Predictors of Different Types of Decision-Making in Adolescence

by

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Abstract

The present study compared the performance of adults and adolescents on two types of decision-making tasks (intuitive vs. deliberative), as well as a number of psychosocial variables, to investigate whether different factors may predict different types of decision-making. Participants were divided into three groups: young adolescents (13-15 yrs), older adolescents (16-17 yrs), and adults (19 + yrs). The Iowa Gambling Task (IGT) measured intuitive based decision-making and a recent decision description task measured deliberative based decision-making. Results indicated a relationship between age with both decision-making tasks, as well as emotion regulation. As hypothesized, deliberative decision-making was predicted by future oriented thinking, independent of age. Intuitive decision-making 'under ambiguity' was predicted by age and sensation seeking. These results provide evidence of the existence of different types of decision-making and the idea that different factors predict each type.

Adolescence represents a time of great change and development where children transition to adulthood. During this time, adolescents must progressively learn to use their own judgment in everyday, and potentially risky, decision-making and rely less on advice or rules given by parents and caregivers (Van Leijenhorst, Moor, Op de Macks, Rombouts, Westenberg, & Crone, 2010). New experiences such as working, driving, dating, and increased time spent outside of the home without supervision expose adolescents to potentially risky situations that demand sophisticated decision-making skills. Although adolescents are expected to demonstrate increasing responsibility and independence in their decision-making, this ability is slow to develop and therefore presents the possibility of serious consequences in their everyday lives (Steinberg, Albert, Cauffman, Banich, Graham, & Woolard, 2008).

The real world implications of poor decision-making in adolescence are demonstrated by self-report and observation studies which reveal elevated rates of risk taking behaviors in mid adolescence such as experimentation with tobacco, drugs and alcohol, unsafe sexual activity, involvement in violence and crime, and injury or death caused by traffic accidents (Boyer, 2006; Casey, Getz, & Galavan, 2008; Furby & Beyth-Marom, 1992; Steinberg, 2004). This type of risky behavior by adolescents has economic, health, and psychological implications with both short-term and lasting effects. Such effects include measurable costs in terms of healthcare or property damage, as well as the less obvious costs to the emotional and psychological wellbeing of those involved or lost potential (Reyna & Farley, 2006). According to Fischhoff (2008), society has much riding on the assessment of an adolescent's capability to make good

decisions. Overestimation may leave adolescents responsible to make choices that are beyond their level of competence, while underestimation may deny adolescents the opportunity to exert their independence and make use of their full potential. Further, if adolescents believe that the expectations placed on them do not match their current developmental level they may feel restricted or abandoned by the amount of autonomy granted to them (Fischhoff, 2008).

Assessment of the development of decision-making competence among adolescents is clearly important and necessary. And although there is considerable societal interest in the topic of adolescent decision-making and judgment, until recently there has been little research available which examines the processes underling the development of such skills (Jacobs & Klaczynski, 2002). Unfortunately, policymakers and those in charge of prevention and intervention rarely make use of the small body of available scientific research in the planning and implementation of programs to improve decision-making skills among teens (Reyna & Farley, 2006). Research is also needed to further our understanding of the basic characteristics of adolescent decision-making as well as to help develop intervention programs to achieve the goal of providing teens with the skills necessary to demonstrate adaptive decision-making skills consistently across low to high risk situations.

Cognitive Perspective

Traditionally, adolescent risk-taking behavior was explained primarily by cognitive immaturity which results in a decision-making deficit. Theories focusing on cognitive processing consider the development of the mental processes which underlie

decision-making and risk-taking behavior and considers decision-making to be a rational and logically based behavior. According to Jacobs and Klaczynski (2002), the majority of traditional theories view cognitive development as a linear process which progresses in a unidirectional fashion beginning in a state of intuition or inefficiency and moving toward a state of logical reasoning or efficiency. Following this reasoning, children should begin with relatively poor decision-making skills and these skills should progress steadily as they age and reach a peak during adulthood.

There are at least three problems with these types of theories. First, it suggests that adult decision-making should be based mainly on logic and reason but the literature in this area suggests that adults frequently rely on the use of heuristics (Reyna, Adam, Porier, LeCroy, & Brainerd, 2005). Second, although it might make intuitive sense, the steady increase in cognitive development over time does not translate into a linear progression of poor to optimal decision-making from childhood to adulthood. Interestingly, although cognitive processes may develop in such a way as to allow for increased reasoning ability, there is a drop in decision-making competence and rise in risk-taking behavior during the adolescent years, as evidenced by increased rates of criminal activity, unintended pregnancy, traffic accidents, and substance abuse (Boyer, 2006; Casey, Getz, & Galavan, 2008; Furby & Beyth-Marom, 1992; Steinberg, 2004). The linear improvement in cognitive ability tends to flatten out during the early adolescent years and is followed closely by the rise in risk-taking behavior in mid adolescence (Reyna & Farley, 2006). This general pattern suggests that there are other

variables involved with decision-making that adolescents struggle with which may be less cognitive in nature.

The third problem with traditional cognitive theories is that research suggests that while many skills related to logical reasoning, such as memory, information processing, and deductive reasoning improve during early adolescence, by the age of 14 to 15 years typically developing adolescents achieve similar levels of logical reasoning as adults when making judgments of hypothetical dilemmas (Kambam & Thompson, 2009). Past research has indicated that adolescents and adults frequently demonstrate similar competence in judgment and decision-making tasks requiring information searches, attention to relevant information, and solution generation, but some studies indicate that they differ on tasks involving the perception of risk, consideration of consequences, and future planning (Jacobs & Ganzel, 1993). These findings would indicate that adolescents and adults demonstrate both similarities and differences in their capacity to use a variety of cognitive skills related to decision-making.

There are at least two different possible explanations for the discrepancy between adult and adolescent decision-making. One possibility is that there are different types of decision-making tasks. In addition, variables other than cognitive ability might play a role. The purpose of the present thesis is to determine whether or not certain psychosocial factors involved in decision-making influence specific types of decision-making more than other types.

Decision-making tasks

Jacobs and Klaczynski (2002) suggest that one reason for the discrepancy in adolescent's ability to demonstrate adult-like performance may have to do with differences in tasks used to measure decision-making. Some tasks focus on the real-world experiences of an individual, while others investigate the ability of an individual to perform under laboratory conditions. Performance of a task under optimal laboratory conditions eliminates many extraneous variables enhancing the internal validity of the experiment but consequently also has the potential to lower external validity. These very factors being controlled for in the laboratory studies may be the important factors in influencing effective decision-making in the real world and help explain the increase in adolescent risk-taking.

Additionally, it appears that there are different types of decisions being made by teens; some may be made more deliberately whereas others may be more reactive and intuitive in nature (Reyna & Farley 2006; Steinberg, 2003). To illustrate, consider the example of an adolescent choosing whether or not to use a contraceptive. The adolescent may use a deliberative approach by taking time and effort to carefully consider the pros and cons of taking birth control pills, using a condom, or abstaining from sexual activity entirely as a means of preventing an unwanted pregnancy or sexually transmitted disease. For example, the adolescent may determine that the social costs (i.e. fear of embarrassment when obtaining condoms, or fear of being the only virgin in a circle of friends), are less than the benefit of using one of these methods (i.e. decreased likelihood of unplanned pregnancy or sexually transmitted infection). Therefore, the adolescent will

choose to use some form of contraception. Alternatively, an adolescent may approach the decision in a completely different way. In a situation where an adolescent is faced with having to make an immediate decision of whether or not to use a condom during a sexual experience, they may be less likely to use a deliberative method. Using a more reactive or intuitive framework of decision-making, the adolescent may not even realize that he or she is making a decision. Instead the decision is based on his or her instinctual and emotional feelings at the time.

Performance on the deliberative versus intuitive types of decisions may be best explained by separate theoretical perspectives. Traditional models represent deliberate decision-making, where the decision made is planned and reasoned. Typically, theories focusing on behavioral intentions and planned behavior fail to account for much of adolescent risk-taking as adolescents are often aware of the potential risks and even overestimate the likelihood of negative consequences but continue to engage in risky behavior because the perceived benefit outweighs the risk (Reyna & Farley, 2006). The more intuitive type of decision-making is explained by *fuzzy-trace theory*, where gist-based intuition is contrasted with deliberative reasoning. A gist is described by Reyna and Farley (2006) as "a fuzzy mental representation of the general meaning of information or experience" (p. 6), and gist-based intuition describes judgments which are based on these 'gists'. For example, a surgeon may rely on gist-based intuition during an emergency surgical procedure. The surgeon has a wealth of knowledge available to her with respect to human anatomy and surgical procedures as well as a vast amount of personal experience to draw on in order to make decisions about best practice. During an

emergency procedure, when quick action is critical, the surgeon would not be wise to take time to draw on every relevant piece of information which may inform her decision of which course of action to take. Instead she is guided by a combination of this general information and her own experiences; her gist-based intuition. She is able to make an effective and efficient decision that is informed by good knowledge and experience, but is not laboriously thought through. This type of decision-making is thought to occur more frequently in adulthood and has been argued to be a more efficient method of decision-making (Reyna & Farley, 2006). Interestingly, this type of decision-making is not typically explored in laboratory based studies, which may contribute to a lack of understanding in the area of adolescent decision-making research.

Both deliberative and reactive or intuitive decisions are likely present in the lives of adolescents and consequently, different factors may influence these different categories or types of decisions. The comparison of different types of decision-making (e.g. reactive or deliberative) has not yet been examined in the literature on decision-making, nor has the possibility that different variables may predict these different types of decisions. For the present thesis, three different possible influences on different types of decision-making will be examined: future-oriented thinking, emotion regulation, and sensation seeking although it is likely that there are other variables which also influence decision-making.

Future Oriented Thinking

One variable which may be related to decision-making is the ability to think of oneself in the future, and to plan ahead for the consequences of one's actions. Future

oriented thinking may at first be thought of as a primarily cognitive skill; however, it does require reflection on the self, and the ability to think of possible consequences for the self in the future involves considering emotions. Furthermore, it frequently requires the ability to place oneself in possible future social contexts. Operational definitions of future oriented thinking found in developmental studies include cognitive, attitudinal and motivational components, making it a complex psychosocial construct (Steinberg, Graham, O'Brien, Woolard, Cauffman, & Banich, 2009).

The ability to make decisions that produce optimal future consequences requires the decision-maker to adjust his or her time perspective to a more future oriented frame of reference. According to Zimbardo and Boyd (1999), the ability to use time as a frame of reference provides an order for the experiences of an individual or group by assigning "temporal categories" or "time frames" which help to assign meaning and coherence to these experiences. Further, the ability to think in terms of time frames allows for future planning which can be useful and necessary with respect to decision-making. Zimbardo and Boyd developed the Zimbardo Time Perspective Inventory, a multidimensional measure of different time perspectives that include: past-positive, past-negative, present hedonism, present fatalism, and future orientation. Past-positive and -negative perspectives refer to favorable and aversive attitudes respectively focused on past events. Present hedonism describes a risk-taking pleasure-seeking tendency in life with respect to time. Present fatalism includes feelings of powerlessness and fatality with respect to the future and control over life events. Finally, the future oriented time perspective reflects a goal oriented, future focused approach to life.

Steinberg, Graham, O'Brien, Woolard, Cauffman, and Banich (2009) comment that,

> "[a]ccording to popular stereotype, young adolescents are notoriously shortsighted, oriented to the immediate rather than the future, unwilling or unable to plan ahead, and less capable than adults at envisioning the longer term consequences of their decisions and actions" (pp. 28).

Steinberg et al. (2009) compared adult and adolescent self-report responses on a future-orientation scale they developed, as well as their performance on a delay discounting task which measures the extent to which individuals prefer smaller, immediate versus larger, delayed rewards. Their results indicate that younger adolescents are generally less future-oriented than adults. Common sense suggests that future oriented thinking, particularly the ability to plan ahead, should be related to decision-making. Further, theorists suggest that evolutionarily speaking, humans rely on the use of a future-oriented time perspective in order to survive certain situations by allowing them to plan ahead or anticipate them (Suddendorf & Corballis, 2007). Present actions can greatly influence future consequences which will in turn increase or decrease an individual's chance of survival. Therefore, it would seem reasonable that the decision to engage in such behaviors should be influenced by the individual's ability to think about the future. It is possible, however, that this is only true of deliberative decision-making, while more reactive or intuitive decision-making may rely less on this skill.

Emotional Factors

Some researchers have criticized the extent to which cognitive decision theorists have exaggerated the cognitively based processes, such as probabilities and rational logic, and disregarded the influence of emotions in the decision-making process (Bechara, Damasio & Damasio, 2003; Lowenstein & Lerner, 2003; Steinberg, 2004). Theories that take an emotional development perspective are likely to focus on the extent to which emotional awareness, analysis, and regulation impact decision-making. Many decision-making situations, especially those involving an element of risk, are likely to provoke emotional responses. Researchers have investigated these reactions and the influence that the emotional response has on potentially risky decision-making (Bechara, Damasio, & Damasio, 2000; Bechara, Damasio, Tranel, & Damasio, 2005; Catanzaro & Laurent, 2004). These researchers posit that as positive emotions increase, the likelihood of risk-taking behavior increases and conversely, when emotions become more negative, risky-behavior is less frequent.

Emotional regulation has also been considered in research on risk-taking and decision-making; specifically, it has been proposed that those who experience difficulty regulating emotions (e.g., those who are impulsive or prone to anger) would be inclined to engage in more risk-taking behaviors than those who have better emotion regulation (Cauffman & Steinberg, 2000a, 2000b; Colder & Stice, 1998; Cooper, Wood, Orcutt, & Albino, 2003; Eisenberg et al., 2001, 2005; Lemery, Essex, & Smider, 2002; Silk, Steinberg, & Morris, 2003; Steinberg & Scott, 2003). Adolescence is a period of substantial development of the brain, including areas associated with emotion regulation (Steinberg, 2005). Further, the areas which contribute to the ability to regulate emotions

typically develop at a slower rate than do changes in motivation and arousal associated with pubertal maturation. Thus adolescents are generally not yet able to regulate their emotional responses to situations to the same degree as adults.

The *somatic marker hypothesis* suggests that an individual's emotional response to consequences dictates the decision-making process when risk and ambiguity are involved (Bechara et al., 1999; 2000; Damasio 1994). The positive or negative valence of the emotional response to a potential future outcome acts as a deterrent or incentive to engage in an action. This hypothesis suggests that emotions play an important role in decision-making. Further, the ability to understand, regulate, and interpret emotions as well as to think about past and future emotional experiences and connect them to present situation are necessary components of effective decision-making and risk-avoidance. The extent to which decision-makers rely on experiential thinking and react to situations affectively varies depending on the individual (Peters & Slovic, 2000).

Slovic, Peters, Finucane, and MacGregor (2005) note that "[t]he feelings that become salient in a judgment or decision-making process depend on characteristics of the individual and the task as well as the interaction between them" (p. 36). They go on to discuss the "relative affective salience" of information, which has an impact on the interpretation of a situation and in turn the reaction evoked. Information may trigger a positive or negative emotional response with varying degrees of intensity depending on whether or not it is relevant to the individual. According to Slovic et al. (2005), individuals consult their own personal "affective pool" for cues when making judgments in much the same way that similarity and memorability play a role in probability

judgments (e.g., representative or availability heuristics; Kahneman, Slovic, & Tversky, 1982). The affective salience of a decision could strongly influence the type of decision-making that is used. When faced with an emotionally charged decision, the decision-maker may be more likely to consult mental shortcuts such as affective heuristics to make decisions than to laboriously weigh the pros and cons of a situation. It is also especially efficient to use these shortcuts when the decision must be made quickly or mental resources are limited.

Sensation Seeking

Sensation seeking is thought to increase during preadolescence through middle adolescence and decline thereafter; however, studies that investigate age differences in sensation seeking are rare (Steinberg et al., 2008). Research investigating a similar construct, reward seeking, indicate a curvilinear developmental pattern, consistent with Zuckerman's model of sensation seeking (Zuckerman et al., 1978), where reward seeking increases from childhood to adolescence and decreases from adolescence to adulthood (see Casey et al., 2008). This pattern may help to explain the sudden rise in risk-taking behaviors among this age group, which follows a similar trajectory. Sensation seeking is not to be confused with impulsivity; the latter refers to the inability to inhibit a response or a lack of self control sometimes leading to unpredictable and rash behavior, while the former refers to the inclination to seek out situations and experiences which are novel and stimulating, and the willingness to engage in behaviors with associated risks in order to achieve them (Zuckerman, 1979).

Steinberg (2008) proposed that risk-taking and decision-making depend on two systems, a socio-emotional system and a cognitive-control system. Pubertal changes in the socio-emotional system trigger increases in reward-seeking, while more gradual changes to the cognitive control system increase the adolescent's ability to self-regulate and therefore engage in less risky behavior. Therefore, he suggests that early to middle adolescence is a critical developmental period in which reckless and risky behavior is most likely due to the "time gap" caused by the sudden increase in reward-seeking paired with a more gradual development of cognitive-control at this time. Adolescents are faced with the challenge of making risk-avoidant decisions while being tempted by new and desirable potential outcomes and lacking the cognitive-control necessary to overcome these temptations. While adolescents may be able to use certain cognitive skills at the same level as an adult when making deliberative decisions, they may be swayed toward more risky choices when faced with more intuitive decisions due to the emotional response associated with the attractive potential reward.

Current Study

Although it has been established that there are many similarities in the cognitive abilities of individuals in late adolescents and adulthood, there can be stark differences observed in the decision-making performance and engagement in risk between these groups. The first aim of this study is to compare the decision-making performance of adolescents and adults as well as their performance on a number of variables related to decision-making. Therefore, participants include both adolescents ranging in age from 13 to 17, and adults between the ages 19 and 28. Additionally, the study aims to determine

whether different factors may predict different types of decision-making, independent of age. Specifically, the study explores how the psychosocial factors of future oriented thinking, emotion regulation, and sensation seeking are related to performance on two types of decision-making tasks. One of the tasks involves more deliberative decision-making, and the other which may involve more intuitive decision-making. Each participant was asked to complete both types of decision-making task. They filled out scales measuring the psychosocial factors of future oriented thinking, sensation seeking and emotion identification.

Consistent with previous research, the first hypothesis is that measures of future oriented thinking, emotion regulation, and sensation seeking, as well as performance on each decision-making task should increase with age. However, it is also hypothesized that different factors predict performance on the different decision-making tasks. The expectation is that future oriented thinking, which involves taking time to consider the future and think through consequences, better predicts performance on the decision-making task which is more deliberate. However, more emotionally based factors such as emotion regulation and sensation seeking better predicts performance on the decision-making task which can be solved more intuitively and reactively.

Method

Participants

Participants the study ranged in age from 13 to 28 years and data was collected to include equal numbers (i.e. 20) of participants from three main age ranges. Adolescents for this study were recruited from a junior and senior high school in the Cape Breton Victoria Regional School Board. Adolescents were divided into two different groups: those between the ages 13-15 years (*M* age = 13.95, *SD* = .76; 8 males, 12 females) and those between 16-17 years (*M* age = 16.4, *SD* = .50; 10 males, 10 females). Twenty undergraduate and graduate students between the ages of 19-28 years (*M* age=22.45, *SD*=3.10; 5 males, 15 females) were recruited from Mount Saint Vincent University to represent the adult group. Partial course credit was offered to the adult group as an incentive. No incentive was offered to the adolescent group. Participants were treated ethically according to APA ethical guidelines (1992). Refer to Appendix A for a copy of informed consent.

Instruments & Procedure

Two different decision-making tasks were used. The Iowa Gambling Task measured the hypothesized intuitive based decision-making and a recent decision description task measured the hypothesized deliberative based decision-making. In addition, three different scales measured the psychosocial measures of time perspective, emotion regulation, and sensation seeking.

Iowa Gambling Task

The Iowa Gambling Task (IGT; Bechara et al., 1994) was designed as a laboratory analogue of a real life decision-making task. It is intended to mimic the uncertainty of

rewards and punishments experienced in real life decisions. The IGT task measures the participant's affective decision-making as, in adults, performance on this task is related to the ability to regulate emotion and relies on areas of the brain referred to as emotion-cognition "brain hubs" such as the orbitofrontal/ventromedial prefrontal cortex (Pessoa, 2008). This task was tested on normal populations versus individuals with damage to the ventromedial prefrontal cortext, which is an area of the brain that has been shown to play an important role in adult decision-making (Bechara, Damasio, Damasio, & Anderson, 1994; Bechara, Damasio, Tranel, & Damasio, 1997; Bechara, Tranel, Damasio, & Damasio, 1998; Bechara, Damasio, & Damasio, 2000).

The IGT was administered using a computer and required participants to select cards from four decks. Two "high-risk" or "disadvantageous" decks involve high rewards for choosing cards, but the choice is also associated with unpredictable risk of an even higher penalty in the future. The other two decks are considered "low-risk" or "advantageous" decks and involve small immediate gains and even smaller unpredictable losses. Good decision makers, after sampling from all decks, develop a strategy of avoiding the high-risk decks and selecting cards from the low-risk decks. The dependent variable for this measure is the number of times that the individual chooses the 'safer' or more advantageous decks in comparison to the disadvantageous decks.

Decision Description Task

The decision description task required participants to reflect on and describe a recent difficult decision and how they came to make that decision (Fischoff, 1996). During the task, an interviewer asks the participants to describe a difficult decision they

have made in the recent past. They were then asked follow-up questions to assess the decision-making process. Follow-up questions included:

1. "How did you come to your final decision?",
2. "What made this a difficult decision?",
3. "What did you think about while making the decision?",
4. "What did you do to help you think about your decision?"

This task is assumed to elicit decisions that were more deliberative in nature. In order to complete the task, the participant was required to answer questions about the decision and therefore must retrospectively analyze his or her rationale for the decision. The description of decisions was audio taped and responses were then transcribed and coded through a process of content analysis to obtain a score on this measure.

A coding system developed by Halpern-Felsher and Cauffman (2001) to evaluate quality of decision-making was adapted for the present task. Responses were coded for the frequency with which they mentioned seven different categories concerning factors that influenced decision making which are described in Table 1. After initial review of the data, the coding guidelines of the task were adapted to include two additional categories to account for considerable mention of the role of emotion and commitment in decision-making. Additionally, the category of 'advice' was expanded to include any mention of seeking information outside of the individual (e.g. research), and was renamed 'information seeking'. The dependent variable for this task was the total number of codes assigned to each response. Coding of all transcripts was done by the primary researcher. Fifty percent of the transcripts was coded by a second researcher to

determine interrater reliability. Agreement was 91.6%.

Table 1. Definitions and examples of coding guidelines for the deliberative decision-making task.

Category Name	***Definitions***	***Example***
Cost	The response includes mention of a negative consequence associated with the decision.	*"French was difficult for me … my marks were dropping."*
Benefit	The response includes mention of a positive consequence associated with the decision.	*"If I dropped calculus I could have a free [period] in my grade twelve year, which is when all my friends had a free [period]."*
Option	The response includes mention of a choice other than the final decision.	*"I could go out and come back not so late and study.."*
Long Term Consequence	The response includes mention of a consequence (positive or negative) associated with the decision which includes a temporal statement.	*"…it would probably just be better in the long run if I did it."*
Emotion	The response includes mention of the role of emotion (including desire) in the decision-making process.	*"…well I thought about the stress that French was putting on me…"*
Information Seeking	The response includes mention of making use of outside sources of information (i.e. advice, research, etc.).	*"I asked lots of people for their opinions."*
Commitment	The response includes mention of commitment, obligation, priority or personal values which influence the decision.	*"…well, I committed to basketball first…"*

*adapted from Halpern-Felsher and Cauffman (2001).

Emotion Identification

Emotion identification is considered by many researchers to be a fundamental component of emotional regulation (Ciarrochi, Forgas, & Mayer, 2006; Mayer, Salovey, & Caruso, 2004; Saarni, 1999). The Emotion Identification Skills survey (Bagby, Parker et al., 1994a; Bagby, Taylor et al., 1994) consists of 12 items (α=.80) representing two subscales of the Toronto Alexithymia Scale (TAS) which measure the extent to which participants experience difficulty identifying (7 items) and verbally describing (5 items) their emotions. Sample items which focus on identifying feelings include "I am confused about what emotion I am feeling" or "I am often puzzled by the sensations in my body". Sample items focusing on difficulty describing emotions include ''It is difficult for me to find the right words for my feelings'' or ''I find it hard to describe how I feel about people". Each item is rated on a 5 point Likert scale ranging from *strongly agree* to *strongly disagree,* with low scores indicating better emotion identification. The scale has been found to have good internal consistency (α=.81) and test-retest reliability (r = .77, p<.01) (Bagby, Parker, & Taylor, 1994b).

Future Oriented Thinking

The Zimbardo Time Perspective Index developed by Zimbardo and Boyd (1999) will be used to assess the extent to which a participant has the ability to consider future consequences. The scale consists of 56 items which represent a multidimensional measure of different time perspectives. Participants are presented with statements and asked to indicate how characteristic each statement is of them on a 5-point Likert scale ranging from *very uncharacteristic* to *very characteristic*. According to Zimbardo and

Boyd (1999), the items in this scale represent 5 factors: past-positive, past-negative, present hedonism, present fatalism, and future orientation. A high score on any of these subscales indicates high levels of this factor. As noted earlier, past-positive or negative perspectives indicate especially favorable or aversive attitudes and focus on past events. Examples of items representing these factors include "I think about the bad things that have happened to me in the past", or "it gives me pleasure to think about the past". Present hedonism describes a risk-taking pleasure-seeking attitude toward life with respect to time. A sample item which represents this factor would be "taking risks keeps my life from becoming boring". Present fatalism includes feelings of powerlessness and fatality with respect to the future and control over life events. A sample item might be "my life path is controlled by forces I cannot influence". Finally, the future oriented time perspective reflected a goal oriented, future focused approach to life. An example of an item representing this factor would be "I complete projects on time by making steady progress". Test-retest reliability ranges from .70 to .80 on each scale, with the future oriented scale demonstrating the highest level (Zimbardo & Boyd, 1999). The scale has been demonstrated to be effective with adult and adolescent populations (Worrell & Mello, 2007).

Sensation Seeking

The Sensation Seeking Scale-V, originally developed by Zuckerman, Eysenck, and Eysenck (1978), will be used to assess sensation seeking. This measure is a shortened version of the older Sensation Seeking Scale-IV (Zuckerman, 1971). The scale is a 19 item, forced choice test where each item consists of two opposing statements (e.g. "I

often wish I could be a mountain climber/I can't understand people who risk their necks climbing mountains"). The scale consists of four subscales: thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility. Higher scores on this measure indicate higher levels of sensation seeking. Internal reliabilities for the four subscales range from 0.56 to 0.82 (Zuckerman, 1971).

Results

The analyses are presented in terms of the two different hypotheses proposed. The first hypothesis was that there would be a relationship between age and performance on decision-making tasks, as well as on each psychosocial factor. The second was that certain psychosocial factors would predict performance on each of the decision-making tasks, independent of age.

Age Relationships

Table 2 displays the Pearson correlations between age and the scores on the two decision-making tasks as well as the different psychosocial measures. For the IGT task, performance was measured by calculating a score for the first as well as final 40 trials. According to Brand, Recknor, Grabenhorst, and Bechara (2007), participants must complete a minimum of 40 trials (i.e., 'decisions under ambiguity') in order to implicitly discriminate between advantageous and disadvantageous decks with reliability (i.e., the first 40 trials). The final 40 trials are thought to provide a more accurate depiction of 'decision-making under risk'. Scores were generated by calculating the difference between advantageous and disadvantageous choices (Brand et al., 2007); therefore, a

score of zero would indicate choosing equally between the advantageous and disadvantageous decks. Positive scores indicate a preference for the advantageous decks, with higher scores indicating better, or 'less risky', decisions. A preference for the disadvantageous decks would be indicated by a negative score.

Table 2. Pearson Correlations for Age, Decision-Making Tasks, and Psychosocial Factors.

	Age	Intuitive 'Ambiguity'	Intuitive 'Risk'	Deliberative
Intuitive 'Ambiguity' Decision-Making	**.449****			
Intuitive 'Risk' Decision-Making	**.457***	**.503***		
Deliberative Decision-Making	**.321***	.073	.096	
Sensation Seeking	.103	**.305***	.122	.147
Emotion Identification	**-.260***	-.014	-.211	-.005
Time Perspectives:				
• Past Negative	-.107	.198	-.035	-.014
• Past Positive	.061	-.096	-.004	-.044
• Present Hedonistic	-.189	-.072	.011	.014
• Present Fatalistic	**-.342****	-.166	.022	**-.300***
• Future Oriented	.148	.111	-.059	**.431****

** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.

As can be seen in Table 2, a significant positive relationship was found between the age of the participant and deliberative decision-making performance. In order to explore possible reasons for this relationship, the performance on the decision-making task was examined in greater detail; specifically, the individual measures of decision-making quality, and the length of responses were considered. It was found that as the age of the participant increases, the frequency with which participants mentioned possible costs (r (59) =.344, p<.01) and seeking out information (r (59)= .307, p<.05) also increased. See Appendix B for further correlations between deliberative decision-making categories, age, and psychosocial factors. A word-count score was also generated for each age group by counting the number of words in each interview and calculating an average word-count for each age group (see Appendix C for response examples). A one way ANOVA revealed that response length differed significantly according to the age of the participant, F(2,59)=6.13, p<.01. Specifically, post hoc tests revealed that adults (M=237.7, SD=142.0) tended to provide significantly longer responses than adolescents in either age range (younger: M=128.9, SD=71.3; older: M=157.3, SD=77.1).

A significant positive relationship was also found between age and performance on the intuitive decision-making task for both the first and final 40 trials. Thus, older participants tended to perform better on both of the decision-making tasks compared to the younger participants. In addition, age was found to be negatively related to scores on the emotion description measure, indicating that as age increases, level of difficulty in describing emotions decreases. A significant negative relationship was also found between age and present fatalism; therefore, as age increases feelings of powerlessness

and lack of control over one's life tend to decrease. Interestingly, age was not found to be significantly related to future oriented thinking.

Gender differences were also considered with respect to performance on decision-making tasks and the measures of psychosocial factors. It was not possible to look for possible differences within the adult group as there was a disproportionate number of females within the group; however, the adolescent data were fairly evenly distributed with respect to gender. On all measures except one, future oriented thinking, there were no significant differences between the two genders. However, adolescent females (M=3.41, SD=.427) were found to have significantly higher in future oriented thinking scores than their male (M=2.86, SD=.685) counterparts, $F(1, 30)= 6.29$, $p<.05$.

Predicting Decision-Making

To test the second hypothesis that certain psychosocial factors can predict performance on decision-making tasks, two hierarchical multiple regression analyses were conducted. Interestingly, performance on tasks of deliberate and intuitive decision-making were not found to be significantly related to one another (p=.728). Further, different psychosocial measures were significantly correlated with each decision-making task; therefore, each analysis includes only psychosocial measures which were related to the respective task. In order to assess whether the psychosocial factors were able to predict decision-making independent of age, age was entered into the first block of the equation, with the relevant psychosocial variables being entered into the second block.

The first analysis examined the criterion variable of deliberative decision-making. As can be seen in Table 2, only the measures of future oriented thinking and present

fatalism were found to be significantly correlated to deliberative decision-making and thus only these two psychosocial measures were included in the second block. In the first model, when age was entered as the only predictor variable in the regression equation, the model accounted for 10.3% of the variance in performance, $F(1, 57) = 6.52$, $p < .05$, whereas when all three variables were included in the regression equation, the model accounted for 26.5% of the variance in performance, $F(3, 54) = 6.61$, $p < .01$. However, in the second model only future oriented thinking was a significant predictor of deliberative decision-making [$B = .364$, $t(58) = 3.013$, $p < .01$], and age [$B = .226$, $t(58) = 1.83$, $p = .072$] and present fatalism [$B = -.118$, $t(56) = -.931$, $p = .356$] were not. These results indicate that when all variables are entered, an increased percentage of the variance is accounted for as compared to the equation including age alone, and that age is not a significant predictor of deliberative decision-making performance when other psychosocial factors are considered.

As intuitive decision-making 'under risk' was not found to be significantly correlated with any psychosocial factor, no additional analyses were conducted using the last 40 trials of the IGT. However, intuitive decision-making 'under ambiguity' was significantly related to both sensation seeking and age. Therefore, a second multiple regression analysis was conducted to determine whether the measures of sensation seeking is able to predict participants' performance on the first 40 trials of the IGT, independent of age. Again both the first [$R^2 = .202$, $F(1,58) = 14.66$, $p < .01$] and second models were significant [$R^2 = .269$, $F(2, 57) = 10.50$, $p < .01$]. In the second model, although age was a significant predictor of performance on this task [$B = .188$, $t(58) = 3.71$,

p= <.01], sensation seeking also accounted for a unique portion of variance [B=.261, t(58)= 2.29, p= <.05]. Thus, participants who tended to be older as well as higher in sensation seeking were more likely to perform better on the first 40 trials of the IGT task.

Discussion

The purpose of the present thesis was to compare the performance of adolescents of different ages to that of adults on measures of intuitive and deliberative decision-making, as well as on psychosocial measures thought to be related to decision-making. The study aimed to determine whether the two types of decision-making could be predicted by different factors, independent of age.

Age Relationships

Decision-Making Performance

Results of the current study were in line with previous research suggesting that individuals tend to make better decisions as they age from adolescence to adulthood (e.g., Cauffman & Steinberg, 2000a; Halpern-Felsher & Cauffman, 2001). Performance on the IGT increased with age whether participants were ambiguously learning the best procedure to maximize gains and minimize losses, as well as when they had time to become adjusted to the expectations and risk involved in the task and to develop an effective strategy. Additionally, the quality of deliberative decision-making performance (i.e. providing a description and rationale for an important decision) also increased with age.

Due to the qualitative nature of the deliberative decision-making task, the richer data set allowed for a more in depth examination of the actual differences in decision-

making quality. Older participants tended to report engaging in a greater level of thought and consideration when making important decisions. In particular, older participants recognized, to a greater extent, the importance of considering the potential costs associated with the decision as well as the benefit of seeking information through advice or research on the topic. Another interesting finding was that older participants tended to produce significantly longer descriptions of the decision-making process than did adolescents in either age group. It is important to consider the impact of these longer descriptions on the variables that were used to assess the quality of the decision. One may argue that word-count should have been controlled for, as higher scores may have resulted from simply having more opportunity to receive credit. Conversely, by controlling for length of response, one would be controlling for precisely the information that is of most value. The difference in description length is important as it defines the groups as being very different in the approach to the task. It is unlikely that adolescents and adults differ significantly with respect to language fluency, which would be a valid and important reason to control for this variable. However, they may differ with respect to the ease with which they can identify and articulate aspects of the decision-making process, as well as the factors that they consider important to decision-making. These variables are important to consider, and could be overlooked if length was controlled.

It is also important to note that the deliberative decision-making task was a more naturalistic task and as such could potentially involve more extraneous influences on performance. For example, the extent to which participants remember the situation may also differ. However, this is unlikely as research suggests that long-term memory

development is largely in place by adolescence (Fitzgerald, 1981). Additionally, the groups may be dissimilarly motivated and interested in the task or may have varying levels of comfort sharing thought processes and emotional responses. Although these factors represent potential issues with interpreting the data, the benefit of this more naturalistic method is that it yields a rich, informative data set which represents real life examples of the decision-making process. For example, the task actually yielded considerations in decision-making which fell outside of the categories originally proposed by Halpern-Felsher and Cauffman (2001); therefore, upon initial review of the data, it was determined that the guidelines would be adapted to include two additional categories: emotion and commitment. In fact, emotional responses were among the most frequently mentioned aspects of deliberative decision-making (M=1.65, SD=1.42), indicating that there are emotional factors at play in decision-making which must be explored further.

Psychosocial Measures

Of the psychosocial measures, only emotion regulation was significantly related to age; specifically, individuals tended to report an increase in ability to understand and describe emotions within themselves as age increased. This finding is consistent with research suggesting that skills necessary to interpret and regulate one's emotions are likely to increase with age as a result of significant development during adolescence, including regions of the brain associated with emotion regulation (Steinberg, 2005).

No significant relationship was found for either future oriented thinking or sensation seeking and age of participant. Research on age differences in future oriented

thinking generally suggests that younger adolescents are less future oriented than adults (for reviews see Furby & Beyth-Marom, 1992; Greene, 1986; Nurim, 1991). However, a number of studies found a pattern of results similar to those of the present research, with gender differences in future oriented thinking but a lack of significant age effects (Ferrari, Nota, & Soresi, 2010; Blinn, & Pike, 1989). For example, Ferrari et al. (2010) found age differences in future orientation among preadolescent to early adolescent populations; however, no age differences were found among the middle to older adolescent population, which better reflects the age sample in the current study. The results from these studies indicate that differences in future orientation are most pronounced between the preadolescent and early adolescent age range; it is possible that future orientation develops through childhood and preadolescence and then plateaus during the early adolescent period, remaining stable through adulthood. It is also important to note that the literature on this topic is fairly limited and Steinberg et al. (2009) suggests that future orientation is a complex psychosocial construct involving many cognitive, attitudinal, and motivational components in addition to age. According to Steinberg et al. (2009),

> "[p]robably the safest conclusion one can draw from [the literature on future-orientation] is that differences among individuals in their attitudes, motives, and beliefs about the future are considerable and vary a great deal as a function of factors in addition to age or developmental stage" (pp. 29-30).

In terms of sensation seeking, research suggests a curvilinear pattern of development, with an increase from childhood to adolescence and decrease from adolescence to adulthood (Zuckerman et al., 1978). However, the current study found no

significant relationship between age and sensation seeking. The data were checked for a possible curvilinear relationship as opposed to a linear relationship, but there was no evidence for this type of relationship either. It is possible that the age range was not sufficient to capture the age differences, as the adult group, with a mean age of 22 years, contains mainly young adults and therefore may still fall within the developmental range of the adolescent group.

Predicting Decision -Making

Interestingly, performance on the deliberative and intuitive decision-making tasks was not found to be significantly related. This suggests that decision-making should be considered a complex phenomenon which must be examined according to the type of decision being made. Thus, the finding supports the possibility that multiple types of decision-making exist. This provides evidence for the idea that different types of decisions may have distinct properties and may be influenced by separate factors. The current study found that indeed deliberative and intuitive decision-making were predicted by distinct psychosocial factors other than age.

Deliberative Decision-Making

As hypothesized, deliberative decision-making was predicted by future oriented thinking, independent of age. The only other time perspective which was found to be related to deliberative decision-making was present fatalism (i.e., feelings of powerlessness or lack of control over one's life events); however, this time perspective did not significantly predict decision-making when age and future oriented thinking were included in the analysis. Thus, those who scored high on taking a future oriented time

perspective tended to describe more thoughtful decision-making. Interestingly, no relationship was found between future orientation and the extent to which temporal references were used while describing their decision (p = .921). In fact, responses across participants did not frequently contain reference to long term consequences; averaging just under one mention per response (M=.92, SD=1.2). Therefore, it would appear as though an individual's likelihood of referring to the future when asked to describe a recent decision is not related to his or her scores on a measure of future oriented thinking. This finding contradicts the intuitive conclusion that individuals who tend to think in terms of a future oriented time perspective would naturally be more inclined to use future oriented language when discussing a decision.

The finding that future oriented thinking predicts deliberative decision-making performance makes sense, as decisions which are more analytical in nature tend to include a greater amount of critical thinking and reflection on the planning and assessment of the decision; processes which would be aided by a well developed ability to consider and think through potential future risks, rewards and outcomes. This also fits with some decision-making theories (Scott, Reppucci, & Woolard, 1995; Steinberg & Cauffman, 1996) identifying several psychosocial factors (including future oriented time perspective) which influence how decisions are made in 'real-world' situations. Evolutionary theorists also argue that the ability to use a future-oriented time perspective has been useful to humans as a survival strategy (e.g., Suddendorf & Corballis, 2007). Thus, it is reasonable to assume that this ability plays a crucial role when making important and risky decisions. Unfortunately, it does not appear to be the case that all

decisions can be predicted by the individuals' level of future orientation. It would appear as though, however well developed, this trait seems to be predictive of decisions which are made deliberatively, with thought and consideration. Conversely, certain decisions, which may be equally important and risky in nature, are made reactively or intuitively, and future oriented thinking is less likely to influence these decisions.

Intuitive Decision-Making

Consistent with the second hypothesis, it was also found that intuitive decision-making under ambiguity was predicted by age and sensation seeking, indicating that older individuals who were also high in sensation seeking tended to make better judgments when initially presented with the intuitive decision-making task. It is important to keep in mind the difference between sensation seeking and impulsivity; sensation seeking refers to a willingness to engage in risks in order to take part in novel experiences, while impulsivity describes diminished self-control resulting in uninhibited or "risky" behavior (Kambam & Thompson, 2009). It would appear that the former is useful when engaging in a novel, ambiguous, intuitive decision-making situation where there is not a clear thought process being used to determine the appropriate course of action. Rather, the individual must rely on his or her instinctual feelings toward the situation to guide the decision. Sensation seeking was not found to be related to performance on later trials of the IGT ('decisions under risk'), which may be due to the fact that, by this time, successful participants should have developed a strategy to avoid risk and choose only cards from advantageous decks; therefore, the willingness to engage in risk should not be related to performance at that stage of the task.

The current study found that performance on deliberative and intuitive decision-making tasks are predicted by separate psychosocial factors. Specifically, deliberative decision-making was predicted by future oriented thinking, whereas intuitive decision-making was predicted by age and sensation seeking. The measure of intuitive decision-making was not found to be related to future oriented thinking, which may be an unexpected result due to research on individuals with damage to the ventromedial region of the prefrontal cortex (VMPFC) of the brain (Bechara et al., 1994). Individuals with VMPFC damage, who tend to perform poorly on the IGT, also tend: (a) not to show physiological reactions to anticipated emotional events, and (b) demonstrate a lack of future oriented behavior, regardless of intelligence level (Bechara et al., 1994). Therefore this research suggests that perhaps the IGT measures an individual's sensitivity to future consequences. However, the literature on the IGT does not include research where an independent measure of future oriented thinking was administered. Rather, it assumes that future oriented thinking is measured due to the nature of the task and the behavior exhibited by participants with this damage versus a control group.

In contrast, research testing the *somatic marker hypothesis* indicates that the IGT may be measuring factors other than future oriented thinking (see Dunn, Dalgleish, & Lawrence, 2006). Skin conductance responses (SCR) were found to be associated with successful performance on the IGT task in VMPFC patients and healthy individuals; however, it was found that healthy individuals began to develop anticipatory SCRs, while the VMPFC patients did not. Thus it was speculated that these patients lacked the ability to develop these 'somatic markers' (i.e. links to past emotional responses to punishment)

to help distinguish good from bad choices (Bechara et al., 1996). Further, research suggests that damage to the VMPFC may be related to a number of other factors such as working memory (Hinson, Jameson, & Whitney, 2002), reversal learning (Rolls Hornak, Wade, & McGrath, 1994), risk taking (Shiv, Lowenstein, & Bechara, 2005), and apathy (Barrash, Tranel, & Anderson 2000) which may be impacting the differences in performance.

It was expected that emotion regulation would be predictive of performance on the IGT, although this was not the case. In fact, emotion regulation scores were not even correlated to IGT performance. Theories, such as the *somatic marker hypothesis* suggest (Bechara et al., 1999; 2000; Damasio 1994) that emotional reactions should play a significant role in decision-making where risk and ambiguity are involved. Therefore, according to this theory, it is reasonable to assume that individuals who tend to have difficulty recognizing and interpreting emotions within themselves would also have difficulty during intuitive decision-making tasks where risk and ambiguity are involved (i.e. the IGT). Interestingly, emotion identification was not significantly related to either type of decision-making in the current study. It is possible that although the ability to cognitively identify and describe emotions tends to increase with age, the ability to make use of these feelings at an implicit level may develop differently. It is also possible that the lack of relationship can be attributed to the measure used. While it is reasonable to assume that the extent to which an individual can identify and describe his or her emotions should be related to the ability to regulate emotions, it is not the same as controlling one's emotions which is likely to be more related to decision-making. The

aforementioned research by Bechara et al. (1996) indicated that individuals with VMPFC damage tended to lack a reaction to *anticipated* emotional responses; therefore, it is possible that the relationship between emotion and decision-making is complex and involves factors which influence one's ability to use somatic triggers to draw connections to anticipated outcomes. Research is needed determine the factors which may moderate the effect of emotion on decision-making.

Implications

Research on adolescent decision-making has yielded a number of different theories suggesting that there are at least two systems involved in the process of decision-making (e.g., Klacztnski, 2001, Reyna & Farley, 2006; Gerrard, Gibbons, et al., 2008; Casey, Getz & Gallavan, 2008; Steinberg, 2008). For example, Klaczynski (2001, 2005) suggests the existence of an experiential and analytic system of information-processing which develop independently, but influence one another. This idea of dual cognitive systems operating independently is not unlike the one proposed by Reyna and Farley (2006) who developed a fuzzy trace theory of decision-making. The description of the experiential system shares some similarities with the proposed *gist-based* decision-making which relies on the use of heuristics, and both theories recognize the analytic system as being more deliberative in nature. Differences arise between these theories in the extent to which the researchers feel that experiential or heuristic-based decision-making can lead to efficient and effective choices. While Klaczynski (2001, 2005) posits that decision-making which relies on the use of experience and heuristics is a less effortful and therefore quicker method of decision-making which leads to a choice that is

"good enough", while the analytic decision-making system yields decisions which are more rational and requires a greater amount of effort. Reyna and Farley (2006) suggest that during *gist-based* decision-making, individuals rely on general knowledge as well as past experience to generate a *fuzzy mental representation* of the situation and therefore allows the individual to make an informed decision more efficiently.

Based on the findings of the current study, it is reasonable to conclude that decision-making should be researched further with respect to the different types of decisions which are being made and what factors may influence these decisions. What may make one type of decision deliberative versus intuitive may very well have to do with the use of different information processing systems such as those proposed by Klaczynski (2001; 2005) or Reyna and Farley (2006). Certain types of decisions may tend to be made with one type of process more frequently than the other and it may be that certain factors influence or prompt the use of one process over the other. However, there may be overlap among the types of decisions which exist, and each decision that is made may be perceived differently depending on the individual and the situation. Thus, something that may be considered analytically for one individual may be more of a quick reactive choice for another.

To illustrate this idea, consider the concept of wearing a seatbelt. This decision could be considered a deliberate decision if the individual takes the time to consider the factors of the decision (i.e. the possible outcomes, costs, benefits, etc.); however, it could reflect a more reactive or intuitive decision where the individual does not engage in any analytical thought. The type of decision-making may be moderated by factors such as

who the teen is driving with. Research indicates that adolescents are more likely to engage in risk taking behavior and less likely to consider the risks associated with decisions when in the presence of peers (Gardner & Steinberg, 2005). Perhaps in a situation with an adult present, the teen may be prompted to consider the importance of the decision based on the opinion of the adult regarding possible injury or legal action, and this may trigger the use of a future oriented time perspective. However, when driving with a same aged peer who does not prompt these thoughts, the teen may not recognize the risk associated with the decision, or that he or she is making a decision at all. This peer influence seems to dissipate as age increases (Gardner & Steinberg, 2005); therefore, peer influence may be important to consider when looking at the type of decision being made during adolescence but less of an issue when considering adult decision-making. This lends support to the idea that additional factors, including psychosocial and situational variables, may influence decision-making aside from those investigated in the present study. The results of the deliberative decision-making task highlighted the importance of variables such as commitment when making decisions. It is possible that factors associated with one's tendency to value certain things such as family, or one's attachment style could influence the type of decision-making that is used as high levels of these variables could potentially prompt thoughts of others and consequences outside of the self, leading to a more deliberative decision-making style.

Results of the current study support the idea that teens may not always be making deliberative decisions which are carefully thought out and tend to be predicted by one's likelihood to consider the future. In terms of practical implications therefore, it is

important to recognize that increasing awareness of future consequences will not always be an effective means of reducing risky decision-making among teens. Regardless of one's ability to perceive future consequences, these skills may not be utilized during reactive decisions. In fact, it is possible that intuitive or reactive decisions are, by nature, more likely to result in risk-taking behavior due to this lack of relationship to future time perspective.

For this reason, Steinberg (2003) suggests that risk-taking in adolescence reflects immature psychosocial development and therefore, intervention to encourage development of emotional and social maturity is unlikely to be successful. Instead, Steinberg suggests that interventions should focus more on strategies to limit the extent to which immature judgment results in harm to the adolescent population. For example, he argues for the use of external strategies such as increasing cigarette prices or increasing access to free or low cost contraceptives to reduce the likelihood of substance use and teen pregnancy.

According to this perspective, it seems as though the focus of intervention needs to shift from within the adolescent to the external environment. Before trying to change what occurs naturally within an individual, it seems reasonable to implement increased environmental strategies to attempt to reduce the potential negative impact of immature judgment. While this is a valid perspective, results of the current study provide useful information regarding the types of decisions being made by teens and psychosocial factors which influence how these decisions are made. Further research on these decision-making factors may yield a better understanding of how to predict risky

decision-making behavior and, therefore, where and what interventions should be put into place.

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Appendix A.

Thank you for your interest in graduate research at Mount Saint Vincent University. My name is Jesslyn Doucette and this research study on Decision-Making is a part of my Master's Thesis which is being supervised by Michelle Eskritt in the Department of Psychology. The purpose of the study is to determine what types of personality factors might predict the types of decision-making done by adolescents and adults.

You will be asked to complete a computerized decision-making task, as well as to describe a recent decision that you have made and answer questions about it. This task will be audio taped for later transcription. You will then be asked to complete three separate questionnaires related to your perspective of time, sensation seeking, and your emotional experiences. Your personal information and your responses will be stored separately to ensure confidentiality. The research will take approximately thirty minutes to complete.

There is no expected risk involved in participating in this study; however if you wish to skip any questions or want to withdrawal at any time throughout the experiment, you may do so without penalty. If you wish, your information and responses will be immediately and permanently deleted. In all other cases, information will be kept confidential and anonymous and only those directly involved in this study will have access to the information which will be stored either on a secured server or a locked room at Mount Saint Vincent University. Finally, if you would like to see the results and/or know more about this study, results and discussion may be emailed to you if you would like to provide your email address.

If you have questions or comments please, send an email to Jesslyn Doucette. Should you want to contact my supervisor, you may email Dr. Michelle Eskritt. Furthermore, if you would like to speak with someone who is not directly involved in this research you may contact the University Ethics Board (UREB) c/o MSVU Research and International Office, at (902) 457-6350, or via email at research@msvu.ca.

If you understand and accept the terms explained here, please sign and return the attached form. Please keep this letter for your records.

Sincerely,

Jesslyn Doucette

Appendix A. Continued

I, _____, am willing to participate in Jesslyn Doucette's research study on Factors Predicting Decision-Making.

Signature: _____ Date: _____

AUDIO RECORDING RELEASE FORM

I, _____, give permission for Jesslyn Doucette to record my voice for her research study on decision-making. I understand that the audio recording and its transcription will not be linked to my name. Also, I understand that the audio recording will be destroyed five years after the data has been published.

Signature: _____ Date: _____

Optional email address at which you can be contacted if you want a copy of the results of the study : _____

Appendix A. Continued

My name is Jesslyn Doucette and I am conducting a research study on Decision-Making as a part of my Master's Thesis at Mount Saint Vincent University. The purpose of the study is to examine how certain psychosocial factors are related to different types of decision-making in adolescents. I would to invite your son or daughter to participate.

Your son or daughter's participation will take place at his or her school in a quiet designated area during class time with the teacher's permission. Students will be asked to complete a computerized decision-making task, as well as to describe a recent decision that they have made and answer questions about it. They will also be asked to complete surveys related to their perspective of time, sensation seeking, and emotion identification. Personal information and their responses on the tasks will be kept separate to ensure confidentiality. The research will take approximately thirty minutes to complete.

There is no expected risk involved in participating in this study; however if your son or daughter does not wish to participate in the experiment for any reason, wish to skip any questions, or wish to withdrawal at any time throughout the experiment, they may do so without penalty. If participants wish, their information and responses will be immediately and permanently deleted. In all other cases, information will be kept confidential and anonymous and only those directly involved in this study will have access to the information which will be stored either on a secure server or a locked room at Mount Saint Vincent University. Finally, if you or your son or daughter would like to see the general results of the study, results will be emailed to you if you would like to provide an email address on the following page.

If you have questions or comments please, send an email to Jesslyn Doucette. Should you want to contact the instructor supervising this project, you may email Dr. Michelle Eskritt. Furthermore, if you would like to speak with someone who is not directly involved in this research you may contact the University Ethics Board (UREB) c/o MSVU Research and International Office, at (902)457-6350, or via email at research@msvu.ca.

If you understand and accept the terms explained here, and would permit your son or daughter to participate please sign and return the attached form. Please keep this letter for your records.

Sincerely,

Jesslyn Doucette

Appendix A. Continued

I, _____, give permission for my son or daughter, _____, to participate in Jesslyn Doucette's research study on decision-making.

Signature: _____ Date: _____

AUDIO RECORDING RELEASE FORM

I, _____, give permission for Jesslyn Doucette to record my son or daughter's voice for her research study on decision-making. I understand that the audio recording and transcription will not be linked to my son or daughter's name. Also, I understand that all data will be destroyed within five years of the data being published.

Signature: _____ Date: _____

Optional email address for results: _____

Appendix B.

Pearson Correlations for deliberative decision-making coding categories, age, future-oriented thinking, and sensation seeking.

	Age	Future-Oriented	Sensation Seeking
Costs	.380**	.305*	.072
Benefits	.192	.144	-.178
Options	.012	.143	.283*
Long Term Consequences	.090	.013	.099
Emotions	-.004	.290*	.293*
Information Seeking	.297*	.170	-.209
Commitments	-.069	.134	.064

**. Correlation is significant at the 0.01 level.
* . Correlation is significant at the 0.05 level.

Appendix C.

Examples of deliberative decision-making responses by age group. Participant responses were transcribed verbatim and appear in *italics*; questions and prompts by the examiner appear in plain font.

Young Adolescents (aged 13-15)

Could you please describe for me a recent decision that you made that you considered to be difficult?

"I had to choose whether to go to the movies with one of my friends or to hang out with the other one at their house so .."

Can you describe how you came to your final decision?

"*Well I kind of wanted to go to the movies more and I kind of had plans with that person first so I kind of went with them.*."

What kinds of things did you think about when making your decision?

"What movie we were going to go see and umm about what we would have done at the .. at my friends house…"

Anything else?

"Not really"

Did you do anything to help you make your decision?

"No, not really.. just kind of thought about it.."

(Age: 14 years)

Older Adolescents (aged 16-17)

Could you please describe for me a recent decision that you made that you considered to be difficult?

"Umm well it's a big decision is that okay? I have to get surgery.. well I don't have to take it-get it, but if I don't get the surgery I can't play any sports or do any activities, so.."

Appendix C. Continued

So you have to decide whether to get the surgery and be able to play sports, or to not get the surgery ..

"yeah, it's really painful and I could be in a wheelchair for a bit and crutches and rehab and stuff so … I decided to do it .."

Can you describe how you came to your final decision?

"Well I've been active my whole life and just the past year and a half I haven't been able to do stuff and it's been really hard, so.. seeing .. just doing that for a year and a half, not being able to do that, I just decided that surgery was the way to go and this little bit of time that I'll be out , in the long run it'll be the best for me, so.."

What kinds of things did you think about when making your decision?

"Basically just what I wanted to do like .. I need activity, I just, I can't just sit on the sidelines. I did it for soccer last year and basketball this year and it wasn't-I couldn't do it anymore."

Did you do anything to help you make your decision?

"I talked to some people who had surgery and my parents helped me and my sister and stuff.."

Anything else?

"yeah I read up online and just kind of looked at my options kind of thing. I read like blogs and stuff people would post, like um their experiences to see how they dealt with the surgery-the specific surgery so I saw their outcomes and it helped me."

(Age: 17 years)

Adults (aged 19?+)

Could you please describe for me a recent decision that you made that you considered to be difficult?

"I've been a facilitator at a church conference-or a youth church conference for the past four years, five years rather, and this year it was really difficult for me to decide whether or not to go. Umm, my ex was going to be there with his new fiancé who used to be my friend, who he started dating before we broke up. So got to see the ex with the other woman who used to be my friend and had to spend the whole weekend with them at a

Appendix C. Continued

church conference with everybody thinking how wonderful they are that they are engaged and that he is going to be a minister. So really difficult to decide whether I was going to be participating again in that conference."

Ok, can you describe for me how you ended up coming to your final decision?

"I thought about how- I sort of weighed the pros and the cons, I knew that even though a lot of people were sort of um superficially feigning excitement for them, a lot of people I knew were very aware of how difficult it was and a lot of them got in touch with me saying they really hope that I would be there regardless and that they weren't worth it 'yada yada'.. so it made me feel better knowing that I had people there that were sort of on my side or at least supporting me and I just knew I loved the conference so much and got so much out of the way that the youth would interact with each other and with me and hearing what they had to say that it was just so worth it to be able to experience that again and knowing that I could avoid them at all costs if I really had to at the conference so it was still a hard decision but it just being there it definitely was better than not being there regardless of who else was present."

You kind of already touched on this but can you just kind of outline for me what did you think about while making this decision?

"I thought about how much youth forum has meant to me in the past. Thought about the type of relationship that my ex and I had had and the type of person he turned out being and whether or not that was worth giving up something that I love so much and um I just thought about all of the friends that I have there who I usually only get to see once a year at the conference and when we all gather as the facilitating team so I definitely didn't want to miss out on the opportunity to see them again."

Did you do anything to help you make your decision?

"Umm.. I chatted with a few people who knew the situation but didn't bring it up with people who weren't totally aware of it cause I didn't want to drag people into the middle of anything. Umm so talked to them, talked to my roommate a lot – she is the director and was very, very aware of the situation, I talked to my family, talked to my current partner and yeah they really helped me arrive at the decision."

(Age: 24 years)