Does Mood State Change Risk Taking Tendency in Older Adults?

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No study has been conducted to evaluate the influences of age differences on specific moods for risk taking tendencies. This study examined the patterns of risk taking tendencies among younger and older persons in 3 transient affective states: positive, neutral, and negative moods. By means of viewing happy, neutral, or sad movie clips, participants were induced to the respective mood. Risk taking tendencies were measured with decision tasks modified from the Choice Dilemmas Questionnaire (N. Kogan & M. A. Wallach, 1964). Consistent with the affect infusion model (J. P. Forgas, 1995), risk taking tendency was greater for those individuals who were in a happy mood than for those who were in a sad mood, for both young and older participants. However, an asymmetrical effect of positive and negative mood on risk taking tendency was identified among both the young and older participants, but in opposite directions. These results are consistent with the predictions of the negativity bias and the positivity effect found in young and older adults, respectively, and are interpreted via information processing and motivation effects of mood on the decision maker.

Keywords: positive and negative mood induction, risk taking tendency, aging

Older adults are faced with many pragmatic predicaments in their everyday lives including important issues related to healthcare, illnesses, and financial investments. Very often, they are required to make and act on risky decisions regarding these issues based on relatively little knowledge and a tired mindset. Concern has been raised about the capacity of older persons in gloomy or elated moods to make fully competent medical decisions, such as those concerning refusal of life-sustaining treatment (Blank et al., 2001; Lee & Ganzini, 1992). There is considerable literature on the effects of positively and negatively valenced mood on judgment and choice (for reviews, see Forgas, 1995; Zajonc, 1998). Despite the profusion of recent research on affect and cognition in the aging mind (Blanchard-Fields, 2005; Carstensen & Mikels, 2005), relatively few studies have systematically examined the effect of age differences, under the influence of specific mood, on risk taking tendency. In particular, the question of how positive and negative mood states influence risk taking tendency in young and

older individuals remains largely unaddressed. The objective of this study is to fill this research gap by examining the patterns of risk taking tendency among young and older persons in three transient affective states: positive, neutral, and negative mood.

Affect Infusion Model (AIM) and Mood-Maintenance Hypothesis (MMH)

One of the most prominent models in this arena of research is the AIM, which suggests that positive mood is expected to increase risk taking tendency whereas negative mood is more likely to reduce the tendency to take risks (Forgas, 1994, 1995). The model asserts that individuals in an elated mood rely on positive cues in making judgments. Together with the mood priming effect, they are more likely to access thoughts prone to positive aspects of risky situations than those who are in a negative mood (Forgas, 1994, 1995; Isen, 1993; Nygren, Isen, Taylor, & Dulin, 1996). Such bias in cognitive processing and selective information retrieval affects how individuals evaluate the situations they are presented with: Individuals in positive moods would perceive the outcome of risky choices as more favorable, which in turn would increase their willingness to take risks. In contrast, people in negative moods are more likely to perceive the world as a threatening place, and thus are more likely to process information systematically and carefully in order to avoid potential losses (Jorgensen, 1998). Together with the mood priming and systematic (or bottom-up) processing strategy, more negative evaluation of the risky choice is generated, so that people are more likely to make conservative decisions under such circumstances.

Another well-known model of the decision making process is the MMH (Isen & Patrick, 1983), which predicts the exact oppo-

site outcomes of those asserted by the AIM. The MMH claims that people in elated moods are motivated to maintain their positive affective states. Consequently, they are not willing to take risks because such action may increase the potential for substantial losses that will be detrimental to their positive affective states. Similarly, this hypothesis argues that people in negative moods do take high risks in order to obtain greater potential gains in the hope of uplifting their negative moods. Thus, this hypothesis suggests that the effect of mood on risk taking tendency is explained through an innate desire to maintain a positive affective state or to mitigate a negative mood, rather than by mere cognitive information processing as suggested by the AIM.

Furthermore, it is suggested that the MMH might only work when there is strong motivation to achieve a particular outcome (Forgas, 1995). However, affect infusion strategies described in the AIM occur under conditions of substantial processing (Forgas, 1995). Individuals engaged in substantial processing select, learn, and interpret novel information about a target and relate this information to preexisting knowledge structures; this processing is the most cognitively demanding strategy in which situational demands require accurate judgments of complex or novel targets in the absence of any preexisting motivational bias. Under these conditions the AIM prevails, because concurrent moods are hypothesized to influence the kinds of information accessed from memory to arrive at a decision. The risk taking tendency task used in the current study simulated weak motivation levels among the participants to achieve an outcome, but at the same time it demanded substantial processing about a novel and complex target. We expected that the AIM, and not the MMH, would be dominant in the context of our experimental paradigm. Specifically, we expected that risk taking tendency would be greater for participants who are in a positive mood than those in a sad mood, according to the AIM, for both younger and older adults.

Recent studies have consistently reported that people tend to make more risky decisions when in a positive mood (Isen, 1993; Mittal & Ross, 1998; Nygren et al., 1996), yet relatively few studies have addressed the impact of negative mood on risk taking tendency compared with research done on the effect of positive mood (Hockey, Maule, Clough, & Bdzola, 2000; Leith & Baumeister, 1996; Mano, 1992). Making matters more complicated, previous studies have found that different negative moods may have different levels of impact on risk taking tendencies, that is, anxiety and anger increase the tendency to take risks whereas depressed mood decreases this tendency (Leith & Baumeister, 1996; Pietromonaco & Rook, 1987). In addition, whereas people in negative moods offer more pessimistic estimates of risk perception (Johnson & Tversky, 1983), fearful people make more pessimistic judgments of future events than angry people (Lerner & Keltner, 2000).

Mood and Risk Taking Tendency

Most studies in this area have been motivated by an approach in which the effects of positive versus negative mood states have been contrasted according to judgment and choice (Forgas, 1995; Higgins, 1997). This is true for both the AIM and the MMH. In other words, their predictions do not include the magnitude of the impacts of positive and negative moods on judgment. As a result, the question of whether the effects of negative and positive moods on risk taking tendency are symmetrical remains largely unanswered.

A recent study examined the effect of positive, neutral, and negative mood on risk taking tendency in young people and found that participants in induced sad moods were significantly more conservative in risk taking tendencies than those who were in either neutral or elated moods (Yuen & Lee, 2003). However, Yuen and Lee (2003) found that young people with induced positive moods did not differ significantly from those in neutral moods. These findings partially support the AIM. Furthermore, including a neutral mood state in the experimental manipulation revealed an interesting finding: an asymmetrical impact of mood on risk taking tendency. Specifically, it appeared that the impact of negative affect had a stronger influence on risk taking tendency than that of a positive one in young people. In their manipulation check of the mood induction procedure, it was found that the magnitude of induction of positive and negative moods was more or less the same with respect to the neutral mood condition. Therefore, the asymmetrical impact of mood on risk taking tendency cannot be explained by the differential impact of positive and negative mood on participants in the mood induction procedure.

These findings may be due to a well-known phenomenon reported in the literature: a negativity bias among young people (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Cacioppo, Gardner, & Berntson, 1999; Rozin & Royzman, 2001). This phenomenon refers to the tendency of younger people to focus on and attend more to negative information as compared with positive data. This tendency might, in turn, lead to the finding of greater impact of negative mood, compared with either positive or neutral mood, on young adults' risk taking tendency. Specifically, Yuen and Lee (2003) found that, compared with risk taking tendency in neutral mood, the mean difference in risk taking tendencies between positive and neutral mood induction (4.95, $p > .05$, ns)—as well as between neutral and negative mood induction (10.97, $p < .05$, significant)—depicted an asymmetrical influence of positive and negative mood.

The remaining, yet interesting, question is whether positive and negative moods in older persons have an asymmetrical impact on risk taking tendency. Most studies have focused on young adults with little research conducted to assess age differences in the impact of positive and negative mood on the perception of risk. Although the effect of age differences on the tendency towards risk taking decisions has been examined, the results have been mixed. Some studies have found no significant age differences in risk taking decisions between young and older adults in card playing (Dror, Katona, & Mungur, 1998), retirement investment decisions (Hershey & Wilson, 1997), and treatment decisions for an illness (Curley, Eraker, & Yates, 1984). However, older adults have been found to be more conservative than younger ones in solving hypothetical life dilemmas (Vroom & Pahl, 1971).

The socioemotional selectivity theory, a major life-span developmental theory on emotional development in adulthood, may guide our prediction on age differences in the perception of risk under different mood states. Socioemotional selectivity theory (Carstensen, 1993; 1995; Carstensen, Gross, & Fung, 1997; Carstensen, Isaacowitz, & Charles, 1999) proposes that constraints on time lead older adults to focus on emotional satisfaction and meaning rather than on pursuit of knowledge, which is the main

focus for young people. In other words, the reexamination of life goals enhances positive affect, which in turn allows older individuals to maintain well-being even when faced with various negative life experiences. According to this theory, positive emotions might have a stronger impact on risk taking tendency in older adults than in young people. Thus, we predict that the impact of positive moods on risk taking tendency will be stronger than that of negative moods in older adults. As a result, we expect that an asymmetrical impact of positive and negative moods on risk taking tendency will occur in older individuals.

Method

Design

In the current study, there were two groups of participants: older and younger. In each group, about one third of participants watched a positive mood-arousing movie, one third watched a negative mood-arousing one, and the remaining participants watched a neutral one. Thus, the current study is a simple 2 (age groups: young and older adults) $\times$ 3 (induced mood groups: happy, neutral, and sad) between-subjects design.

Participants

A total of 188 people participated in this experiment. We used a group of 90 older subjects whose mean age was 67.72 years ($SD = 4.14$; range $= 60–78$ years) and another group of 98 younger subjects whose mean age was 20.30 years ($SD = 2.11$; range $= 18–25$ years). The older adult group had 51 women and 39 men whose mean years of education was 5.44 ($SD = 4.19$); the younger group had 55 women and 43 men whose mean years of education was 15.86 ($SD = 1.98$). The older participants for the study were healthy Chinese older adults who were members of a community center in Hong Kong, whereas the younger participants were recruited from three youth centers. Younger subjects had significantly higher levels of education than older participants, $t(186) = 22.08$, $p < .01$.

Prior studies on risk taking tendencies suggest that gender, personality constructs, and time pressure have significant impact on the risk taking tendency of individuals (Byrnes, Miller, & Schafer, 1999; Kohler, 1996). Therefore, in order to control for the personal factors affecting risk taking tendency (age and gender differences), balanced ratios of men and women were randomly assigned to one of the three induced mood groups. Statistical analyses revealed that there was no significant difference between the induced mood groups in terms of gender, marital status (for older subjects, 56.7% were married and 43.3% were unmarried, whereas for young subjects, 100% were unmarried), age, and years of education in both groups of older and younger subjects.

Mood Induction

Previous studies have shown that movies or story procedures are the most effective means for inducing both elated and sad moods (Gerrards-Hesse, Spies, & Hesse, 1994; Westermann, Spies, Stahl, & Hesse, 1996). In this study, movie clips were used because they provided a direct and effective way to induce a certain mood (Forgas & Moylan, 1987), and this method has been used successfully in the local context (Yuen & Lee, 2003). A pretest was used

to select movie clips that were most likely to induce elated, neutral, and sad moods. Ten independent judges (60–75 years of age) were invited to attend six sessions—scheduled at least 3 days apart—and saw one of six different movie clips in each session. Before viewing the clip, they were asked to sit down quietly and wait in the room for 10 min so that they could calm down and would more likely be in a neutral mood. After watching the movie, they were asked to rate their emotional states on an 11-point happy–sad bipolar scale.

The clips were selected on the basis of producing significant but comparable magnitude of impact on mood. Thus, with the help of these 10 independent older judges, three movie clips—categorized as "happy," "neutral," and "sad"—were selected for mood induction. Subsequently, the three movie clips were viewed by 10 young judges (18–25 years of age) in a similar manner to ensure that the mood induction effect on young adults was comparable. The three clips were of similar length, ranging from 22–26 min. The clips were also validated by another 10 judges to ensure that clip length would not increase participants' tedium level, which could, in turn, influence participants' moods. Finally, the contents of the movie clips were examined by these judges to ensure that the situations portrayed in the clips did not resemble any of the cases presented in the decision tasks. This ensured that the movie clips would have minimal effect on the judgments made during the decision tasks.

The mood induction procedure of the experiment was checked by repeated measures on a self-reported mood questionnaire administered before and after the risk taking tendency task. The self-reported mood questionnaire was used to measure three dimensions of an individual's mood, as suggested by Matthews, Pitcaithly, and Mann (1995): unpleasant–pleasant, tense–relax, and tiresome–energetic. One more dimension, the anxious–calm dimension, was also added. According to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994), depressed patients are characterized by persistent feelings of sadness, increased irritability, and lack of energy. In light of these characteristics, the unpleasant–pleasant dimension served as a measurement for the feeling of sadness, the tiresome–energetic dimension served as a measurement for lack of energy, and both the tense–relax and the anxious–calm dimensions served as a measurement for irritability. In the questionnaire, each of the four dimensions was rated on an 11-point Likert-type scale anchored between $+5$ and -5. The scale was then rescored on an 11-point Likert-type scale ranging from 0–10. The overall mood rating was obtained by averaging the scores of the four dimensions.

Validation of Decision Task

Participants' risk taking tendencies were measured by perception of risk tasks. Each decision task consisted of a case describing a "life dilemma" and two opposing scales measuring participants' willingness to perform one of two acts involved in the dilemma. The descriptions of the life dilemmas used were constructed according to the format of the Choice Dilemmas Questionnaire (Kogan & Wallach, 1964). The decision tasks were based on the Choice Dilemmas Questionnaire because it includes realistic and detailed descriptions of common, everyday life dilemmas. These tasks have been widely used in research on risk taking tendency

and constitute a well-accepted method to operationalize the concept of risk taking tendency (Forgas, 1982).

Three cases applicable to Chinese culture were selected from the Choice Dilemmas Questionnaire and seven more dilemmas were constructed following the format and style of the Choice Dilemmas Questionnaire for the pretest. In the course of case construction, the novelties of the dilemmas were carefully adjusted to minimize the presence of decision schema inducing a direct access processing strategy. In each case of 10 life dilemmas, two options were available for the situation: a predictable but less rewarding option, and a highly rewarding but risky alternative. The risk taking tendencies of the participants were then assessed by measuring the willingness to choose the risky act, obtained by comparing the mean scores of two opposing scales. The first scale required participants to indicate their willingness to perform the conservative act by means of probability estimation (0%–100%). The other scale counter-checked the first scale by asking participants to rate their willingness to choose the risky act on an 11-point Likert-type scale anchored between −5 and +5, rescaled to range from 0–100. The first probability estimation was also rescaled to run from 0–100, with higher values indicating higher tendency for risk taking. Thus the mean of the two scales represented participants' willingness to take risk—that is, their risk taking tendency.

Cases that yielded a mean score around the middle of the scale—that is, participants who had the same chance to perform any one of the acts—were selected for use in the experiment. Furthermore, the cases described were chosen for their freedom from the necessity to make judgments which would be confounded by cultural values and religious beliefs. The 10 cases in random sequence were pretested by 20 independent older judges (in neutral mood) and the 3 most appropriate cases were thus finally chosen for the current study. These three selected cases involved decisions in choosing medical treatment, career planning, and opening a restaurant (see the case of career planning in the Appendix), respectively.

Questionnaire sets containing the self-report mood questionnaires and the three cases were prepared, with the two self-report mood questionnaires presented both at the beginning and the end of the study. The three cases in the middle were arranged in sequences following a 3 × 3 Latin square to eliminate order effects of different arrangements.

Procedure

Participants were randomly assigned to one of three groups: positive mood (*n* = 30 older vs. *n* = 32 younger), negative mood (*n* = 30 older vs. *n* = 33 younger), and neutral mood (*n* = 30 older vs. *n* = 33 younger). The experiments were carried out in a quiet room in the community center and youth center for the older and younger subjects, respectively, on a one-to-one basis. After participants were seated and provided consent, they were presented with standard instructions. For the sake of avoiding confirmatory bias, participants were told, as a disguise, that they were participating in two studies. The first was to understand their reactions to a movie and the second was to investigate their risk taking tendency. Participants then watched a movie designed to manipulate the valence of their affective state, following which they performed the perception-of-risk task. Mood state was assessed twice,

once following the viewing of the movie and prior to the risk perception task, and once immediately after the risk perception task.

In the first part of the experiment, the assigned movie clip was presented to the participants for the induction of the designated mood. The mood manipulation procedure was administered in an unobtrusive manner. Participants were instructed by the experimenter to view the movie clip as if they were watching it at home. To counter demand characteristics, it was explained that the video might or might not evoke feelings and that it was safe to go along with any feelings that may occur (Westermann et al., 1996). At the conclusion of the movie, participants were asked to complete the mood questionnaire verbally, with recordings made by the experimenter. These manipulation checks were performed to ascertain that the movies were successful in inducing the mood effect in participants.

After the completion of the mood questionnaire, the experimenter conducted the risk taking tendency task with the participants. Both the probability estimation and the 11-point Likert-type scale were used, and both scores for the three cases combined to form a score ranging from 0–100. The mood questionnaires containing the self-reported mood were presented again verbally to the participants by the experimenter, and participants were asked to complete the questionnaire in order to check whether the induced mood had lasted throughout the entire experimental sessions. Finally, each participant was informed about the nature of the study, thanked for her or his participation, and informed that the experiment was completed. The debriefing for participants exposed to the depressed mood induction included watching the happy mood induction movie clip to alleviate any residual effects (Frost & Green, 1982). Data collection for the younger subjects was done 10 months after the experiments with older subjects had been completed.

Results

Validation of Mood Manipulation

Mood scores at postinduction were analyzed using a two-way analysis of variance (ANOVA), with age group (young, older adults) and mood induction group (sad, neutral, happy) as between-subjects factors. The mood manipulation procedure was effective, as there was a significant main effect for mood induction procedure, $F(2, 182) = 114.36$, $p < .01$, $\eta^2 = 0.53$. Post hoc comparison using Tukey's honestly significant difference revealed a trend of increasing mood scores from sad ($M = 4.18$, $SD = 1.29$), through neutral ($M = 5.42$, $SD = 1.01$), to happy ($M = 6.85$, $SD = 1.10$) mood induction groups (see Table 1). Moreover, there was a significant main effect of age group, $F(1, 182) = 15.78$, $p < .01$, $\eta^2 = 0.08$, and the interaction between age group and mood induction was also significant, $F(2, 182) = 7.20$, $p < .01$, $\eta^2 = 0.07$. Similar results were obtained for each of four self-rated mood items.

To indicate that the mood scores did not change significantly after subjects had completed the risk taking tendency task, older adults' mood scores at postinduction and after-tasks were analyzed using a mixed repeated-measures ANOVA with mood induction group (sad, neutral, and happy) as between-subjects factors. No significant effect of time was found, $F(1, 87) = 2.37$, $p > .05$.

Table 1
Postinduction and Post-Risk Taking Tendency Task Mood Scores as a Function of Age and Mood Induction

| | Young | | | | | Old | | | | | Total | | | |
| | | Postinduction | | Posttask | | | Postinduction | | Posttask | | | Postinduction | | Posttask | |
Induced mood state	*n*	*M*	*SD*	*M*	*SD*	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Negative	33	4.83	1.20	5.17	1.12	30	3.48	0.97	4.43	1.23	4.18	1.29	4.81	1.22
Neutral	33	5.70	1.29	5.70	1.16	30	5.12	0.40	5.13	0.44	5.42	1.01	5.43	0.93
Positive	32	6.81	1.12	6.70	1.21	30	6.90	1.09	6.34	1.07	6.85	1.10	6.53	1.15
Total	98	5.77	1.44	5.85	1.32	90	5.16	1.65	5.30	1.25	5.48	1.57	5.59	1.31

Similar results were found in the young adult group, $F(1, 95) = 2.29$, $p > .05$. Results indicate that induced mood state was maintained throughout the risk taking tendency task phase.

Effect of Mood on Risk Taking Tendency

As mentioned before, the two scales measuring participants' willingness to take risk in the decision tasks were rescaled into a risk score on a scale from 0–100: the higher the score, the higher the risk taking tendency. The overall risk taking tendency was obtained by averaging the risk scores of the three decision cases. Then the overall risk taking tendency was subjected to a 2×3 age (younger, older adults) by mood induction (happy, neutral, sad) between-subjects ANOVA. There was a significant main effect for mood, $F(1, 182) = 75.75$. $p < .01$, $\eta^2 = 0.45$. However, the main effect for age group was not significant, $F(1, 182) = 1.90$, $p = .17$, $\eta^2 = 0.01$. Finally, there was a significant Age × Mood Induction interaction, $F(2, 182) = 35.21$, $p < .01$, $\eta^2 = 0.28$. Similar results were found for each of the three risk perception tasks used in the current study. The descriptive statistics are shown in Table 2.

Post hoc comparison with the Tukey Test was performed to check for the significance of differences between the risk taking tendencies of the mood induction conditions in both older and younger subjects. In older subjects, there was a clear trend of increasing risk taking tendency from sad, through neutral, to happy mood induction groups. The mean differences in risk taking tendencies were significant between the positive and neutral mood groups ($M = 29.33$, $SE = 4.02$, $p < .01$), the positive and negative mood groups ($M = 50.14$, $SE = 4.02$, $p < .01$), as well as the negative and neutral mood groups ($M = 20.81$, $SE = 4.02$, $p < .01$). In younger subjects, the differences in risk taking tendency were significant between the positive and negative mood groups ($M = 10.71$, $SE = 2.98$, $p < .01$), and the negative and neutral mood groups ($M = 12.62$, $SE = 2.97$, $p < .01$). Yet the risk taking

tendency between the positive and neutral mood groups failed to show a significant difference ($M = 1.90$, $SE = 2.98$, $p = .80$).

Discussion

Despite their ages, young and old adults are required to make risk taking decisions every day. This study examined age differences in the impact of mood on the perception of risk. In our study, we compared younger and older adults' risk taking tendencies for three induced mood states: elated, neutral, and sad mood. As expected, our findings demonstrate that risk taking tendency is greater for those individuals who are in a happy mood than those who are in a sad mood, in both young and older participants. The present data lend support to the AIM (Forgas, 1995). Our participants were asked to estimate their willingness to choose a risky option that by definition involved substantial processing. The AIM predicts that for people who engage in substantial processing, mood-congruent information is easier to attend to, process, and recall. Therefore an elated mood leads to a higher level of risk taking tendency than a sad mood. Our contribution here is to generalize the earlier findings that mood states can influence risk taking tendencies on social and consumer judgments (Forgas, 1995; Forgas & Ciarrochi, 2001).

A main interest of this research is to identify an asymmetrical effect of positive and negative mood on risk taking tendency in young and older participants, but in the opposite direction predicted. Specifically, young participants are less likely to make risky decisions when they are in negative moods than when they are in neutral and positive moods. In other words, no difference in risk taking tendency is found between those who are in positive versus neutral moods in young people. This result replicates what we have found in one of our earlier studies (Yuen & Lee, 2003) and is consistent with the phenomenon of the negativity bias in young persons (Baumeister et al., 2001; Cacioppo et al., 1999;

Table 2
Risk Taking Tendency as a Function of Age and Mood Induction

| | Young | | | Old | | | Total | |
Induced mood state	*n*	*M*	*SD*	*n*	*M*	*SD*	*M*	*SD*
Negative	33	42.67	11.66	30	29.58	17.39	36.44	15.97
Neutral	33	55.29	12.90	30	50.39	15.00	52.96	14.04
Positive	32	53.39	11.39	30	79.72	14.18	66.13	18.37
Total	98	50.42	13.14	90	53.23	25.79	51.77	20.20

Rozin & Royzman, 2001). Evidence from previous studies indicates that young adults process negative information at a deeper level than positive information, and that negative information plays a more important role than positive information in their attention, search, impression formation, memory and decision making (Baumeister et al., 2001; Rozin & Royzman, 2001).

On the other hand, in comparison with the impact on those in neutral mood states, the impact of a positive mood was greater than that of a negative mood in older participants. In particular, results revealed that older individuals who were in a happy mood were most likely to select the risky option, followed by those who were in a neutral mood, and then by those who were in a sad mood. With reference to the risk taking tendency in neutral moods in older adults, the significant mean differences in risk taking tendencies—between positive and neutral (29.33) and between neutral and negative (20.81) mood induction—depict an asymmetry of influence between positive and negative moods. These findings are consistent with the prediction of the socioemotional selectivity theory that positive emotion plays a more important role in cognitive functioning in older adults than in their younger counterparts (Carstensen, 1995; Carstensen et al., 1999). The present data add to a growing body of literature that illustrates that older adults show a remarkable advantage in attending to and memorizing positive emotional stimuli over memorizing negative emotional material (Charles, Mather, & Carstensen, 2003; Mather & Carstensen, 2003; Mikels, Larkin, Reuter-Lorenz, & Carstensen, 2005).

Our investigation contributes to the literature on mood and risk taking tendency in three specific ways. First, we simultaneously examine the role of the positive and negative moods on the perception of risk. This extends research work that has only manipulated positive or negative moods by comparing them with neutral moods (Isen, Nygren, & Ashby, 1988; Mano, 1992). By manipulating positive and negative moods and comparing them to each other and simultaneously to a neutral mood condition, we have extended findings from earlier investigations. Second, this work examines the effect of age differences on risk perception by comparing two groups of subjects: younger and older adults. By making such age-based comparisons, age-related conclusions can be drawn with substantial data, so that the trajectory of risk taking tendency across adulthood could be explored in the current study. Finally, the current study provides additional supporting evidence for socioemotional selectivity theory by integrating two lines of investigation, namely emotional development across adulthood and age differences in the link between mood and risk perception.

The literature has already provided us with a good account of the influence of positive and negative moods on social judgments. The explanations can also be applied to judgments concerning risk taking. People in a positive mood perceive the environment as a rather safe place and adopt a top-down processing to make judgments (Forgas, 1994; Isen, 1993; Nygren et al., 1996). More positive material is available in their working memories for their reference in making judgments. In judgment processes mood acts as an indicator for them to focus on the positive aspects of the outcome; they thus perceive the choice as less risky and the outcome as more favorable; they are more willing to take a risk (Isen, 1993; Nygren et al., 1996). Alternatively, the presence of a negative mood signifies a dangerous environment; individuals are more cautious through using bottom-up processing. Together with

the priming of negative materials, the systematic or bottom-up processing of negative materials results in a more conservative decision.

The current study addressed the influence of mood only on the outcome of cognitive processing, namely risk taking tendency. The question about the underlying mechanisms influencing mood (especially negative mood) remains unanswered even though several hypotheses have been proposed in the literature to account for the influence of mood on different facets of cognitive processing. Drevets and Raichle's (1998) findings provided strong evidence showing the detrimental effect of mood on neural activities for cognitive functioning, and this may suggest that change in brain activity accompanying mood state may negatively affect the quality of judgment in risk taking. Mood also affects encoding and retrieval processes of memory involved in risk taking (Matthews et al., 1995; Natale & Hantas, 1982; Pyszczynski, Hamilton, Herring, & Greenberg, 1989; Teasdale, 1993). Mood also determines the decision making strategies we use in risk taking (Forgas, 1995; Isen, 1993) as well as the perception and preference for risk in decision outcomes (Schwarz, 2000). These factors interact with each other during the process of judgment in risk taking and in turn play important roles in risk assessment. Therefore, the complex interaction between cognitive resources, memory encoding and retrieval, choice of processing strategies, as well as the perception and preference of risk in the environment and the decision outcome, should be clarified (Edell & Burke, 1987; Forgas, 1994; 1995; Hockey et al., 2000; Nygren et al., 1996; Petty, Schumann, Richman, & Strathman, 1993; Schwarz, 2000). The influence of mood on each aspect of cognitive functioning, plus the overall impact of mood in their interactions, is also worthy of further investigation.

The limitations of this project point to future directions for research in this area. As one of our reviewers pointed out, the present pattern of our findings may be attributed to the fact that the mood induction was stronger for our older participants than our young participants, particularly in the negative induced mood state. Although we attempted to ensure that the magnitude of mood induced by movie clips was comparable for young and older adults among 20 independent judges (10 young adults and 10 older adults), apparently the impact of the sad movie was stronger for old adults than younger ones. Our sad movie clip was about the difficulties a middle-aged woman faced while she was taking care of her adult child with a severe mental disability. Indeed, these data are consistent with recent results indicating that older adults report greater feelings of sadness than their younger counterparts when exposed to edited films related to personal and health-related loss (Kunzmann & Grühn, 2005). Kunzmann and Grühn (2005) explained that, compared with young adults, older adults are more likely to personalize these loss events as they compare them to losses they, or someone to whom they feel close, have suffered. Therefore, one challenge for future research is to ensure comparability in the impact of the sad mood-arousing stimuli on both young and older adults.

Second, the sources of affect (induced by watching a movie and by completing a task) may be different or similar in many aspects, and a comparative investigation of such sources is another direction for future research. Third, many dimensions of risk taking—including outcome uncertainty, outcome expectation, outcome potential, personal involvement, and perceived safety and control—

have not been investigated systematically in the current study (Yates & Stone, 1992). Further replications of the findings of this study are needed to determine to what extent these dimensions influence the impact of affect on risk taking tendency. Fourth, although the importance of personality characteristics, such as extroversion and introversion, in the perception of risk has been shown (Lerner & Keltner, 2000; Zelenski & Larsen, 2002), no personality assessment was conducted to control for personality in the current study. We assume that the randomization of group assignment reduced the impact of personality constructs on our results. Nevertheless, future studies—with assessment of personality as a covariate in the examination of age differences regarding the impact of mood on risk taking tendency—are needed to substantiate our data.

Lastly, the internal validity of the study could be questioned for two reasons: First, the data collection for younger subjects was done 10 months after we had completed the experiments with older subjects, and second, our younger participants had significantly more years of education than our older participants. The first concern is whether our young participants might have had unique experiences that significantly affected our measurement during the 10-month period. However, we believe that 10 months is a relatively short time and, furthermore, no dramatic societal events occurred during that period; thus it is unlikely that our results were contaminated by this factor.

The second issue suggests that our results may have been caused by the potential confounding variable, education, instead of our main independent variable, age. In a recent population-based survey in Hong Kong, 41.4% of older respondents aged 60 and above had no formal education whereas 37.2% of them either had some, or had completed, primary school education (Chou, Chow, & Chi, 2004). On the other hand, more than 60% of young people had received university-level education in Hong Kong (Task Force on Population Policy, 2003). Thus, the age difference for education is a reflection of the rapid societal changes in Hong Kong; university-level education is much more common than 40 years ago when the current cohort of older adults was young. Therefore, we are faced with a trade-off between external and internal validity, and in this study external validity has been addressed. Some readers may have concerns about whether our older subjects understood the risk taking tendency task. As described in the Method section, each risk taking tendency problem was assessed by two questions phrased in opposite directions concerning risk taking; that is, one was conservative and the other was risky. The correlations between these two items in older adults ranged from .81 to .87, which is comparable to the associations found in younger participants (i.e., from .77 to .83). It seems unlikely that older participants did not understand the tasks they had undertaken in the study. Nevertheless, we acknowledge that education is related to risk taking tendency and is likely to affect the judgments of both young and older adults (Solvic, 1999), and future studies should match samples on this characteristic in order to further substantiate the internal validity of our results.

The current study addressed the effects of positive and negative moods on risk taking decisions in younger and older adults. The data supported our hypotheses substantially. Our findings revealed that both young and older adults in induced sad moods were more conservative in making risky decisions than those who were in induced elated moods. More interestingly, an asymmetrical effect

between positive and negative moods was observed in both young and older adults, but in opposite directions. Specifically, the impact of positive moods on the perception of risk is greater than that of negative moods for older adults, whereas the effect of negative moods is stronger than that of positive moods for young adults. Both the negativity bias in young adulthood and the positivity effect in older adults may have contributed to these asymmetrical phenomena.

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(*Appendix follows*)

Appendix

One of Three Life Dilemmas Used to Assess Risk Taking Tendency

Mr. Lee, an engineer, has been working in a large corporation for five years after he graduated from university. He is ensured of a stable and secure job with a modest, though sufficient, salary, and retirement benefits after retirement. On the other hand, it is not likely that his salary will increase much between now and his retirement. In a causal event, a small company offers him a job. He will have a higher salary if he accepts the offer and he might receive a share in the ownership if the company survives the competition in the market. However, the company is a new one with an uncertain future, and no one can guarantee that the company will survive the severe competition in the market.

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