will process information with more fluency, originality, and flexibility than are

- a the individuals who are in positive moods following a discussion in the group
- b the individuals who are in negative and positive moods following the interpersonal comparison of choices in the group.

In the information processing approach, response time (RT) is traditionally defined as the amount of time consumed in understanding a problem, thinking, and searching for a suitable solution in order to create a correct response (Bucur and Madden, 2007). It is shown that high time pressure results in reduced information exchange (Kelly and Barsade, 2001). If more information is processed when people are in negative moods than when they are in positive moods, RT to make a decision and to explain the reasons for the decision will be higher in negative moods than it would be in positive moods. Moreover, RT will be higher following the discussion in a group than following response comparison in the group because the individuals will gain access to, think about, and process more information following a discussion than following the interpersonal comparison of choices in a group. Combining individuals' mood states with PAT and SCT, it can be predicted that:

H_4 Individuals' RT will be higher in a negative mood following a discussion in the group than it would be for

- a the individuals who are in positive moods following discussion in the group
- b the individuals who are in negative and positive moods following the interpersonal comparison of choices in the group.

2 Method

2.1 Research design

An experimental study inducing a happy and a sad mood immediately followed by the discussion and the interpersonal comparison of choices in a group was used to test the hypotheses. The responses to questions were obtained individually before the experimental manipulation (pre-test), and the responses to same questions were obtained after the experimental manipulation (post-test) in order to gauge the effects of mood states along with group processes. Accordingly, post- and pre-test responses to questions were compared. Five experimental conditions were present:

1 positive mood group discussion (PMGD)

2 negative mood group discussion (NMGD)

3 positive mood social comparison (PMSC)

4 negative mood social comparison (NMSC)

5 buffer task control (BTCO) conditions.

Participants were randomly assigned to groups. In PMGD, 92 participants were in three six-person groups, six five-person groups, and 11 four-person groups; in the NMGD condition, 86 participants were in three six-person groups, five four-person groups, and 12 four-person groups; in the SCPM condition, 100 participants were in six six-person groups, eight five-person groups, and six four-person groups; in the NMSC condition, 95 participants were in three six-person groups, nine five-person groups, and eight four-person groups; and in the BTCO condition, 89 participants were in four six-person groups, five five-person groups, and ten four-person groups. Each condition had 20 groups. Student participants were used because they are extensively used in group decision-making research. Moreover, the decisions of students on hypothetical situations have reasonable resemblance to the decisions of average people in real life (Cox, 2002).

2.2 Participants

A total of 462 students in the age group of 19 to 28 years (male = 283, *M* age = 24.08; female = 179, *M* age = 24.84), including graduate and post-graduate engineering students, management students, and research scholars from the Indian Institute of Technology Kharagpur, West Bengal (India), participated in this study. Prior to their participation, subjects were informed about the opportunity to cooperate in a study related to making decisions concerning financial gain and loss as well as health-risk situations. Nothing about the actual experiment was communicated. Informed consent was sought, and those who signed the informed consent form were the study's participants.

The subjects participated as individuals and groups. They had studied 14–21 years in formal educational institutions and had one to five years of work experience (Table 1). Those in the NMGD and PMSC conditions had more experience than did the participants in the other conditions. The socio-demographic profiles of participants in different conditions were compared using the F test when data were in metric scale and χ^2 test when data were in frequencies. Chi-square values suggested that male and female participants were proportionately distributed in five conditions, and the participants' home backgrounds suggested that they were equally from rural, semi-urban, and urban areas. Participants' ages and their numbers of years studied in formal educational institutions were more or less comparable in five conditions. All of the participants in different conditions were from nuclear families of three to seven members. The average annual family income was about 50,000 Indian rupees, and the participants in the PMSC condition had more income than did the participants in the PMGD, NMSC, and BTCO conditions. By and large, participants in different conditions were similar with regard to gender composition, age, and formal education (Table 1).

Table 1 Sample profile

Characteristic	*Descriptive statistics*	*Different condition*					χ^2	*F*
		PMGD	*NMGD*	*PMSC*	*NMSC*	*BTCO*		
Gender	Male (%)	55 (11.9)	59 (12.7)	56 (12.12)	60 (12.98)	53 (11.47)	3.45	
	Female (%)	37 (8.0)	27 (5.95)	44 (9.52)	35 (7.57)	36 (7.79)		
Age	*M (SD)*	23.01 (2.49)	25.47 (3.83)	25.07 (4.27)	25.0 (4.46)	23.28 (2.51)		1.82
Years studied	*M (SD)*	17.93 (2.78)	19.22 (2.63)	19.16 (3.32)	18.92 (3.71)	18.19 (2.84)		1.12
Income in INR	*M (SD)*	480,434 (154,947)	502,906 (183,481)	572,530 (266,078)	485,347 (223,798)	470,786 (140,778)		4.02**
Job experience	*M (SD)*	1.89 (1.18)	2.10 (2.89)	2.66 (3.06)	1.73 (2.22)	1.96 (1.17)		10.44***
Family size	*M (SD)*	5.14 (1.86)	5.23 (1.83)	4.76 (1.30)	4.67 (1.51)	5.07 (1.86)		1.96
Birth place	*N* (%)							
Urban		43 (9.30)	43 (9.30)	49 (10.6)	54 (11.68)	43 (9.30)	10.25	
Semi-urban		29 (6.27)	17 (3.67)	29 (6.27)	15 (3.24)	26 (5.62)		
Rural		20 (4.32)	26 (5.73)	22 (4.76)	26 (5.62)	20 (4.32)		

Notes: INR = Indian rupees; PMGD = positive mood group discussion; NMGD = negative mood group discussion;
PMSC = positive mood social comparison; NMSC = negative mood social comparison; BTCO = buffer task control condition
*p<0.05; **p<0.01; ***p<0.001

2.3 Measure

Along with the above-mentioned socio-demographic information, the questionnaire measured the choice behaviours of the participants, reasons for their choices, and RT. Another questionnaire assessed mood states.

- *Choices under uncertainty.* Four problems assessed choice under uncertainty. The problems given below contained one positive and one negative hypothetical prospect as well as two health-risk situations. Every situation had two alternatives: A and B. Each participant was asked to choose only one alternative in each situation, indicating his/her preference.

1	Positive prospect (Kahneman and Tversky, 1979)	
	A You can win Rs.25,000 with probability .33 Rs.24,000 with probability .66 0 with probability .01	B You can win Rs.24,000 with certainty
2	Negative prospect(Kahneman and Tversky, 1979)	
	A You can lose Rs.40,000 with probability .80 0 with probability .20	B You can lose Rs.30,000 with certainty
	Health situation(Kahneman and Tversky, 1979)	
	Consider the following two frames (survival and mortality). In each frame two alternative treatments are there. Please indicate the frame as well as treatment you would prefer.	
3	Survival frame	
	A (Surgery): Of 100 people having surgery 90 live through the post-operative period, 58 are alive at the end of the first year and 32 are alive at the end of five years.	B (Radiation therapy): Of 100 people having radiation therapy all live through the treatment, 77 are alive at the end of one year and 23 are alive at the end of five years.
4	Mortality frame	
	A (Surgery): Of 100 people having surgery 10 die during surgery of the post-operative period, 30 die by the end of the first year and 60 die by the end of five years.	B (Radiation therapy): Of 100 people having radiation therapy, none die during treatment, 22 die by the end of one year and 78 die by the end of five years.

- *Reasons for choice.* For each problem, each participant was asked to describe and to explain up to 100 words for why he/she preferred that choice, using the space provided after each problem.
- *RT.* RT was measured similarly as earlier (Bucur and Madden, 2007). The amount of time that each participant reported in the questionnaire was the time from the beginning of the questionnaire to the completion of the questionnaire.
- *Positive and negative affectivity.* The mood state was measured using a shorter version of the positive affectivity and negative affectivity schedule [PANAS] (Watson et al., 1988). Six items that portray a positive mood were: active, strong, enthusiastic, excited, attentive, and alert; meanwhile, six items that portrayed a negative mood were: scared, nervous, irritable, guilty, upset, and distressed. The response descriptions against each item were given on a five-point unidirectional scale ranging from ‘not at all’ (= 1) to ‘extremely’ (= 5). Each participant was asked to indicate his/her feeling on each item by encircling a response that best described

his/her current mood. Inter-item consistency of the PANAS was estimated using the Cronbach alpha. Before mood induction, inter-item consistency was 0.93 for positive affectivity items and 0.96 for negative affectivity items in the positive mood-induction group, and it was 0.76 for positive affectivity items and 0.81 for negative affectivity items in the negative mood-induction group.

2.4 Pre-test

The questionnaire containing the standard instructions was distributed to the subjects. They were given five minutes' time to read the instructions. Then, the experimenter explained the instructions and answered questions that the subjects raised. It was emphasised that they should read the items carefully and choose the answers as accurately as possible. On completion, participants retained the questionnaires, and the experimental manipulation followed.

2.5 Experimental manipulation

2.5.1 Mood induction

For the induction of positive moods, comedy video clips from 20 top comedy movies were shown, along with some clips from a laughter channel show and the non-verbal comedies of Mr. Bean (British Broadcasting Corporation, UK). Similarly, for the induction of negative moods, video clips from 20 top tragedy movies; tragedy scenes that depicted the Japanese tsunami, Hiroshima and Nagasaki incidents, and torture to children were shown. The comedy and tragedy clips each were 30 min long.

2.5.2 Group discussion

Following the mood induction, participants were asked to form four-, five-, and six-person groups. In group discussion sessions, each participant in the group that had the pre-test questionnaire was given a fresh questionnaire containing four items in the same order as in the pre-test with the following instructions.

> "Given here are the descriptions of the same situations that you considered before. Please copy your answer to each question below, and keep the completed questionnaire on the table. In real life, whenever people face such situations, they are likely to discuss them with others. Now, having formed the group, you discuss each question and its option. In each question, two options (A or B) are available. You discuss among yourselves which option is to be preferred. For each question, you may argue among yourselves as effectively as possible. Discussion of each situation will facilitate you to receive different opinions, ideas, and reasons from others that you had not considered before as well as to give your opinions, ideas, and reasons to others. In fact, consider each situation carefully in the light of information gained during the course of discussion to specify which option (A or B) is to be preferred for each question. Perhaps, during the course of discussion, you will arrive at a common decision. However, if you cannot, do not worry. Discuss all situations/questions for maximum 25 min. Once it is completed, you go to your seat and fill up another questionnaire."

After the participants reviewed the instructions, the experimenter made clarifications. The experimenter then collected the pre-test questionnaire. After completing discussion in the group, each participant went to his/her seat and completed a questionnaire identical to the pre-test questionnaire.

2.5.3 Social comparison

Following the mood induction, participants were asked to form four-, five-, and six-person groups. As earlier, each participant in the group that had the pre-test questionnaire was given a fresh questionnaire containing the four items in the same order as on the pre-test with the following instructions. Also, each participant was handed two options (A and B) written on two pieces of paper and pasted over two cardboards.

> "Given here are the descriptions of the same situations that you have considered before. Please copy your answer to each question below, and keep the pre-test questionnaire on the table. In real life, whenever people face such situations, they are likely to search for the opinions of others to know what options they prefer. Now, having formed a group, to do so, for the first question, keep your option (A or B that you have filled in to a question) on the table. Others can follow you in a clock-wise fashion and keep their options on the table to question 1. You can know and compare your options with those of other group members. After you have seen the options of others and others have seen your option to question 1, collect your option (A or B). Do similarly for questions 2, 3, and 4. Once it is completed, you go to your seat and fill out a fresh questionnaire."

The experimenter collected the pre-test questionnaire. Each participant went to his/her seat and completed a questionnaire that was identical to the pre-test questionnaire.

2.6 Control

In the control condition, a cancellation test was given to each subject in the group as a filler task with the following instructions. "Please do not open the next page until told to do so. This is a test to measure your speed. In the next pages, you will find random generated integer numbers from 001 to 100 arranged in rows and columns. You have to cancel the odd numbers row- or column-wise".

The instructions were clarified further, and then, the signal was given to 'start'. After ten minutes, the 'stop' signal was given, and the cancellation sheets were collected.

Upon completion of the cancellation task, each participant went to his/her seat and completed a questionnaire identical to the pre-test questionnaire.

2.7 Post-test

After the experimental manipulation, the experimenter mentioned that while writing replies, the respondents should not feel bound by what they had decided earlier. Rather, they should consider each situation and the related questions carefully and give their best responses to each question. It was also stressed not to leave any portion of the questionnaire blank. On completion, the post-test questionnaires were collected in each condition. Finally, the subjects were debriefed, answered, and thanked by the experimenter.

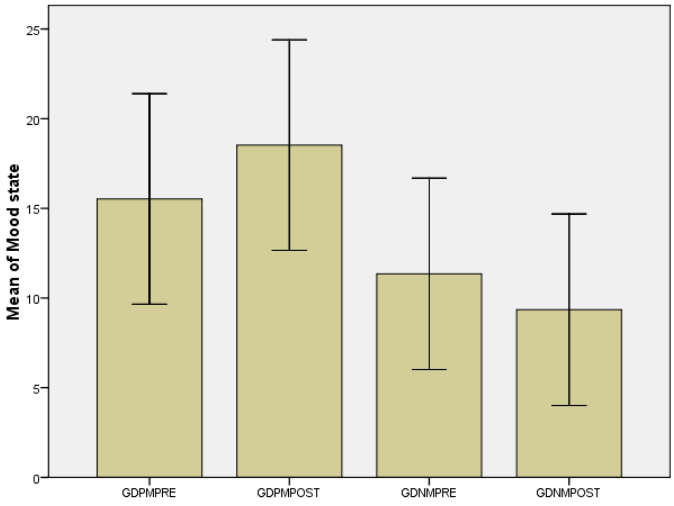
2.8 Procedure

After the pre-test, positive and negative moods were induced in each condition except for the control condition. Immediately following the mood induction, groups were formed, and group members each participated in a discussion and in the interpersonal comparison of choices. Each session had 15–35 participants. After the experimental manipulations, participants completed the questionnaire as they did in the pre-test. The PMGD, NMGD, PMSC, and NMSC conditions took one hour and 30 min, and the BTCO condition took one hour.

2.9 Analysis of reasons

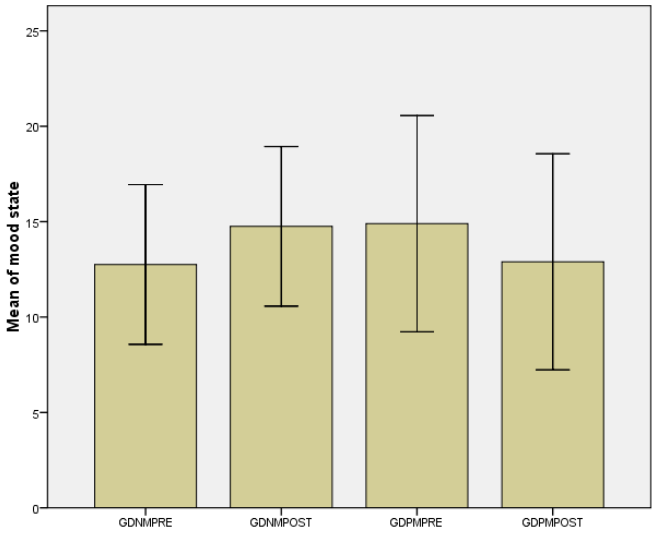
Participants wrote their reasons for choosing options for each question during pre- and post-tests. One expert in communication and another in management evaluated the participants' written explanations to each problem for the dimensions of fluency (production of ideas), originality (uniqueness of ideas), and flexibility (variety of ideas) on the basis of information bits, the confidence of the writing, and divergent thinking, respectively. Each dimension was measured on a 10-point scale, with '0' representing an absence of the dimension and '9' representing a complete presence of the dimension. Both the experts evaluated the first 15 participants' written explanations to four problems. The inter-expert reliability of the evaluations of the three dimensions ranged from 0.80–0.88. Each expert evaluated the written statements of 231 participants.

Figure 1(a) Mood states before and after watching comedy video clips in GD condition (see online version for colours)



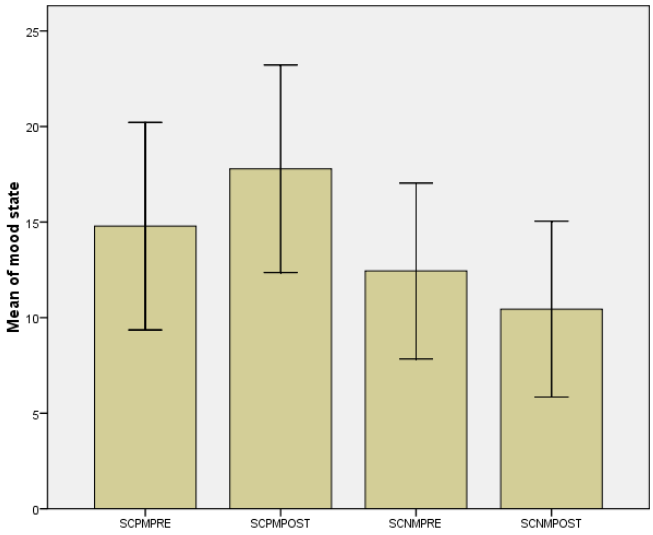
Notes: GDPMPRE: Group discussion positive mood before watching comedy video clips
GDPMPOST: Group discussion positive mood after watching comedy video clips
GDNMPRE: Group discussion negative mood before watching comedy video clips
GDNMPOST: Group discussion negative mood after watching comedy video clips

Figure 1(b) Mood states before and after watching tragedy video clips in GD condition (see online version for colours)



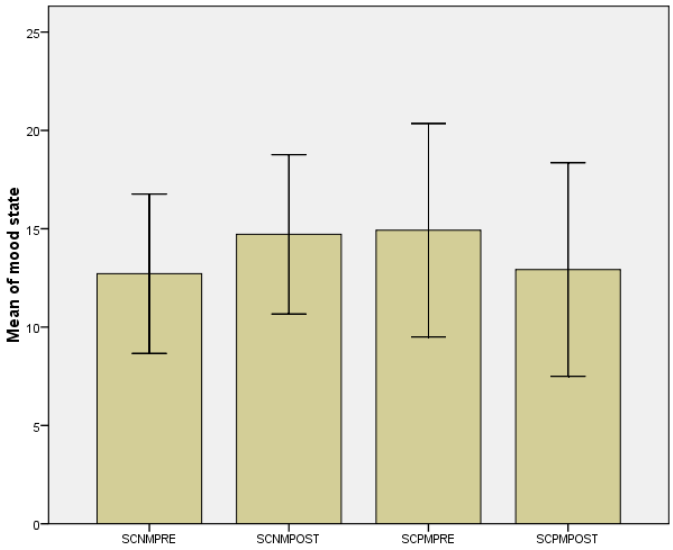
Notes: GDNMPRE: Group discussion negative mood before watching tragedy video clips
GDNMPOST: Group discussion negative mood after watching tragedy video clips
GDPMPRE: Group discussion positive mood before watching tragedy video clips
GDPMPOST: Group discussion positive mood after watching tragedy video clips

Figure 1(c) Mood states before and after watching comedy video clips in SC condition (see online version for colours)



Notes: SCPMPRE: Social comparison positive mood before watching comedy video clips
SCPMPOST: Social comparison positive mood after watching comedy video clips
SCNMPRE: Social comparison negative mood before watching comedy video clips
SCNMPOST: Social comparison negative mood after watching comedy video clips

Figure 1(d) Mood states before and after watching tragedy video clips in SC condition (see online version for colours)



Notes: SCNMPRE: Social comparison negative mood before watching tragedy video clips
SCNMPOST: Social comparison negative mood after watching tragedy video clips
SCPMPRE: Social comparison positive mood before watching tragedy video clips
SCPMPOST: Social comparison positive mood after watching tragedy video clips

3 Results

3.1 Manipulation check in positive and negative mood states

A paired sample t-test was performed to examine the differences in the positive and negative moods of the participants before and after watching the comedy and tragedy video clips immediately after the pre-test. Participants' initial positive and negative mood states were intensified after watching the comedy and tragedy video clips, respectively. In the positive mood-induction group before discussion, an increase occurred in the positive affectivity scores, $t(92) = 62.59$, $p < .001$, and a decrease was noted in the negative affectivity scores, $t(92) = 52.11$, $p < .001$ [Figure 1(a)]. Contrarily, in the negative mood-induction group before discussion, the negative affectivity scores increased, $t(86) = 65.42$, $p < .001$, and positive affectivity scores decreased, $t(86) = 56.55$, $p < .001$ [Figure 1(b)]. Before interpersonal comparison, an increase was seen in the positive affectivity scores, $t(100) = 54.47$, $p < .001$, and a decrease was seen in the negative affectivity scores, $t(100) = 44.42$, $p < .001$, of the positive mood-induction group [Figure 1(c)]. Contrarily, the negative affectivity scores increased, $t(95) = 70.84$, $p < .001$, and the positive affectivity scores decreased, $t(95) = 61.21$, $p < .001$, in the negative mood-induction group [Figure 1(d)]. These observations confirmed that positive and negative moods were induced by watching collections of comedy and tragedy video clips, respectively. Group discussion and interpersonal comparison immediately followed the mood induction.

3.2 Individuals' choices under uncertainty in pre- and post-test

To capture the effectiveness of group processes under different mood states, the individual was the unit of analysis. The responses (2: A or B) to financial gain and loss situations and to health-risk problems were in frequencies, and a 2 × 2 contingency chi-square test was carried out to compare pre- and post-test (2) individuals' choices for four problems (Table 2). Following group discussion only, irrespective of mood states, in the financial gain situation (positive prospect), more participants in the post-test preferred certain gain over uncertain gain. However, in the financial loss situation (negative prospect), more participants preferred the risky option of loss with uncertainty than a similar amount of loss with certainty. In the survival and mortality frames (problems three and four), more participants preferred cautious options on the post-test than on the pre-test, where immediate gains were eminent compared with risky options. First, individuals who were in negative and positive moods following discussion in the group demonstrated less risk and cautious orientations. Second, individuals' predominant initial choice was more preferred following group discussion only. Although the predominant initial individual preferences were intensified similarly following the PMSC and NMSC conditions, they were not significant enough to warrant attention. In the control condition, no change in choice following the buffer task was found. Third, more (fewer) individuals preferred a choice on the pre-test, few (many) persons were mobilised through discussion to shift their preferences. Supporting the first hypothesis, more participants favoured the predominant pre-test choices following the PMGD and NMGD conditions only.

3.3 DQ in pre- and post-test

The predominant choice relative to the non-predominant choice of participants in a dichotomous choice situation is considered to capture procedural rationality and substantive rationality in a decision-making task (Simon, 1976). Accordingly, an equation is formulated to assess DQ as follows:

$$DQ = \left(\frac{\text{Predominate choice} - \text{Non-predominate choice}}{\text{Predominate choice} + \text{Non-predominate choice}} \right) X\ 100 \qquad (1)$$

The pre- and post-test DQ for four items in five conditions were analysed using ANCOVA (Table 2). The pre-test DQ was the covariate, the post-test DQ was the dependent variable, and five conditions were fixed factors. A significant correlation was found between the covariate and the dependent variable (R squared =.87), and also, the interaction of the covariate x condition was non-significant, F (4, 10) = .88, confirming the homogeneity of regression slopes. The results suggested that when the pre-test DQ was made similar across five conditions and their variances were removed, the post-test DQ in five conditions differed significantly, F (4, 10) = 13.99, p <.001. The post-hoc least significant difference (LSD) test suggested that the post-test DQ in the PMGD and NMGD conditions was higher than the post-test DQ in the remaining three conditions. The DQ in neither the former two nor the latter three conditions differed. Supporting the second hypothesis, DQ improved only following PMGD and NMGD.

Table 2 Choice in different conditions and DQ

Problems	*Condition*	*Pre-test*		*Post-test*		χ^2	*Pre-dominate choice*	*Pre-test DQ*	*Post-test DQ*
		A (%)	*B (%)*	*A (%)*	*B (%)*				
Problem 1	PMGD	39 (42.3)	53 (57.7)	10 (10.8)	82 (89.1)	23.39***	B	15.2	78.2
	NMGD	30 (34.8)	56 (65.1)	09 (10.4)	77 (89.6)	14.16***	B	30.2	79.0
	PMSC	32 (32.0)	68 (68.0)	24 (24.0)	76 (76.0)	1.58	B	36.0	52.0
	NMSC	35 (36.8)	60 (63.2)	28 (29.4)	67 (70.6)	1.16	B	26.3	41.0
	BTCO	28 (31.5)	61 (68.5)	27 (30.3)	62 (69.7)	0.02	B	37.0	39.3
Problem 2	PMGD	54 (58.6)	38 (41.4)	82 (89.1)	10 (10.9)	22.10***	A	17.4	78.2
	NMGD	45 (52.3)	41 (47.7)	65 (75.5)	21 (24.4)	10.09**	A	4.7	51.1
	PMSC	68 (68.0)	32 (32.0)	73 (73.0)	27 (27.0)	0.60	A	36.0	46.0
	NMSC	53 (55.7)	42 (54.3)	64 (67.3)	31 (32.7)	2.69	A	11.5	48.4
	BTCO	50 (56.0)	39 (44.0)	52 (57.8)	37 (42.2)	0.09	A	12.3	16.8
Problem 3	PMGD	44 (47.8)	48 (52.2)	26 (28.2)	66 (71.7)	7.47**	B	4.3	43.4
	NMGD	42 (48.8)	44 (51.2)	24 (28.0)	62 (72.0)	7.46**	B	2.3	44.1
	PMSC	47 (47.0)	53 (53.0)	42 (42.0)	58 (58.0)	0.50	B	6.0	16.0
	NMSC	46 (48.4)	49 (51.6)	43 (45.5)	52 (54.5)	0.48	B	3.1	9.4
	BTCO	40 (45.0)	49 (55.0)	39 (43.8)	50 (56.2)	0.02	B	10.1	12.3
Problem 4	PMGD	41 (44.5)	51 (55.5)	29 (31.5)	63 (68.5)	3.32*	B	10.8	36.95
	NMGD	37 (43.0)	49 (57.0)	21 (24.5)	65 (75.5)	6.66**	B	14.0	51.1
	PMSC	43 (43.0)	57 (57.0)	41 (41.0)	59 (59.0)	0.08	B	14.0	18.0
	NMSC	42 (44.2)	53 (55.8)	32 (33.6)	63 (66.4)	2.21	B	11.5	32.6
	BTCO	35 (39.4)	54 (60.6)	34 (38.1)	55 (61.9)	0.02	B	21.3	23.5

Notes: PMGD = positive mood group discussion; NMGD = negative mood group discussion; PMSC = positive mood social comparison; NMSC = negative mood social comparison; BTCO = buffer task control condition; DQ = decision quality
*p<0.05; **p<0.01; ***p<0.001

Table 3 Information attributes in choices in different condition

Problems	*Condition*	*PMGD*		*NMGD*		*PMSC*		*NMSC*		*BTCO*		*F*
		M (SD)		*M (SD)*		*M (SD)*		*M (SD)*		*M (SD)*		
		Choice A	*Choice B*	*Choice A*	*Choice B*	*Choice A*	*Choice B*	*Choice A*	*Choice B*	*Choice A*	*Choice B*	
Problem 1	Pre-flexibility	6.41 (.91)	6.20 (.78)	7.63 (1.01)	7.65 (1.20)	5.81 (.82)	5.88 (.85)	6.49 (.85)	6.36 (.92)	6.50 (1.10)	6.55 (1.08)	31.99***
	Post-flexibility	6.68 (.79)	6.41 (.84)	8.00 (.74)	7.96 (.77)	5.98 (.84)	5.64 (.82)	6.80 (1.01)	6.65 (.96)	6.51 (1.06)	6.56 (1.05)	
	Pre-fluency	6.23 (.81)	6.25 (.70)	7.84 (.68)	8.03 (.69)	5.98 (.87)	5.72 (.91)	6.37 (1.03)	6.28 (.97)	6.32 (.72)	6.33 (.71)	44.63***
	Post-fluency	6.40 (.78)	6.45 (.85)	8.06 (.78)	8.33 (.70)	6.20 (.88)	5.92 (.90)	6.64 (.96)	6.58 (.99)	6.49 (.97)	6.50 (.98)	
	Pre-originality	5.98 (.68)	5.72 (.72)	7.00 (1.05)	6.33 (1.26)	5.61 (.71)	5.61 (.84)	6.68 (1.12)	6.23 (1.25)	6.68 (1.12)	6.49 (.97)	48.32***
	Post-originality	6.25 (.67)	5.94 (.70)	7.29 (1.11)	6.62 (1.25)	5.77 (.72)	5.82 (.82)	6.96 (1.83)	6.52 (1.25)	6.68 (1.22)	6.50 (.98)	
Problem 2	Pre-flexibility	6.35 (.80)	6.41 (.84)	8.00 (.70)	7.72 (.94)	5.74 (.82)	6.00 (1.00)	6.55 (.86)	6.27 (.84)	6.35 (1.02)	6.34 (1.13)	37.09***
	Post-flexibility	6.55 (.89)	6.60 (.78)	8.34 (.74)	7.54 (.95)	5.95 (.83)	6.26 (.84)	6.75 (1.02)	6.27 (.84)	6.35 (1.12)	6.34 (1.22)	
	Pre-fluency	6.20 (.46)	6.29 (.73)	7.78 (.72)	7.00 (.67)	5.66 (.90)	6.01 (.89)	6.36 (1.02)	6.57 (1.15)	6.48 (1.08)	6.41 (.74)	51.58***
	Post-fluency	6.43 (.73)	6.50 (.84)	8.06 (.68)	7.32 (.68)	5.91 (.92)	6.25 (.83)	6.55 (.95)	6.32 (.99)	6.48 (1.03)	6.41 (.74)	
	Pre-originality	5.75 (.67)	6.05 (.74)	6.02 (1.13)	7.00 (.67)	5.79 (.78)	6.01 (.89)	6.15 (.56)	6.29 (.47)	6.00 (1.07)	6.41 (.74)	45.11***
	Post-originality	5.93 (.70)	6.30 (.67)	6.31 (1.25)	6.98 (1.17)	5.97 (.79)	6.25 (.83)	6.32 (.62)	6.00 (.44)	6.01 (1.07)	6.41 (.74)	
Problem 3	Pre-flexibility	6.27 (.81)	6.20 (.83)	7.60 (.94)	8.22 (.69)	5.64 (.81)	5.75 (.89)	6.50 (.96)	6.09 (.98)	6.45 (1.03)	6.27 (1.09)	28.08***
	Post-flexibility	6.45 (.80)	6.39 (.85)	7.89 (.99)	8.30 (.71)	5.84 (.81)	5.95 (.89)	6.70 (.96)	6.30 (.98)	6.45 (1.03)	6.77 (1.05)	
	Pre-fluency	6.18 (.69)	6.29 (.79)	7.60 (.64)	8.05 (.74)	5.66 (.96)	5.71 (.78)	6.09(.98)	6.63 (.95)	6.39 (.85)	6.49 (.94)	65.60***
	Post-fluency	6.33 (.76)	6.50 (.74)	7.88 (.63)	8.30 (.71)	5.87 (.96)	5.91 (.83)	6.30 (.98)	6.53 (.96)	6.39 (.85)	6.49 (.94)	
	Pre-originality	6.00 (.64)	5.79 (.70)	6.60 (1.17)	6.36 (1.31)	5.71 (.79)	5.71 (.82)	6.24 (.52)	6.06 (.64)	6.00 (1.07)	6.34 (1.08)	61.02***
	Post-originality	6.21 (.67)	5.98 (.71)	6.89 (1.16)	6.66 (1.23)	5.45 (.79)	5.92 (.82)	6.44 (.62)	6.36 (.44)	6.00 (1.00)	6.34 (1.08)	
Problem 4	Pre-flexibility	6.37 (.08)	6.41 (.80)	7.15 (.81)	7.54 (.72)	5.67 (.77)	5.83 (.78)	6.66 (1.03)	6.90 (.73)	6.50 (1.81)	6.30 (1.03)	41.85***
	Post-flexibility	6.57 (.81)	6.61 (.88)	7.45 (1.11)	7.92 (.79).	5.92 (.90)	6.92 (1.03)	7.22 (.91)	6.50 (1.81)	6.50 (1.81)	6.30 (1.03)	
	Pre-fluency	6.20 (.71)	6.27 (.77)	7.00 (.64)	7.17 (.72)	5.67 (.83)	5.72 (.88)	5.71 (.89)	6.90 (.73)	6.32 (.83)	6.49 (.92)	34.21***
	Post-fluency	6.35 (.66)	6.49 (.80)	7.29 (.70)	8.30 (.69)	5.89 (.83)	5.77 (94)	5.98 (.89)	7.22 (.91)	6.32 (.83)	6.49 (.97)	
	Pre-originality	5.88 (.67)	6.00 (.72)	6.25 (1.29)	6.35 (1.20)	5.61 (.80)	5.59 (.78)	6.21 (.56)	6.09 (.59)	6.95 (1.13)	6.18 (1.20)	42.14***
	Post-originality	6.19 (.66)	6.24 (.77)	6.53 (1.20)	6.65 (1.25)	5.84 (.80)	5.82 (.83)	6.50 (.68)	6.38 (.57)	6.35 (1.13)	6.18 (1.20)	

Notes: PMGD = positive mood group discussion; NMGD = negative mood group discussion; PMSC = positive mood social comparison; NMSC = negative mood social comparison, BTCO = buffer task control condition
$^*p$<0.05.; $^{**}p$<0.01; $^{***}p$<0.001

3.4 Information attributes

ANCOVA was used to compare the information attributes of flexibility, fluency, and originality of the reasons participants mentioned to explain their pre- and post-test choices of each problem in five conditions. Significant correlations were found between the covariate and the dependent variable (R square range =.43–.62). The pre-test assessment of the information attribute was the covariate, the post-test assessment of the attribute was the dependent variable, and conditions were fixed factors. First, the analysis of flexibility, fluency, and originality of information revealed that when the pre-test attributes were made similar across five conditions, the *F* values suggested that the post-test information attributes differed in five conditions across four items (Table 3). However, information attributes did not change following the cancellation task in the BTCO condition, and those were observed to be lower than the remaining four conditions. Second, the post-hoc LSD test suggested that the post-test information attributes were observed to be higher following NMSC than following PMSC, and a similar pattern was observed following NMGD and PMGD. These findings indicated that the post-test information attributes increased more potently when the participants in groups were in negative moods than in positive moods. Lastly, barring few exceptions, the originality of information changed more potently than did the flexibility and fluency of information. Partially supporting the third hypothesis, individuals who were in negative moods following the comparison of choices and discussion in groups processed information with more fluency, originality, and flexibility than did the individuals who were in positive moods.

3.5 RT in pre- and post-test

The questionnaire was the same in pre- and post-test. RT was the time taken to complete the questionnaire in pre- and post-test in five conditions. The RTs in pre- and post-test in five conditions were analysed using ANCOVA (Table 4). A significant correlation was found between the covariate and the dependent variable (R squared =.66), confirming the homogeneity of regression slopes. Results suggested that when the pre-test RT was made similar across five conditions, the post-test RT in five conditions differed significantly, F (4, 457) = 24.13, p<.001. The average post-test RT was about 24.95 minutes. The post-hoc LSD test suggested that the post-test RT was highest following NMGD. Participants' RT following NMGD was higher than the participants' RT following PMGD, and similar was the significant pattern of RT following NMSC and PMSC. The post-test RT was lowest following BTCO condition, and it did not differ from the pre-test RT and was sharply lower than that of other conditions. Supporting the last hypothesis, individuals' RTs were greater for those who were in negative moods following discussion than in

a the individuals who were in positive moods

b the individuals who were in negative and positive moods following interpersonal comparison in the group.

Table 4 RT in different condition

Condition	*Pre-test RT*	*Post-test RT*
	M (SD)	*M (SD)*
PMGD	23.45 (1.87)	25.23 (2.24)
NMGD	23.54 (1.41)	25.53 (1.62)
PMSC	23.02 (2.01)	24.70 (2.36)
NMSC	23.51 (1.55)	25.42 (1.89)
BTCO	22.95 (2.49)	23.85 (2.74)

Notes: PMGD = positive mood group discussion, NMGD = negative mood group discussion, PMSC = positive mood social comparison, NMSC = negative mood social comparison, BTCO = buffer task control

4 Discussion

A total of 462 students participated in five conditions to examine the influence of mood states and group processes on decision-making and information processing. Findings support choice polarisation and improvement in DQ only following group discussion. The information attributes of fluency, originality, and flexibility and the RT are higher in the NMGD and NMSC conditions than in their counterpart conditions. When active cognitive processes are triggered through group discussion, choices polarise, and the influences of mood states degenerate gradually. When passive cognitive processes are activated through the interpersonal comparison of choices in the group, the negative moods of group members slow down thinking and facilitate deep information processing but hardly alter the group members' decision.

4.1 Choice shift

Literature on risk-preferences has shown three types of preferences:

a risk aversion

b risk neutrality

c risk seeking.

Among these three, risk neutrality and risk aversion are most dominant (Gupta et al., 2004; Harvey, 1990). The results concur with these findings that individuals following PMGD and NMGD value risk aversion. Only in the loss domain do they prefer riskier decisions of loss with higher probability than a similar loss with certainty.

Previous literature separates group polarisation and choice shift. In group polarisation, individuals' post-discussion/post-comparison decisions are compared with their pre-discussion/pre-comparison preferences. In choice shift, groups' post-discussion/post-comparison decisions are compared with their pre-discussion/ pre-comparison decisions. While the group is the unit of analysis in choice shift, the individual is the unit of analysis in group polarisation (Hinsz and Davis, 1984; Myers and Lamm, 1976). The options that individuals initially predominantly prefer in each situation are preferred by more individuals following PMGD and NMGD. It is, therefore,

a case of group polarisation in financial gain and loss situations as well as in health-risk situations following discussion, irrespective of the participants' mood states.

More systematic processing of information, more knowledge-based thinking, more shared information, and a higher motivation to develop an accurate and multi-faceted understanding of the decision-making problem are evident following labour-intensive group discussion than following effortless, preference-driven social comparison. The media-richness theory (Daft and Lengel, 1986) also postulates that in the controversial problem, the richest medium of face-to-face discussion is more effective in resolving the problem than are the other decision-making procedures. In face-to-face discussion, decisions are formed through exchange and sharing of information, along with active feedback from others and information certification by other group members. It does not so happen in interpersonal comparison of choices. On all counts, more systematic information processing following discussion than following interpersonal comparison of choices has resulted in response polarisation in former condition than in latter condition.

4.2 DQ

Only the post-test DQ following PMGD and NMGD did not differ, and both conditions are found to have higher DQ than do the other conditions, which did not differ among them. Contrary to our proposition, when cognition is actively triggered through group discussion that facilitates information dissemination and the systematic processing of information, the effects of a negative and a positive mood degenerate gradually and do not bring a differential impact on DQ. As far as procedural and outcome rationality are concerned, group discussion is more information-laden than effect-laden. Even if evidence exists for more information processing with regard to a negative a mood than a positive mood following social comparisons, it is not sufficient enough to cause choice polarisation and improve DQ.

4.3 Information attributes

The extent of fluency, originality, and flexibility of information specifies information processing (Baron et al., 1994). Individuals who are in negative moods following group discussion and interpersonal comparison report higher fluency, originality, and flexibility of information in explaining the choice than the counterpart conditions. It appears that individuals who are in negative moods may be thinking more profoundly and critically than do those who are in positive moods. Participants improve the strategic focus on a decision when information is integrated through discussion rather than through social comparison. During discussion, verbal, persuasive and self-generated information are disseminated with non-verbal cues. Also, information certification (about the correctness of information) among group members occurs, which is absent during social comparison. The lack of information certification during social comparisons does not endorse validity in information, and group members do not use such self-generated information to change their decisions.

4.4 RT

Individuals who are in positive moods often prefer relatively heuristic, top-down processing, whereas individuals who are in negative moods prefer relatively systematic,

bottom-up processing (Forgas, 1992, 1995; Schwarz et al., 1991). In a group, heuristic processing may be reflected in the use of simple decision rules (e.g., majority wins) and shorter decision time, whereas systematic processing may be reflected in longer decision time and more information elaboration. Also, a negative mood slows down thinking; the individual systematically processes information but does not feel convinced about the information and does not use the information to alter his/her decision in the absence of information certification. This is affirmed also in RTs, which are higher for negative moods than for positive moods.

Making unbiased decisions is essential for judges, police officers, lawyers, and psychologists in their daily work. The findings suggest that making a decision following a group discussion will alter the individual's choice in favour of an effective decision. Decision-making in groups is context-sensitive (Hinsz et al., 1997; Levine et al., 1993). Group decisions are made within adaptive, cultural, and historical contexts developed over the course of the group's existence. Having used hypothetical decision tasks and a sample that consisted of students, the generalisability of this study is somewhat limited. Further investigation on real-life situations is required in order to examine choice behaviour and information processing in a group.

5 Conclusions

The findings of the study encapsulate two contributions. First, from a practical point of view, the choice under uncertainty polarises and DQ improves following group discussion irrespective of mood states. Individuals generally show risk-aversion in financial gain and health risk situations that is more preferred following group discussion. The reverse happens in financial loss domains. Second, from a theoretical point of view, when active cognitive processes are triggered through group discussion, a mood state hardly plays a role in influencing the individual's decision. Contrarily, when passive cognitive processes are activated through social comparison, a negative mood initiates slow, deep, and elaborate information processing compared with a positive mood, but in the absence of cross-checking of information and of information certification by other group members following interpersonal comparison, the individual does not use that information. Consequently, negative moods of group members following interpersonal comparison do not help in changing the individual's decision.

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