Are Delay Discounting, Probability Discounting, Time Perception, and Time Perspective Related? A Cross-Cultural Study Among Latino and White American Students

Ana Amelia L. Baumann Neves

Utah State University

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ARE DELAY DISCOUNTING, PROBABILITY DISCOUNTING, TIME PERCEPTION, AND TIME PERSPECTIVE RELATED?
A CROSS-CULTURAL STUDY AMONG LATINO AND WHITE AMERICAN STUDENTS

by

Ana Amelia L. Neves

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Psychology

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UTAH STATE UNIVERSITY
Logan, Utah

2009
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ABSTRACT

Are Delay Discounting, Probability Discounting, Time Perception, and Time Perspective Related? A Cross-Cultural Study Among Latino and White American Students

by

Ana A. L. Baumann Neves, Doctor of Philosophy

Utah State University, 2009

Major Professors: Dr. Amy L. Odum and Dr. Melanie Domenech Rodriguez
Department: Psychology

The present study aimed to evaluate (a) the extent to which different impulsivity measures would be related to each other and to a risk taking measure, (b) the extent to which impulsivity, risk taking, time perception and time perspective are related to each other, and (c) the extent to which these processes differ in Latino and White American students. Experiment I was conducted at Utah State University. One hundred and forty-three participants were exposed to the delay discounting, probability discounting and temporal bisection procedures, and answered the Barratt Impulsiveness Scale (BIS-11) and the Zimbardo Time Perspective Inventory (ZTPI). Results showed that (a) the AUC for delay discounting was related to the scores on the BIS-11 scale, (b) the AUCs for delay and probability discounting were positively and significantly correlated, (c) the mean of the temporal bisection procedure was correlated with the AUC of the delay
discounting procedure, (d) the scores on the ZTPI were correlated with the impulsivity measures, and (e) the scores on the ZTPI subscales were also correlated with the risk taking measure. These results suggest that different impulsivity measures may be evaluating similar decision-making processes, that impulsivity and risk taking may be different decision-making processes, and that time perception and time perspective are related to impulsivity and risk taking. Experiment II was conducted at Washington University in St. Louis, with 18 Latinos and 16 White Americans. Results show that while Latinos were more impulsive in the delay discounting procedure, their scores did not differ from the White Americans on the BIS-11. Interestingly, Latinos and White Americans did not differ on time perception, but they did differ on time perspective: Latinos scored higher on fatalism compared to White Americans.
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Ana A. L. Baumann Neves
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CHAPTER I
INTRODUCTION

Decision making involves different processes, such as impulsivity, risk taking, time perception and time perspective. These processes are complex: There is not necessarily theoretical consensus regarding their definitions and, accordingly, there are different behavioral manifestations related to each one of them. The present study aimed to investigate the correlation between some behavioral manifestations related to impulsivity, risk taking, time perception, and time perspective. All these processes may be affected by culture, another complex phenomenon. The presented study also aimed to evaluate whether the above decision-making processes differ between two samples that may differ in cultural aspects, Latino and White American students.

The structure of the review of the literature will be as follows. In the first section of the document, the concept of impulsivity and risk taking will be reviewed. In the second section, the concept of time will be reviewed. In each of these sections, some behavioral manifestations of these decision-making processes will be outlined. Finally, the rationale for evaluating the effect of culture on decision-making processes and for studying Latinos and White Americans will be provided.
People make decisions all the time. Consider, for example, the choice between buying an unnecessary item at a shopping mall or saving money and buying something more expensive later in time. In certain circumstances, buying the extra item can be considered impulsive behavior. This could be the case, for example, if the person who is buying the item is spending more than s/he could afford, if s/he has bills to be paid with that money being spent. The same behavior of buying the extra item, nevertheless, might be considered as “having fun” or “enjoying life” instead if, for example, the person who is buying the item has enough financial resources to afford the item and the bills to be paid. The same behavior, therefore, can be considered either impulsive or not, depending on the context.

A similar rationale can be drawn when considering a behavior as risk taking or not. For example, if the economy is not stable, buying an extra item at the shopping mall can be considered risky behavior because the person does not necessarily have certainty on how his/her financial aspects will be later on. On the other hand, if the economy is stable, the person has a stable income, buying an extra item may actually be considered “fun” and the behavior is not necessarily a risky behavior. These examples suggest that the same behavior in different contexts may be socially acceptable or not, and deemed impulsive, risk taking or not. Context, culture, age, historical and economical aspects may permeate the social considerations of what may be defined as impulsivity (Evenden,
It is important, therefore, to define what is considered impulsivity and risk taking and evaluate which variables affect these processes.

Impulsivity

Researchers have recognized that there is not necessarily a consensus in the field of what specifically entails impulsivity, and that impulsivity is a multidimensional and complex construct (e.g., Evenden, 1999; Mitchell, 2004; Reynolds, 2006). One of the main difficulties in defining impulsivity is the lack of consensus on the theoretical background of the definition of the concept. That is, it is not clear which personality factors, such as sensation seeking, lack of persistence, or spontaneity, are related to impulsivity (e.g., Miller, Joseph, & Tudway, 2004; Zermatten, Van der Linden, d’Acremont, Jermann, & Bechara, 2005). For example, Barrat and Patton (1983) considered impulsivity as a multidimensional construct, with three factors (motor, nonplanning, and attention). Eysenck also considers impulsivity a multidimensional construct, but with characteristics related to psychoticism, extraversion, and neuroticism (Eysenck & Eysenck, 1978). Dickman (1990), on the other hand, tries to reconcile the functional and dysfunctional aspects of impulsivity.

Related to the absence of a theoretical consensus of what is considered impulsivity is the fact that the concept has been used to describe a wide range of different behavioral manifestations (Gerbin, Ahadi, & Patton, 1987; Smith et al., 2007). For example, researchers have described behaviors such as sensation seeking, acting without thinking, inattention, lack of persistence, urgency, lack of premeditation, lack of perseverance, choosing the smaller outcome over the larger delayed outcome, diminished
ability to delay gratification, inability to withhold a response, and risk taking as impulsivity (de Wit, 2008; de Wit, Engasser, & Richards, 2002; Petry, 2001b; Mitchell, 2004; Newman, Widom, & Nathan, 1985; see Evenden, 1999 for a review). Given that the concept of impulsivity is related to different behavioral manifestations, it is not clear whether the different measures that aim to evaluate impulsivity (a) are empirically distinct, and thus evaluate different behaviors related to an overall concept (impulsivity), or (b) evaluate similar behaviors related to impulsivity that are being named differently (Miller et al., 2004). In the present study, impulsivity is assessed through self-report and also via experimental manipulation.

The first goal of the present study, therefore, was to evaluate whether one self-report measure and one behavioral measure evaluate similar aspects of impulsivity. More specifically, participants of the present study answered the Barratt Impulsivity Scale (BIS-11; Patton, Stanford, & Barratt, 1995) and were exposed to the delay discounting procedure (see below). The present study was not comprehensive and did not aim to “solve” the lack of consensus of what is impulsivity, but it aimed to explore the relationship between the two impulsivity measures. The first goal of the present study, therefore, was to evaluate the following behavioral manifestations of impulsivity: motor, nonplanning, and attention impulsivity, as reported by the participants in the BIS-11 scale, and the degree of discounting of larger delayed outcomes, as measured by a behavioral measure, the delay discounting procedure.

*Barratt Impulsiveness Scale (BIS-11)*

The BIS-11 is one of the most common self-report measures of impulsivity (Arce
& Santisteban, 2006). The most recent version of the scale was developed in 1995 (Patton et al., 1995) and contains 30 items in three subscales of factors: (a) attention/cognitive: This subscale measured inattention and cognitive instability; (b) motor: This subscale indicated motor impulsiveness and lack of perseverance; and (c) nonplanning: This subscale evaluated the lack of self-control and intolerance of cognitive complexity.

Studies have shown that those who score higher on the questionnaire also (a) have high prevalence of substance use/abuse (e.g., Clark, Robbins, Ersche, & Sahakian, 2006; Mitchell, Fields, D’Esposito, & Boettiger, 2005; Reynolds et al., 2007), (b) score high in aggressive behavior (e.g., Fossati et al., 2007; Zouk, Tousignant, Seguin, Leasage, & Turecki, 2006), (c) have high levels of dysfunctional cognitions (e.g., Mobini, Pearce, Grant, Mills, & Yeomans, 2006), and (d) score lower on an academic-related questionnaire (Vigil-Colet & Morales-Vives, 2005), among others. The BIS-11 was chosen because it has been used with White American (Patton et al., 1995) and Spanish-speaking populations (Oquendo et al., 2001).

One criticism of the self-report measures is that researchers need to rely on the veracity of the participants’ answers, and they may not be necessarily reliable. Self-report measures, nevertheless, can add to the understanding of impulsivity as a complex phenomenon because they allow researchers to gather information on a variety of acts, such as planning activities or attention to tasks, whereas behavioral measures evaluate a specific behavior, such as the degree of discounting of an outcome (Gerbin et al., 1987; Reynolds, 2006). To capture more than one aspect of impulsivity, participants of the present study were also exposed to the delay discounting procedure.
Delay Discounting

Delay discounting refers to the decrease in the value of an outcome as the delay until its receipt increases (Mazur, 1987; Rachlin, Ranieri, & Cross, 1991). For example, when asked to choose between $50 now and $100 in one day, the majority of the participants choose to wait for $100 in one day. However, as the delay to the delivery of the larger outcome increases, the value of the outcome decreases and the probability of choosing the smaller immediate outcome increase. That is, if now the participant has to choose between $50 now and $100 in two years, the probability of choosing $50 increases when compared to the previous choice.

In this behavioral measure, named delay or temporal discounting procedure (Mazur, 1987), participants are asked to make hypothetical choices between smaller immediate outcome and a larger delayed outcome in each of several trials. In the present study, delay discounting was assessed using a computer-based task developed by Du, Green and Myerson (2002). In this procedure, the magnitude of the delayed outcome remains constant while the magnitude of the immediate outcome is adjusted across trials. The goal of this titration procedure was to find the indifference point (or point of subjective value) for each delay, which is the point at which both the immediate and the delayed outcomes have the same value. Here, the word subjective refers to the value of the outcome as judged by the participant (Rachlin et al., 1991). The indifference points for each delay are plotted to form the delay discounting curve (see Critchfield & Kollins, 2001; Mazur). The indifference curve is empirically determined and is considered a measure of the degree to which the larger outcome has been discounted, or had its value decreased, due to the delay to its receipt (e.g., Bickel & Marsch, 2001).
The present value of an outcome diminishes substantially with shorter delays and less per unit of time with longer delays of the receipt of the delayed outcome, and is often described by a hyperboloid function (Myerson & Green, 1995):

\[ V = \frac{A}{1 + kD} \]  

(1)

where \( V \) is the value at the indifference point, \( A \) is the amount of the delayed outcome, \( D \) is the delay, \( k \) is a derived constant proportional to the degree of delay discounting, and \( s \) represents the nonlinear scaling of amount and/or time. When \( s \) equals 1, the equation reduces to a simple hyperbola (Mazur, 1987):

\[ V = \frac{A}{1 + kD} \]  

(2)

An example of a delay discounting curve is shown in Figure 1, where the lines represent the best fitting discounting function generated by the hyperboloid equation.

The delays employed in the procedure have varied from as little as 5 minutes to as much as 25 years (e.g., Crean, de Wit & Richards, 2000; Odum, Madden, & Bickel, 2002) and the amounts of money used have varied from as little as 5¢ to as much as $50,000 (e.g., Giordano et al., 2002; Green, Myerson, & McFadden, 1997, Holt, Green, & Myerson, 2003; Lagorio & Madden, 2005). In these studies, participants usually do not receive the outcomes that they choose, but they are asked to imagine the delivery to the outcomes as being real and to answer as if they would actually receive the rewards. Research to date has found no difference between discounting of real and hypothetical monetary outcomes (e.g., Johnson & Bickel, 2002; Johnson, Baker, & Bickel, 2007; Lagorio & Madden, 2005; Madden et al., 2004). For practical and financial reasons, the present study used hypothetical outcomes to assess the delay discounting curve.
Figure 1. Hypothetical data representing present value as a function of the delay for two different degrees of discounting by delay.

Delay Discounting: General Findings

Several factors may affect the degree of discounting. For example, people tend to discount small amounts (e.g., $100) more steeply than larger amounts (e.g., $25,000; Green et al., 1997; see Green & Myerson, 2004, for a review). Moreover, different outcomes are discounted differently. For example, food is discounted more steeply than money (e.g., Odum, Baumann, & Rimington, 2006), alcohol is discounted more steeply than money by social drinkers (e.g., Estle, Green, Myerson, & Holt, 2007; Odum & Rainaud, 2003), and people with drug abuse problems discount their drug of abuse more steeply than money (e.g., Bickel, Odum, & Madden, 1999; Madden, Petry, Badger, & Bickel, 1997; Odum et al., 2002; Odum & Baumann, 2007a, 2007b; see Reynolds, 2006 for a review). The context also affects the degree of discounting. For example, gamblers discount money more steeply when they are in a casino compared to when they are in a coffee shop (Dixon, Jacobs, & Sanders, 2006). Finally, different populations show
different degrees of discounting of money. People who abuse drugs discount money more steeply than control participants (e.g., Bickel et al.; Coffey, Gudleski, Saladin, & Brady, 2003; Field, Santarcangelo, Summal, Goudie, & Cole, 2006; Kirby & Petry, 2004; Kirby, Petry, & Bickel, 1999; Odum et al., 2002; Ohmura, Takahashi, & Kitamura, 2005; Petry, 2001a, 2001b; Reynolds et al., 2007; Vuchinich & Simpson, 1998), and extraverted participants discount money more steeply than introverted participants (Ostaszewski, 1996). The degree of discounting is also steep for younger and lower-income participants (e.g., Green, Fry, & Myerson, 1994; Green, Myerson, Litchman, Rosen, & Fry, 1996; Green, Myerson, & Ostaszewski, 1999b; Scheres et al., 2006; see also de Wit, Flory, Acheson, McCloskey, & Manuck, 2007; Read & Read, 2004).

Some authors have suggested that the degree of perceived riskiness of receiving the delayed outcome may affect the choice in the delay discounting procedure. That is, participants may perceive that the longer the time before the delivery of the outcome, the greater the possibility that something may happen to impair the delivery of the outcome (Green & Myerson, 1996, 2004; Sherwood, 2007). Participants may, therefore, choose the small immediate outcome more often not necessarily because they value the immediate outcome more than the larger delayed outcome, but because they perceive that they will not necessarily receive the larger delayed outcome. Indeed, some authors suggest that the delay to receiving the outcome can be evaluated in terms of perceived odds against receiving the outcome (Bezion, Rapoport, & Yagil, 1989; Green & Myerson, 1996; Green, Myerson, & Ostaszewski, 1999b; Myerson & Green, 1995; Stevenson, 1986). One study by Patak and Reynolds (2007) suggested that delay and perceived riskiness are related. Participants were exposed to the delay discounting
procedure and asked to rate their certainty about the delivery of the delayed outcome. The results showed that as the delay increased, so did the perceived uncertainty of receiving the outcome (see also Reynolds, Patak, & Shroff, 2007; Takahashi, Ikeda, & Hasegawa, 2007). Because the perceived risk of not receiving the outcome may affect delay discounting, the present study assessed how the odds against receiving an outcome affected the degree of discounting in a separate procedure called the probability discounting procedure (see below). If delay discounting evaluates the degree of impulsivity, and if the degree of riskiness is related to the choices in delay discounting, the question that follows is: are impulsivity and risk taking related? That is, do participants that are more impulsive in the delay discounting procedure tend to take or to avoid risks?

Risk Taking and Impulsivity

Risk taking is another complex concept, and it has been used to describe a number of different behaviors, such as alcohol consumption, tobacco use, unsafe sexual activity, dangerous driving, aggression, delinquency, drug use, and normbreaking (Boyer, 2006; see also Reyna & Farley, 2006). According to Boyer there are at least four theoretical perspectives that try to explain the development of risk taking: cognitive, emotional, and social development, and psychobiological theories. The specifics of each theory are beyond the scope of the present study, but it is important to note that, similar to impulsivity, researchers have been trying to understand which factors (e.g., sensitivity to risk, probability estimation, and perceptions of vulnerability) and which personality traits (e.g., neuroticism and conscientiousness) are related to risk taking (e.g., Boyer).
Accordingly, different methodologies have been used to assess risk taking, such as the Balloon Analogue Risk Task (Lejuez et al., 2002), the Bechara Gambling Task (Bechara, Damasio, Damasio, & Anderson, 1994), and the probability discounting task (Rachlin et al., 1991; Yi & Bickel, 2005). Similar to impulsivity, the behavior of risk taking per se is not a pathological or a maladaptive behavior (see Reyna & Farley, 2006). Examples of risky behaviors that can be considered functional can be found in sports, such as sky diving, climbing, and skiing. Again, the long term social, physical, and psychological consequences of engaging in these behaviors are the ones that will determine whether they are maladaptive and risky to the individual and to those around him/her or not.

Impulsivity has often been related to risky behaviors (e.g., Butler & Montgomery, 2004; Cherpitel, 1999; Donohew et al., 2000; Zuckerman & Kuhlman, 2000), but some researchers have suggested that impulsivity and risk taking are different decision-making processes (e.g., Vigil-Colet, 2007). More specifically, behavior analysts have recently suggested that impulsivity (or one of the behavior manifestation of it: discounting of delayed larger outcomes), and risk taking (or one behavior manifestation of risk taking; discounting of uncertain outcomes) are different processes: participants that are impulsive (that discount steeply delayed outcomes) do not necessarily take risks (discount uncertain outcomes; see below). The present study, therefore, aimed to further evaluate the relationship between two behavioral manifestations of impulsivity, discounting of delayed outcomes (as measured by the delay discounting procedure) and motor, nonplanning and attention impulsivity (self-report impulsivity as measured by the BIS-11), and one behavioral manifestation of risk taking; the discounting of probabilistic behaviors, as measured by the probability discounting procedure.
Probability Discounting

Studies of probability discounting aim to determine the degree to which the value of an outcome is diminished due to the uncertainty of delivery (Rachlin et al., 1991; Yi & Bickel, 2005). Probability discounting refers to the decrease in the subjective value of an outcome as the odds against its receipt increase (or as the probability of its receipt decreases; Myerson, Green, Hanson, Holt, & Estle, 2003). For example, a participant may choose $100 with 100% certainty instead of $120 with a probability of 10% to be delivered. As the odds against decrease (or the probability of the delivery of the outcome increases), the participant may be more likely to choose the risky option. For example, she may choose 80% probability of receiving $120 over the certain $100. It is said that choosing the larger riskier option means that the participant discounted the delayed outcome, or took risks.

The probability discounting procedure is similar to the delay discounting procedure, differing primarily in that the task involves probability instead of delays (Du et al., 2002; Estle et al., 2006). The literature has shown that the probability discounting functions are well described by the following equation (Green & Myerson, 2004; Green, Myerson, & Ostaszewski, 1999a):

\[ V = \frac{A}{1 + hO} \]  \hspace{1cm} (3)

where \( V \) is the subjective value of a probabilistic outcome of amount \( A \), \( h \) is a parameter analogous to \( k \) (Equation 1) that reflects the degree of decrease of the subjective value of the outcome, \( O \) is the odds against the receipt of a probabilistic outcome (where \( O = (1/p)-1, \) and \( p \) is the probability of receipt), and \( s \) represents the nonlinear scaling of
amount and/or odds against the receipt of the outcome (Green et al., 1999a). When $s$ equals 1, the equation reduces to a hyperbola (Rachlin et al., 1991):

$$V = A/(1 + hO)$$

(4)

Figure 2 shows hypothetical probability discounting curves, where the lines represent the best fitting discounting function generated by the hyperboloid equation (Equation 3).

Probability Discounting and Delay Discounting:

Same Underlying Processes

Delay discounting and probability discounting have been described with similar mathematical functions, either with the hyperboloid (Equations 1 and 3; Du et al., 2002; Estle et al., 2006; Green et al., 1999a; Myerson et al., 2003) or the hyperbolic equations (Equations 2 and 4; Rachlin et al., 1991; Reynolds, Richards, Horn, & Karraker, 2004; Richards et al., 1999; Yi & Bickel, 2005). The question that follows is whether delay and probability discounting assess the same underlying aspect of impulsivity. The literature indicates that this is not necessarily the case. Studies have shown that despite the similarity in the mathematical description of the discounting curves, some variables affect delay and probability discounting differently (Green & Myerson, 2004).

One variable that affects delay and probability discounting differently is the amount of the outcome. Participants discount larger amounts more steeply than smaller amounts in probability discounting, whereas the reverse happens in the delay discounting (e.g., Estle et al., 2006; Green et al., 1999a; Myerson et al., 2003; Yi & Bickel, 2005).
The different effects of amount on the degree of discounting suggest that different processes may be involved in the delay and probability discounting of an outcome (Estle et al.; Green & Myerson, 2004). That is, it poses a problem for the assumption that if the same equation describes both delay and probability discounting, then the processes underlying decision-making that involves delays of the outcomes should be the same, or similar to, the processes underlying decision-making with probabilistic outcomes (Green & Myerson, 1996; Prelec & Lowenstein, 1991; Rachlin, Siegel, & Cross, 1994; Stevenson, 1986). Similarly, the different effects of amount questions the fact that these behavioral manifestations of impulsivity and risk taking are not necessarily related to each other. Because the effect of amount is different for delay and probability discounting, the present study assessed the degree of discounting of two amounts, $10 and $100 as used in previous studies (e.g., Odum & Rainaud, 2003; Odum et al., 2006).
A second variable that affects differentially the degree of delay and probability discounting is culture. Crosscultural research has shown that both processes exist across national groups. However the patterns of behavior seem to vary across groups. In a study comparing the degree of discounting by American, Chinese and Japanese students, Du and colleagues (2002) found that Americans discounted delayed outcomes similar to Chinese, and both discounted more steeply than Japanese students. On the other hand, in probability discounting, American students discounted outcomes more steeply than Japanese and Chinese students. Nevertheless, the Japanese students discounted probabilistic outcomes more steeply than the Chinese students (see also Mahajna, Benzion, Bogaire, & Shavit, in press; Takahashi, Oono, & Radford, 2008). These results suggested that cultures may affect the degree of discounting of delayed and probabilistic outcomes (de Wit et al., 2007). To evaluate the effect of culture group membership on delay and probability discounting processes, the present study assessed the performance of Latino and White American students (see section about culture and decision-making processes below).

Decision Making and Time Perception

Decision-making processes may also be affected by the perception of time. For example, sometimes we feel that time flies, and sometimes we feel that time moves slowly. Time may be perceived differently when we are waiting for an important date than waiting for a boring talk to finish (e.g., Jonas & Huguet, 2008). The duration of an event is the time that events last (Levine, 1997; e.g., half an hour to the date or to the end of the speech), and the perception of the duration of an event is subjective, affected by a
number of variables (e.g., see Fraise, 1984). Time perception may influence how people make decisions and behave in life.

A number of authors have suggested that impulsivity and time perception are related processes. One source of evidence of correlation between impulsivity and time perception comes from neurological studies. The argument is related to the dopaminergic systems. More specifically, some studies have revealed that the dopaminergic system is related to the discounting of outcomes (Boettiger et al., 2007; Fellows & Farah, 2005; Floresco, Tse, & Ghods-Sharifi, 2007). The hypothesis, therefore, is that dopamine is related to the perception of time (Rammsayer, 1997; Wittmann, Leland, Churan, & Paulus, 2007). The hypothesis, therefore, is that the dopaminergic systems may modulate both impulsivity and perception of time (Takahashi, 2005).

Another source of evidence of the relationship between impulsivity and time perception comes from the correlation between questionnaires and time estimation or reproduction tasks. For example, Glicksohn, Leshem, and Aharoni (2006) found that the correlation between performance on a time reproduction task and scores on impulsivity questionnaires is small but significant (see also Bauer, 2001; Berlin, Rolls, & Kischka, 2004). Because the delay discounting procedure involves choices over time, one of the questions that we may ask is: would a person who overestimates time make different choices in delay discounting than a person who underestimates time? (see Read & Roelofsma, 2003; Read, Frederick, Orsel, & Rahman, 2005; Takahashi, 2005, 2006; Takahashi et al., 2008).
Delay Discounting and Time Perception

There are some suggestions that the degree of discounting of delayed outcomes may be affected by the perceived time to the delivery of the outcome (e.g., Takahashi, 2005). The argument here is that impulsive individuals would perceive the duration of the larger delayed outcome as being too long to wait increasing the probability to choose the smaller immediate outcome more often than the larger delayed outcome (Wittmann & Paulus, 2008). For example, when choosing between $10 now and $20 in a week, a participant who perceives the duration of a week as long may choose the $10 now, whereas a participant who perceives the duration of a week as short may choose to receive $20 later.

Other authors suggested that the degree of delay discounting may be affected by the perception of the delay (see Frederick, Lowenstein, & O’Donoghue, 2002 for a review; see also LeBoeuf, 2006; Read & Roelofsma, 2003; Scholten & Read, 2006; Takahashi, 2006). For example, a group of authors manipulated the framing of the choices to evaluate how time and degree of discounting are related. The premise of these studies is that the impact of the temporal distance of the receipt of the outcome was affected by how time was described. For example, Read and colleagues (2005) described the delivery of the outcome as delay (e.g., 1 month) or a specific date (e.g., October 30th). The results showed that participants chose the larger delayed outcome more often when time was described as date compared to when it was described as delays of the delivery of the outcome (Loewenstein, 1988; Scholten & Read, 2006; see also Chandran & Menon, 2004 for other examples of framing on decision-making processes).
A couple of studies have empirically measured the perception of time and evaluated the correlation between the degree of delay discounting and time perception. Barkley, Edwards, Laneri, Fletcher, and Metevia (2001), for example, showed that teenagers with attention-deficit/hyperactivity disorder (ADHD) discounted delayed money more steeply and manifested more impaired time reproduction, but not time estimation, than the control participants. Using a modified delay discounting task, where participants experience the consequences of their choices, Reynolds and Schiffbauer (2004) showed that production and reproduction of intervals were underestimated and discounting was steeper when participants were sleep deprived compared to when they were not sleep deprived.

Different from Barkley and colleagues (2001) and Reynolds and Schiffbauer (2004) studies, McDonald, Schleifer, Richards, and de Wit (2003) did not find correlation between time perception and the degree of delay discounting. The authors exposed participants to $\Delta^9$-tetrahydrocannabinol (THC) and assessed their performance on a delay-discounting task and a time reproduction. The results showed that the effect of THC on time estimation is independent of the degree of discounting. That is, participants tended to overestimate time when under the influence of THC, while THC did not affect the degree of discounting suggesting that delay discounting and time perception may not necessarily be related to each other.

The low degree of discounting of hypothetical outcomes, and/or the small amount ($10) used in the experiment, was the main explanation used by McDonald and colleagues (2003) for the independent effect of THC on time and discounting. Another study, however, showed a high degree of discounting for the same small amount of using
hypothetical money outcomes (Odum et al., 2006). One variable not mentioned by McDonald and colleagues that may have affected the power of the data analysis is the fact that they correlated the $k$ value, which is not normally distributed (Rachlin et al., 1991), with time discrimination data. The present study used a different measure, the area under the discounting curve (AUC; Myerson, Green, & Warusawitharana, 2001), which is a normally distributed measure, to evaluate the degree of discounting (see method section for more details).

The above studies used the time reproduction task, where participants are required to press a key from the keyboard for the same duration as a sample was presented. For example, if a sample was presented for 4 s in the screen, the participant is required to maintain the key pressed for 4 s. The problem with this measure is that the behavior (i.e., pressing the bar) may be affected not only by the participant’s perception of time (i.e., his/her perception of duration of 4 s) but also by the ability to maintain the key pressed for the specific amount of time. That is, participants may release the key before the required duration (4 s in this example) not necessarily because time perception is impaired, but because of the physical inability to maintain the key pressed. Another behavioral task that aims to evaluate the perception of time is the temporal bisection procedure. An advantage of using the temporal bisection procedure over the time reproduction task is that it allows researchers to measure the accuracy of time perception without requiring participants to maintain a key pressed and thus diminishing the confounding effect of behavioral inhibition on the task. No published study has evaluated whether the degree of delay discounting is correlated with the outcomes of the temporal bisection procedure.
Temporal Bisection Procedure

The temporal bisection procedure is a discrete-trial procedure in which participants are required to categorize different temporal stimuli (Church & Deluty, 1977). In the training phase, a trial begins with the presentation of a sample for either a short (e.g., 2 s) or a long (e.g., 8 s) period of time. After the termination of the sample duration, two comparison stimuli are presented. Participants receive points for choosing one comparison (e.g., left side) following the short stimulus (short responses), and choosing the other comparison (e.g., right side) following the long stimulus (long responses). During the testing phase, participants are required to classify stimuli of different durations (e.g., 3, 4, 5, and 6 s) as either short or long without feedback. The general finding is an ogival psychometric function (see below) in which the proportion of long responses increases as the stimulus duration increases (e.g., Church & Deluty; Lieving, Lane, Cherek, & Tcheremissine, 2005a, 2005b; Wearden, Rogers, & Thomas, 1997).

Blough (1996) suggested that three different aspects could affect performance in temporal discrimination tasks. First, people can make an error by guessing, due to inattention (e.g., saying “short” or “long” randomly), reflecting a lack of overall stimulus control. Second, the stimuli may be confused because of stimulus similarity (e.g., a person cannot distinguish between a 4 s and a 2 s duration stimuli and answers “short” for both of them). Such confusion of temporal discrimination is related to the sensitivity of the stimulus discrimination. Finally, people may have a preference for one choice over the other, reflecting bias in their behavior (e.g., a person has a general tendency to answer “long” more often than “short” in a moment of uncertainty).
To measure these errors, Blough (1996) suggested fitting a cumulative normal function with four parameters:

\[ f(t) = a + \frac{b}{\sqrt{2\pi}\sigma} \left[ \exp - \left( \frac{(t - \mu)^2}{2\sigma^2} \right) \right] \]

where \( f(t) \) is the proportion of long responses at a given stimulus duration \( t \), \( a \) is the lower asymptote of the function, \( b \) is the range of the function (upper - lower asymptote), \( \mu \) the mean, and \( \sigma \) the standard deviation. In Blough’s (1996) analysis, overall stimulus control can be measured by the difference between the upper and lower asymptotes of the function, and indicates the degree to which the responses are under the control of the sample. A larger range indicates greater stimulus control, whereas a smaller range suggests less stimulus control. The slope (the standard deviation) of the function measures sensitivity to time, indicating sensitivity to the differences between samples of different durations. A smaller standard deviation shows greater sensitivity to the differences between short and long samples. Bias for one response over the other is measured by the mean of the function. The mean is the point where there is an equal probability of “short” and “long” responses, and is also called the indifference point. The mean quantifies lateral shifts in the function. For example, increases in the mean indicate shifts to the right and represent underestimation of time. On the other hand, decreases in the mean indicate shifts to the left, representing overestimation of time. Figure 3 exemplifies the three possible aspects of the function (Blough, 1996).
There are no known published studies using the bisection procedure with humans that have analyzed the data with the four-parameter equation proposed by Blough (1996; but see Brown, Newcomb, & Kahrl, 1995 for a different analysis). In the present experiments, Blough’s four parameter equation is used to evaluate the outcomes of the temporal bisection procedure.

**Temporal Bisection Procedure:**

**General Findings**

The temporal bisection procedure was originally used by Church and Deluty (1977) to study animal timing. With humans, the procedure has been used with college...
students (e.g., Allan, 2002; Ferrara, Lejeune, & Wearden, 1997; Wearden, 1991; Wearden & Ferrara, 1995; Wearden et al., 1997; Wearden, Edwards, Fakhri, & Percival, 1998), adults (e.g., Lieving et al., 2006a, 2006b; Melgire et al., 2005), and children (e.g., Balboa-Verduzco, Sanchez-Castillo, & Velazquez-Martinez, 2005; Droit-Volet, 2003; Droit-Volet, Clement, & Fayol, 2003; Droit-Volet, Tourret, & Wearden, 2004; Droit-Volet & Wearden, 2002; McCormack, Brown, Maylor, Darby, & Green, 1999). These studies show that the psychophysical function can be obtained for all ages, but young children show more variability, or are less sensitive to time, when compared to adults (but see Wearden, Wearden, & Rabbitt, 1997).

The procedure has been conducted with visual and auditory stimuli (Droit-Volet, Brunot & Niedenthal, 2004; Penney, Gibbon, & Meck, 2000; Wearden et al., 1998), and the results have shown that if presented in the same session, visual signals are judged to be shorter than auditory signals. On the other hand, the presentation of the stimuli between sessions does not result in differences in the classifications. The procedure has also been used with pictures of angry, happy, and neutral faces (Effron, Niedenthal, Gil, & Droit-Volet, 2006), in which the participants judged the duration of the presentation of the faces. The results indicate that participants tend to overestimate the duration of angry faces--that is, they tend to say that angry faces have longer durations compared to happy faces and neutral faces, and that happy faces had longer durations than neutral ones, even if all the samples were presented for the same duration (see also Droit-Volet et al., 2004).

The stimulus spacing and the range of the long:short ratio have been manipulated in the temporal bisection procedure. The data show that the stimulus distribution influences the location of the bisection point, especially when the ratio of long:short
stimuli is greater. More specifically, the mean is closer to the geometric mean (nth square root of (short*long stimuli)) when the distribution of the testing stimuli is logarithmically spaced (e.g., 2, 2.5, 3.17, 5), and closer to the arithmetic mean ((short*long stimuli)/2) when the distribution is linear (e.g., 2, 3, 4, 5). This effect is more accentuated when the ratio of the long:short stimuli is large (e.g., 5:1), compared to smaller ratios (e.g., 2:1; Allan, 2002; Allan & Gibbon, 1991; Brown et al., 1995; Wearden & Ferrara, 1995; Wearden et al., 1997).

Time Perspective

An important aspect to consider is that time involves different aspects of behavior, not only the perception of duration of events but also time perspective, or how people perceive the importance of past, present or future events (e.g., see Block, Buggie, & Matsui, 1996; Sobol-Kwapinska, 2007). A second question about to the relation between impulsivity and time, therefore, is related to the perspective people have towards time. More specifically, would perspectives regarding the past and the present, and goals in the future affect the degree of discounting? For example, would a person that enjoys the present and values the present more than future (e.g., “present hedonistic”) discount differently than a person that is more focused on the future (i.e., “future oriented”)? One study tried to assess this question but did not find a significant correlation (Vuchinich & Simpson, 1998, Experiment II). In this study, the authors correlated the $k$ derived from delay discounting and a self-report measure, the Zimbardo Time Perspective questionnaire (see below). The problem with this correlation is the same as explained for McDonald and colleagues (2003) data: the distribution of $k$ values is skewed and may not
be the best measure to correlate with other normalized scores, such as the questionnaire scores.

To evaluate the perspective on past, present, and future events, the participants of the present study answered the same questionnaire used by Vuchinich and Simpson (1998), the Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999; see below).

Zimbardo Time Perspective Inventory (ZTPI)

The ZTPI was developed in 1999 (Zimbardo & Boyd, 1999) to provide a valid metric of attitudes about time. The main advantage of ZTPI is that it is a multidimensional scale of perspective of time (Zimbardo & Boyd), containing 56 items divided in five different subscales, each of which captures a dimension of the perspective of time (see Boyd & Zimbardo, 2005): (a) past-negative subscale evaluates negative, aversive view of the past; (b) present-hedonistic subscale evaluates hedonistic, risk-taking behaviors; (c) future subscale evaluates general future orientation; (d) past-positive subscale evaluates sentimental attitudes towards the past; and (e) present-fatalistic subscale evaluates a fatalistic, helpless, and hopeless attitude of the present.

The correlation between the scores of ZTPI and the degree of delay discounting has been evaluated in a study by Vuchinich and Simpson (1998, Experiment II). In that study, students who were problem drinkers discounted $1,000 more steeply than students who were light drinkers. Their degree of discounting, however, did not correlate with the scores on the ZTPI. One explanation that the authors offer is that in the delay discounting procedure, participants made decisions only about one quantity of money, whereas in the
questionnaire participants have to make decisions concerning several domains of their lives. A second explanation could be related to the measure they used. As mentioned before, the use of $k$ as a main measure may diminish the power of the statistical analysis because it has a skewed distribution (Myerson et al., 2001). The present study used the AUC (Myerson et al.) to evaluate the correlation with the other measures, including the ZTPI score.

The scores of ZTPI dimensions have been correlated with scores on other questionnaires, showing that those who score high in the Present Scale reported (a) higher substance use (e.g., Carey, Henson, Carey, & Maisto, 2007; Keough, Zimbardo, & Boyd, 1999; Zimbardo, Keough, & Boyd, 1999), (b) more symptoms of pathological gambling (e.g., Hodgings & Engel, 2002; MacKillop, Mattson, MacKillop, Castelda, & Donovick, 2007), (c) less tendency to have healthy behaviors (e.g., Hamilton, Kives, Micevski, & Grace, 2003; Henson, Carey, Carey & Maisto, 2006; Rothspan & Read, 1996) and (d) lower tendency to protect the environment (e.g., prevent unnecessary use of the earth’s natural resources; Milfont & Gouveia, 2006).

The perception of time may differ from culture to culture and may affect schedule management and experience of events (e.g., Macduff, 2006). For example, in some cultures, it seems that punctuality for meetings is highly valued. As a consequence, people avoid being late. Examples of these cultures are Swiss and German. On the other hand, other countries do not value punctuality and actually punish it—if a person arrives on time for a party, s/he may find the place empty. Examples of these cultures are Brazilian and Indonesian (Brislim & Kim, 2003). The concept of time is a social phenomenon and may be affected by context (Boyd & Zimbardo, 2005) and by culture.
For example, social psychology studies have shown that when answering the question “what day is today?” or “what month is it?”, participants tend to choose temporal landmarks as anchors to help them answer the questions, and these landmarks vary according to the culture and important events of life, such as the Sabbath (or Saturday; Koriat & Fischhoff; 1974), vacations (Valax, Tremblay, & Sarocchi, 1996), the date of an exam or of an important soccer game (Jonas & Huguet, 2008). Culture, indeed, may also affect other decision-making processes, as discussed next.

Culture and Decision-Making Processes

Although culture is a difficult concept to define (e.g., Johnston & Herzig, 2006; Park, 2005), the present study used the American Psychology Association’s definition of culture as “the belief systems and value orientations that influence customs, norms, practices, and social institutions, including psychological processes (language, caretaking practices, media, educational systems) and organizations” (American Psychological Association, 2003, p. 380). Inherent in this definition is the idea that every individual has a cultural and ethnic heritage, and that these definitions are dynamic.

A study that evaluated how economy and cultural practices may affect the behavior of individuals from different countries was conducted by Henrich and colleagues (2005). In this study, participants from 15 small communities from different countries across the world were exposed to three games: the ultimatum game, the dictator game, and the public goods game. The games evaluate selfishness and cooperation by asking participants to offer and accept or reject amounts of money. The results of this study showed that economic variables such as amount of land available for cash crop
farming (as opposed to subsistence farming), demographic variables such as camp size, and cultural variables such as accepting gifts and sharing goods affected participants’ behavior. For example, participants from bigger camp sizes tended to offer a higher share of their money in the game (e.g., Hazda, Tanzania); participants from villages whose cultural practices imply that accepting gifts means having to reciprocate tended to reject the offers (Au and Gnau villages from Papua, New Guinea), and participants from communities that value sharing (such as whale hunters from Lamalera, Indonesia) tended to share their money in the game more often. The authors suggested that these results indicate that behaviors in the laboratory reflect community practices.

Other decision-making studies have shown that behavior may be affected by culture. As noted previously, researchers have shown that the degree of discounting in delay and probability tasks vary systematically across cultural groups (de Wit et al., 2007; Du et al., 2002; see also Gallimore, Weiss, & Finney, 1974; Tan & Johnson, 1996). The same appears to be the case for other general decision-making processes (e.g., Hsee & Weber, 1999; see Choi, Choi, & Norenzayan, 2004; Weber & Hsee, 2000 for a review). For example, Wright and Phillips (1980) showed that Southeast Asians were more confident in probability judgments than British participants and Hsee and Weber demonstrated that Chinese participants are more willing to take risks than Americans (see also Wallsten & Gu, 2003; Yates, Lee, Shinotsuka, Patalano, & Sieck, 1998).

Despite recent growth, research evaluation of the cross-cultural generality of decision-making processes is still limited (Choi et al., 2004). Some exceptions are studies in economics (e.g., Katzner, 2002; Marshall & Boush, 2001) and marketing (e.g., Briley, Morris, & Simonson, 2000; Chen, Ng, & Rao, 2005). Katzner argues that economic
models of behavior should have assumptions specific to each community. For example, American cultural patterns suggest that a person’s consumption is determined in large part by his/her income, and the U.S. macroeconomics can be explained based on that assumption. The decision process of buying goods is not the same in other populations, however. Japanese persons, compared to White Americans, have been described as more collectivistic. Degree of collectivistic behaviors might affect the relationship between income and consumption in a systematic and observable way across the two groups.

In the marketing field, Chen and colleagues (2005) examined how cultural values affect impulsivity when buying products. Their argument is that multinational firms that address diverse markets need to recognize the differences in impulsivity of their consumers and develop strategies to reach different consumers. Specifically, the authors exposed bilingual students from Singapore to two collages: one with symbols from the culture of Singapore (e.g., the Singaporean Airlines model and the Tiger beer icon), and the other with symbols from American culture (e.g., Marilyn Monroe and the Coca-Cola icon). Then, they asked participants to indicate if they would be willing to pay for an overnight delivery of a book rather than wait for the standard shipping period. The results showed that participants who were exposed to the American icons chose to pay for the overnight shipping more often than the participants exposed to the Singaporean symbols.

Although researchers have been investigating the effects of culture on decision-making, most of the studies have been restricted to comparisons of American and Asian populations (but Wittman et al., 2007). No known published study has evaluated discounting of outcomes and time perception processes among different Westerners cultures, and more specifically, between Latinos and White Americans. Within Western
cultures, Latinos are a well-studied population by multicultural researchers. Several authors suggest that White Americans and Latinos differ on a number of values, one of them being *presentismo* (valuing the present time) and another being *fatalismo* (fatalism; Bernal & Enchautegui-de-Jesus, 1994; Marin & Marin, 1991). There is little data about the *presentismo* value (Cauce & Domenech-Rodriguez, 2002; Steidel, Ikhlas, Lopez, Rahman, & Teichman, 2002). More researchers have evaluated the *fatalismo* value but there are some issues about these studies. First, the definition and the methodology used to study *fatalismo* is not well established in the literature (Abraido-Lanza, 2007). For example, the definitions encompass the idea of inevitability of events (e.g., Cuellar, Arnold, & Gonzalez, 1995; Davis, Thompson, Gutierrez, Boateng, & Jandorf, 2002; Dettenborn, DuHamel, & Butts, 2004; Diaz & Ayala, 1999; O’Maley, 2002), the belief in religious destiny and external locus of control (e.g., Buriel & Rivera, 1977; Byrd, Cohn, & Gonzalez, 1999; Gorin, 2005; O’Maley, 2002; Shapiro & Simonsen, 1994), and/or inevitability and external control (e.g., Guzman, Santiago-Rivera, & Hasse, 2005; Ramos, 2004; Ross, 1983). Second, measurements used to evaluate fatalism range from one single question, such as “I can’t change my destiny, so there’s no point in wearing seatbelts” (e.g., Byrd et al.) to a complete scale (e.g., Gorin, 2005; Magai, 2004). Third, when researchers study fatalism, most of them correlate fatalism with other risky behaviors, and do not necessarily compare the degree of fatalism between White Americans and Latinos. The present study contributes to the literature by measuring the degree of orientation towards the present time and fatalism using the ZTPI present hedonism and the ZTPI present fatalism subscales. The advantage of this measure is that it provides scores on other temporal orientations (e.g., orientation towards the future,
present, or past), and allows researchers and clinicians to evaluate a global profile of orientation towards events in time.

**Latinos and White Americans: Definitions**

The number of Latinos in the United States is rapidly growing. According to the U.S. Census Bureau, in 2005, the U.S. Latino population totaled 15% of the country’s population (U.S. Census Bureau, 2006, 2008). The terms “Latino,” “Hispanic,” “Caucasian,” or “White American” have political and geographical connotations in their use (Alcoff, 2007). The term *Hispanic* was introduced in the 1990 Census to refer to people with origins in Mexico, Central or South America, the Caribbean and Spain. The term *Latino* has been preferred by the community and it refers to the same group with the exception of the exclusively Spanish-European population, and includes immigrants from Latin America who do not necessarily speak Spanish, such as Brazilians and second- or third-generation Latinos (Cauce & Domenech-Rodriguez, 2002; Garcia & Marotta, 1997; Marin & Marin, 1991; see also Alcoff, 2007). The term *White* has been used by the U.S. Census Bureau to describe people with European ancestry, but the terminology to describe the white population in the U.S. has also varied throughout U.S. history and labels such as *Caucasian, European American,* and *Anglo* have also been used to describe the White population of the U.S. (McDermott & Samson, 2005).

The political aspects of the terms “Latino,” “Hispanic,” “American” or “White American” are, however, beyond the scope of the present study. It is necessary to recognize that Latinos are not a single ethnic group and that they vary in terms of cultural influences according to their country of origin (Burchard et al., 2005). It is also
necessary to recognize that there is no static definition of what constitutes a White American (McDermott & Samson, 2005), and people may also differ in terms of their cultural background according to their state of origin within the U.S. (see Citrin, Reingold, & Green, 1990; Devos & Banaji, 2005; Rothenberg, 2008 for studies and essays about the concept of “white” or “American”).

It is important, nevertheless, to identify similarities and differences of two main cultures. The definitions proposed here are meant only to describe two groups of people that differ by three criteria: (a) common cultural heritage, (b) language (Spanish or English), and (c) geographical origin. The term Latino is used to describe people who were born and who have spent most of their lives in countries that speak Spanish, with the exception of Spain, such as Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela as well as Puerto Rico. The Latino participants had been living in the U.S. for a minimum of 6 months to a maximum of 3 years, and had been living in their country of origin for the last year before arriving in the U.S. Besides being in the U.S., to be eligible to participate in the present study, the participants had not left their country of origin for more than 1 year continuously (with the exception of living in the U.S.). These criteria aimed to diminish the possible influence of other cultures on participants’ behavior, even if they were born in a Latino country.

The term White American is used to describe people born in the U.S. who describe themselves as White or Caucasian and who have spent most of their lives in the U.S. To be able to participate in the present study, the students also must have not spent
more than 1 year continuously away from the U.S., must have been living in the U.S. for the past year, and must have been at least 18 years old.

*Latinos*

The literature about multiculturalism suggests that Latinos share values that differ from White Americans. It is important to understand the different values of each population because they can affect therapeutic relations (Falicov, 1998), childrearing and gender socialization (Raffaeli & Ontai, 2004), research methodology (Marin, 2001), and marketing strategies (Burton, 2005; Spears, Lin, & Mowen, 2001). For example, Bernal and Saez-Santiago (2006) have argued that psychotherapy has to take culture into account. The framework that includes culture in psychotherapy interventions takes into account aspects such as language, content and methods. Treatment delivered in the native language (e.g., Spanish), therefore, reflects sensitivity to the culture and to the client. Some Latinos--even the ones who live in the U.S.--have difficulties when communicating personal matters in English. Content and methods should also reflect the client’s background, such as social support and their specific values and customs.

In the marketing field, Leonardi (2003) showed that the perceptions of working-class Latinos living in the U.S. about cell phones, computers and the Internet were probably influenced by Latino values. For example, cell phones were considered a necessary and positive technology for all the participants. They identified cell phones as a medium that helps them communicate and maintain interpersonal relationship with important people in their lives. However, computers and the Internet were technologies viewed as positive only because they allowed access to information and were perceived to diminish the inferiority gap between White Americans and Latinos. Computers and the
Internet were mainly considered negatives because they are technologies that diminish social contact, according to the participants from this study. These perceptions may have been permeated by the Latino values of collectivism and the importance that family and friends more than by the possession of technology (see also Ogden, Ogden & Schau, 2004 for more examples of the impact of culture on consumer purchase decisions).

In research, Latino values seem to play an important role in the recruitment and retention of the sample. For example, Latino participants give importance to the relationship with research assistants. For example, they tend to ask personal questions (e.g., “Are you married?”) and engage in small talk before the implementation of the research protocol. Latinos also often seem less concerned about time and tend to stay after the research protocol is done to talk with the research assistant (Skaff, Chesla, Mycue, & Fisher, 2002).

Latino perception of time is also reflected in terms of long-term goals. Studies have suggested that some cultures in the U.S. are more future-oriented, while Latino cultures are more present-oriented. That is, White Americans tend to plan for the future, while Latinos tend to be concerned for immediate, practical problems (Marin & Marin, 1991; Zea, Belgrave, Garcia, & Quezada, 1997). For example, Gonzalez, Gaxiola, and Yanofsky (1993) showed that Mexicans agreed more with present-oriented statements of the Stanford Time Perspective Inventory than White Americans, showing results consistent with the common stereotype. However, contrary to the stereotype, Mexican students characterized themselves as being concerned with arriving on time to appointments (see also Levine, West, & Reis, 1980; Marin, 2001; Rojas-Mendez, Davies, Omer, Chetthamrongchai, & Madran, 2002). The present study focused on time...
perception as one of the values that is suggested to differ between White Americans and Latinos. The different aspects of time perception and time perspective were measured, as mentioned above, through the temporal bisection procedure and the ZTPI questionnaire.

Cross-Cultural Study: Some Comments

The methodology used in cross-cultural studies has been a topic of discussion in several areas, and researchers have expressed concerns about the instrumentation and sampling design (Lenartowicz & Roth, 1999; Sekaran, 1983). For the present study, the concerns about instrumentation translation and validity were addressed by using instructions in English for the White American sample and in Spanish for the Latino sample. Moreover, the questionnaires were validated in both English and Spanish. Finally, the experiment was conducted by a bilingual researcher.

A second concern regarding cross-cultural research is the sampling method, that is, whether the sample used is representative of the country of origin. There is no doubt that research conducted in different countries (e.g., Mexico and U.S.) would have a sample that better represents the Latino or the White American population, but it is not always possible to establish stringent control on sample recruitment when conducting cross-cultural research (Sekaran, 1983). A more economical way of assessing differences in culture is to evaluate similarities and differences between two populations living in the same country, or to use proxies (Lenartowicz & Roth, 1999) as criteria to define the sample. The sample, in this case, is defined by place of birth, time spent in the place of birth, language spoken and country of residence, connecting cultural groups to geographical locations. Even though this approach has its limitations, we may
hypothesize that if the measures used capture differences between the two populations, one could suspect that these differences would be also found, to some degree, if the study were conducted between samples from two different countries (Sekaran, 1983). One alternative that helps to evaluate the influence of the Latino or the White American culture on the decision-making processes is to assess the level of acculturation, or the assimilation of cultural elements (Berry, 1980) of the Latino participants to the American culture. Acculturation is an aspect to take into account in cross-cultural studies because research has shown that the more assimilated the participants are to the main culture, the more the outcome may differ from people of their country of origin (see below, but see Rodriguez, 2006).

Cross-cultural studies have also been criticized from an ethical perspective regarding the comparison of two cultures. More specifically, it has been suggested that researchers may increase the stereotypes and beliefs about differences in the cultures (Heine & Norenzayan, 2006). This criticism is related to the two different bodies of research in psychology: one aims to identify culturally specific processes (the emic approach) and another aims to identify universal processes (the etic approach; Berry, 1989; Pike, 1967). The present study, however, adopted the conceptualization that both approaches are valuable and necessary in science. The etic approach, as Pike (1967) mentions, provides perspective on different events around the world so that similarities and differences between cultures can be recognized. It allows a researcher to understand the practices of different communities. On the other hand, the emic approach allows a researcher to understand behavior as a whole (see also Berry, 1989). The main argument here is that these two approaches should not be a dichotomous, but that they should be
complementary. The present study, therefore, assumed universality of decision-making processes, for example, but that the degree of manifestations of these processes may differ from culture to culture. (See also Noreyzayan & Heine, 2005; and Smith, Spillane, & Annus, 2006 for other discussions on this topic.)

Acculturation

Acculturation is a term borrowed from the anthropology (Rodriguez, 2006) and describes the assimilation of cultural elements of the dominant society, such as language and attitudes (Berry, 1980). The concept is important, as globalization is allowing more connection between cultures (Berry, 2005). Juniu (2000) showed that the behavior of South American immigrants changes after they have lived for a while in the U.S. For example, the participants tended to socialize more with friends and not so much with family as they did in their original country, and to allocate more time to work and less time to leisure activities.

Adaptations to a new country are necessary for a better lifestyle, and research has shown that participants who are less acculturated tend to have a higher risk of substance abuse (e.g., Niery, Kulic, Keith, & Hurdle, 2005; Vega, Alderete, Kolody, & Aguilar-Gaxiola, 1998), lower academic achievement (e.g., Lopez, Ehly, & Garcia-Vasquez, 2002; Valencia & Johnson, 2006), and less health care (e.g., Gonzales, Deardorff, Formoso, Barr, & Barrera, 2006; Moran et al., 2006; Solis, Marks, Garcia, & Shelton, 1990; see Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005; and Rodriguez, 2006, for a review). The present study used the Short Acculturation Scale for Hispanics (SASH; Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987) to measure acculturation,
and both the White American and the Latino participants were asked to answer it. The goal of using this measure was to evaluate whether the degree of acculturation is correlated with time perception and the degree of discounting in probability and/or delay discounting. This scale or its subscales have been widely used in studies of health (e.g., Totolero-Luna et al., 2006), drug abuse (e.g., Hunter, Wong, Beighley, & Morral, 2006), and parent-child interaction (e.g., Pasch et al., 2006), for example.

Summary

In summary, the present study aimed to evaluate the correlation between some behavioral manifestations of impulsivity, risk taking, time perception and time perspective, and to see whether, and how, culture affects these decision making processes.
CHAPTER III

STATEMENT OF THE PROBLEM

The present study aimed to evaluate (a) the extent to which different impulsivity measures (delay discounting and the BIS scale) would be related to each other and to a risk-taking measure (probability discounting); (b) the extent to which impulsivity, risk-taking, time perception, and time perspective (as measured by the temporal bisection task and ZTPI scale) are related to each other; and (c) the extent to which these processes differ in Latino and White American students.
CHAPTER IV

METHOD

The present study had two experiments. Experiment I was conducted at Utah State University with students from Introductory Psychology classes. Experiment II was conducted in St. Louis, Missouri, in the laboratory of Drs. Leonard Green and Joel Myerson, with students recruited from St. Louis area universities. The details of the experiments are described below.

Experiment I

The goals of the Experiment I were to assess different behavioral manifestations of impulsivity, such as motor, non-planning and attention impulsivity, as evaluated by the scores on the BIS-11 questionnaire, and the discounting of delayed outcomes, as measured by the delay discounting procedure, and (a) evaluate whether these behaviors are related amongst each other and whether they were related to risk taking, or discounting of certain outcome, as evaluated by the probability discounting task; and (b) evaluate whether there was a correlation between delay discounting, time perception and time perspective, as assessed by the temporal bisection procedure and the ZTPI questionnaire.

Participants

One hundred forty-three undergraduate students from introductory psychology classes participated in this study. The participants were contacted through class announcements in class about different available research projects. The study was
announced on the courses website for Psychology 1010 class (see Appendix A).

**Apparatus/Instruments**

The experiment was conducted in a computer laboratory that had 25 computers. The experimenter scheduled different days and times for the data collection sessions. Each participant had one computer to answer the questions. Stimuli were presented and responses were recorded on a computer using a program developed by the first author in Visual Basic.Net 2005 software (see below).

**Procedure**

Participants were provided a letter of information (see Appendix B). For delay discounting and probability discounting, participants were exposed to two conditions that differ in the amount of outcomes: the small condition ($10.00) and the large condition ($100.00). Participants were also exposed to the temporal bisection procedure. Following the behavioral tasks, participants completed the BIS-11 and the ZTPI scales. Block randomization was used to determine (a) whether the participant was exposed to the delay discounting, probability discounting, or to the bisection procedure as the first, second, or third task; (b) whether the participant was exposed to the small or large condition first in both the delay and probability discounting procedures; and (c) to determine the order of administration of the BIS and ZTPI scales. At the end, participants completed the demographic questionnaire (adapted from Domenech-Rodriguez, 2003; see Appendix K).
Delay Discounting

Participants were first exposed to a practice procedure (see Appendix C for instructions), which consisted of five trials similar to the testing trials (see below). After the practice trials, the participants could choose to practice more, to ask questions about the experiment or to start the experiment itself. No participant repeated the practice trials or asked questions about the procedure.

For each trial, the participants made choices between the immediate and delayed outcomes. The delays were 1 day, 2 days, 1 week, 2 weeks, 1 month, 2 months, and 6 years. For each delay, participants were exposed to 10 trials. The first trial was always $100 delayed versus $50 now in the large condition or $10 delayed versus $5 now in the small condition (see Du et al., 2002). For the subsequent choices, the immediate amount was adjusted based on the participant's response. If the participant had chosen the immediate outcome, the next immediate outcome decreased. If the participant had chosen the delayed outcome, the amount of the immediate outcome increased. The quantity added to or subtracted from the immediate outcome was adjusted across the trials. The first adjustment was half of the difference between the immediate and the delayed amount (($100 - $50)/2 = $25 in this example for the large condition). So, if the participant had chosen the immediate outcome on the first trial, the amounts on the next trial were $100 delayed versus $25 now. That is, the immediate amount was $50 (the last immediate amount) minus the adjustment ($25) for this trial. On the other hand, if the participant had chosen the delayed outcome, the amounts on the second trial were $100 delayed versus $75 now ($50 + $25). For the next trials, the size of the adjustment was half the size of the previous adjustment. In this case, the adjustment was $12.50 ($25/2).
Therefore, in the third trial, if the participant had chosen the immediate outcome on the first and second trials, the amounts on the third trial was $100 delayed versus $12.50 ($25 from the last trial minus the adjustment), whereas if he had chosen the delayed option, the amounts were $100 delayed versus $87.50 ($25 plus the adjustment) now. This procedure, including these delays and amounts, is consistent with those used in previous studies (e.g., Du et al., 2002; Odum & Rainaud, 2003; Odum et al., 2006; Petry, 2001a; see Appendix D for a graphical explanation of the procedure).

The indifference point was calculated as the last immediate amount for each delay (i.e., the titration point). The indifference points for each delay were plotted, and the hyperbola and the hyperboloid equations (Mazur, 1987; Myerson & Green, 1995) were fit to the data using nonlinear regression in GraphPad Prism®. In addition, the AUC (Myerson et al., 2001) was calculated. The AUC is normally distributed, allowing the use of parametric tests to compare the differences between the groups. To calculate the AUC, the delays and the indifference points are normalized. That is, all the delays are expressed as a proportion of the minimum delay (i.e., all delays are divided by 1 day), and the indifference points are expressed as the proportion of the delayed amount (i.e., the indifference point divided by the delayed amount; in this case, 100 in the large condition, or 10 in the small condition). Then, the AUC (Myerson et al.) is calculated by adding the results of the following equation for each delay and indifference point: \((x_2-x_1)/[(y_1+y_2)/2]\), where \(x_1\) and \(x_2\) are successive delays and \(y_1\) and \(y_2\) are the indifference values associated with these delays.
Probability Discounting

The probability discounting procedure is similar to the delay discounting procedure, differing in that the task involves probability instead of delays. During the probability discounting procedure, participants were also exposed to practice trials, as with the delay discounting procedure (see Appendix C for the instructions).

For the experiment, participants were asked to choose between a sure and a risky outcome. The probabilities were .95, .90, .70, .50, .30, .10, and .05. The probabilities were shown in the screen as a percentage chance of receiving the probabilistic outcome (e.g., 50% chance). Analogous to the delay discounting procedure, the first choice was always $100 with a probability of less than 1 versus $50 with certainty. If the participant chose the certain amount, for example, on the next trial, the certain amount decreased. If, on the other hand, the participant chose the probabilistic amount, the value of the certain amount increased. As in the delay discounting procedure, the size of the first adjustment was half of the certain amount, and the size of the next adjustment was half of the previous adjustment. The indifference point was calculated as the last immediate amount for each probability. The participants were exposed to 10 trials per probability. This procedure is similar to that used in other studies (e.g., Du et al., 2002; Estle et al., 2007; see Appendix E for a graphical explanation of the procedure).

Bisection Procedure

In this task, participants were required to categorize the duration of stimulus as either short or long. At the beginning of the task, participants were exposed to 10 training trials (Wearden & Ferrara, 1995; see Appendix F for instructions). At the beginning of
the training, the sentence “PRESS THE BUTTON IF YOU ARE READY” appeared on
the top of a button. This trial-initiation response was used for all the trials to orient
participants towards the screen and increase the probability that they would attend to the
sample. As soon as the participant clicked the button with the mouse, the message was
removed and a blue circle was presented in the middle of the screen. Participants were
exposed to four “short” trials (S) and four “long” trials (L) in the following order:
SLSLSLSL. On the “short” trials, the blue circle was presented for 2 s with the label
SHORT at the bottom of the screen. On the “long” trials, the blue circle was presented
for 4 s with the label LONG at the bottom of the screen. After the duration of the sample
elapsed (either 2 s or 4 s), the circle disappeared from the screen. Following these trials,
participants were required to categorize the samples as either short or long. In the next 10
trials, the samples were presented, but there was no label on the screen. Once the sample
disappeared, two white circles, one with the SHORT label and another with the LONG
label, appeared at the bottom of the screen. The side on which the SHORT and LONG
comparison appeared was balanced across trials. A question was displayed at the center
of the screen: “Was it a SHORT or a LONG sample?” A click with the mouse on the
SHORT was correct if the duration of the sample was for 2 s, and selecting the LONG
comparison was correct following the 4 s duration sample. Clicking on either comparison
cleared the screen and the feedback was presented. If the response was correct, the
following feedback appeared in the screen: “CORRECT!” If the response was incorrect,
the following sentence appeared in the screen: “INCORRECT” (see Appendix G for
graphic details). The trials were separated by a random inter-trial interval (ITI) chosen
from a distribution between 5 and 7 s in this training and in the testing phase. To go to
the next phase, a participant had to reach a performance criterion of at least 90% accuracy in responding short in the presence of the 2 s sample and in responding long in the presence of the 4 s sample. If the participant did not reach the criterion, s/he was exposed to a second training set. All participants reached the criteria.

After the training trials, the participants were exposed to the testing trials. In this phase, five blocks of stimuli with different durations (2.0 s, 2.2 s, 2.8 s, 3.1 s, 3.5 s, and 4.0 s) were presented in random order. Before each block, a short (2 s) and a long (4 s) sample were presented. That is, the blue circle was presented on the screen with the respective labels. The participant did not need to answer on these trials. After the sample duration elapsed, the following question, with the comparisons (SHORT and LONG circles), appeared on the screen: “Was that more similar to the SHORT or to the LONG duration?” After participants clicked on the comparisons, no feedback was offered. The number of trials of training and testing, ITI duration, type of feedback, and sample duration of the present procedure are in the range used in previous studies in the literature (Lieving et al., 2005, 2006; Wearden & Ferrara, 1995; Wearden et al., 1997).

To analyze the data, all the long responses were averaged across blocks of the same sample (e.g., all responses for the 2.0 s sample, for the 2.2 s sample). The normalized were used to obtain estimates of the mean and SD of the function. Data were normalized to avoid conducting analysis with different asymptotes across participants (and especially across groups, in Experiment II; see McClure et al., 2005; Odum & Ward, 2007).

First, the non-normalized data were fit to Blough’s (1996) psychophysical function to obtain the range of the function. Data were then normalized using Odum and
Ward’s method (2007) where the proportion of long responses at the 2s sample duration was subtracted from the obtained proportion long responses for each of the three shortest sample durations (2 s, 2.2 s and 2.8 s), with the constraint that the result could not be less than zero. For the three longest sample durations (3.1 s, 3.5 s, and 4.0 s), the difference between the proportion of long responses at the 4 s sample duration and 1.0 was added to the obtained proportion of long responses, with the constraint that the result could not be more than 1.0. First, the non-normalized data was fit to Blough’s psychophysical function to obtain the range of the function. Then, data was normalized and fit again to the function to obtain the mean and SD of the function. The range is obtained without being normalized to obtain the degree of stimulus control before the correction. The mean reflects the point of subjective equality and the slope is a measure of sensitivity to the differences of time.

Questionnaires

After participants completed the behavioral tasks, they answered computerized versions of three questionnaires: the BIS-11 (Patton et al., 1995), the ZTPI (Zimbardo & Boyd, 1999), and the SASH (Marin et al., 1987) scales. That is, all the questions were shown on the screen, and the participant selected the answer with the mouse (see Appendices H, I, and J). Finally, participants answered a demographic questionnaire (see Appendix K).

Experiment II

The goal of Experiment II was to evaluate whether Latinos and White Americans
students differ in decision-making processes as evaluated in Experiment I. All the procedures were conducted as in Experiment I, with the exception of the sample and the location of the study. Participants in this study also answered the SASH scale.

Latinos were defined as people born in countries that speak Spanish (with the exception of Spain), such as Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay and Venezuela. Students were eligible to participate in the study if they had lived most of their lives in their country of origin, if they had not spent more than 1 year continuously away from their country, and if they were living in their country of origin for the year immediately prior to coming to the U.S. The Latino participants would also have to be living in the U.S. for a minimum of 6 months and a maximum of 3 years, and be at least 18 years old.

White Americans were defined as people born in the U.S. who (a) described themselves as either White or Caucasian, (b) have lived most of their lives in the U.S., (c) have not spent more than 1 year continuously away from the U.S., and (c) have been living in the U.S. for the past year, and are at least 18 years old.

Participants

Thirty-four undergraduate and graduate students (18 Latinos and 16 White Americans) from different universities located in St. Louis, Missouri, were invited to participate in this study. Participants were contacted through flyers posted throughout the universities, Latino liaisons in the community, and the International Student Offices staff (see Appendix A for examples of the flyers). Latino participants were contacted and their
data were collected first, and the White American sample was contacted later in the same semester, matching age and gender as much as possible. The schools where the sample was contacted were Washington University and St. Louis University. Latino participants were screened for eligibility (see Appendix L for phone screen). If participants met the criteria, they were invited to participate in the study. The study was conducted at Drs. Leonard Green and Joel Myerson’s laboratory at Washington University in St Louis, Missouri.

All participants were exposed to the delay and probability discounting procedures and the temporal bisection procedures, as in Experiment I. The participants also answered the BIS-11, the ZTPI and the SASH scales, and the demographic questionnaire. See Appendices B for the Informed Consent, C and F for the instructions of the procedures, H and H.2 for the BIS-11, I for the ZTPI, J for the SASH, and Appendix K for the demographic questionnaires. All the participants received $20 for their participation.
The first goal of the present study was to assess different aspects of impulsivity, and to evaluate whether impulsivity and risk taking, as measured by the delay discounting task, the scores on the BIS-11 (Patton et al., 1995) and by the probability discounting task are related. The second goal of the study was to evaluate whether there was a correlation between delay discounting and time perception and time perspective, assessed through the temporal bisection procedure and the ZTPI questionnaire. The third goal of the study was to evaluate whether these decision making processes differ between Latinos and White Americans students. Experiment I, collected at Utah State University (USU), aimed to evaluate the first two goals of the study. This experiment was approved by the USU Institutional Review Board. Experiment II, collected at Washington University, aimed to evaluate the third goal of the study, and will be described later. The experiment was approved by the Washington University in St. Louis’s Institutional Review Board.

Experiment I--Utah State University

Demographics

One hundred forty-three participants were recruited for Experiment I at Utah State University. Forty one percent of them were males, with an average age of 19 years and 13 years of education. Most of the participants were single, and did not smoke or
drink. The participants had an average income of $590 per month and most of them received financial help from their parents (see Table 1). All participants in Experiment I were Caucasians.

Impulsivity and Risk-Taking Measures

Participants were exposed to the delay discounting tasks for $10 and $100 amounts, and answered the BIS-11 to evaluate their degree of impulsivity. Participants were also exposed to the probability discounting tasks for $10 and $100 amounts to evaluate risk taking. The results of the BIS-11 will be described first, and the results of the delay and probability discounting tasks will be described first later. Following the results, the correlation between these tasks will be reported.

Table 1

Demographic and Participants Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N = 143</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (% male)</td>
<td>41.3</td>
</tr>
<tr>
<td>Age (years)</td>
<td>19.88 (2.4)</td>
</tr>
<tr>
<td>Marital status (% single)</td>
<td>88.11</td>
</tr>
<tr>
<td>Education (years)</td>
<td>13.89 (0.09)</td>
</tr>
<tr>
<td>Income ($ monthly)</td>
<td>590 (74.64)</td>
</tr>
<tr>
<td>Number of siblings (mean)</td>
<td>3.77 (0.16)</td>
</tr>
<tr>
<td>Number of roommates (mean)</td>
<td>4.13 (2.3)</td>
</tr>
<tr>
<td>Parent income (mean)</td>
<td>31,036 (6,711)</td>
</tr>
<tr>
<td>Cigarette consumption (% participants that smoke)</td>
<td>3.5</td>
</tr>
<tr>
<td>Alcohol consumption (% participants that do drink)</td>
<td>9.8</td>
</tr>
<tr>
<td>Receives financial help from parents (%)</td>
<td>67.1</td>
</tr>
</tbody>
</table>

*Note.* Numbers in parenthesis indicate standard deviation.
Barratt Impulsiveness Scale

In order to establish the suitability of the scales for further analyses, alpha reliabilities were calculated for the full scale and each subscale. Table 2 shows the Cronbach’s alpha, range, mean, and SD for each. Cronbach’s alpha was acceptable only for the motor subscale. A careful review of scale properties revealed that minor changes results in adequate alphas. For the nonplanning subscale, removing item 3 (‘I am happy-go-lucky”) resulted in a new scale alpha of .72 (minimum = 1, maximum = 3, mean = 2.01, $SD = .42$). A review of scale properties for the attention subscale showed that major changes would be needed to make the scale useful. Thus this scale is dropped from further analysis.

Table 2

Minimum, Maximum, Mean, and Standard Deviation Scores for Each of the Barrett Impulsiveness Scale per Sample

<table>
<thead>
<tr>
<th>Subscale</th>
<th>alpha</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total scores for BIS (30 items; 30-120)</td>
<td>.80</td>
<td>1.50</td>
<td>2.97</td>
<td>2.20</td>
<td>.30</td>
</tr>
<tr>
<td>Motor (10 items; 10-40)</td>
<td>.75</td>
<td>1.20</td>
<td>3.30</td>
<td>2.24</td>
<td>.42</td>
</tr>
<tr>
<td>Nonplanning (12 items; 12-48)</td>
<td>.68</td>
<td>1.08</td>
<td>3.00</td>
<td>2.06</td>
<td>.42</td>
</tr>
<tr>
<td>Attention (8 items; 8-36)</td>
<td>.58</td>
<td>1.50</td>
<td>3.25</td>
<td>2.37</td>
<td>.38</td>
</tr>
</tbody>
</table>

Note. Number of items and the range of scores for each subscale are shown in parentheses.
Delay and Probability Discounting

First, to evaluate the model that would best fit the data, the hyperboloid and hyperbolic models were fitted to the delay (Equations 1 and 2) and to the probability discounting (Equations 3 and 4) data. The Akaike Information Criterion (AIC) was used to evaluate how well the data supported the models. The advantage of the AIC is that it takes into account goodness of fit and the number of parameters in each model and indicates which of the two models is more likely to be correct for the data set. To establish the best model for this data set, the null hypothesis was established as the hyperbolic model and the alternative model was established as the hyperboloid model.

The AICs revealed that the hyperboloid model would likely be more correct for these data. That is, the analysis showed that the difference between the AICs for the hyperbolic and hyperboloid model was 1.46 for the delay discounting task for $10, and 12.95 for the delay discounting task for $100. For the probability data, the differences between the two models was 1.25 for the probability discounting task for $100, but it was -1.75 for the probability discounting tasks for $10. Although these results indicated that the hyperbolic model may provide a better fit for the probability data for $10 than the hyperboloid model, the difference between the models is small.

To further evaluate which model would provide a better fit for the data, an extra-sum-of-squares $F$ test, a test that indicates the degree of improvement in explaining the data that one model has in comparison to the other was also conducted with the probability data. The results of the test showed the hyperboloid model was not necessarily the preferred one for the probability discounting for $10, $F_{1,5} = 5.57, p = 0.06$. The results of these analyses, however, indicate that the hyperboloid model can provide a
good fit for most of these data sets and therefore the data from this and from Experiment II will be fit to that model. Table 3 shows the parameters and goodness of fit for both models for all tasks and amounts.

Figure 4 shows the median indifference points for delay (left) and probability (right) discounting for $10 and $100 as a function of delay (delay discounting) or odds against the receipt (probability discounting).

Figure 5 shows the AUCs for delay and probability discounting tasks for the $10 and $100 amounts. A 2 (tasks) x 2 (amounts) model analysis of variance (ANOVA) was calculated. The ANOVA yielded significant effect for task, $F(1,142) = 179.4, p < .001$, and for amount, $F(1,142) = 21.36, p < 0.001$, as well as an effect of the interaction between task and amount, $F(1,142) = 126.45, p < 0.001$. In summary, the small amount ($10) was discounted more steeply in the delay discounting task, and less steeply in the probability discounting task.

**Correlations**

Table 4 shows the correlation matrix for the impulsivity and risk-taking measures. Pearson correlation tests between the impulsivity and risk-taking measures showed that the AUCs for delay discounting task were positively correlated among themselves, $r = .703, p < .001$, and the SUCs for probability discounting task were also positively correlated among themselves, $r = .583, p < .001$. The AUCs for delay discounting task were postively correlated with the AUCs for probability discounting task. All these correlations were significant.
Table 3

Median $k$, $h$, and $s$ Parameters as Well as $R^2$ for the Hyperbolic and Hyperboloid Decay Models Fit to the Median Indifference Points for $10$ and $100$

<table>
<thead>
<tr>
<th>Equation</th>
<th>Outcome</th>
<th>Outcome</th>
<th>$k/h$</th>
<th>$s$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperbola</td>
<td>Delay discounting</td>
<td>$10$</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = A/(1 + kD)$</td>
<td></td>
<td>$100$</td>
<td>0.003</td>
<td></td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Probability</td>
<td>$10$</td>
<td>1.05</td>
<td></td>
<td>0.96</td>
</tr>
<tr>
<td>Hyperboloid</td>
<td>Delay discounting</td>
<td>$10$</td>
<td>0.06</td>
<td>0.44</td>
<td>0.99</td>
</tr>
<tr>
<td>$V = A/(1 + kD)^s$</td>
<td></td>
<td>$100$</td>
<td>0.01</td>
<td>0.38</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>Probability</td>
<td>$10$</td>
<td>2.80</td>
<td>0.55</td>
<td>0.98</td>
</tr>
<tr>
<td>Hyperboloid</td>
<td></td>
<td>$100$</td>
<td>3.24</td>
<td>0.63</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Figure 4. Delay discounting functions (left) and probability discounting functions (right) for the two amounts, $10$ and $100$. Points show median indifference points for money as a function of delay or odds against its receipt. Curves represent the best-fit discount functions as generated by Equations 1 and 3.
### Table 4

**Correlation of Impulsivity and Risk-Taking Measures**

<table>
<thead>
<tr>
<th>Tasks</th>
<th>1 for $10</th>
<th>1 for $100</th>
<th>2 for $10</th>
<th>2 for $100</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 for $10</td>
<td>$r = 1$</td>
<td>$p$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 for $100</td>
<td>$r = .703^a$</td>
<td>$p = .00$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 for $10</td>
<td>$r = .164^a$</td>
<td>$p = .05$</td>
<td>$r = .200^a$</td>
<td>$p = .02$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 for $100</td>
<td>$r = .326^a$</td>
<td>$p = .00$</td>
<td>$r = .265^a$</td>
<td>$p = .00$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$r = -.149$</td>
<td>$p = .08$</td>
<td>$r = .109$</td>
<td>$p = .19$</td>
<td>$r = .077$</td>
<td>$p = .36$</td>
</tr>
<tr>
<td>4</td>
<td>$r = -.203^a$</td>
<td>$p = .01$</td>
<td>$r = -.240^a$</td>
<td>$p = .00$</td>
<td>$r = .120$</td>
<td>$p = .15$</td>
</tr>
</tbody>
</table>

*Note.* 1 = AUC for delay discounting task, 2 = AUC for probability discounting task, 3 = motor, 4 = nonplanning, 5 = attention, $^a$ = correlations statistically significant.

![Figure 5](image). Mean area under the curve (AUC) for delay and probability discounting in two amounts, $10 and $100 for participants from Utah State University ($N = 143$). Vertical lines show one standard error above and below the means. The mean of the condition marked with the letter ‘a’, ‘b’, ‘c’ and ‘d’ are significantly different from each other.
The correlations between the AUCs for delay discounting and all the BIS subscales suggested that participants that were impulsive (i.e., chose the small immediate amount more often than the large delayed amount) in the delay discounting task also scored high on the BIS subscales. The negative correlation between the AUC for delay discounting and the scores on BIS subscales, however, was significant only for the nonplanning subscale, $r = -.203, p = .01$, and $r = -.240, p < .001$, for the AUCs for $10$ and $100$, respectively. Regarding the relationship between the AUCs for probability discounting and the scores on the BIS subscales, there was a positive trend in all of them, indicating that participants that discount certain outcomes in the probability discounting task do not necessarily score high on the BIS subscales, but none of these correlations were significant.

Time Measures

*Temporal Bisection Procedure*

Because the range is a measure of stimulus control, it is fit to Blough’s (1996) equation before being normalized. The range for this sample was 0.86, indicating that participants did show strong stimulus control. Table 5 shows the means and standard deviation for the non-normalized data and for the data with Odum and Ward (2007) normalization. The non-normalized data have a slightly higher mean and SD than the normalized data.

Figure 6 shows the proportion of long responses as a function of stimulus duration. The data in Figure 6 is not normalized, to show the obtained psychophysical
Table 5


<table>
<thead>
<tr>
<th>Data</th>
<th>mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-normalized</td>
<td>2.98</td>
<td>1.24</td>
</tr>
<tr>
<td>Odum and Ward normalization</td>
<td>2.91</td>
<td>1.13</td>
</tr>
</tbody>
</table>

Figure 6. Mean proportion of responses to the long sample as a function of sample duration.

function. The correlation (see below) analyses were conducted with the normalized data, which were fit to Blough’s equation to obtain the mean, standard deviation, and the range of the function. The equation did not converge for data from 19 participants from this sample. The data of these participants tended to be scattered; that is, the proportion of long responses did not tend to increase as a function of the sample duration.
Participants scored higher on the past positive subscale, followed by the future subscale, the present hedonistic subscale, the past negative subscale, and scored lower on the present fatalistic subscale. Table 6 shows the scores for each subscale. The ZTPI does not have an overall scale. Scores on this scale ranged from 2.94 to 3.74. Cronbach’s alphas were good for all subscales with the exception of the present fatalistic subscale. For this reason, an item analysis was conducted with this subscale. The analysis showed that item 47 had a low corrected item-total correlation with the scale. Removing the item from the scale resulted in an adequate alpha (.70; min. 1.13, max. - 3.88, \( M = 2.17 \), \( SD = .55 \)). For this reason, further analyses were conducted with the present fatalistic without item 47 (“Life today is too complicated; I would prefer the simpler life of the past”).

Table 6

Minimum, Maximum, Mean, and Standard Deviation Scores for Each of the Zimbardo Time Perspective Inventory

<table>
<thead>
<tr>
<th>Subscales</th>
<th>alpha</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past negative (10 items; 10-50)</td>
<td>.82</td>
<td>1.20</td>
<td>4.50</td>
<td>2.94</td>
<td>.67</td>
</tr>
<tr>
<td>Present hedonistic (15 items; 15-75)</td>
<td>.80</td>
<td>2.33</td>
<td>4.53</td>
<td>3.40</td>
<td>.48</td>
</tr>
<tr>
<td>Future (13 items; 13-65)</td>
<td>.73</td>
<td>2.08</td>
<td>4.46</td>
<td>3.47</td>
<td>.48</td>
</tr>
<tr>
<td>Present fatalistic ( 9 items; 9-45)</td>
<td>.68</td>
<td>1.22</td>
<td>3.56</td>
<td>2.23</td>
<td>.52</td>
</tr>
<tr>
<td>Past positive (9 items; 9-45)</td>
<td>.73</td>
<td>1.78</td>
<td>4.89</td>
<td>3.74</td>
<td>.53</td>
</tr>
</tbody>
</table>

*Note. Number of items and the range of scores for each subscale are shown in parentheses.*
**Correlations**

The correlations of the outcomes of the temporal bisection procedures were conducted with the normalized men and standard deviation using the Odum and Ward (2007) method, and with the non-normalized range. Overall, the outcomes of the temporal bisection procedure correlated amongst each other, and the ZTPI subscales correlated amongst each other. Correlation between the time measures showed that the past negative subscale was negatively related with the mean and the standard deviation of the temporal bisection procedure, but none of the correlations were statistically significant. The present hedonistic, future, and fatalistic subscales had mixed correlations with the temporal bisection procedure, none of them significantly correlated. The past positive subscale, however, was negatively related with the mean of the temporal bisection procedure, with a moderately significant relation, \( r = -.206, p = .02 \). Table 7 shows the correlation matrix for the time measures.

**Impulsivity, Risk Taking, and Time**

The correlation matrix between impulsivity, risk taking and time measures are shown in Table 8. The results show that the AUCs for delay discounting and probability discounting tasks were positively correlated with the mean from the temporal bisection, with the only significant relation between the mean and the AUC for $10 on the delay discounting task. There was a trend, not significant, for a negative correlation between the AUCs for delay and probability discounting tasks and the standard deviation of the temporal bisection procedure, and for the a positive correlation between the AUCs and the range from the temporal bisection procedure. The significant relation between the
Table 7

Correlations of the Time Measures with Normalized Data from the Temporal Bisection Procedure and the Scores of the ZTPI Subscales

<table>
<thead>
<tr>
<th>Tasks</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>.135</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-.289&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-.883&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>-.109</td>
<td>.011</td>
<td>.020</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>-.130</td>
<td>.062</td>
<td>-.136</td>
<td>-.071</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>.145</td>
<td>-.081</td>
<td>.05</td>
<td>.039</td>
<td>-.376&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>-.076</td>
<td>-.020</td>
<td>.164</td>
<td>.146</td>
<td>.304&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-.394&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>.006</td>
<td>-.206&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-.154</td>
<td>-.365&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.026</td>
<td>.197&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-.267&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Note. 6 = normalized mean from the temporal bisection task, 7 = normalized standard deviation from the temporal bisection task; 8 = non-normalized range from the temporal bisection task, 9 = past negative, 10 = present hedonistic, 11 = future, 12 = fatalistic, 13 = past positive, <sup>a</sup> = correlations statistically significant.

mean and the AUC for delay discounting and the nonsignificant relation between the AUC for probability discounting and the outcomes for the temporal bisection procedure indicated that the perception of time and impulsivity, but not necessarily risk taking, are related:
Table 8

Correlations Between the Impulsivity and Time Measures for Experiment I

<table>
<thead>
<tr>
<th>Tasks</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 for $10</td>
<td>$r = \begin{array}{l} .187^a \ \cdot .161 \ \cdot .072 \ \cdot .198^a \ \cdot .192^a \ \cdot .051 \ \cdot .123 \ \cdot .137 \ \end{array} \ $p \begin{array}{l} .04 \ .07 \ .43 \ .01 \ .02 \ .54 \ .14 \ .10 \ \end{array}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 for $100</td>
<td>$r = \begin{array}{l} .269 \ \cdot .103 \ \cdot .002 \ \cdot .111 \ \cdot .165^a \ \cdot .091 \ \cdot .219^a \ \cdot .179^a \ \end{array} \ $p \begin{array}{l} .00 \ .26 \ .98 \ .187 \ .04 \ .28 \ .00 \ .03 \ \end{array}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 for $10</td>
<td>$r = \begin{array}{l} .082 \ \cdot .010 \ \cdot .031 \ \cdot .003 \ \cdot .135 \ \cdot .091 \ \cdot .212^a \ \cdot .008 \ \end{array} \ $p \begin{array}{l} .37 \ .91 \ .73 \ .97 \ .10 \ .28 \ .01 \ .92 \ \end{array}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 for $100</td>
<td>$r = \begin{array}{l} .030 \ \cdot .091 \ \cdot .117 \ \cdot .086 \ \cdot .198^a \ \cdot .191^a \ \cdot .162^a \ \cdot .114 \ \end{array} \ $p \begin{array}{l} .74 \ .32 \ .20 \ .30 \ .01 \ .02 \ .05 \ .175 \ \end{array}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$r = \begin{array}{l} -.148 \ \cdot .145 \ \cdot .121 \ \cdot .110 \ \cdot .535^a \ \cdot .284^a \ \cdot .180^a \ \cdot .094 \ \end{array} \ $p \begin{array}{l} .10 \ .11 \ .18 \ .19 \ .00 \ .00 \ .03 \ .27 \ \end{array}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$r = \begin{array}{l} -.033 \ \cdot .141 \ \cdot .004 \ \cdot .246^a \ \cdot .242^a \ \cdot .556^a \ \cdot .427^a \ \cdot .209^a \ \end{array} \ $p \begin{array}{l} .71 \ .12 \ .95 \ .00 \ .00 \ .00 \ .00 \ .01 \ \end{array}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. 1 = AUC for delay discounting task, 2 = AUC for probability discounting task, 3 = motor, 4 = nonplanning, 5 = normalized mean from the temporal bisection task, 6 = normalized standard deviation from the temporal bisection task, 7 = non-normalized range from the temporal bisection task, 8 = past negative, 9 = present hedonistic, 10 = future, 11 = fatalistic, 12 = past positive, $^a$ = correlations statistically significant.

Impulsive participants (or participants who showed steep discounting of delayed outcomes) tended to have lower means in the temporal bisection procedure (i.e., they tended to overestimate the passage of time) than nonimpulsive participants.

There was a negative relation between the AUCs of delay discounting and the scores on the past negative, present hedonistic, and fatalism subscales, and a positive relation between the AUCs and the future and past positive subscales. The relation was
significant between the AUC for $10 and the scores on the past negative and present hedonistic subscales, between the AUC for $100 and the scores on the present hedonistic subscale, between both AUCs and the fatalistic subscale, and between the AUC for $100 and the past positive subscale. These results indicated that participants who chose more often the small immediate amount in the delay discounting tasks scored high on the past negative and present hedonistic subscales, and that this relation was significant. The results also indicated that participants that chose more often the small immediate outcome in the delay discounting task also scored low in past positive subscales, suggesting that impulsivity is negatively correlated with positive perspectives towards the past.

Interestingly enough, the AUCs for probability discounting and the scores on the ZTPI subscales were also correlated (see Table 8). There was a negative trend between the AUCs for probability discounting and the scored on the past negative subscale, although none of the correlations was significant. Regarding the relation between the AUCs and the scores on the present hedonistic and fatalism subscales, the correlations were positive and significant for the AUC for $100, and the scores on the present hedonism subscale, and significant for the AUCs for the two amounts and the scores on the fatalism subscale. Finally, there was a negative correlation between the AUCs for probability discounting and the scores on the future subscale, being the correlation between the AUC for $100 and the score on the subscale significant. These data suggest that the there is a relation between time perspective and risk taking. Note that smaller AUCs on the probability discounting task indicate steep discounting of the uncertain outcome, hence the smaller the AUC, the less risk taking the participant. The data
therefore indicate that participants that were risk takers (or people that discounted certain outcomes in the probability discounting task) were also hedonistic and fatalistic, and had less negative views regarding the past (i.e., scored lower on the past negative subscale), and tended not to establish goals for the future.

The correlations between the two personality questionnaires show an interesting pattern of scores: the scores on the past negative, on the present hedonistic, and on the fatalistic subscales were positively correlated with all the BIS subscales. All the correlations between the present hedonistic and fatalism, and one relation between past negative subscale and the BIS subscales were significantly correlated. These results suggested that negative perspectives of the past, hedonism, and fatalism are positively correlated with impulsivity, as measured by the scores on the BIS subscales. The scores of the future subscale and past positive subscales, on the other hand, were negatively correlated with the scores on all the BIS subscales. All correlations with the future subscales were significant, whereas only the correlation between past positive and nonplanning were significant. These data indicated that perspective towards the future is negatively correlated with impulsivity, and that positive perceptions towards past are negatively related to motor impulsivity.

In summary, the results of Experiment I show that (a) there was a negative correlation between the AUCs of delay discounting of delayed outcomes and the scores on the BIS subscales, especially the nonplanning subscale, suggesting that participants that discounted delayed outcomes also scored high on the BIS scale; (b) there was a positive correlation between the AUCs of delay and probability tasks, indicating that impulsive people in the delay discounting task were not necessarily risk takers in the
probability discounting task; (c) there was no significant correlation between the outcomes from the temporal bisection procedure and the scores of most of the ZTPI subscales, with the exception of the past negative subscale, suggesting that “telling time” may not necessarily be related with attitudes towards time; (d) there was a positive correlation between the mean of the temporal bisection procedure and the AUCs for the delay discounting, indicating that perception of time and impulsivity may be related to each other; (e) there were a number of significant correlations between the AUCs of the delay discounting task and the scores on the ZTPI subscales, suggesting that impulsivity and time perspective are related processes; and (f) there were also correlations between the AUCs of probability discounting and the scores on the ZTPI subscales, indicating that risk taking and perspectives towards time may be related to each other.

Experiment II--Washington University

This experiment aimed to evaluate whether Latinos and White Americans would differ on the degree of impulsivity and on the perception of time and time perspective. No correlations were conducted with these data due to the small sample sizes.

Demographics

Table 9 shows the demographic and other characteristics of the participants of each sample. Latino participants were from Puerto Rico (n = 8), Perú (n = 2), Bolivia (n = 2), México (n = 2), Colombia (n = 1), Argentina (n = 1), Venezuela (n = 1), and Uruguay (n = 1). Analyses were conducted to examine differences in delay discounting, probability discounting, time perception, and time perspective between Latinos and
Table 9

Demographic and Participants’ Characteristics for Each Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Latinos</th>
<th>White Americans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( N = 18 )</td>
<td>( N = 16 )</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>44.4%</td>
<td>37.5%</td>
</tr>
<tr>
<td>Age (years)</td>
<td>21.38 (2.8)</td>
<td>21.35 (3.4)</td>
</tr>
<tr>
<td>Marital status (% single)</td>
<td>77.8%</td>
<td>93.8%</td>
</tr>
<tr>
<td>Education (years)</td>
<td>12.9 (6.2)</td>
<td>15.8 (2.9)</td>
</tr>
<tr>
<td>Income ($ monthly)</td>
<td>535 (665)</td>
<td>493 (722)</td>
</tr>
<tr>
<td>Number of siblings (mean)</td>
<td>1.9 (0.9)</td>
<td>1.8 (1.1)</td>
</tr>
<tr>
<td>Number of roommates (mean)</td>
<td>3.4 (3.1)</td>
<td>2.0 (0.9)</td>
</tr>
<tr>
<td>Parent income (mean)</td>
<td>20,677 (32,91)</td>
<td>45,538 (107,32)</td>
</tr>
<tr>
<td>Cigarette consumption (% participants that smoke)</td>
<td>5.6%</td>
<td>0%</td>
</tr>
<tr>
<td>Alcohol consumption (% participants that drink)</td>
<td>66.7%</td>
<td>56.2%</td>
</tr>
<tr>
<td>Receives financial help from parents (%)</td>
<td>77.8%(^a)</td>
<td>75.0%</td>
</tr>
</tbody>
</table>

Note. Numbers in parentheses indicates standard deviation. \(^a\) = one participant from each group did not answer this question.

White Americans. Only one significant difference was found in alcohol intake, \( t = -2.25, p = .031 \), with Latinos showing higher alcohol intake than White Americans.

Impulsivity Measures

Barratt Impulsiveness Scale

As for the BIS scores, the two samples had similar overall scores: all participants tended to score higher on the attention subscale, followed by the motor subscale and had lower scores on the nonplanning subscale. The Cronbach’s alphas for the total scale were good. The alphas for the subscales, however, were not acceptable for the nonplanning and attention subscales for the Latino sample, nor the alphas for the motor and attention subscale for the White American sample (see Table 10). The item analysis revealed that if item 23 (I walk and move fast”) is discarded from the motor subscale, the alphas
increase to .82 and .78 for the Latinos and White Americans, respectively. Regarding the nonplanning subscale, if item 28 (“I am more interested in the present than the future”) is not included in the analysis, the reliabilities for the subscale increase to .70 and .73 for Latinos and White Americans, respectively. Finally, if item 24 (“I solve problems trial-by-trial”) is not included in the attention subscale, the alphas are .78 for Latinos, and .70 for White Americans. Independent t tests revealed that Latinos and White Americans did not significantly differ on their scores on the motor, \( t = .940, p = .35 \), nonplanning, \( t = -.248, p = .80 \), and attention, \( t = 1.68, p = .103 \) subscales with all the items, nor on the subscales with higher alphas.

**Delay and Probability Discounting**

The median parameters for the hyperbolic and hyperboloid equation are shown in Table 11. Figure 7 below shows the median indifference points for delay (left) and
Table 11

Median, k, h, and s Parameters as well as $R^2$ for the Hyperbolic and Hyperboloid Decay Models Fit to the Median Indifference Points for $10 and $100 for the Latino and White American Sample

<table>
<thead>
<tr>
<th>Sample</th>
<th>Equation</th>
<th>Task</th>
<th>Outcome</th>
<th>$k/h$</th>
<th>s</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latinos</td>
<td>Hyperbola</td>
<td>Delay</td>
<td>$10$</td>
<td>0.07</td>
<td>0.94</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>$V = A/(1 + kD)$</td>
<td>$100$</td>
<td>0.016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probability</td>
<td>$10$</td>
<td>1.669</td>
<td>0.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V = A/(1 + hO)$</td>
<td>$100$</td>
<td>1.591</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperboloid</td>
<td>$V = A/(1 + kD)^x$</td>
<td>Delay</td>
<td>$10$</td>
<td>0.254</td>
<td>0.37</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>$V = A/(1 + hO)^x$</td>
<td>$100$</td>
<td>0.043</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>Hyperbola</td>
<td>Delay</td>
<td>$10$</td>
<td>0.046</td>
<td>0.82</td>
<td>0.99</td>
</tr>
<tr>
<td>Americans</td>
<td>$V = A/(1 + kD)$</td>
<td>$100$</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probability</td>
<td>$10$</td>
<td>0.987</td>
<td>0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V = A/(1 + hO)$</td>
<td>$100$</td>
<td>0.791</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperboloid</td>
<td>$V = A/(1 + kD)^x$</td>
<td>Delay</td>
<td>$10$</td>
<td>0.029</td>
<td>0.98</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>$V = A/(1 + hO)^x$</td>
<td>$100$</td>
<td>0.003</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probability</td>
<td>$10$</td>
<td>1.368</td>
<td>0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V = A/(1 + hO)^x$</td>
<td>$100$</td>
<td>0.352</td>
<td>1.85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

probability (right) discounting for $10 and $100 as a function of delay (delay discounting) or odds against the receipt (probability discounting) for Latinos (upper panel) and White American students (lower panel).

Figure 8 shows the AUCs for $10 and $100 for the delay and probability discounting tasks for each sample. A 2 (task) x 2 (amount) ANOVA test yielded a
significant effect for task, $F(1, 32) = 16.23, p < .001; \eta^2 = .34$, but not for amount, $F(1, 32) = 0.462, p = .50; \eta^2 = .01$, but there was an interaction between task and amount, $F(1, 32) = 4.52, p = .04; \eta^2 = .12$. Follow up independent $t$ tests revealed that the AUCs for delay discounting for $10$ and $100$ was smaller for Latinos, $t = -2.39, p = .023$ and $t = -2.43, p = .021$, respectively, compared to White Americans suggesting greater impulsivity among Latinos. The analysis also showed that the AUC for probability discounting for $10$ was significantly smaller for Latinos than White Americans,

*Figure 7.* Delay discounting functions (left) and probability discounting functions (right) for the two amounts, $10$ and $100$ for the Latinos (upper panel) and White Americans students (lower panel). Points show median indifference points for money as a function of delay or odds against its receipt. Curves represent the best-fit discount functions as generated by Equations 1 and 3.
$t = -2.21, p = .034$, but Latinos and White Americans did not differ in the AUC for probability discounting for $100, t = -1.57, p = .13$, suggesting that Latinos may be less risk takers than White Americans.

**Latinos**

The analyses for the Latino sample showed that there was a significant overall effect of task, $F(3, 17) = 7.16, p = 0.0004$. Post-hoc tests revealed that the AUCs for $10$
and $100 for the delay discounting tasks were not significantly different from each other, $t = 1.4, p = 0.08$, nor was there a difference between the AUCs for $10 and $100 for the probability discounting tasks, $t = 0.64, p = 0.26$. There was, however, a significant difference between the AUC for $10 for the delay discounting task and the AUC for $10 discounting task and the AUC for $100 for the probability task, $t = 3.10, p = 0.006$. These analyses indicated that there was not a significant effect of amount within delay and probability tasks, but that Latinos discounted delayed amounts more steeply than probabilistic amounts.

White Americans

Analyses for White Americans showed that there was an overall significant effect of task, $F(3, 15) = 6.54, p = 0.0009$. Post hoc tests revealed that the AUCs for $10 and $100 for delay discounting tasks were not significantly different from each other, $t = 1.08, p = 0.29$, nor were the AUCs for $10 and $100 for probability discounting tasks, $t = 1.308, p = 0.10$. There was, however, a significant difference between the AUC for $10 for the delay discounting task and the AUC for $10 for the probability discounting task, $t = 2.12, p = 0.05$, and between the AUC for $100 for the delay discounting task and the AUC for the probability discounting task, $t = 3.18, p = 0.007$. Similar to Latinos, the data indicate that there was not a significant effect of amount within tasks, but White Americans discounted delayed outcomes more steeply than probabilistic outcomes.
Temporal Bisection Procedure

The analysis for the outcomes of the temporal bisection procedure was conducted as in Experiment I. Table 12 shows the average mean and standard deviation range obtained after the normalization of the data. As in Experiment I, the mean and standard deviation were normalized using Odum and Ward’s (2007) method. Blough’s (1996) equation did not converge for data from two Latino participants and from one White American participant. The data of these participants tended to be flat, with the proportion of long responses not increasing as a function of the sample duration. The non-normalized were 0.93 for the Latinos and 0.79 for the White Americans.

Figure 9 shows the obtained psychophysical function (the data are not normalized for this figure) for the Latino (filled circles) and White American (empty circles) samples. Independent t-tests analysis conducted with the normalized data using the Odum and Ward (2007) method revealed that Latinos and White Americans did not differ in their mean, $t = -1.5, p = .14$, in their standard deviation, $t = .534, p = .59$, nor in their range. $t = 1.804, p = .081$.

Zimbardo Time Perspective Inventory

The results on the ZTPI scale showed that participants from both groups scored higher on the past positive subscale, followed by the future subscale, the present hedonistic subscale, the past negative subscale and the present fatalistic subscale. Table 13 shows the Cronbach’s alphas and the minimum, maximum, mean, and standard
Table 12


<table>
<thead>
<tr>
<th>Sample</th>
<th>Latinos (N = 18)</th>
<th>White Americans (N = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>SD</td>
</tr>
<tr>
<td>Non-normalized data</td>
<td>2.87</td>
<td>1.21</td>
</tr>
<tr>
<td>Odum and Ward normalization</td>
<td>2.86</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Figure 9. Mean proportion of responses to the long sample as a function of sample duration for the Latinos (filled circles) and White American (empty circles) samples.
Table 13

**Minimum, Maximum, Mean, and Standard Deviation Scores for Each of the Zimbardo Time Perspective Inventory per Sample**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Subscales</th>
<th>alphas</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latinos (N = 18)</td>
<td>Past negative (10 items; 10-50)</td>
<td>.78</td>
<td>2.20</td>
<td>4.30</td>
<td>3.11</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>Present hedonistic (15 items; 15-75)</td>
<td>.80</td>
<td>2.60</td>
<td>4.27</td>
<td>3.49</td>
<td>.51</td>
</tr>
<tr>
<td></td>
<td>Future (13 items; 13-65)</td>
<td>.73</td>
<td>2.69</td>
<td>4.31</td>
<td>3.67</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td>Present fatalistic (9 items; 9-45)</td>
<td>.66</td>
<td>2.00</td>
<td>3.78</td>
<td>2.74</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td>Post positive (9 items; 9-45)</td>
<td>.68</td>
<td>3.00</td>
<td>4.78</td>
<td>3.97</td>
<td>.47</td>
</tr>
<tr>
<td>White Americans (N = 16)</td>
<td>Past negative</td>
<td>.78</td>
<td>1.80</td>
<td>4.20</td>
<td>2.82</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td>Present hedonistic</td>
<td>.89</td>
<td>2.00</td>
<td>4.27</td>
<td>3.17</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>Future</td>
<td>.74</td>
<td>2.85</td>
<td>4.69</td>
<td>3.62</td>
<td>.52</td>
</tr>
<tr>
<td></td>
<td>Present fatalistic</td>
<td>.74</td>
<td>1.33</td>
<td>3.11</td>
<td>2.12</td>
<td>.54</td>
</tr>
<tr>
<td></td>
<td>Past positive</td>
<td>.79</td>
<td>2.89</td>
<td>4.78</td>
<td>3.78</td>
<td>.54</td>
</tr>
</tbody>
</table>

*Note.* Number of items and the range of scores for each subscale are shown in parentheses.

the item 13, \( t = 3.10, p = 0.004 \). The samples did not differ significantly on the scores for the other ZTPI subscales.

**Acculturation**

To evaluate whether the degree of acculturation would affect the degree of impulsivity, time perception, and perspective, participants answered the SASH scale. SASH scores ranged from 2.08 to 4.57 with lower scores meaning that the participants were less acculturated and higher scores meaning more. Table 14 shows the Cronbach’s alpha and the minimum, maximum, mean and standard deviation scores for the total and each SASH subscale. Latinos and White Americans differed in their total scale, \( t = -14.51, p < .001 \). Total scale scores were acceptable for both Latinos and White Americans. Subscale scores, however, mostly unacceptable. The alphas were so low that
Table 14

Minimum, Maximum, Mean, and Standard Deviation Scores for Each of the Short Acculturation Scale per Sample

<table>
<thead>
<tr>
<th>Sample</th>
<th>Subscales</th>
<th>alphas</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latinos (N = 18)</td>
<td>SASH total scores (5 items; 12-60)</td>
<td>.71</td>
<td>2.00</td>
<td>3.50</td>
<td>2.58</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td>Language subscale (5 items; 5-25)</td>
<td>.29</td>
<td>1.60</td>
<td>2.80</td>
<td>2.08</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>Media subscale (3 items; 3-15)</td>
<td>.24</td>
<td>2.33</td>
<td>4.67</td>
<td>3.53</td>
<td>.62</td>
</tr>
<tr>
<td></td>
<td>Ethnic subscale (4 items; 4-20)</td>
<td>.93</td>
<td>1.75</td>
<td>4.00</td>
<td>2.48</td>
<td>.59</td>
</tr>
<tr>
<td>White Americans (N = 16)</td>
<td>SASH total scores</td>
<td>.90</td>
<td>3.67</td>
<td>5.00</td>
<td>4.57</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>Language</td>
<td>.80</td>
<td>4.20</td>
<td>5.00</td>
<td>4.81</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td>Media</td>
<td>.62</td>
<td>3.67</td>
<td>5.00</td>
<td>4.83</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td>Ethnicity</td>
<td>.59</td>
<td>3.00</td>
<td>5.00</td>
<td>4.07</td>
<td>.68</td>
</tr>
</tbody>
</table>

Note. Number of items and the range of scores for each subscale are shown in parentheses.

the item analysis was not conducted for these subscales. These uneven scores are probably due to the small sample size. More data need to be collected to establish further conclusions about the reliability of this measure for these samples.

In sum, the results of Experiment II shows that (a) Latinos discounted delayed outcomes and certain outcomes more than White Americans, (b) Latinos and White Americans did not statistically differ on their scores on the BIS subscales, (c) Latinos and White Americans did not differ in their time perception, and (d) Latinos were more fatalistic than White Americans.
CHAPTER VI
DISCUSSION

The present study aimed to evaluate (a) the extent to which different impulsivity and risk taking measures would be related to each other, (b) the extent to which impulsivity, time perception and time perspective are related to each other, and (c) the extent to which these processes differ in Latino and White American students. This discussion chapter will be divided into three sections. The first section will address the results from Experiment I. The results will be interpreted in light of the concepts of impulsivity, risk-taking, time perception, and time perspective. Specifically, the first section will examine the relationship among the impulsivity and risk-taking measures used in Experiment I, as well as the correlation between these and time perception and time perspective. In the second section, this author will evaluate the results of Experiment II and the possible influence of culture on decision-making processes. Finally, in the third section, possible implications of these results for applied settings will be discussed.

Section 1--Discussion of Experiment I

Analysis of the data from Experiment I showed that there was an effect of amount on the degree of delay and probability discounting and the following significant relations: (a) a positive correlation between the AUCs of delay and probability tasks; (b) a negative correlation between the AUC of delay discounting and the scores on the BIS nonplanning subscale; (c) a negative correlation between the standard deviation from the temporal
bisection procedure and the scores on the past positive subscale; (d) a positive correlation between the AUCs for delay discounting task and the mean from the temporal bisection procedure; (e) a negative correlation between the AUCs for delay discounting and the scores on past negative and present hedonistic subscales, and a positive correlation between the AUCs for delay discounting and the scores on past positive subscale; (f) a positive correlation between the AUCs for probability discounting and the scores on the present hedonistic and present fatalistic subscales, and a negative correlation between the AUCs for probability discounting and the scores on the future subscale; and (g) a number of correlations between the scores on the BIS subscales and the scores on the ZTPI subscales.

There results suggestws that (a) different impulsivity measures were moderately correlated with each other; (b) risk taking and impulsivity may be part of different decision-making processes, because participants that discounted delayed outcomes in delay discounting did not necessarily discount uncertain outcomes in probability discounting; (c) time perception is related to delay discounting; and (d) time perspective is related to impulsivity and to risk taking. Each of these results will be discussed below.

**Impulsivity**

One of the main discussions in the literature concerns the definition of impulsivity. As mentioned before, most authors agree that impulsivity encompasses different aspects, such as difficulty attending, sensation-seeking, acting without thinking, irritability, unconscious risk-taking and present orientation, among other characteristics (see Evenden, 1999 for a list of different definitions and characteristics). The challenge
now is to understand how these different aspects of impulsivity are related to each other (Evenden, 1999). The present study aimed to evaluate four specific manifestations of impulsivity, as measured by the delay discounting procedure and the BIS scale: the discounting of delayed outcomes, and motor, attention, and nonplanning impulsiveness as reported by the participants in the BIS scale.

**Relationship Between Delay Discounting and the Barratt Impulsiveness Scale (BIS-11)**

In the delay discounting procedure, participants were asked to make a series of choices between a small immediate outcome and a large delayed outcome. The main measure used in the study was the Area Under the Curve (AUC; Myerson et al., 2001). In delay discounting task, small AUCs indicate that the participants choose the small immediate outcome more often (i.e., they were more impulsive in the task). The Barratt Impulsiveness scale consists of 30 items with 3 subscales: Non-Planning (careful consideration of choices and problems), Motor (perseverance and unplanned action) and Attention (focus and thought control). High scores indicate that the individual is impulsive in these areas. In Experiment I, there was a negative trend in the correlation between the AUCs of delay discounting and the scores on the BIS subscales. That is, small AUCs for delay discounting were associated with high scores on the BIS subscales, especially with the nonplanning subscale.

It is unclear, however, how the correlation between delay discounting and the BIS subscales matches previous findings. First, not many studies have evaluated the correlation between delay discounting and personality questionnaires (Green & Myerson, 2004). Second, the available data are mixed. Some studies have found correlations
between delay discounting and the BIS subscales (Bjork, Hommer, Grant, & Danube, 2004, Experiment I; de Wit et al., 2007; Einsenberg et al., 2007; Kirby & Petry, 2004; McLeish & Oxoby, 2007, Experiment II; Mitchell, 1999; Swann, Bjork, Moeller, & Dougherty, 2002; Yeomans, Leitch, & Mobini, 2008), while other studies have reported no significant correlation between these two measures (e.g., Coffey et al., 2003; Einsenberg, Campbell, MacKillop, Lum, & Wilson, 2007; Krishnan-Sarin et al., 2007; Lane, Cherek, Rhoades, Pietras, & Tcheremissine, 2003; McLeish & Oxoby, 2007, Experiment I).

It is also important to note that not all studies measuring the correlation between delay discounting and the BIS scale have conducted separate analyses with each subscale of the questionnaire (e.g., Coffey et al., 2003; Krishnan-Sarin et al., 2007; Lane et al., 2003). The negative correlation found in Experiment I therefore emphasizes the importance of a more detailed evaluation of the correlation between these two measures (but see Bjork et al., 2004; Mitchell et al., 2005). Separate analyses with each subscale are important because the subscales access different aspects of impulsivity, and a correlation with the total score may not reveal the details of which behaviors correlate with what aspects of impulsive behavior (Osburn, 2000).

Of the studies that do analyze correlations between delay discounting and each subscale, studies have reported a positive correlation between \( k \) or \( \log(k) \); the degree of discounting of delayed outcome) and the nonplanning subscale (de Wit et al., 2007; Kirby & Petry, 2004; Mitchell, 1999; Swann et al., 2002; Yeomans et al., 2008), and/or a positive correlation between delay discounting and the Motor subscale (Einsenberg et al., 2007; Kirby & Petry, 2004; McLeish & Oxoby, 2007, Petry, 2001b). Two studies have
found a negative correlation between $k$ and the Attention subscale (de Wit et al., 2007, Mitchell, 1999). In de Wit et al., the negative correlation between $k$ and the Attention subscale, however, was not retained in a multiple regression analysis; that is, although the correlation was significant, the scores on the subscales did not predict the degree of delay discounting. Mitchell (1999) mentions that the correlation may be due to the large variability in the data. It is not clear, therefore, what is the correlation between BIS subscales and delay discounting. One explanation for the different correlations between the delay discounting and the BIS subscales is that the BIS, as other personality questionnaires, measures a number of behaviors whereas delay discounting is a task that measures a specific behavior: the degree of discounting of the value of an outcome due to the delay to its receipt. The behaviors in the delay discounting procedure, then, may or may not involve the behaviors described in each of the three subscales in the BIS (Bjork et al., 2004; de Wit et al.; McLeish & Oxoby). In other words, it may be that behaviors involved in the decision-making process of the delay discounting task are described by questions that are spread across the different BIS subscales.

Related to analysis on the subscales, is the importance of conducting reliability analysis with the scale, as well as item analysis. As it was shown in this study, the alphas for some subscales were low, below acceptance due to specific items. On this study, the alphas of the nonplanning and attention, and the fatalism subscales on Experiment I, and the alphas of all three BIS subscales, as well as the ones on the present fatalism and the past positive subscales for Experiment II, were affected by specific items. Care should be
taken on analyzing correlations with subscales with low alphas. Although the directions of the correlations were not affected by the alphas on the subscales, the magnitude was affected by it.

An alternative explanation to the confusion in the literature regarding the relation between the outcomes of the delay discounting task and the scores on the BIS subscales is that they may evaluate different classes of behavior. Accordingly, the nonconsistency of the correlations between delay discounting and the scores on the BIS subscales reflects the complexity of what is named “impulsive behavior.” A number of variables such as demographics of the sample (e.g., age, race, and gender, as shown by de Wit et al., 2007) and the delay discounting procedure itself (i.e., the delays and amounts used) may affect the correlation between these two measures. Future studies could evaluate the effect of these variables and their possible effect on the correlation between delay discounting and personality measures. Yet another explanation for the nonconsistency in the literature may be that self-report measures are more susceptible to self-report bias as compared to behavioral measures, which may affect the correlation between these two measures.

One contribution of the present study to the literature is the evidence of a statistically correlation between the AUCs of the delay discounting task and the nonplanning subscale with a sample of undergraduate students. Most of the studies that have evaluated the correlation between delay discounting and the scores on the BIS have done so with substance abusers (e.g., Coffey et al., 2003; Mitchell, 1999; Petry, 2001b), people with behavioral disorders (e.g., Swann et al., 2002), or middle-aged participants (de Wit et al., 2007). McLeish and Oxoby (2007) also evaluated the correlation between delay discounting and BIS scores with undergraduate students. In their study, participants
first answered the BIS and then participated in an unrelated bargaining game, and were then exposed to the delay discounting task. In the bargaining game, participants were allocated into three groups that differed in the feedback received at the end of the game: one group learned that they had received a payoff higher than the median of payoff for the game (positive feedback), the second group learned that they had received a payoff lower than the median (negative feedback), and a control group did not receive any information about the payoff. Participants then answered the BIS scale and were exposed to the delay discounting task. Results showed that only the delay discounting rate for the participants in the negative group was positively correlated to the scores on the motor subscale.

There are two main differences between the present study and the previous study by McLeish and Oxoby (2007). First, McLeish and Oxoby’s study aimed to evaluate the effect of priming on discounting (i.e., positive and negative feedback), whereas the present study had no priming. Second, in McLeish and Oxoby’s study, participants answered the BIS before being exposed to the delay discounting task, whereas participants were exposed to the behavioral measures (delay and probability discounting tasks) before answering the personality measures. Future studies should evaluate whether framing and/or the order of tasks affects the correlation between delay discounting task and the scores on the BIS subscales.

Another study that also evaluated the correlation between the degree of delay discounting and the scores on the BIS subscales was Einsenberg and colleagues (2007). In this study, the authors aimed to evaluate whether genetic components would predict the discount rates for delayed outcomes and scores on personality questionnaires.
Different from the present study, and similar to McLeish and Oxoby (2007), the authors found a positive correlation between delay discounting and motor subscale. Given the similar undergraduate subject sample in the present study and the Eisenberg and colleagues (2007) study, it is not clear why the present study obtained a significant correlation between delay discounting and the nonplanning subscale and not between delay discounting and the motor subscale. One possible explanation is that, as mentioned above, items from both subscales may describe behaviors related to delay discounting, and therefore it may be that it is not a subscale per se that is related to the degree of discounting, but a different combination of items in the scale. To help solve this issue, one alternative for future studies is to conduct a post hoc discriminant function analysis to evaluate which items may predict the degree of discounting of delayed outcomes (e.g., McLeish & Oxoby).

A second contribution of the present study to the literature is the evaluation of a possible correlation between the degree of probability discounting and the scores on the BIS subscale. Only one published study, to the best of my knowledge, has also evaluated such a correlation. As in Mitchell (1999), the results of the present study found no significant correlation between the degree of probability discounting and any of the BIS subscales. The absence of correlation between probability discounting and the scores on the BIS subscales may indicate that none of the BIS subscales is specifically related to risky behavior as measured by probability discounting. These results could also strengthen the argument that risk-taking and impulsivity may be two different decision making processes. Future studies, however, should replicate the present findings and evaluate which personality scale is related to probability discounting.
Delay and Probability Discounting: Same or Different Processes

The results of Experiment I showed that the effect of amount on delay and probability discounting was replicated. That is, the small amount ($10) was discounted more steeply than the large amount ($100) in the delay discounting task, whereas the large amount was discounted more steeply than the small amount in the probability discounting task. This effect is well established in the literature with monetary outcomes (see Green & Myerson, 2004 for a review). The amount effect in delay and probability discounting tasks is related to the discussion of whether impulsivity and risk taking are part of the same process or if they are different aspects of decision-making processes. Specifically, if impulsivity and risk taking were part of the same process, participants would discount different amounts similarly in delay and probability discounting. Data in the present study and in previous studies (e.g., Estle et al., 2006; Holt et al., 2003; Myerson et al., 2003) reveal, however, that this is not the case. The differential effect of amount in the two discounting tasks suggests, therefore, that delay and probability discounting may be part of different decision-making processes.

The correlation between delay and probability discounting is also related to the discussion about whether these are similar or different decision-making processes (Myerson et al., 2003). There are three possible relationships that may exist between delay and probability discounting. First, discounting of delayed and of probabilistic outcomes may be part of different processes. That is, impulsive individuals that are likely to choose small immediate outcomes (i.e., steep delay discounting) would also have a strong preference for larger riskier outcomes (i.e., steep probabilistic discounting),
yielding a positive correlation between delay and probability discounting. Second, a negative correlation could also reflect that delay and probability discounting would imply that they are part of the same processes. In other words, if discounting of delayed and probabilistic outcomes is related to impulsivity in the same fashion, impulsive individuals should show steep discounting of delayed outcomes and would show a small tendency to discount probabilistic outcomes. Third, delay and probability discounting may be unrelated processes, yielding no significant correlation (Myerson et al., 2003).

The literature remains inconclusive as to which relationship exists between delay and probability discounting. For example, when the correlation is significant, it tends to be a positive relationship (e.g., Crean et al., 2000; Myerson et al., 2003; Olson, Hooper, Collins, & Luciana, 2007; Reynolds, Karraker, Horn, & Richards, 2003; Richards, Zhang, Mitchell, & de Wit, 1999), ranging from .2 (Myerson et al., 2003) to .74 (Richards et al., 1999). The correlation between delay and probability discounting, however, is often not significant (e.g., Ohmura et al., 2005, 2006; Reynolds et al., 2004). In Experiment I, the correlations between the AUCs for the delay discounting task and the AUCs for the probability discounting tasks were positive. These data reinforce the idea that impulsivity and risk taking, as measured by delay and probability discounting, are different decision-making processes: impulsive participants were not necessarily risk takers in the present study.

In summary, the answer to the first goal of the present study regarding the relationship between different measures of impulsivity is that (a) the AUC of delay discounting task was significantly and negatively related to the scores of the nonplanning subscale; (b) the AUCs of probability discounting task were related in an opposite pattern
than the AUCs of delay discounting task with the scores of the BIS subscales, but the
correlations were not significant; (c) the amount of effect on the AUCs of delay and
probability discounting tasks was replicated; and (d) there was a significant and positive
correlation between the AUCs of delay and probability discounting tasks. The second
question of the present study was to evaluate if time perception and time perspective
were related to impulsivity and risk taking. Time is a complex construct, so this author
will first talk about the concept of time and the measures used in the present study before
talking about the relationship between time, impulsivity, and risk taking.

Time Perception/Time Perspective

The word time is usually related to as the measure of hours, minutes and seconds.
The “clock time” refers to the duration of an event, and the speed of a clock, the
“physical time” (Levine, 1997; Levine & Norenzayan, 1999). Time, however, also
involves the subjective perception of the duration of an event, which may vary from
context to context and from person to person. For example, drugs and emotional stimuli
may affect the perception of the duration of an event. That is, studies have shown that
participants exposed to marijuana and methamphetamine tend to overestimate the
passage of time (perceive time as passing faster) compared to control participants or to
control conditions (e.g., Lieving, Lane, Cherek, & Tcheremissine, 2006a; Lieving et al.,
2006b; Wittman et al., 2007), and participants tend to overestimate the duration of angry
faces compared to neutral faces (Droit-Volet et al., 2004; Effron et al., 2006; Tiples,
2008). In the present study, the perception of the duration of an event was defined as time
perception (Levine, 1999; Boyd & Zimbardo, 2005), and was measured using the temporal bisection procedure.

The results of the present study revealed that participants from Utah State University showed a relatively flat psychophysical function (range = 0.85). The obtained mean, however, was similar to the arithmetic mean of the duration of the samples, and the obtained standard deviation was similar to the ones obtained with pigeons (e.g., Odum & Ward, 2007). These data suggest that USU participants did not have a strong bias to perceive the stimuli as either short or long, but that they may have a relatively small degree of stimulus control.

One procedural difference may also have affected the performance of the participants in the present task. In the current procedure, the stimuli used were of a very short duration (the anchors were 2 s and 4 s). Other studies have used stimuli with longer durations (e.g., 4 s and 8 s or 1 s and 9 s; Wearden, 1991; Wearden et al., 2008), and have shown that variables such as stimulus spacing also affect participants’ performance on the task (Ferrara et al., 1997; Wearden & Ferrara, 1995; Wearden et al., 1997). The durations and stimuli spacing used in the present study, however, were similar to Lieving and colleagues (2006a, 2006b) and were chosen for two main reasons (a) the task needed to be somewhat difficult for participants to complete, so there would have enough variability in the data to be able to correlate with the other measures used in the study; and (b) pilot studies with stimuli with longer durations resulted in very long experimental sessions, increasing the probability that other variables, such as fatigue, would affect participants’ performance.
Despite the differences between the current study and previous studies, the present study contributes to the literature on human timing through the analysis conducted using the Blough (1996) equation. Most of the analysis of human data uses the mean or the Weber Fraction. The advantage of using Blough’s equation is that the parameters yield not only the point of subjective equality to evaluate bias on the data, but also allow researchers to evaluate the effect of attention to the samples and sensitivity to changes in time. This is the first known study that compares the outcomes of the temporal bisection procedure with time perspective and impulsivity.

*Time Perspective*

In addition to the perception of event duration, the sense of time also involves attitudes and perceptions towards time. More specifically, Boyd and Zimbardo (2005) explain that tendencies to overemphasize the present, the past and/or the future may affect decision making processes. For example, people that score high on present hedonism tend to place greater emphasis on what is happening in the present compared to what may happen in the future. On the other spectrum of attitudes toward time are people that emphasize the future. Future-oriented people tend to establish goals and plans for the future and to proactively search for positive consequences for their behaviors. Other aspects of time perspective include present fatalism, past positivism and past negativism. Fatalistic people are those who, according to Boyd and Zimbardo, do not believe in the contingent relationships between their behaviors and the consequences of their actions. There is not much research on part positive or on past negative time perspectives, but according to Boyd and Zimbardo, people that are focused on negative aspects of the past
also tend to be stressed, have anxiety and depression. On the other hand, past positive
time perspective is related to happiness, self-esteem and friendliness (see also Zimbardo & Boyd, 1999).

To evaluate attitude towards time, participants in the present study answered the
ZTPI (Zimbardo & Boyd, 1999). The results showed that participants scored higher on
the ZTPI past positive subscale, followed by the future, the present hedonistic, the past
negative subscale, and scored lower on the present fatalistic subscale.

One interesting finding from the current study was the absence of a significant
correlation between the mean, range, and standard deviation from the temporal bisection
procedure (time perception) and the scores on most of the ZTPI subscales (time
perspective). Note, however, that the correlation between the standard deviation and the
scores on the past positive subscale was significant, but the correlation between the mean
and the range of the temporal bisection procedure and this specific scale was not near
significance. Future studies should continue to examine whether and how time perception
and time perspective are related processes.

Another study that evaluated whether time perception is related to time
perspective was conducted by Lennings and Burns (1998). In this study, participants
answered the time perspective questionnaire, where they were asked to write a list of
events that they thought would occur in their personal life and in the society’s future, as
well as to estimate how far away in time these events would occur. To measure time
perception, participants were asked to estimate time in a WAIS subtest task (Experiment
I) and to report when they thought that 30 s had elapsed (Experiment II). The results
showed that the correlation between time estimation and future perspective was very low $\rho = .28$ (Experiment I) and mediated by age (Experiment II).

The relation between time perception and time perspective, therefore, is not clear. Lennings and Burns’ (1998) mentioned that the tasks used in the studies might affect this relationship. For example, it may be that the questions in time perspective measures are related to a time that does not necessarily have a “beginning” and an “end,” different from questions on time perception tasks. That is, when a participant answers questions about her/his future, present or past, the researcher does not compare those answers with an objective measure of time (i.e., the start of the end of the past, the start of the present, and the start of the future is subjective), whereas tasks in time perception do have an objective measure of comparison (i.e., the duration of an event). Therefore, researchers should try to use different tasks to evaluate whether there is a relationship between time perception and time perspective.

A second interpretation about the absence of a relationship between time perception and time perspective could be that the perception of the event duration may not necessarily be related to attitudes towards time (e.g., hedonism, fatalism, fast pace of life). That is, “telling time” may not necessarily be related to how one behaves towards time. In other words, two people may be accurate in saying what time it is or on reporting the duration of an event, but one person may be more hedonistic than the other person and hence behave differently in the present contingencies. Understanding how time perception and time perspective are related to each other may or may not be important when evaluating whether these processes are related to impulsivity. For example, when receiving the choice “do you want a small outcome now or would you wait for 10
minutes to receive a better outcome?”, both perception of time and time perspective could influence the choice for one or the other outcome. That is, if an individual perceives time as passing slower and waiting 10 minutes would be aversive, the probability of choosing the smaller outcome increases. This process of choice may or not be related to hedonism, for example. The choice for the smaller outcome may not necessarily occur because time is passing faster or slower, but just because the individual tends to choose the “right here, right now” option. Future studies, therefore, should continue evaluating the correlation between time perception and time perspective.

Impulsivity, Risk Taking, and Time

Impulsivity and Time Perception

A number of researchers have suggested that time perception and impulsivity as measured by the delay discounting task may be related (Read & Roelofsma, 2003; Read et al., 2005; Takashi, 2005, 2006; Takahashi et al., 2008; Wittmann & Paulus, 2008; Zauberman, Kim, Malkoc, & Bettman, 2008), but few studies have evaluated the relationship between these two processes. For example, Barkley et al. (2001) exposed teens with ADHD and control participants to a delay discounting task, a time estimation task and a time reproduction task. The results showed that ADHD participants tended to discount delayed outcomes more steeply than control participants, and that ADHD participants also tended to estimate and reproduce time as longer than control participants. It is important to note, however, that the authors discuss the possibility that ADHD participants committed more errors in the time tasks because of the nature of the task, and not necessarily because they have different perception of time. That is, for the
time reproduction task, participants needed to press for a period of time, whereas for the time estimation task, participants needed to remember the duration of an event. These behaviors could have been affected by a lack of control over motor responses and/or inattention to the tasks, and not necessarily by the perception of time (but see Reynolds & Schiffbauer, 2004)

The time representation and time reproduction tasks, therefore, have the drawback of not disentangling whether attention, motor inhibition, and/or time perception affects the performance of participants on the tasks. One advantage of using the temporal bisection procedure is that it allows researchers to separate attentional aspects from perception of time, and to evaluate whether these processes are correlated with delay discounting. The results of the present study showed that the mean of the temporal bisection task were positively and significantly related to the AUCs of delay discounting task, suggesting that being able to discriminate time and discounting of delayed outcomes may be related processes. That is, smaller AUCs in the delay discounting procedure (impulsivity) were positively correlated with higher means (overestimation of time). Note that the relation with the range and standard deviations were not significantly correlated, suggesting that the overall stimulus control and sensitivity to the passage of time are not necessarily related to impulsivity, but that bias towards perceiving the time as passing quickly is related to the discounting of delayed outcomes.

There was also a pattern, although not significant, between the relation of the scores of the BIS subscales and the outcomes of the temporal bisection procedure: the correlation was positive between the scores and the standard deviation, and negative between the scores and the mean and range of the temporal bisection procedure. This
systematic pattern of relations, along with the significant relation between the AUCs of delay discounting and the means of the temporal bisection procedure suggests that time perception and impulsivity can be related processes. One of the drawbacks of the temporal bisection procedure used here, however, is that the duration of the samples was very short and hence it is unclear if the performance on the task affected the relationship between time perception and degree of discounting. Future studies could manipulate the duration of the intervals in the delay discounting task as well as the duration of the samples in the temporal bisection procedure to further evaluate whether these two processes are related to each other.

Impulsivity and Time Perspective

The relation found between impulsivity and time perspective is another contribution from this study to the literature. Specifically, the results showed that the AUCs for discounting were significantly and negatively correlated with the scores on the past negative and present hedonistic subscales, as well as with the fatalistic subscale. The correlations were significant but weak for the past negative and present hedonistic with the AUC for $10, and for present hedonistic and past positive with the AUC for $100. Because small AUCs in the delay discounting procedure reflect impulsivity, these results indicate that people that have a negative perspective regarding past events and are hedonistic tend to be more impulsive. The relations between the AUCs for delay discounting and the scores on the past positive subscales, on the other hand, were positive and significant for the AUC for $100. This result indicates that impulsive participants also had positive perceptions about the past.
The relation between delay discounting and time perspective has not been widely studied in the literature. Only two studies, to my knowledge, have evaluated this relationship. As mentioned before, Vuchinich and Simpson (1998, Experiment II) did not find correlations between discounting and any subscales from the ZTPI. The authors, however, correlated $k$ with the scores on the subscales, which may have affected the power of the correlation analysis. In a study by MacKillop, Anderson, Castelda, Mattson, and Donovick (2006), social drinkers and their controls were exposed to the delay discounting task and answered only the present hedonistic and Future subscales. Participants also answered the Eysenck impulsiveness questionnaire. Their results showed that there was a positive relationship between the present hedonistic and the impulsivity and venturesomeness subscales of the Eysenck impulsiveness questionnaire, but there was no significant correlation between delay discounting ($\log k$) and the questionnaires.

Another contribution of the present study to the literature was the finding of significant correlations between the scores on the BIS and the ZTPI subscales. In the present study, the scores on the past negative, present hedonistic and present fatalistic subscales correlated positively with the scores on all BIS subscales, whereas the scores on the future and past positive subscales correlated negatively with the BIS subscales. The relation was significant only for the nonplanning subscale and all the ZTPI subscales, and for the motor subscale with the present hedonistic, future, and the fatalistic subscales. These results suggest that participants that are (a) are present hedonistic, (b) are fatalistic, and (c) do not plan for the future score high on all BIS subscales. The data
also show that participants that have negative perceptions of the past also score high on
the motor impulsiveness subscales.

In one study, Petry (2001b) did a component analysis with the scores of the BIS,
ZTPI and other scales and found positive correlations between the nonplanning and
motor subscales with the present hedonism and present fatalism subscales in one
component; and negative correlations between the future orientation and past orientation
subscales with the nonplanning subscale in another component. It is worth mentioning
that Petry used an older version of the ZTPI scale. Regardless, the pattern of the
correlations between her study and the present study are similar, even with different
samples: whereas the sample in the present study consisted of undergraduate students,
both males and females, Petry’s sample consisted of males, half of them being substance
abusers and/or pathological gamblers. The present study and Petry’s study add empirical
data indicating that impulsivity and time perspective may be related processes and future
studies should continue to investigate this relationship.

Risk Taking, Time Perception,
and Time Perspective

Results showed no significant correlations between risk taking, as measured by
the AUC of the probability discounting task, and the outcomes of temporal bisection
procedure. Discounting of uncertain outcomes, however, was significantly correlated
with some subscales of the ZTPI, suggesting that time perspective and risk taking may be
related. Note, again, that a larger AUC in the probability discounting task means that the
participant is risk taker, hence a positive correlation between the AUC for probability
discounting with a ZTPI subscale indicates that the participants were risk takers and
scored high on the scale. On the hand, a negative correlation between the AUC for probability discounting and scores in the ZTPI subscales indicates that the participants were risk takers but scored lower on the ZTPI subscale.

The results showed a negative relation between the AUCs for probability discounting and the scores on the future subscale. These relations indicate that people that were risk takers in the probability discounting procedure did not tend to set goals for the future. The data also show a positive correlation between the AUCs for probability discounting and the scores of the present hedonistic and on the present fatalistic subscale, with a significant but weak correlation between the AUC for $10 and the scores on the present hedonistic and a significant correlation between both AUCs and the scores on the present fatalism. That is, risk takers tended to be hedonistic and fatalistic.

The pattern of significant correlations between AUCs for both delay discounting and for probability discounting are intriguing in the sense that the perspective of time had similar relations with both decision-making processes. More specifically, hedonism was high in both impulsive and risk taker participants. The fact that hedonism mediates in a similar fashion both impulsivity and risk taking is interesting considering the idea that these may be part of different decision-making processes. One suggestion is that there may be a continuum in the behavioral manifestations between impulsivity and risk taking, where some manifestations are different whereas others overlap. The obtained correlations between the AUCs for delay discounting and probability discounting tasks with the scores on the ZTPI subscales, however, are weak, and future studies should investigate further the relation between time perspective, impulsivity and risk taking.
In summary, the results of Experiment I showed that impulsivity is a complex phenomenon that involves discounting of delayed outcomes, as well as motor, nonplanning impulsivity. The alpha on the attention subscale was low, so conclusions could not be drawn from the relation between delay discounting with attention impulsivity. When evaluated by the correlation between the AUCs for delay and probability discounting tasks, the data clearly indicates that impulsivity and risk taking are part of a different decision-making process. When observing the correlations between impulsivity, risk taking, and time perspective, however, the idea that these are unrelated processes can be questioned. The results also showed that discounting of delayed outcomes and time perception are related, but not discounting of uncertain outcomes and time perception.

Section 2--Discussion of Experiment II

The Recruitment Process

Experiment II was conducted in Washington University, in St. Louis, Missouri. Part of the difficulties in collecting these data was due to time constraints and shortage of bilingual research assistants to help collect data from Latino participants. Besides these two factors, another important variable that affected the data collection of the present study was the recruitment in itself of the Latino students.

Research has shown that recruitment in communities of ethnic minority for research seems to be more challenging than recruitment of White Americans (Gallagher-Thompson et al., 2004; Hendrickson, 2007). Variables such as language and illiteracy highly affect recruitment and the probability of dropout rates of ethnic minorities from
research programs. Although the present sample was of undergraduate students, and therefore language and literacy were not variables that affected the recruitment of the sample for the present study, some strategies similar to the ones used to recruit ethnic minorities in rural communities were used to increase the probability of recruitment of Latinos to the present study.

The first strategy was to send e-mails to Latino liaisons (i.e., International Student Officers, International clubs) from Washington University. The response rate from this first step was low. Only eight participants answered the e-mails, and from these, only six qualified for the study. The second strategy that we used was to contact, via telephone, other potential Latino liaisons in other universities and schools in St. Louis. A second wave of three participants was recruited as a result of this strategy. The third strategy used was to post printed flyers around Washington University campus. No participant was reportedly recruited though the flyers.

The most successful strategies to recruit Latino participants for the present study were face-to-face contact and word-of-mouth. More specifically, this author contacted Latino students and asked them to invite friends to come to the study. One participant invited five other friends to participate in the study. The word-of-mouth and face-to-face strategies have been reported to successful in rural communities (Domenech-Rodriguez, Rodriguez, & Davis, 2006). It would be interesting to evaluate in future studies whether ethnic minorities share the same process of recruitment, regardless of whether they are from a rural community or university students.
Main Results

Data from Experiment II are preliminary, and should be taken with caution. The preliminary analyses showed that Latino students (a) discounted delayed outcomes ($10 and $100) more steeply than White American students, and discounted small probability outcomes ($10) more steeply than White American students; (b) did not differ in their scores on the BIS-11 scale; (c) had no difference in the mean, standard deviation or range in the temporal bisection procedure compared to White American students; but (d) scored higher on the present fatalism subscale than White Americans. These results suggest that Latinos may be more impulsive in the delay discounting task, but do not differ in the scores in the self-report questionnaire regarding impulsivity, than White Americans. Latinos are also more fatalistic than their White American counterparts, but do not differ in their perception of time. Both samples had similar patterns of scores on the BIS and ZTPI subscales, indicating that, although Latinos and White Americans differed in degree on some decision-making processes, they have similar patterns of impulsivity, time perception, and time perspective.

Two other studies have shown that participants from different cultures tend to discount delayed and probabilistic amounts to different degrees. As mentioned before, Du and colleagues (2002) showed that Americans discounted delayed outcomes similar to Chinese, and both discounted delayed outcomes more steeply than Japanese students, but American students discounted probabilistic outcomes more steeply than Japanese and Chinese students, whereas Japanese students discounted probabilistic outcomes more steeply than the Chinese students (see also Takahashi et al., 2008). In a recent study, Mahajna, Benzion, Bogaire, and Shavit (in press) showed that Israeli Arabs discounted
delayed and probabilistic outcomes more steeply than Jews. The present study is the first one that compares the degree of impulsivity between Latinos and White Americans living in the United States.

Although Latinos were more impulsive on the delay discounting task than White Americans, they did not differ on their scores on the BIS. Before drawing any interpretations about the results, it is important to remember that the sample size of the present study is small, and more data should be collected to better evaluate whether Latinos and White Americans would differ in their scores on personality scales. That is, the present study does not allow us to know if (a) Latinos are more impulsive on discounting of delayed and of probabilistic outcomes, but are less impulsive on the behaviors measured by the BIS subscales (e.g., attention, planning, motor impulsivity); (b) Latinos behave more impulsively on the delay and probability discounting tasks, but report that they are less impulsive in the BIS scale due to contextual variables such as social acceptance; or (c) the BIS is not the best measure to capture cultural differences in impulsive behaviors between Latinos and White Americans (i.e., the scale was translated to Spanish in 2001 and it has not yet been used in cross-cultural studies). More data needs to be collected to evaluate why Latinos and White Americans differed in the degree of delay and probability discounting but not on their scores on the BIS scale.

An alternative explanation to the absence of a statistical difference on the scores of the BIS subscales between Latinos and White Americans may be related to the issue of the construction of scales in itself. For example, Thomas (2007) has argued that when conducting research, the researcher’s background can affect the way that s/he conceptualizes the findings. In this sense, a behavior in the scale that would be coded as
impulsive in the U.S. (the home country of the developers of the BIS-11) may not necessarily be considered impulsive in a Latin Country. As we have been highlighting across the document, different contexts such economic, and historic aspects can determine if one behavior is considered as impulsive or not. In this sense, while answering the BIS-11, Latinos may have normalized their answers to their own background, where a particular behavior would not necessarily be considered impulsive. In other words, Latino participants could have biased their answers towards their own culture (Helfrich, 1999) and reported that they are not impulsive. Note that the Latino participants in the present study had been living in the U.S. for less than 3 years. It would be interesting to see whether the pattern of responses would change as they acculturate more to the White American mainstream culture.

The results of the present study also showed that Latinos and White Americans did not differ in their performance on the temporal bisection procedure. Two similar studies have evaluated differences in time perception in two cultural groups. Eisler (1992, 1995) showed that African immigrants living in Sweden for a long time tended to overestimate time (had lower mean) compared to native Swedish. As Eisler (2003) mentioned, an advantage of understanding how people from different culture understand time could help understand how they behave according to time (e.g., what they do in their free time, how they behave regarding punctuality, etc.). These and the data from present study are mainly descriptive at this point, and both Eisler’s samples and the sample from the present study are too small to draw any further conclusions or establish any correlation with other behaviors. Future studies should replicate this finding and evaluate the implications of these results on possible behavioral manifestations.
The present study showed that Latinos scored higher than White Americans on the fatalism subscale but the samples did not differ in their scores on the hedonism subscale. Hedonism and fatalism are two of the values that have been mentioned to be characteristics of Latinos (Diaz & Ayala, 1999; Garcia-Preto, 1996; Inclan, 1985). Hedonism, or present orientation, is not a value well studied in the cross-cultural literature, but some researchers state that Latinos are more present oriented than White Americans (Garcia-Preto; Inclan; but see Carter, Yeh, & , 2008). The results of the present study, however, did not support this idea: although Latinos and White Americans differed in the magnitude of their answers on the present hedonism subscale, the difference was not significant. The data, nevertheless, are preliminary, and more data should be collected to establish a conclusion. Fatalism, on the other hand, is a value that has been more studied compared to hedonism. The present study contributes to the literature by measuring the degree of fatalism using the present fatalism subscale from the ZTPI. The advantage of this measure is that it provides scores on other temporal orientations (e.g., orientation towards the future, present, or past), and allows researchers and clinicians to evaluate a global profile of orientation towards time.

In summary, the present study contributed to the literature by showing that Latinos and White Americans had differences in the degree of impulsivity and time perspective. Nevertheless, the present findings also showed that both groups had similarities: Latinos and White Americans discounted delayed and probabilistic outcomes hyperbolically, their performance yielded a psychophysical function on the temporal bisection procedure, and both groups showed similar patterns on the scores on the BIS and ZTPI subscales. These results are related to the emit perspective in that different
ethnic groups would have different degrees in decision making processes, and also with the etic perspective in that, regardless of the cultural background, different groups of participants would show similar pattern of behavior on these tasks.

Section 3--Other Implications, Suggestions, and Interpretations

Latinos and White Americans showed differences in the degree on impulsivity and on time perspective. Because the samples did not significantly differ in age or in economic characteristics, it is tempting to suggest that their cultural background was the main variable that affected their behavior. Other researchers have shown that culture does affect a number of decision making processes, such as end-of-life decisions (e.g., Kwak & Haley, 2005) and cooperation in business contexts (e.g., Chen & Li, 2005).

Although we recognize that culture can play a big factor in the decision-making processes, culture cannot be used as the only factor explaining the differences between two samples. Thompson (2003) has said that the use of the concept culture can sometimes be considered a mistake when it is interpreted as the cause of behaviors. That is, saying that Latinos behave differently than White Americans because of their different cultural values is not an explanation of their behavior, but a description of their behavior. Researchers should continue to investigate what, in the context of their participants, affects their behavior. In other words, as Thompson states, cultural values are not “floating things,” but are behavioral patterns affected by economic, ecological, demographical and political variables (see also Betancourt & Lopez, 1993; McCrae & Terraciano, 2005, for other misuses of the word “culture”).
Accordingly, economic factors could help explain why Latinos were more impulsive than White Americans in the present study. For example, Latin American countries have more history of high inflation than the United States. More specifically, data from Economic Commission for Latin America and the Caribbean (ECLAC) shows that Argentina, Bolivia, Mexico and Peru had inflation rates as high as 4,924% per year between 1991 and 1998 (Stallings & Perez, 2000, Table 3-2), whereas the highest inflation rate for the United States during those same years was 4.2% (United Nations, Table A.3).

During time of high inflation rates, money loses its value quickly, and impulsivity can actually be considered functional. Or even, as the examples at the beginning of the present project, the behavior of buying an extra item in high inflation rate may not be considered as impulsive by the community. Indeed, “been impulsive,” or not waiting for larger outcomes to be delivered later in time are behaviors reinforced in a country with high inflation. Accordingly, people tend to discount delayed monetary outcomes more steeply during high inflation rates compared to when the inflation is controlled (Ostaszewski, Green, & Myerson, 1998, Todorov, 2005; see also Masaharu, Nobuo, Suchinda, & Siritwat, 2008). The Latino participants from the present study were students that had been living here in the U.S. for a maximum of 3 years, and most probably had experienced high inflation rates in their country of origin. In future studies, it would be interesting to evaluate whether the degree of delay discounting would decrease with the number of years living in the U.S., in a more stable economy.

Socioeconomic characteristics of the countries, therefore, could also account for differences between people from two cultural groups and should be considered in cross-
cultural studies. The advantage of defining which socio-economic aspects can affect behavior is that researchers can measure these aspects and empirically evaluate how these variables differ in the samples being studied (Betancourt & Lopez, 1993). The knowledge of the effect that these variables have on the behavior may help disentangle what about culture (e.g., ethnicity, social class, etc.) is related to the phenomenon being studied in itself. For example, when conducting analysis to evaluate the data, we could control for the effects of socioeconomic income and evaluate whether and how the behavior of the participants differ in their impulsivity, risk taking, and time perception/perspective. Betancourt and Lopez also suggested that researchers should also measure the cultural aspects (e.g., values and norms) that are relevant to the phenomenon being studied and correlate and compare them with social variables (e.g., income and education) because these are interrelated variables. That is, income may affect peoples’ values, and vice versa. By defining cultural values, their behavioral manifestations and correlating them with social variables, researchers can contribute to the understanding of what culture is and its role in behavior. In the present study, therefore, we asked participants to answer demographic questions regarding income, education and their parents’ income, as well as values deemed to be different between the two cultures (hedonism and fatalism) while evaluating impulsivity, risk-taking, and time perception. More data, however, are necessary to evaluate how these variables are correlated.

While we aimed to evaluate the differences between Latinos and White Americans, the present study also examined the similarities between the two groups. The study had a top-down approach: it began with a theory that typically does not incorporate culture in the studies as a dependent measure (Behavior Analysis), and incorporated
culture to broaden its theoretical domain (Betancourt & Lopez, 1993). The preliminary results of Experiment II showed that while the groups differed in degree of some decision-making processes, all participants showed similar pattern of responses in the tasks and on the scores for the questionnaires. There was evidence, therefore, for both the emic and the etic approaches, with variability with the groups.

The present study had a number of limitations, such as sample size and duration of the stimuli in the temporal bisection procedure. The findings of the study, however, are intriguing and yield a number of possible follow up questions. For example, probability discounting was not correlated with any of the personality questionnaires in the present study. It could be interesting to evaluate if there is a personality questionnaire that would correlate with probability discounting. In the present study, the degree of discounting was correlated with scores on the nonplanning, but other studies have found correlations of delay discounting with other BIS subscales. Are there demographic variables that are affecting the correlation between these two measures? Impulsivity and time perception were also related in the present study. If we change the perception of time (e.g., reinforce overestimation or underestimation of time), would that affect impulsivity? Time perspective was related to impulsivity and risk taking: if affecting the perspective towards time, would other decision-making processes be affected? Latinos and White Americans differ in their degree of delay and probability discounting, would more acculturated Latinos differ in their degree of discounting compared to less acculturated Latinos? Or, on the other hand, would White Americans living in Latino countries discount the outcomes more steeply than White Americans living in the U.S.?
CHAPTER VII

CONCLUSION

The main conclusion of the study is that impulsivity, risk taking, time perception, and time perspective are complex phenomena that can be affected by culture. The present study provides some highlights on the possible relation between these phenomena.

Besides the main results already mentioned, the study has also two additional contributions to the literature. First, the study used two measures, behavioral measures and self-report measures, to evaluate impulsivity. The goal was to evaluate the relationship between these measures to help improve the understanding about impulsive behavior and factors that affect it (including cultural variables). The benefits of using personality questionnaires is that they are less expensive than the behavioral measures, well established in terms of psychometric properties and have face validity. The drawbacks of the personality questionnaires are that they are subjective, and may not be as sensitive to manipulations in the laboratory as the behavioral measures are (Dougherty, Mathias, Marsh, Moeller, & Swann, 2004). The advantages of laboratory measures are the possibilities that researchers have to manipulate the environment to evaluate how different variables affect impulsivity. Moreover, laboratory measures are objective and their outcomes are easy to evaluate (Dougherty et al.). The drawback of laboratory measures, on the other hand, is that they measure only one dimension of the behavior, resulting in limited external generalizability. Validating the relation between personality questionnaires and behavioral measures, therefore, would provide convergent
or divergent evidence for what is impulsivity and would help both researchers and clinicians to understand the complexity of such behavior.

The second contribution of the study is related to the theoretical issues between emic and etic perspectives. The study was based on a behavioral analysis perspective, which has universal premises. The methodology is, therefore, based on that approach—behavioral measures that evaluate how organisms make choices when the variables are manipulated (see Berry, 1989 for an explanation of theory and methodology driven by emic and etic perspectives). The contribution of the study was to put aside the etic perspective and evaluate whether two cultural groups could differ in their behaviors in the measures used.

Most of the cross-cultural studies use questionnaires as their main methodology. The contribution of the study to the cross-cultural literature is the use of behavioral measures, along with self-report measures, to evaluate cross-cultural differences between Latinos and White Americans. There are, as mentioned above, advantages and disadvantages in both methodologies and the use of both can only help us understand better the complexities of the behaviors being studied. Indeed, as the results of Experiment II showed, participants differed in the behavioral measured but not on the self-report measure. If only one instrument were to be used in the present study, the conclusions regarding impulsivity could have been biased. Future studies in both behavior analysis and in cross-cultural fields, therefore, could only gain by empirically evaluating culture and by using different methodologies to study complex behaviors.
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APPENDICES
Appendix A:
Utah State University Students' Recruitment Announcement
(Experiment I)
Research Opportunity: Decision Making

Dr. Odum and her graduate student, Ana Baumann Neves, in the Department of Psychology are conducting a study that explores how people make decisions about monetary alternatives available after different amounts of time or with a particular probability. The students that participate in this study will fill out a brief questionnaire with basic information about themselves, such as age, gender, income and major and about their family, such as number of siblings and income. They will then do three computer tasks where they will be asked to make some decisions. In these tasks, the participant will be asked to indicate his/her preferences for two money options, one that is available now and one after a delay; or one that is available for sure and one that has a probability to be delivered. There will be a series of questions similar to these examples: “Would you prefer to receive $9 now or $10 in 2 weeks?”, “Would you prefer to receive $9 for sure or $10 with 70% chance” All these questions are hypothetical; the participants will not actually receive the money described in these choices. In the third task, the participants will be asked to evaluate whether a stimulus was presented for a short or for a long period of time. Finally, the participants will answer two questionnaires about other decision making processes.

The potential risks for participating in this research are minimal, because the study only requires the participant to answer some questions about his/her preferences or about perception of time. All participants will receive course credit for their participation. There may or may not be other direct benefits to them. We, however, may learn more about how people make choices about delayed and probabilistic alternatives.

Total Time Commitment:
One session of approximately 60 minutes.

Write-up Due: No

Where do I sign up?
Go to the YETC computer lab located in the Education Building at the designed days/times (announced by your professor). If these dates/times do not work for you, e-mail Ana Baumann Neves (Research assistant) at anaaneves@cc.usu.edu.
Appendix A.2:

Flyers in English

(Experiment II)
DECISION MAKING STUDY
WITH LATINO STUDENTS

If you are from:
Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, México, Nicaragua, Panamá, Paraguay, Perú, Puerto Rico, Uruguay, or Venezuela

And...
1) have been living in the United States for more than 6 months but less than 3 years,
2) have more than 18 years old,
3) and are student in a college or in graduate/professional school

Please be a participant in a study of decision making.
Payment: $20.00  Duration: one hour
Place: Psychology Department of Washington University

Send an e-mail with your name, phone number, and the best time to contact you to:
usudecisionmaking@yahoo.com
Appendix A.3:

Flyers in Spanish

(Experiment II)
ESTUDIO SOBRE TOMA DE DECISIONES
CON ALUMNOS LATINOS

Si eres de:
Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba,
Republica Dominicana, Ecuador, El Salvador, Guatemala,
Honduras, México, Nicaragua, Panamá, Paraguay, Perú,
Puerto Rico, Uruguay, o Venezuela

Y ....
1) vives en los Estados Unidos hace más de 6 meses,
   pero menos de 3 años,
2) tienes más de 18 años,
3) y eres estudiante en un colegio o alumno de
   graduación o profesional en una universidad

Participa en un estudio sobre toma de decisiones.
Pago: $20.00                   Duración: una hora
Lugar: Departamento de Psicología de Washington
       University

Envía un e-mail con tu nombre, teléfono, y mejor hora para
llamar a: usudecisionmaking@yahoo.com
Appendix B:

Letter of Information

Experiment I
LETTER OF INFORMATION
“Decision Making”

participate or withdraw at any time without consequence or loss of benefits.

Confidentiality. When you were contacted by telephone, you were assigned a code number. We will match your code number with your name only until your data are completely collected. After your data are collected today, the information matching your name to the code will be destroyed. The code and the data collected today will be kept separated in a locked file cabinet in a locked room.

IRB Approval Statement. The Institutional Review Board (IRB) for the protection of human participants at USU has reviewed and approved this research study. If you have any questions or concerns about your rights, contact the IRB office at 797-1821.

Investigator statement. “I certify that the research study has been explained to the individual by me or my research staff (Ann Baumann), and that the individual understands the nature, purpose, and the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered.”

Signature of Investigators

Amy Odum, Ph.D.  Ana Baumann, M.S.
PI. Investigator  Graduate Student
Amy.Odum@usu.edu  anameyev@cs.usu.edu
797-5578  797-5553

Wesley Thomas  Dan Bostock  Ryan Greene
797-5553  797-5553  797-5553
Student Investigators

Date: ____________

Introduction/Purpose. Professor Amy Odum and her graduate student Ann Baumann in the Department of Psychology at Utah State University are conducting a research study to find out more about how people make decisions about some alternatives available after different amounts of time.

Procedures. If you agree to be in this study, the following will happen to you: You will first fill out a brief questionnaire with some information about yourself. You will then complete a series of choice questions. This experience may take no more than about an hour. In one section of the experiment, you will be asked to indicate your preferences for two money options, one that is available now and one after a delay; or one that is available for sure and one that is available with a certain probability. All these questions are hypothetical; you will not actually receive the money described in these choices. In another section of the experiment, you will be asked to classify if a stimulus is short or long. Finally, you will answer two questionnaires about some decision making processes, and one about some of your behaviors.

Risks. The potential risks are minimal, because the study only requires you to answer some questions about your preferences.

Benefits. There may or may not be any direct benefits to you from participating in this study. The investigator, however, may learn more about how people make choices about delayed alternatives.

Extra credit: For your time and participation in this study, you will earn course credit from the class.

Explanation and offer to answer questions. Ana Baumann has explained this study to you and answered your questions. If you have other questions or research-related problems, you may reach Professor Odum at 797-5578.

Voluntary nature of participation and right to withdraw without consequences. Participation in research is entirely voluntary. You may refuse to
Appendix B.2:

Letter of Information

Experiment II--English Format
LETTER OF INFORMATION

"Decision Making"

Introduction/Purpose: Professor Amy Odom and her graduate student Ana Baumann in the Department of Psychology at Utah State University, and Professors Leonard Green and Joel Myerson from Washington University are conducting a research study to find out more about how people make decisions about some alternatives available after different amounts of time or probability, and about how people perceive time.

Procedures: If you agree to be in this study, the following will happen to you: You will first fill out a brief questionnaire with some information about yourself. You will then complete a series of choice questions. This experience may take no more than about an hour. In one section of the experiment, you will be asked to indicate your preferences for two money options, one that is available now and one after a delay. Then, you will indicate your choices about outcomes with different probabilities of being delivered. All these questions are hypothetical; you will not actually receive the money described in these choices. In another section of the experiment, you will be asked to classify if a stimulus is short or long. Finally, you will answer two questionnaires about some decision making processes.

Risks: The potential risks are minimal, because the study only requires you to answer some questions about your preferences.

Benefits: There may or may not be any direct benefits to you from participating in this study. The investigator, however, may learn more about how people make decisions.

Compensation: For your time and participation in the study, you will earn $20.00.

Examination and offer to answer questions:
Ana Baumann has explained this study to you and answered your questions. If you have other questions or research-related problems, you may reach Professor Odom at 435-797-5578 (Utah State University), Professor Green at 314-935-6534 or Professor Myerson at 314-935-9815 (Washington University).

Voluntary nature of participation and right to withdraw without consequences: Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without consequence or loss of benefits.

Confidentiality: When you were contacted by telephone, you were assigned a code number. We will match your code number with your name only until your data are completely collected. After your data are collected today, the information matching your name to the code will be destroyed. The code and the data collected today will be kept in a locked file cabinet in a locked room.

IRB Approval Statement: The Institutional Review Board (IRB) for the protection of human participants at USU and of Washington University has reviewed and approved this research study. If you have any questions or concerns about your rights, contact the Utah State University IRB office at 435-797-1821, or the Washington State University IRB office at 314-633-7400.

Investigator statement: I certify that the research study has been explained to the individual by me or my research staff and that the individual understands the nature, purpose, and the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered.

Signature of Investigators:

Amy Odom, Ph.D.
PI Investigator
435-797-5578

Joel Myerson, Ph.D.

Ana Baumann, M.S.
Graduate Student

Leonard Green, Ph.D.
Inbox@artsci.wustl.edu
314-935-6534

Date: ___________
Appendix B.3:

Letter of Information

Experiment II--Spanish Format
CARTA DE INFORMACIÓN

"Toma de decisiones"

Introducción/Objetivo. La profesora Amy Odum y su alumna de pos-graduo Ana Baumann en el Departamento de Psicología en la Utah State University, y los Profesores Leonard Green y Joel Myerson de la Washington University están conduciendo una investigación para estudiar sobre cómo las personas toman decisiones con relación a alternativas que están disponibles después de un cierto tiempo o probabilidad, y sobre cómo perciben el tiempo.

Procedimientos. Si estás de acuerdo con participar en este estudio, lo siguiente va a pasar: primero, usted va a contestar un cuestionario sobre algunas informaciones sobre usted. Luego, usted va a completar una serie de preguntas sobre alternativas. Este experimento no tomará más de una hora. En una sección del experimento, usted indicará sus preferencias por dos alternativas de dinero, una que está disponible ahora y otra que estará disponible después de un determinado tiempo. Después, usted indicaría sus alternativas sobre diferentes probabilidades de recibir el dinero. Todas estas preguntas son hipotéticas, usted no recibirá el dinero de estas alternativas. En otra sección del experimento, usted clasificará la duración de unos estímulos como corta o larga. Finalmente, usted contestará dos cuestionarios sobre tema de decisiones.

Riesgos. Los riesgos potenciales son mínimos, porque el estudio nada más requiere que usted conteste algunas preguntas sobre sus preferencias.

Beneficios. Habrá o no otros beneficios directos para usted por participar en este estudio. El investigador, entrenamiento, podrá aprender más sobre cómo las personas toman decisiones.

Compensación. Por su participación en el estudio, usted recibirá $20.00.

Explicación y respuesta a sus preguntas. Ana Baumann le ha explicado el estudio y ha contestado sus preguntas. Si usted tiene más preguntas, podrá llamar a la Profesora Odum en el 435-797-5578 (Utah State University), al Profesor Green en el 314-935-6534, el Profesor Myerson en el 314-935-9813 (Washington University). Por favor, hable en inglés con ellos.

Participación voluntaria y derecho de salir del estudio sin consecuencias. La participación en este estudio es totalmente voluntaria. Usted puede negarse a participar o salir del estudio a cualquier momento sin consecuencias o pérdidas de beneficios.

Confidencialidad. Cuando usted fue contactado/a por teléfono, le fue asignado un número de código. Su número de código y su nombre solamente están vinculados temporalmente. Después que sus datos sean recopilados hoy, la información que combina su nombre al código se destruirá. De este momento en adelante, todos sus datos serán anónimos. El código y los datos recogidos hoy estarán en un armario con llaves en un escritorio con llaves.

Declaración de aprobación de IRB. El Comité Institucional de Repaso (IRB, por sus siglas en inglés) de USU y de Washington University han revisado y aprobado este estudio. Si usted tiene cualquier pregunta o preocupación acerca de sus derechos, puede comunicarse con el personal del IRB de la Utah State University al 435-797-1821, o el IRB de Washington State University en el 314-633-7400. Es importante observar que vas a tener que hablar en inglés cuando llames al IRB.

Declaración del Investigador. "Certifico que el estudio ha sido explicado al participante por mí o por mi personal de investigación, y que el individuo entiende la naturaleza, el propósito, y los riesgos y los beneficios posibles que se asocian con participar en esta investigación. Cualquier pregunta que se ha hecho ha sido contestada."

Firma de los investigadores.

Amy Odum, Ph.D.
Odum@usu.edu
435-797-5578

Leonard Green, Ph.D.
lcgreen@usu.edu
314-935-6534

Joel Myerson, Ph.D.
myerson@wustl.edu
(314) 935-9815

Ana Baumann, M.S.
Estudiante de Post-graduo
ana@usu.edu
435-797-5553

Fecha.
Appendix C:

Instructions for Delay and Probability Discounting Tasks

for Experiments I and II
DELAY DISCOUNTING INSTRUCTIONS

At the beginning of the experiment, the participants received the following instructions on the computer screen:

**English - Procedure instruction:**

You will be asked to make a group of choices between hypothetical alternatives. These choices will be displayed on the screen. On some trials, one amount of a specific alternative is to be paid right now, and this amount will vary from trial to trial. The other amount of the alternative will remain fixed, but its payment will be delayed. The screen will show you how long the delay will be. For each choice, select the amount that you want by clicking the chosen amount with the mouse. There are no correct or incorrect choices. Please, just choose the one you would prefer.

**Spanish - Instrucciones del procedimiento:**

Se le pedirá que haga una serie de selecciones entre alternativas hipotéticas. Estas selecciones estarán en la pantalla. En algunas tentativas, una cantidad específica deberá ser pagada en este momento, y esta cantidad variará de presentación en presentación. La cantidad del otro resultado permanecerá fija, pero su pago será atrasado. La pantalla le mostrará cuán larga será la demora. Para cada alternativa, seleccione la cantidad que desea presionando el botón de la cantidad con el mouse. No hay selecciones correctas o incorrectas. Por favor, simplemente elija la que usted prefiera.

PROBABILITY DISCOUNTING INSTRUCTIONS

At the beginning of the experiment, the participants received the following instructions on the computer screen:

**English - Procedure instruction:**

You will be asked to make a group of choices between hypothetical alternatives. These choices will be displayed on the screen. On some trials, one amount of a specific alternative is to be paid for sure, and this amount will vary from trial to trial. The other amount of the alternative will remain fixed, but its payment will be probabilistic. For each choice, select the amount that you want by clicking the chosen amount with the mouse. There are no correct or incorrect choices. Please, just choose the one you would prefer.

**Spanish - Instrucciones del procedimiento:**

Se le pedirá que haga una serie de selecciones entre alternativas hipotéticas. Estas selecciones estarán en la pantalla. En algunas tentativas, una cantidad específica deberá ser pagada de seguro, y esta cantidad variará de presentación en presentación. La cantidad del otro resultado permanecerá fija, pero se le pagará con una probabilidad. Para cada alternativa, seleccione la cantidad que desea presionando el botón de la cantidad con el mouse. No hay selecciones correctas o incorrectas. Por favor, simplemente elija la que usted prefiera.
Appendix D:

Graphic Explanation of the Delay Discounting Procedure
After the participant pressed the button in the screen labeled "Press here if you are ready to start", this is what appeared in the screen:

<table>
<thead>
<tr>
<th>DELAY</th>
<th>NOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome</td>
<td>Outcome</td>
</tr>
</tbody>
</table>

So, for the first alternative, this is what appeared in the screen:

<table>
<thead>
<tr>
<th>1 DAY</th>
<th>NOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$50</td>
</tr>
</tbody>
</table>

If the participant chooses the "NOW" button, by clicking on the amount, the next screen was:

<table>
<thead>
<tr>
<th>1 DAY</th>
<th>NOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$25</td>
</tr>
</tbody>
</table>

On the other hand, if he chooses the "DELAY" button, by clicking on the amount, this was the second trial:

<table>
<thead>
<tr>
<th>1 DAY</th>
<th>NOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$75</td>
</tr>
</tbody>
</table>

The amounts of the immediate outcome ("NOW") changed according to the behavior of the participant (see text for details). After 10 trials of the first delay (1 DAY), the screen presented a button labeled "press here if you are ready to continue":

Press here if you are ready to continue
After the participant pressed the button by clicking on it, the trials for the next delay started:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 DAYS</td>
<td>NOW</td>
</tr>
<tr>
<td>$100</td>
<td>$75</td>
</tr>
</tbody>
</table>

Each of the seven (1 day, 2 days, 1 week, 2 weeks, 1 months, 2 months, and 6 years) delays had 10 trials and the screen looked similar for all of them.

At the end of the experiment, the following screen appeared:

Please, call the experimenter.
Appendix E:

Graphic Explanation of the Probability Discounting Task
After the participant pressed the button in the screen labeled "Press here if you are ready to start", this is what appeared in the screen:

<table>
<thead>
<tr>
<th>PROBABILITY</th>
<th>PROBABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome</td>
<td>Outcome</td>
</tr>
</tbody>
</table>

So, for the first alternative, this is what appeared in the screen:

<table>
<thead>
<tr>
<th>95% CHANCE</th>
<th>100% CHANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$50</td>
</tr>
</tbody>
</table>

If the participant had chosen the "95% CHANCE button, by clicking on the amount, the next screen was:

<table>
<thead>
<tr>
<th>95% CHANCE</th>
<th>100% CHANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$25</td>
</tr>
</tbody>
</table>

On the other hand, if he had chosen the "100% CHANCE button, by clicking on the amount, this was the second trial:

<table>
<thead>
<tr>
<th>95% CHANCE</th>
<th>100% CHANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$75</td>
</tr>
</tbody>
</table>

The amounts of the sure outcome (100%CHANCE) changed according to the behavior of the participant (see text for details). After 10 trials of the first probability (95% CHANCE), the screen presented a button labeled "press here if you are ready to continue":

Press here if you are ready to continue
After the participant pressed the button by clicking on it, the trials for the next probability started:

<table>
<thead>
<tr>
<th>90% CHANCE</th>
<th>100% CHANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$75</td>
</tr>
</tbody>
</table>

Each of the seven probabilities (95%, 90%, 70%, 50%, 30%, 10% and 5% chance) had 10 trials and the screen looked similar for all of them.

At the end of the experiment, the following screen appeared:

Please, call the experimenter.
Appendix F:

Instructions for Time Bisection Procedure Training
At the beginning of the experiment, the participants received the following instructions on the computer screen:

<table>
<thead>
<tr>
<th>English - Procedure instruction:</th>
<th>Spanish - Instrucciones del procedimiento:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This experiment examines your time perception. First, the question “READY?” will appear on the screen. When you are ready, press the button to start the trial. A blue circle will appear on the screen. On some trials, this circle will be labeled either “Short” or “Long”, and you just need to pay attention to the time that the circle is presented on the screen. On other trials, the circle will not be labeled. On these trials, the blue circle will be on the screen for a while, and disappear. Then, two white circles will appear with the labels “Short” and “Long”. On these trials, select “Short” when you think that the blue circle was similar to the length of the short time, and select “Long” when you think that the blue circle was similar to the length of the long time. Note that sometimes will receive feedback for your choices, other times you will not receive feedback, but your responses will still be recorded.</td>
<td>Este experimento va a examinar como es su percepción temporal. Primero, la pregunta “LISTO?” va a aparecer en la pantalla. Cuando estés listo, presione el botón para empezar la tentativa. Después de un tiempo, un círculo azul va a aparecer en la pantalla. En algunas tentativas, este círculo va a tener el rótulo de “Corto” o “Largo”, y usted nada más tendrá que poner atención al tiempo que el círculo esté presente en la pantalla. En otras tentativas, el círculo no tendrá rótulos. En estas tentativas, el círculo azul estará en la pantalla por un tiempo y luego desaparecerá. Entonces, dos círculos blancos van a aparecer en la pantalla con los rótulos “Corto” y “Largo”. En esas tentativas, seleccione el “Corto” cuando cree que la duración del círculo azul fue similar a la duración corta; y seleccione “Largo” cuando cree que el círculo azul fue similar en duración al tiempo largo. <strong>Observe que algunas veces vas a recibir feedback por tus elecciones, otras veces no vas a recibir feedback, pero tus respuestas serán grabadas.</strong></td>
</tr>
</tbody>
</table>
Appendix G:

Graphic Explanation of the Bisection Procedure Task
After the participant pressed the button on the screen labeled “Press here if you are ready”, this is what appeared on the screen (first ten trials):

If it was a “short” trial, the label “SHORT” appeared on the bottom of the screen, and the blue circle was visible for 2 s. If it was a “long” trial, the label “LONG” appeared on the screen, and the blue circle was visible for 4 s. After the duration of the sample elapsed, the circle disappeared and the next trial started.

For the next ten trials, the sequence was the following:

1. Sample presentation for either 2 s (“short” trials) or 4 s (“long” trials):

2. Comparisons presentation:

   Was it a SHORT or a LONG stimulus?

   SHORT

   LONG

3. After the participants responded, there was the feedback. If it was a correct response (selecting “SHORT” in the “short” trials or “LONG” in the “long” trials, the feedback was “Correct!”). Else, it was “Incorrect”:

   CORRECT!
Appendix H:

Barratt Impulsiveness Scale (BIS-11)

English Format
People think and behave differently in different situations. This is a scale to measure the ways that you behave and think. Answer quickly and honestly.

<table>
<thead>
<tr>
<th></th>
<th>Rarely/Never</th>
<th>Occasionally</th>
<th>Often</th>
<th>Almost</th>
<th>Always/Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I plan tasks carefully.</td>
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<tr>
<td>2</td>
<td>I do things without thinking.</td>
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<tr>
<td>3</td>
<td>I make-up my mind quickly.</td>
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<tr>
<td>4</td>
<td>I am happy-go-lucky.</td>
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<tr>
<td>5</td>
<td>I don’t “pay attention”.</td>
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<td>6</td>
<td>I have “racing” thoughts.</td>
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<td>7</td>
<td>I plan trips well ahead of time.</td>
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<td>8</td>
<td>I am self-controlled.</td>
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<td>9</td>
<td>I concentrate easily.</td>
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<td>10</td>
<td>I save regularly.</td>
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<tr>
<td>11</td>
<td>I “squirm” at plays or lectures.</td>
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<tr>
<td>12</td>
<td>I am a careful thinker.</td>
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<tr>
<td>13</td>
<td>I plan for job security.</td>
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<tr>
<td>14</td>
<td>I say things without thinking.</td>
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<tr>
<td>15</td>
<td>I like to think about complex problems.</td>
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<tr>
<td>16</td>
<td>I change jobs.</td>
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<tr>
<td>17</td>
<td>I act “on impulse”.</td>
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<tr>
<td>18</td>
<td>I get easily bored when solving thought problems.</td>
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<td>19</td>
<td>I act on the spur of the moment.</td>
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<tr>
<td>20</td>
<td>I am a steady thinker.</td>
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<tr>
<td>21</td>
<td>I change residences.</td>
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<td>22</td>
<td>I buy things on impulse.</td>
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<tr>
<td>23</td>
<td>I can only think about one problem at a time.</td>
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<tr>
<td>24</td>
<td>I change hobbies.</td>
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<tr>
<td>25</td>
<td>I spend or change more than I earn</td>
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<tr>
<td>26</td>
<td>I often have extraneous thoughts when thinking</td>
<td></td>
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<tr>
<td>27</td>
<td>I am more interested in the present than the future</td>
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<tr>
<td>28</td>
<td>I am restless at the theater or lectures</td>
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<tr>
<td>29</td>
<td>I like puzzles</td>
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<tr>
<td>30</td>
<td>I am future oriented</td>
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</tbody>
</table>
Appendix H.2:

Barratt Impulsiveness Scale (BIS-11)

Spanish Format
Las personas son diferentes en cuanto a la forma en que se comportan y piensan en distintas situaciones. Esta es una prueba para medir algunas de las formas en que usted actúa y piensa. Responda rápida y honestamente.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Raremente o Nunca</th>
<th>Ocasionadamente</th>
<th>A menudo</th>
<th>Siempre o casi siempre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planifico mis tareas con cuidado.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hago las cosas sin pensarlas.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Casi nunca me tomo las cosas a pecho. (No me perturbo con facilidad.)</td>
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<tr>
<td>4</td>
<td>Mis pensamientos pueden tener gran velocidad. (Tengo pensamientos que van muy rápido en mi mente).</td>
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<tr>
<td>5</td>
<td>Planifico mis viajes con antelación.</td>
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<tr>
<td>6</td>
<td>Soy una persona con autocontrol.</td>
<td></td>
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<tr>
<td>7</td>
<td>Me concentro con facilidad. (Se me hace fácil concentrarme).</td>
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<tr>
<td>8</td>
<td>Ahorro con regularidad.</td>
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<tr>
<td>9</td>
<td>Se me hace difícil estar quieto por largos períodos de tiempo.</td>
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<tr>
<td>10</td>
<td>Pienso las cosas cuidadosamente.</td>
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<tr>
<td>11</td>
<td>Planifico para tener un empleo fijo. (Me esfuerzo por asegurar que tendrá dinero para pagar por mis gastos.)</td>
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<tr>
<td>12</td>
<td>Digo las cosas sin pensarlas.</td>
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<tr>
<td>13</td>
<td>Me gusta pensar sobre problemas complicados. (Me gusta pensar sobre problemas complejos.)</td>
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<tr>
<td>14</td>
<td>Cambio de trabajo frecuentemente. (No me quedo en el mismo trabajo por largos períodos de tiempo.)</td>
<td></td>
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<tr>
<td>15</td>
<td>Actúo impulsivamente.</td>
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<tr>
<td>16</td>
<td>Me aburro con facilidad tratando de resolver problemas en mi mente. (Me aburre pensar en algo por demasiado tiempo.)</td>
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<tr>
<td>17</td>
<td>Visito al médico y al dentista con regularidad.</td>
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<tr>
<td>Nº</td>
<td>Pregunta</td>
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<td>-------------------------------------------------------------------------------------------</td>
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<tr>
<td>18</td>
<td>Hago las cosas en el momento que se me ocurren.</td>
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<tr>
<td>19</td>
<td>Soy una persona que piensa sin distraerse. (Puedo enfocar mi mente en una sola cosa por mucho tiempo.)</td>
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<tr>
<td>20</td>
<td>Cambio de vivienda a menudo. (Me mudo con frecuencia o no me gusta vivir en el mismo sitio por mucho tiempo.)</td>
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<tr>
<td>21</td>
<td>Compro cosas impulsivamente.</td>
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<tr>
<td>22</td>
<td>Yo termino lo que empiezo.</td>
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<tr>
<td>23</td>
<td>Camino y me muevo con rapidez.</td>
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<tr>
<td>24</td>
<td>Resuelvo los problemas experimentando. (Resuelvo los problemas tratando una posible solución y viendo si funciona.)</td>
<td></td>
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<tr>
<td>25</td>
<td>Gasto efectivo o en crédito más de lo que gano. (Gasto más de lo que gano.)</td>
<td></td>
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<tr>
<td>26</td>
<td>Hablo rápido.</td>
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<tr>
<td>27</td>
<td>Tengo pensamientos extraños cuando estoy pensando. (A veces tengo pensamientos irrelevantes cuando estoy pensando.)</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>28</td>
<td>Me interesa más el presente que el futuro.</td>
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<tr>
<td>29</td>
<td>Me siento inquieto en clases o charlas. (Me siento inquieto si tengo que oír a alguien hablar por un largo período de tiempo.)</td>
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<tr>
<td>30</td>
<td>Planifico para el futuro. (Me interesa más el futuro que el presente.)</td>
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</tbody>
</table>
Appendix I:

Zimbardo's Stanford Time Perspective Inventory (ZTPI)

English Format Participant #
How characteristic or true is this of you?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>very characteristic</th>
<th>uncharacteristic</th>
<th>neutral</th>
<th>characteristic</th>
<th>very characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I believe that getting together with one's friends to party is one of life's important pleasures.</td>
<td></td>
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<tr>
<td>2</td>
<td>Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories.</td>
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<tr>
<td>3</td>
<td>Fate determines much in life</td>
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<tr>
<td>4</td>
<td>I often think of what I should have done different in my life.</td>
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<tr>
<td>5</td>
<td>My decisions are mostly influenced by people and things around me.</td>
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<tr>
<td>6</td>
<td>I believe that a person's day should be planned ahead each morning.</td>
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<tr>
<td>7</td>
<td>It gives me pleasure to think about my past.</td>
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<tr>
<td>8</td>
<td>I do things impulsively.</td>
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<tr>
<td>9</td>
<td>If things don't get done on time, I don't worry about it.</td>
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<tr>
<td>10</td>
<td>When I want to achieve something, I set goals and consider specific means for reaching those goals.</td>
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<tr>
<td>11</td>
<td>On balance, there is much more good to recall than bad in my past.</td>
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<tr>
<td>12</td>
<td>When listening to my favorite music, I often lose track of time.</td>
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<tr>
<td>13</td>
<td>Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play.</td>
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<tr>
<td>14</td>
<td>Since whatever will be will be, it doesn't really matter what I do.</td>
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<tr>
<td>15</td>
<td>I enjoy stories about how things used to be in the “good old times”.</td>
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<tr>
<td>16</td>
<td>Painful past experience keep being replayed in my mind.</td>
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<tr>
<td>17</td>
<td>I try to live my life as fully as possible, one day at a time.</td>
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<tr>
<td>18</td>
<td>It upsets me to be late for appointments.</td>
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<tr>
<td>19</td>
<td>Ideally, I would live each day as if it were my last day.</td>
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<tr>
<td>20</td>
<td>Happy memories of good times spring readily to mind.</td>
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<tr>
<td>21</td>
<td>I meet my obligations to friends and authorities on time.</td>
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<tr>
<td>22</td>
<td>I’ve taken my share of abuse and rejection in the past.</td>
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</tr>
<tr>
<td>23</td>
<td>I make decisions on the spur of the moment.</td>
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<tr>
<td>24</td>
<td>I take each day as it is rather than to plan it out.</td>
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</tr>
<tr>
<td>25</td>
<td>The past has too many unpleasant memories that I prefer not to think about.</td>
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<tr>
<td>26</td>
<td>It is important to put excitement in my life.</td>
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</tr>
<tr>
<td>27</td>
<td>I’ve made mistakes in the past that I wish I could undo.</td>
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</tr>
<tr>
<td>28</td>
<td>I feel that it’s more important to enjoy what you’re doing than to get work done on time.</td>
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<tr>
<td>29</td>
<td>I get nostalgic about my childhood.</td>
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<tr>
<td>30</td>
<td>Before making a decision, I weigh the costs against the benefits.</td>
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<tr>
<td>31</td>
<td>Taking risks keeps my life from becoming boring.</td>
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<tr>
<td>32</td>
<td>It is more important for me to enjoy life’s journey than to focus only on the destination.</td>
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<td></td>
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</tr>
<tr>
<td>33</td>
<td>Things rarely work out as I expected.</td>
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<tr>
<td>34</td>
<td>It’s hard for me to forget unpleasant images of my youth.</td>
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<tr>
<td>35</td>
<td>It takes joy out of the process and flow of my activities, if I have to think about goals, outcomes, and products.</td>
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<tr>
<td>36</td>
<td>Even when I am enjoying the present, I am drawn back to comparisons with similar past experiences.</td>
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<tr>
<td>37</td>
<td>You can’t really plan for the future because things change so much.</td>
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<tr>
<td>38</td>
<td>My life path is controlled by forces I cannot influence.</td>
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<tr>
<td>39</td>
<td>It doesn’t make sense to worry about the future, since there is nothing that I can do about it anyway.</td>
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<tr>
<td>40</td>
<td>I complete projects on time by making steady progress.</td>
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<tr>
<td>41</td>
<td>I find myself tuning out when family members talk about the way things used to be.</td>
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<tr>
<td>42</td>
<td>I take risks to put excitement in my life.</td>
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<tr>
<td>43</td>
<td>I make lists of things to do.</td>
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<tr>
<td>44</td>
<td>I often follow my heart more than my head.</td>
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<tr>
<td>45</td>
<td>I am able to resist temptations when I know that there is work to be done.</td>
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<tr>
<td>46</td>
<td>I find myself getting swept up in the excitement of the moment.</td>
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<tr>
<td>47</td>
<td>Life today is too complicated; I would prefer the simpler life of the past.</td>
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<tr>
<td>48</td>
<td>I prefer friends who are spontaneous rather than predictable.</td>
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<tr>
<td>49</td>
<td>I like family rituals and traditions that are regularly repeated.</td>
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<tr>
<td>50</td>
<td>I think about the bad things that have happened to me in the past.</td>
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<tr>
<td>51</td>
<td>I keep working at difficult, uninteresting task if they will help me get ahead.</td>
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</tr>
<tr>
<td>52</td>
<td>Spending what I earn on pleasures today is better than saving for tomorrow’s security.</td>
<td></td>
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<tr>
<td>53</td>
<td>Often luck pays off better than hard work.</td>
<td></td>
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<tr>
<td>54</td>
<td>I think about the good things that I have missed out in my life.</td>
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<tr>
<td>55</td>
<td>I like my close relationships to be passionate.</td>
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<tr>
<td>56</td>
<td>There will always be time to catch up on my work.</td>
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</tbody>
</table>
Appendix I.2:

Zimbardo’s Stanford Time Perspective Inventory (ZTPI)

Spanish Format Participant #
¿Cuán característico eso es de usted?

<table>
<thead>
<tr>
<th></th>
<th>Para nada característica</th>
<th>No es característica</th>
<th>Neutral</th>
<th>Característica</th>
<th>Muy característica</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pienso que reunirse con los amigos en una fiesta es uno de los placeres más importantes de la vida.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Las imágenes, sonidos y olores de la infancia traen recuerdos maravillosos.</td>
<td></td>
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<tr>
<td>3</td>
<td>El destino determina mucho de mi vida.</td>
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<tr>
<td>4</td>
<td>A menudo pienso en las cosas tan diferentes que pudiera haber hecho en mi vida.</td>
<td></td>
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<tr>
<td>5</td>
<td>Mis decisiones están muy influidas por las personas y las cosas que me rodean.</td>
<td></td>
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<tr>
<td>6</td>
<td>Creo que el día de una persona debería planificarse por la mañana.</td>
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<tr>
<td>7</td>
<td>Me gusta pensar en el pasado.</td>
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<tr>
<td>8</td>
<td>Hago cosas impulsivamente.</td>
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<tr>
<td>9</td>
<td>No me preocupa si las cosas no se hacen a tiempo.</td>
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<tr>
<td>10</td>
<td>Cuando quiero conseguir algo, me fijo unas metas y considero los medios para poder conseguirlas.</td>
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<tr>
<td>11</td>
<td>Si los pongo en una balanza, tengo mucho más recuerdos buenos que malos.</td>
<td></td>
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<tr>
<td>12</td>
<td>Cuando escucho mi música favorita, pierdo la noción del tiempo.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13</td>
<td>Preparar el trabajo para el día siguiente y cumplir con los plazos se antepone a la diversión de hoy en la noche.</td>
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<tr>
<td>14</td>
<td>Ya que las cosas serán lo que serán, realmente no me preocupa lo que pase.</td>
<td></td>
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<tr>
<td>15</td>
<td>Me divierten las historias sobre cómo eran las cosas en los &quot;viejos tiempos&quot;.</td>
<td></td>
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<tr>
<td>16</td>
<td>Las experiencias dolorosas del pasado permanecen en mi memoria.</td>
<td></td>
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<tr>
<td>17</td>
<td>De una vez por todas, voy a vivir mi vida tan plenamente como sea posible.</td>
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<tr>
<td>18</td>
<td>Me molesta mucho llegar tarde a mis citas o compromisos.</td>
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<tr>
<td>19</td>
<td>Idealmente, viviría cada día como si fuese el último.</td>
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<tr>
<td>20</td>
<td>Los recuerdos felices de los buenos tiempos están muy presentes en mi mente.</td>
<td></td>
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<tr>
<td>21</td>
<td>Cumplo con las obligaciones para con mis amigos y jefes a tiempo.</td>
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<tr>
<td>22</td>
<td>He tenido mi ración de abuso y rechazo en el pasado.</td>
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<tr>
<td>23</td>
<td>Tomo mis decisiones en el mismo momento en que actúo.</td>
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<tr>
<td>24</td>
<td>Afronto cada día como viene, sin intentar planificarlo.</td>
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<tr>
<td>25</td>
<td>El pasado tiene demasiados momentos desagradables y prefiero no pensar en ellos.</td>
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<tr>
<td>26</td>
<td>Es importante poner excitación a mi vida.</td>
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<tr>
<td>27</td>
<td>He cometido errores en el pasado que aja pudieran deshacerse.</td>
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<tr>
<td>28</td>
<td>Es más importante divertirse con lo que uno está haciendo que conseguir hacer la tarea a tiempo.</td>
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<tr>
<td>29</td>
<td>Tengo nostalgia de mi infancia.</td>
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<tr>
<td>30</td>
<td>Antes de tomar una decisión, valoro los costes y beneficios.</td>
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<tr>
<td>31</td>
<td>Tomar riesgo hace que mi vida no sea aburrida.</td>
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<tr>
<td>32</td>
<td>Es más importante para mí divertirme cada día de mi vida que estar pensando en el destino que me espera.</td>
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<tr>
<td>33</td>
<td>Pocas veces salen las cosas como yo quiero.</td>
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<tr>
<td>34</td>
<td>Es difícil olvidar imágenes desagradables de mi infancia.</td>
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<tr>
<td>35</td>
<td>Cuando pienso en mis metas y las cosas que he hecho, me siento feliz por el proceso que he seguido y las actividades que he hecho.</td>
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<tr>
<td>36</td>
<td>Incluso cuando me divierto en el presente, retrocedo en el tiempo para compararme con momentos pasados parecidos.</td>
<td></td>
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<tr>
<td>37</td>
<td>Uno no puede planificar el futuro porque las cosas cambian mucho.</td>
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<tr>
<td>38</td>
<td>El camino de mi vida está controlado por fuerzas en las que no puedo influir.</td>
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<tr>
<td>39</td>
<td>No tiene sentido preocuparme por el futuro ya que de todos modos no puedo hacer nada.</td>
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<tr>
<td>40</td>
<td>Terminó mis proyectos a tiempo, avanzando de manera estable y continua.</td>
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</tr>
<tr>
<td>41</td>
<td>Me encuentro “fuera de onda” cuando los miembros de mi familia hablan de cómo solían ser las cosas.</td>
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<tr>
<td>42</td>
<td>Me arriesgo para poner excitación en mi vida.</td>
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<tr>
<td>43</td>
<td>Hago listas de cosas para hacer.</td>
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<tr>
<td>44</td>
<td>Con frecuencia sigo lo que me dice el corazón más que la cabeza.</td>
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<tr>
<td>45</td>
<td>Soy capaz de resistirme a las tentaciones cuando sé que hay trabajo que hacer.</td>
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<tr>
<td>46</td>
<td>Me dejo llevar por la excitación del momento.</td>
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<tr>
<td>47</td>
<td>La vida de hoy es demasiado complicada, preferiría la vida más sencilla de antes.</td>
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<tr>
<td>48</td>
<td>Prefiero amigos que son espontáneos más que predecibles.</td>
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<tr>
<td>49</td>
<td>Me gustan los rituales y tradiciones familiares que se repiten regularmente.</td>
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<tr>
<td>50</td>
<td>Pienso en las cosas malas que me han ocurrido en el pasado.</td>
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</tr>
<tr>
<td>51</td>
<td>Me manto trabajando en tareas poco interesantes si estas me ayudan a salir adelante.</td>
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<tr>
<td>52</td>
<td>Gastar lo que gano en placer hoy, es mejor que ahorrarlo para la seguridad del mañana.</td>
<td></td>
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<tr>
<td>53</td>
<td>Con frecuencia la suerte compensa más que el duro trabajo.</td>
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<tr>
<td>54</td>
<td>Pienso en las cosas buenas que me he perdido en mi vida.</td>
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</tr>
<tr>
<td>55</td>
<td>Me gusta ser apasionado en mis relaciones íntimas.</td>
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<tr>
<td>56</td>
<td>Siempre habrá tiempo para ponerme al día en el trabajo.</td>
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</table>
Appendix J:

Short Acculturation Scale—English Version
ENGLISH VERSION

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
<th>Options</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>In general, what language do you read and speak?</td>
<td>Only Spanish, Spanish better than English, English, Both equally, English better than Spanish, Only English</td>
</tr>
<tr>
<td>2</td>
<td>What was the language(s) you used as a child?</td>
<td></td>
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<tr>
<td>3</td>
<td>What language do you usually speak at home?</td>
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<tr>
<td>4</td>
<td>In which language do you usually think?</td>
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<tr>
<td>5</td>
<td>What language do you usually speak with your friends?</td>
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<tr>
<td>6</td>
<td>In what language(s) are the T.V. programs you usually watch?</td>
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<tr>
<td>7</td>
<td>In what language(s) are the radio programs you usually listen to?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>In general, in what language(s) are the movies, T.V., and radio programs you prefer to watch and listen to?</td>
<td>Only English, More Latinos than Americans, About half and half, More Americans than Latinos, All Americans</td>
</tr>
<tr>
<td>9</td>
<td>Your close friends are:</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>You prefer going to social gatherings/parties at which people are:</td>
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<tr>
<td>11</td>
<td>The persons you visit or who visit you are:</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>If you could choose your children’s friends, you would want them to be:</td>
<td></td>
</tr>
</tbody>
</table>
Appendix J.2:

Short Acculturation Scale–Spanish Version
### SPANISH VERSION

<table>
<thead>
<tr>
<th></th>
<th>Sólo Español</th>
<th>Más Español que Inglés</th>
<th>Ambos por igual</th>
<th>Más Inglés que Español</th>
<th>Sólo Inglés</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>¿Por lo general, ¿qué idioma(s) lee y habla usted?</td>
<td></td>
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<tr>
<td>2</td>
<td>¿Cuál fue el idioma(s) que habló cuando era niño(a)?</td>
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<tr>
<td>3</td>
<td>¿Por lo general, ¿qué idioma(s) habla en su casa?</td>
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<tr>
<td>4</td>
<td>¿Por lo general, ¿en qué idioma(s) piensa?</td>
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<tr>
<td>5</td>
<td>¿Por lo general, ¿qué idioma(s) habla con sus amigos?</td>
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<tr>
<td>6</td>
<td>¿Por lo general, ¿en qué idioma(s) son los programas de televisión que usted ve?</td>
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<tr>
<td>7</td>
<td>¿Por lo general, ¿en qué idioma(s) son los programas de radio que usted escucha?</td>
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<tr>
<td>8</td>
<td>¿Por lo general, ¿en qué idioma(s) prefiere oir y ver películas, y programas de radio y televisión?</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Sólo Latinos</th>
<th>Más Latinos Americanos</th>
<th>Casi igual</th>
<th>Más Americanos Latinos</th>
<th>Sólo Americanos</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Sus amigos y amigas más cercanos son:</td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>Usted prefiere ir a reuniones sociales/fiestas en las cuales las personas son:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Las personas que usted visita o que le visitan son:</td>
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<tr>
<td>12</td>
<td>Si usted pudiera escoger los amigos(as) de sus hijos(as), quisiera que ellos(as) fueran:</td>
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</table>
Appendix K:
Demographic Questionnaire
Experiments I and II
English Version
Participant Information – Decision Making Study

Participant #

*Please answer the following questions. Let the research assistant know if she can clarify something for you.*

1. How old are you? _______________

2. What is your ethnicity?  
   For example, White, Caucasian, Hispanic, Latino

3. How long have you been living in the U.S.? ____________

4. What is your gender (sex)? _______________

5. What is your monthly income? _______________

6. Would you say you grew up in a rural or urban area? ____________

7. In which country have you lived the most part of your life? ____________

8. How many years of education have you completed? _______________

9. What is your major? _______________

10. Do you smoke cigarettes? ___ Yes ___ No  
    a. If yes, how often? How much? What type?

11. Do you drink alcohol? ___ Yes ___ No  
    a. If yes, how often? How much? What type?

12. How much would you estimate is the monthly income of your parents? 
    ____________
13. Do you receive financial help from your parents? Yes ___ No ___

14. What is your father’s occupation? ______________

15. What is your mother’s occupation? ______________

16. How many siblings do you have? ____________

17. You live _____ on campus _____ off campus
    _____ with roommates (how many? _____)
    _____ by yourself

18. Do you have enough money to ….

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Almost always</th>
<th>Rarely</th>
<th>Never</th>
<th>N/A</th>
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<tr>
<td>Buy food</td>
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<tr>
<td>Buy gasoline for the car</td>
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<tr>
<td>Pay the bills</td>
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<tr>
<td>Maintain the house</td>
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<tr>
<td>Buy school materials</td>
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<tr>
<td>Buy the clothes that you need</td>
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<tr>
<td>Buy the clothes that you want</td>
<td></td>
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<tr>
<td>Do fun activities, such as going to the movies, restaurants</td>
<td></td>
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</tr>
<tr>
<td>Buy gifts for special occasions</td>
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</table>

19. How many people live at your parents’ house? __________
    If they live separate, how many people live at your mother’s house? _____
    how many people live at your father’s house? _____
20. Does your mother have enough money to .....  

<table>
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<tr>
<td>Pay the bills</td>
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<td>Maintain the house</td>
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<tr>
<td>Buy the clothes that she needs</td>
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<tr>
<td>Buy the clothes that she wants</td>
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<tr>
<td>Do fun activities, such as going to the movies, restaurants</td>
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<tr>
<td>Buy gifts for special occasions</td>
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</table>

21. Does your father have enough money to .....  

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<th>Rarely</th>
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<td>Buy food</td>
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<td>Buy gasoline for the car</td>
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<tr>
<td>Buy the clothes that he needs</td>
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Appendix K.2:

Demographic Questionnaire

Experiment II

Spanish Version
Por favor, conteste las próximas preguntas. Deje saber a la investigadora si necesitas de más clarificación.

1. ¿Cuántos años tienes? ________________
2. ¿Cuál es tua etnia? ________________

Por ejemplo, Blanco, Hispano/a, Latina/o

3. ¿Hace cuánto tiempo vives en los EUA? ________________
4. ¿Cuál es tu género (sexo)? ________________
5. ¿Cuánto recibes por mes? ________________
6. ¿Dirías que creciste en un área rural o urbana? ________________
7. ¿En cuál País has vivido la mayor parte de tu vida? ________________
8. ¿Cuántos años completos de educación tienes? ________________
9. ¿Cuál es tu major? ________________
10. ¿Fumas cijarrillos? ___ Sí ___ No
    a. Si sí, ¿cuánto fumas?, ¿cuan frecuentemente fumas? y ¿qué fumas?
11. ¿Bebes alcohol? ___ Sí ___ No
    b. Si sí, ¿cuánto bebes?, ¿cuan frecuentemente bebes? y ¿qué bebes?
12. ¿A cuánto estimarías que ganan sus padres por mes? ________________
13. ¿Recibes ayuda financiera de tus padres? Sí ___ No ___
14. ¿Cuál es la ocupación de tu padre? ________________

15. ¿Cuál es la ocupación de tu madre? ________________

16. ¿Cuántos hermanos tienes? __________

17. Vives _____ en el campus _______ fuera del campus

_________ con roommates (¿cuántos? _______)

______ sólo/a

18. Tienes dinero suficiente para _____

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<tr>
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<th>Casi nunca</th>
<th>Nunca</th>
<th>No se aplica</th>
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<tr>
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<td>Pagar las cuentas</td>
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<tr>
<td>Mantener la casa arreglada</td>
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<td>Hacer cosas divertidas, como ir al cine o a un restaurant</td>
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</table>

19. ¿Cuántas personas viven en la casa de tus padres? __________

Si ellos viven separados, ¿cuántas personas viven en la casa de tu madre? _______

¿Cuántas personas viven en la casa de tu padre? ______
20. ¿Tiene tu madre dinero suficiente para ..... 

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21. ¿Tiene tu padre dinero suficiente para ..... 

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Appendix L:

Telephone Screen Experiment II for

White American Sample
Telephone Screening Sheet – Decision Making Study

English Version

Participant # ______________

Identify yourself and the reason that you are calling. Ask potential participant if this is a convenient time for them to answer a few questions for some information that you need to know to see if they can participate in the study.

1. How old are you? ______________ (<18 not eligible, read the instructions below)

2. What is your ethnicity? ______________ (only Latinos* and White Americans are eligible to participate in the study, but finish items)

3. How long have you lived in the US? ______________

4. Have you ever left the U.S? ______

   If yes:

   What was the greatest amount of time that you have been outside the U.S. at one time? ___

   Thinking about all the time you have spent outside the U.S., what is the total time? ____

5. Have you been living in the U.S. for the past year? ______

Read one of the following, depending on participants’ answers:

White American over than 18 years old, considering themselves as either White American or Caucasian, with at least 70% of his/her life living in the U.S., and not being out of the U.S. for more than 1 year at a time: “Thank you for answering my questions. I’d like to schedule a time for you to participate in the study. What are some times in the next few days that would work for you?”

White American under 18 years old, have lived more than 1 year continuously outside the U.S. at a time and/or spent more than 70% of their life out of the U.S.: “Thank you for answering my questions. We need participants with somewhat different characteristics at this time, so we will not be able to have you participate in the study. Thank you for your time.” * see the phone screen for Latinos.
Appendix L.2:

Telephone Screen Experiment II

for Spanish Format
Identifique-se y explique la razón de su llamada. Pregunte al participante en potencial si es un horario conveniente para que él/ella conteste algunas preguntas para que obtengas algunas informaciones que necesitas para que veas si ellos pueden participar del estudio.

1. ¿Cuántos años tienes? ____________ (<18 no puede participar, lea las instrucciones abajo)
2. ¿Cuál es tu etnia? ________________ (solamente Latinos y Americanos pueden participar en el estudio, pero termine las preguntas)
3. ¿De qué País eres? ________________
   1. ¿Por cuánto tiempo has vivido en tu País de origen? ___________
   2. ¿Has salido/viajado fuera de tu País?
   Si sí:
   ¿Cuál fue la cantidad máxima de tiempo continuo que has pasado lejos de tu País?
   ___________
   ¿Cuál es la cantidad total en que has pasado fuera de tu País? ___________
3. ¿Por cuánto tiempo has vivido en los Estados Unidos? ___________
4. ¿Hace cuánto tiempo llegaste a los Estados Unidos? ___________

Lea una de las siguientes frases, dependiendo de las respuestas de los participantes:

Latinos mayores que 18 años, con máximo de 1 año lejos de su País de origen, con menos de 2 años, pero con mínimo de 1 mes viviendo en los Estados Unidos: “Gracias por responder a mis preguntas. Me gustaría ver una hora para que vengas participar del estudio. ¿Cuáles son algunos horarios en los próximos días que serían buenos para usted?”

Latinos con más de 2 años viviendo en los Estados Unidos y/o menos que 18 años y/o con más de un año fuera de su País de origen: “Gracias por contestar a mis preguntas. Nosotros necesitamos de participantes con algunas características un poco diferentes en este momento, entonces no podremos tenerlo en este estudio. Gracias por su tiempo.”

* Si los participantes dicen que son Hispánicos, ellos también participarán del estudio. Personas de los siguientes países podrán participar como Latinos: Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, República Dominicana, Ecuador, El Salvador, Guatemala, Honduras, México, Nicaragua, Panamá, Paraguay, Perú, Puerto Rico, Uruguay y Venezuela.
CURRICULUM VITAE

Ana Amelia L. Baumann das Neves
(Ana A. L. Baumann)
September, 2008

CONTACT INFORMATION

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St Louis, MO 63112
Telephone: (435) 757-1576
E-mail: baumann.ana@gmail.com
Spouse: Jordan R. Baumann Walker
Married name: Ana Amelia Baumann Walker

EDUCATIONAL HISTORY

2008 Ph.D., Psychology, Behavior Analysis
Utah State University.
Chairs: Amy Odum, Ph.D. and Melanie Domenech Rodríguez, Ph.D
Dissertation: Are delay discounting, probability discounting and time
perception related? A cross-cultural study among Latino and White
American students.

2002 M.A., Behavior Analysis
Programa de Analise do Comportamento (Behavior Analysis Program)
Universidade de Brasilia (UnB), Brazil.
Advisor: Josele Abreu-Rodrigues, Ph.D.
Thesis: Instrucao e Auto-Instrucao: Efeitos da variabilidade
comportamental [Instruction and Self-Instruction: Effects of behavioral
variability]

2000 B.A., Psychology
UniCEUB, Brasilia, Brazil.
AWARDS

2007 Robins Award for Graduate Researcher of the Year (2006-2007), Utah State University.
Award given to one student per year for hard work and dedication to individual goals and to the goals of USU.

2007 Graduate Research Assistant of the Year (2006-2007), College of Education and Human Services, Utah State University.
Award given to one student per year for hard work and dedication to individual goals and to the goals of the College.

2007 Walter R. Borg Scholarship from Psychology Department; College of Education and Human Services of Utah State University ($5,000).
Scholarship given to one student per year who demonstrates academic achievement, financial need, and personal integrity.

2006 National Latino/a Psychological Association Distinguished Student Service Award, nominee. Award given to a graduate student who has made outstanding service contributions to the US Latina/o community.

PROFESSIONAL ACTIVITIES

Research

Positions

2008 – Present Postdoctoral Research Associate at the Center for Latino Family Research, George Warren Brown School of Social Work, Washington University in St. Louis
Mentor: Dr. Luis Zayas

2006 – 2008 Research Assistant, Latino Family Research Laboratory, Department of Psychology, Utah State University.
Principal Investigator: Melanie Domenech Rodriguez, Ph.D.
Parenting intervention with Latino families.
2006 – 2007  
*Research Assistant*, Storytelling for Home Enrichment of Language and Literacy Skills (SHELLS) Project.  
Early Intervention Research Institute, Utah State University.  
Principal Investigator: Lisa Boyce, Ph.D.  
*Increasing literacy through parent-child interaction with Latino families.*

2005 - 2006  
*Research Assistant*, Bilingual Early Language and Literacy Support (BELLS) Project.  
Early Intervention Research Institute, Utah State University.  
Principal Investigator: Mark Innocenti, Ph.D.  
*Increasing literacy of low-income Latino children.*

**Grants**

2007  
Psi Chi – The National Honor Society in Psychology ($1,500)  
“A cross-cultural comparison of delay discounting: Are Latinos more impulsive than White Americans?”

2007  
American Psychological Association Dissertation Research Award ($1,000)  
“Are delay discounting, probability discounting and time perception related? A cross-cultural study among Latino and White American students”

**PUBLICATIONS**

**Under review**


**In press**


In print


In preparation


**CONFERNCe PRESENTATIONS: PAPERS**

Baumann, A., & Odum, A. L. (2009, May). Relationship between impulsivity, risk taking, time perception and time perspective. In A. Baumann (Chair), Recent research on delay discounting and timing. Symposium to be presented at the 35th annual meeting of the Association for Behavior Analysis, Phoenix, AZ.


CONFERENCE PRESENTATIONS: POSTERS


TEACHING

2008 (Summer-Fall)  
Teaching Assistant. Scientific Thinking and Methods (Psy 3500 online). Utah State University

2008 (Summer)  
Instructor. Multicultural Psychology (Psy 4240 online). Utah State University

2006 (Summer)  
Instructor. Behavior Analysis: Basic Processes (Psy 1400 online). Utah State University
2006 (Spring) Teaching Assistant. Educational Psychology (Psy 3660). Utah State University

2005 (Summer) Instructor. Behavior Analysis: Basic Processes (Psy 1400 online). Utah State University


2002 (Fall) Instructor. Análise do Comportamento [Behavior Analysis]. Universidade de Brasília, Brazil

2001 (Fall) Teaching Assistant. Advanced Behavior Analysis. UnB, Brazil

2000-2002 Instructor. Different mini-courses on Behavior Analysis. Instituto Brasiliense de Análise do Comportamento, IBAC [Brazilian Institute of Behavior Analysis]

1997-1999 Teaching Assistant. Psychology and Physiology. UniCEUB, Brazil

PROFESSIONAL MEMBERSHIPS

American Psychological Association
Association for Behavior Analysis
Society for Quantitative Analyses of Behavior
Psi Chi, the National Honor Society in Psychology
National Latino/a Psychological Association
Associação Brasileira de Medicina Comportamental (ABPMC) [Brazilian Association of Behavioral Medicine]

REFERENCES - References available on request.