The Psychological Record, 2011, 61, 613–632

Theoretical Article

RELATION BETWEEN TIME PERSPECTIVE AND DELAY DISCOUNTING: A LITERATURE REVIEW

Ursina Teuscher and Suzanne H. Mitchell

Oregon Health & Science University

In this article, we examine the relation between delay discounting and future time perspective by reviewing how these concepts have been measured and quantified in order to assess their conceptual similarities. The extent to which the different measures are empirically related is reviewed by describing studies that have assessed both constructs and by comparing the variables that have been associated with variations in delay discounting and in time horizon. We suggest that both steep delay discounting and a short future time perspective are associated with a range of problematic and health-damaging behaviors, such as addictive disorders, risky behavior, poor school performance, and delinquency. However, despite these shared associations, and despite the conceptual similarities, the few studies that allow a direct comparison between measures of future time perspective and delay discounting do not give reason to presume a robust relation between them.

Key words: delay discounting, time perspective, decision making, impulsivity, intertemporal choice

Recently there has been an increasing level of interest in delay discounting, that is, the process of devaluing outcomes that occur in the future (e.g., Ainslie, 1974; Logue 1988; Rachlin & Green, 1972; for a review, see Green & Myerson, 2004). This process can be used to explain the observation that individuals will sometimes choose a smaller, more quickly available reward rather than a larger reward available later. Such choices have been thought of as impulsive or rash because waiting would result in a larger reward. Given the link between delay discounting and impulsive behavior, it is unsurprising that part of the interest in delay discounting is driven by the growing literature linking higher levels of discounting, and presumably heightened delay aversion, to a number of psychiatric diagnoses, for example, drug addiction, attention-deficit/hyperactivity disorder, and schizophrenia (see array of chapters in Madden & Bickel, 2010, for reviews). A number of researchers have suggested that heightened delay discounting is synonymous

Preparation of this article was supported by SHM Grant DA024195. The authors are grateful to Vanessa Wilson and Sarah Tappon for help with the references, proofreading, and feedback on a previous version of the article.

Correspondence concerning this article should be addressed to Ursina Teuscher or Suzanne Mitchell, Department of Behavioral Neuroscience, L470, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd., Portland, OR 97239-3098. E-mail: ursina@teuscher.ch

with having a foreshortened time horizon and considering only a limited period into the future (e.g., Petry, Bickel, & Arnett, 1998; Rachlin, Siegel, & Cross, 1994).

Although the literature is not specific about how these constructs interact, the use of the term *horizon* is somewhat at odds with the well-established discounting function in which the subjective value of an outcome declines smoothly as the delay increases. Rather, a horizon conceptualization would suggest a stepwise function for individuals, or at least that the value of a delayed item should decrease precipitously once the delay exceeds the individual's time horizon. Such an implied discontinuity in the delay discounting function has not been empirically observed. Proponents of a conceptual linkage between the two constructs might argue that the use of widely spaced delays in the typical discounting paradigm makes it difficult to see discontinuities. Further, they might explain the discounting function tending to an asymptote rather than falling to a predicted level of zero as being due to participants being reluctant to value a delayed reward as negligible. Research addressing these explanations would be useful. Nevertheless, it is important to examine the level of overlap between the constructs of delay discounting and time horizon (also known as future time perspective) because there is a large literature on each, which might suggest novel research directions if there proves to be a significant level of overlap.

To explore the extent of overlap between delay discounting and future time perspective, we first briefly examine how each has been defined and quantified so as to then assess their relative conceptual similarity. We also examine relative similarity suggested by studies in which both delay discounting and future time perspective have been measured and compare variables associated with variations in time horizon and in delay discounting. Measures of future time perspective can only be assessed in human participants, and for that reason the vast and interesting literature in which delay discounting has been studied in nonhuman animals will be ignored.

Measures and Conceptualizations of Delay Discounting and Future Time Perspective

As reviewed by Madden and Johnson (2010), delay discounting is ordinarily measured by examining the preference between a small reward available immediately or soon versus a larger reward available at a later time. By varying the amount of the sooner reward, researchers can identify the point at which study participants value the larger, later reward. Alternatively, by varying the length of the delay to the larger reward, researchers can obtain a series of values to describe the change in value of the larger, delayed reward as a function of delay length. Studies with humans have assessed discounting for delays ranging in length from minutes to years. Also, a variety of reward types have been used (e.g., food, stickers, money, juice), and studies have differed in whether study participants actually receive their chosen alternative or whether rewards are hypothetical. Usually the smaller, sooner and larger, later alternatives are presented in the form of a questionnaire, with participants indicating which of the two alternatives they prefer, rather than as an experiential task (for examples of alternative experiental tasks, see Mischel & Grusec, 1967; Reynolds, Karraker, Horn, & Richards, 2003; Schweighofer, Tanaka, & Doya, 2007). Although differing in their details, all

of these procedures attempt to quantify the extent to which an individual devalues reward outcomes as a function of the delay before the reward outcomes are available.

Compared with delay discounting, a larger array of very different approaches have been taken to assess future time perspective. These differences in approach to some degree reflect the fact that different measures take different views on what is meant by future time perspective (see also Shipp, Edwards, & Lambert, 2009, for an overview of different measures). Some researchers have asked participants to graphically represent the importance of the future relative to the past and present as a way of measuring future time perspective. For example, Cottle and Klineberg (1974) asked participants to draw circles representing the past, present, and future. Individuals with more extensive future time perspectives were those who drew a relatively larger circle for the future circle and drew it in such a way that it had limited overlap with the past or present circles (also see Cottle & Pleck, 1969). Such graphical methods have some face validity, but potential difficulties in standardization between individuals and quantification have led to such methods not being widely used.

Other measures are based on asking the participant to generate material that can be used to infer the length of an individual's temporal perspective within a clearly defined context. Thus, several groups of researchers have used a form of storytelling to measure future time perspective, asking participants to tell or complete a story, followed by a question such as "How much time was involved in the action of this story? How long would it have all taken if it had really happened?" (Barndt & Johnson, 1955; Leshan, 1952; Teahan, 1958). In a more structured form, based on the Thematic Apperception Test (TAT; Murray, 1943), Klineberg (1967) and other groups have asked participants to tell a story about TAT Cards 1 (boy with violin) and 14 (silhouette in window) and to estimate the span of time encompassed by the story. Klineberg (1967) suggested that this estimate, which he called "action time span," reflects the participants' spontaneous tendency to extend their thoughts beyond the present and to consider the longer range outcomes of the situation depicted. Participants with stories that moved further into the future were assumed to be exhibiting a longer future time perspective than those whose story ended after a shorter period into the future. As can be imagined, if the story does not provide well-defined time markers, determining the extent of its projection into the future is problematic. Further, variation in method of administration has been shown to affect future time perspective as measured with the TAT (Wohlford, 1968), and scoring does not consider story richness or detail.

Several other measures also have relied on participants to generate their own material, rather than use a structured context as previously described. Possibly the most widely used of these measures was devised by Wallace (1956). In Wallace's Future Events Test, participants were asked to name 10 events that refer to things that might happen to them during the rest of their lives and to indicate the age at which they thought each event would occur. The number of years between the participants' actual age and the most distant event given served as a measure of the extension of their time horizon (also see O'Rand & Ellis, 1974). In a similar task, Trommsdorff, Lamm, and Schmidt (1979) asked participants to list their hopes and fears. These were then categorized into various life domains (e.g., occupation)

by independent judges. These generative response tasks are configured in ways that permit simple scoring but have the characteristic of being highly susceptive to life-stage influence. For example, persons who have just had a child might generate very different items from persons of a similar age who have not. Measuring future time perspective using such a conceptualization is fraught with other complications (e.g., the number of significant events that can reasonably occur before death), and the technique provides a measure that does not reflect the depth and richness with which a person thinks about the future events.

Although it is not unreasonable to expect that life stage will influence future time perspective (Lang & Carstensen, 2002), there is an implicit expectation that there is a high degree of stability to future time perspective and an abstract value that can be assessed. Several questionnaire measures have been developed that adopt this approach by asking general questions about an individual's attitude toward future events. One of the most widely used measures of this type is the (Stanford) Zimbardo Time Perspective Inventory (ZTPI; see Zimbardo & Boyd, 1999, for a review). The ZTPI consists of five subscales: Past-Positive, reflecting a warm, sentimental, positive attitude toward the past; Past-Negative, reflecting a generally negative, aversive view of the past; Present-Hedonistic, reflecting a hedonistic, enjoyment- and pleasure-focused, risk-taking "devil may care" attitude toward time and life; Present-Fatalistic, measuring a fatalistic, helpless, and hopeless attitude toward the future and life; and Future, measuring a general future orientation that includes the planning for and achievement of future goals, often at the expense of present enjoyment, delayed gratification, and avoidance of time-wasting temptations (also see D'Alessio, Guarino, de Pascalis, & Zimbardo, 2003, and Keough, Zimbardo, & Boyd, 1999, for questionnaire variants focusing on one or more subscales). Similar, though not as widely adopted, measures have been developed recently to examine the degree to which individuals perceive their use of time as structured and purposive (Bond & Feather, 1988), the extent to which individuals plan for the future (Prenda & Lachman, 2001), and their consideration of future consequences (CFC; Strathman, Gleicher, Boninger, & Edwards, 1994).

Studies Directly Comparing Delay Discounting and Future Time Perspective

The different types of measures of future time perspective appear to have some, yet limited, overlap, and there has been little interest in comparing the measures systematically within the same study. Measures assessing the maximum distance of significant future events encapsulated by the Wallace (1956) questionnaire and the richer assessments of future plans and attitudes toward the future addressed by the ZTPI and CFC appear to have more in common with delay discounting, as all require a view of the future as a progression of events, with events further away in time as more distal. However, surprisingly, few researchers have measured both delay discounting and future time perspective in the same study.

Joireman, Balliet, Sprott, Spangenberg, and Schultz (2008) demonstrated that both the Immediate and the Future subscales of the CFC scale were related to performance on a discounting task. Specifically, results revealed that steeper discounting was related to lower scores on the

CFC-Future subscale, as well as higher scores on the CFC-Immediate subscale. Interestingly, CFC-Immediate scores were better correlated with delay discounting, perhaps reflecting the fact that delay discounting measures require individuals to assess the subjective value of future reward outcomes relative to immediate rewards. Moreover, an experimental manipulation directed at depleting self-control led to more temporal discounting only in individuals who scored high on the CFC-Immediate subscale. These findings are consistent with Joireman et al.'s susceptibility hypothesis, according to which concern with immediate consequences should be the best predictor of low self-control (i.e., people concerned with immediate consequences are susceptible to self-control failure). The findings are less consistent with their alternative buffering hypothesis, according to which concern with future consequences should be the best predictor of self-control (i.e., a concern with future consequences should buffer a person against self-control failure).

Daugherty and Brase (2010) also measured the relation between delay discounting (measured with the Monetary Choice Questionnaire; Kirby, Petry, & Bickel, 1999) and time perspective (measured with the ZTPI and CFC scales). Like Joireman et al. (2008), they found significant but small correlations (all rs < .2) between delay discounting and all measures of time perspective. In particular, steeper delay discounting was related to higher scores on the present subscales of the ZTPI (Present-Hedonistic and Present-Fatalistic) and to lower scores on the Future subscale of the ZTPI and on the CFC scale. Similarly, Steinberg et al. (2009) used a self-developed scale of future orientation as a self-report measure and found that it correlated significantly, although very modestly, with delay discounting (r = .18). Consistent with the hypothesis that time perspective may affect delay discounting, Liu and Aaker (2007) reported that young individuals who had experienced at least one cancer death among their acquaintances, compared to those who had not, made decisions that favored the long-term future over short-term interests. Furthermore, this group difference was eliminated when life course was made temporarily salient by envisioning the life of one's best friend 50 years later, suggesting that participants' attention on the future was underlying the group differences in delay discounting.

In contrast, two other studies that have measured both delay discounting and future time perspective in the same individuals have found them to show different patterns (direct correlations between measures were not reported as was done in the previously described studies). Fellows and Farah (2005) observed that people with frontal lobe injury showed a significantly foreshortened personal future time perspective as measured by Wallace's (1956) Future Events Test but did not discount delayed rewards more steeply than controls. These results are surprising, given the large number of studies that indicate that lesions to the prefrontal cortex in rats increase delay discounting (e.g., Mobini et al., 2002). It is possible that the results reflect group differences in the perception of mortality and a sense of urgency to accomplish life goals associated with having sustained a severe frontal lobe injury. These differences might influence the Wallace measure of future time perspective while not having an impact on discounting. Unfortunately, these consequences of experiencing a severe injury were not assessed.

In a second study, MacKillop, Anderson, Castelda, Mattson, and Donovick (2006) found that pathological gambling measures correlated with delay discounting performance and with the Impulsivity subscale of

the Eysenck Impulsivity Questionnaire (Eysenck & Eysenck, 1978), but not with measures of future time perspective (i.e., the ZTPI and Wallace's Future Events Test). Such a finding implies that measures of discounting and future time perspective would be not strongly related, given the modest correlation previously observed between discounting and measures of future time perspective.

Thus, on balance, it appears that there is a small, positive relation between measures of delay discounting and future time perspective in healthy populations. Unfortunately, the association does not appear to be highly robust and no causal mechanism is suggested by the literature. Another possible strategy to better understand the relation may be to examine factors for which the impacts on delay discounting and on measures of future time perspective have been assessed. If a large number of such factors exist for which the effects on each measure are similar, then it may be reasonable to conclude that the measures have some shared basis. Further, identification of these factors might provide useful information about mechanisms underlying the discounting/time perspective relation. The following two sections review studies of the association between delay discounting and future time perspective in populations that differ in their propensity to engage in unhealthy behaviors and studies of the association in populations that differ in their demographic features.

Studies Focused on the Propensity to Engage in Unhealthy Behaviors

Substance Abuse and Dependence

For delay discounting, a large number of studies have indicated that individuals who are dependent on drugs of abuse (e.g., nicotine, alcohol, cocaine, methamphetamine) usually discount delayed rewards more steeply than individuals who are not dependent (see recent reviews by Reynolds, 2006, and Yi, Mitchell, & Bickel, 2010). This discounting difference extends to nondependent heavy users compared with nondependent lighter users, and to individuals who use a wider variety of illicit substances compared with those who use fewer substances (Kollins, 2003; Mitchell, 2003). Similarly, research using the ZTPI showed that inpatients in drug and alcohol treatment facilities (Klingemann, 2001), hazardous drinkers (MacKillop, Mattson, Anderson, Castelda, & Donovick, 2007), and generally people who report using alcohol, drugs, and tobacco (Keough et al., 1999) are both more present oriented and less future oriented. Further, research using Wallace's Future Events Test showed that opiate-dependent individuals (Alvos, Gregson, & Ross, 1993; Manganiello, 1978; Petry, Bickel, & Arnett, 1998) as well as alcoholics (Smart, 1968) had a shortened extension of future time perspective. A recent study by Fieulaine and Martinez (2010) additionally found that these relations between substance abuse and both high present and low future orientation as measured by the ZTPI were moderated by individuals' desire for control as a personality variable, suggesting that desire for control may have a buffering effect on the relation between time perspective and substance use.

In summary, these studies suggest that persons with substance abuse disorders or high levels of use show steeper delay discounting and a shorter

future time perspective, but mechanistic explanations to account for the association have not been offered.

Gambling

Pathological gambling is often classified as an addictive disorder, and studies have generally supported the conclusion that pathological gambling is associated with steeper delay discounting (see MacKillop et al., 2006, described earlier, and Petry & Madden, 2010, for a review). However, as noted by Petry and Madden, existing studies are complicated by measurement issues associated with the diagnosis of this disorder.

In studies of future time perspective, Hodgins and Engel (2002) found that both the ZTPI and Wallace's Future Events Test discriminated pathological gamblers from social gamblers, although not from psychiatric controls. The absence of a difference between pathological gamblers relative to a psychiatric control group led Hodgins and Engel to propose that psychological distress may play a more significant role in distorted time perspective. However, studies systematically assessing this factor in either future time perspective or in delay discounting unfortunately are lacking. In contrast to Hodgins and Engel, MacKillop et al. (2006) found that pathological gambling was not correlated with these same measures of future time perspective (ZTPI and the Future Events Test), but the MacKillop et al. study used a nonclinical sample, which may account for the different results between the two studies. Thus, like the substance abuse research, studies of gamblers suggest that pathological levels of gambling are associated with steeper discounting functions and a more circumscribed future time perspective, and again the mechanisms underlying these effects of pathology are unexamined.

Risky Behavior

Drug use is often viewed as a prototypical example of risky behavior, but even within drug use there are ways to increase the risk of an adverse outcome, such as illness or death. From this perspective, delay discounting has been linked to the tendency to engage in more risky behavior, in that heroin addicts who reported sharing needles, and thus increasing their risk of contracting HIV or hepatitis C, had steeper discounting functions than those who did not (Odum, Madden, Badger, & Bickel, 2000). Studies examining future time perspective have focused on other risky activities, like risky driving and unsafe sex. Thus, Zimbardo, Keough, and Boyd (1997) found that present time perspective as measured by the ZTPI was an independent predictor of self-reported risky driving (i.e., admitting to taking risks driving, car racing, speeding, taking risks while biking, and driving under the influence of alcohol), even when controlling for other correlates of risky driving, such as sensation seeking, impulsivity, and aggression. Although weaker, there was also a significant negative relation between future orientation and risky driving. Rothspan and Read (1996) found that, among heterosexual college students, those high in future and low in present time orientation were less likely to be sexually experienced and more likely to have had fewer sexual partners, implying a lower likelihood of engaging in risky behavior. Consistent with this finding, those

high in future orientation were also more likely to use alternate methods of reducing exposure to HIV (e.g., inquiring about partner's sexual history, delaying or abstaining from sex). Thus, although different criteria have been used to classify individuals as engaging in more risky behavior, the studies reviewed are consistent with the idea that those engaging in more risky behavior are more likely to discount more steeply and to exhibit lower scores on measures of future time perspective.

Delinquency

Krueger, Caspi, Moffitt, White, and Stouthamer-Loeber (1996) found that 13-year-old boys who showed signs of aggressive and delinquent disorders tended to seek immediate gratification in a laboratory task, implying steeper discounting of delayed rewards, more often than boys without these disorders and boys who showed signs of internalizing disorders (anxiety and depression). However, Wilson and Daly (2006) found that young offenders (12–19 years old) were not significantly different from nonoffenders in discounting the future using a task in which individuals chose between monetary rewards available "tomorrow" versus rewards available later (range: 7–162 days).

In contrast to this small but mixed literature, early studies using time perspective measures have reported consistently that, compared with nondelinquents, delinquents have a shorter future time perspective as measured with Wallace's Future Events Test (Landau, 1975; Stein, Sarbin, & Kulik, 1968) and story-completion techniques (Barndt & Johnson, 1955; Davids, Kidder, & Reich, 1962; Siegman, 1961). Across these studies, additional variables were controlled for, including age, gender, education, academic achievement, intelligence, ethnicity, socioeconomic status, and institutionalization. Interestingly, Siegman (1961) hypothesized that a shorter duration of future time perspective may be related to having a slower internal clock because delinquent (imprisoned) subjects exhibited shorter time-estimation scores than nondelinquent controls (inductees in the Israeli Army) who were matched for age, education, and ethnicity. The time estimate scores were derived by asking subjects how long a specific event had taken; those reporting that a shorter time had passed were assumed to have a slower running internal clock. This idea of the internal clock affecting future time perspective has not been fully assessed. However, if an internal clock plays a role, it will complicate the putative relation between future time perspective and delay discounting. Wittmann, Leland, Churan, & Paulus (2007) reported that stimulant-dependent individuals, who in other studies exhibit steeper discounting functions and would have shorter predicted time horizons, estimated time intervals of 53 s as substantially longer than control participants, implying a faster running internal clock. In summary, although the association between delinquency and delay discounting is unclear, delinquency does appear to be associated with a shorter future time perspective.

Eating Disorders and Obesity

The link between dysregulated eating behaviors and delay discounting has been made on many occasions, and, indeed, early research examining

the phenomenon focused on decisions between eating desirable foods/juice immediately rather than waiting for additional food/juice later (e.g., Forzano & Logue, 1994; Logue & King, 1991). Within this framework it is unsurprising that steeper delay discounting has been related to obesity in women, though not in men (Weller, Cook, Avsar, & Cox, 2008), higher percentage of body fat (Rasmussen, Lawyer, & Reilly, 2010), and higher body mass index (Smith, Bogin, & Bishai, 2005; Borghans & Golsteyn, 2006; Zhang & Rashad, 2008; but see Rasmussen et al., 2010; Manwaring, Green, Myerson, Strube, & Wilfley, 2011). In contrast, studies assessing future time perspective are lacking. However, it should be noted that a time-perspective intervention (described in more detail in the section titled "Attempts to Manipulate Future Time Perspective") to enhance long-term thinking about physical activity led to increased levels of physical activity (Hall & Fong, 2003), which suggests that time perspective may be causally associated with health behavior that prevents obesity. Thus, while the literature is clear that steeper delay discounting is associated with obesity, data are unavailable to determine whether the relation also exists for future time perspective.

In summary, pertinent studies are not available in any of these areas to allow us to make a definitive assessment of the correspondence between steeper discounting functions and shorter future time perspective. Nonetheless, the literature indicates that when populations are compared that differ in health-related characteristics (substance abuse, gambling, risky behavior, delinquency, eating disorders and obesity), they tend to exhibit steeper delay discounting functions and more proximate future time perspectives. In no area are the relations between the two constructs in discordant directions.

Studies Focused on the Differences in the Demographic Characteristics of Populations

Gender

A meta-analysis of 33 studies by Silverman (2003) found that women discounted delayed rewards less steeply than men. However, the gender differences were small and detectable only by some measures of delay discounting. The findings on gender differences in future time perspective are even less consistent. A study by Zimbardo et al. (1997) with a large sample size found men to be more present oriented and women more future oriented, a finding that would be consistent with the delay discounting findings. In contrast, another study using interview methods found that adolescents' narratives of the life course beyond the adulthood transition revealed greater extension overall among males than females (Greene & Wheatley, 1992). These differences, however, may be affected by differences in the content of the narratives, for example, by the female participants' greater focus on marriage and family and by their anticipation of younger ages at marriage and parenthood than the male participants. Yet another study found no systematic gender differences (Fingerman & Perlmutter, 1995). Thus, for both discounting and future time perspective the association with gender appears to be minimal.

Age

A number of studies have used cross-sectional designs to examine whether there are systematic differences in delay discounting as a function of age. These studies used samples in the age range of around 12 to 75 years and have generally indicated that discounting decreases across the life span (Green, Fry, & Myerson, 1994; Harrison, Lau, & Williams, 2002), which may point to a life-span developmental trend toward increased self-control. It is noteworthy though that in Green et al.'s (1994) study, a single function with age-sensitive parameters described all age groups' discounting curves well, suggesting that even though there are quantitative age differences in delay discounting, the process of choosing between rewards of different amounts and delays is qualitatively similar across the life span. Steinberg et al. (2009) found only quantitative, not qualitative, age differences in delay discounting functions. However, in their overall younger sample, with participants aged 10 to 30 years, they found that delay discounting only decreased until age 16, after which it remained stable. This discrepancy from the discounting studies mentioned earlier may stem from the circumscribed age range of assessed participants. Characterizing future time perspective in the same sample, these authors also found that younger adolescents demonstrated a weaker orientation to the future than did individuals ages 16 and older, as reflected in their self-characterizations as "less concerned about the future" and "less likely to anticipate the consequences of their decisions," which is compatible with the discounting/future time perspective relation outlined in the section examining groups differing on health-related characteristics. Similarly, an early study by Klineberg (1967) found that, among healthy individuals, the years from childhood to adolescence were characterized by an increasing concern with distant future events, indicating an increasing orientation toward the future.

Thus, it appears that future time perspective increases with age. On the other hand though, the actual amount of lifetime left inevitably decreases over the life span, and the perception that one's remaining lifetime is decreasing may shorten future time perspective in older age (Carstensen, Isaacowitz, & Charles, 1999; Carstensen, 2006). Lang and Carstensen (2002) accordingly found in a sample of 20- to 90-year-old adults that older adults perceived their future time as more limited than younger adults, as measured with Carstensen and Lang's Future Orientation Scale (Carstensen & Lang, 1996). They found that future time perspective was strongly associated with chronological age, sharing more than 50% of the variance with age. Consistent with this, Fingerman and Perlmutter (1995) found that whereas both younger adults (ages 20 to 37) and older adults (ages 60 to 81) reported thinking about the next few months more frequently than about longer or shorter future time periods, younger participants reported thinking frequently about more distant time periods, whereas older participants did not. Trommsdorff et al. (1979) further suggested that future orientation may be modified by changes in one's external environment, such as entry into an occupation. Their longitudinal research showed that adolescents who entered the workforce anticipated relatively more events in the occupational domain than before entering and these events were located in the nearer future. The authors suggested that the less extended length of future time orientation for older adolescents may indicate a strong concern with actual problems in the near future.

In summary, although the relation between delay discounting gradient and age seems relatively clear in that older individuals discount less steeply than younger ones, the relation between age and the extent of one's future time perspective is considerably more complex and mixed. Complications arise due to the methods used to assess future time perspective being influenced by life stage and by the time left before expected death.

Education/Social Class

There is clear evidence from multiple studies that higher intelligence is associated with lower delay discounting (meta-analysis by Shamosh & Gray, 2008), and also that discount rate for real, delayed monetary rewards is reliably negatively correlated with college GPA in undergraduates (i.e., lower discounting rates are correlated with higher GPAs), and the relation remains reliable after controlling for SAT scores (Kirby, Winston, & Santiesteban, 2005). Compatible with these results, Harrison et al. (2002) found in a sample of Danish participants that individuals with longer investments in education had substantially lower discount rates. Bauer and Chytilová (2009) assessed the impact of education on discount rates of Ugandan villagers by exploiting two independent exogenous sources of variation in schooling, across villages and over time, and also found that the degree of delay discounting decreased with education. Similarly, Kirby et al. (2002) found that discount rates in Tsimane' Amerindians of the Bolivian rain forest decreased with increases in educational levels and literacy and tended to decrease as recent income rose. Rates were not associated with current wealth. Thus, overall, these studies suggest that shallower discounting gradients are associated with higher levels of intelligence and educational attainment (but cf. Godoy & Jacobson, 1999).

The literature also suggests a similar relation between educational attainment and indices of future planning. Thus, Prenda and Lachman (2001) found education and income to be positively related to future planning. O'Rand and Ellis (1974) found that lower class youth in the Job Corps had a less extended notion of future time than college freshmen (as measured with a modified version of Wallace's, 1956, measure of extension). Also, their outlook on the future was less systematically ordered than that of college freshmen, in that the youth imagined events occurring during early life-cycle periods (initial and early adult phases) but not over later life-cycle periods (intermediate and later adult). Further, in both the lower class and middle-class samples, the length of temporal perspective was a factor mediating work or academic performance. Consistent with these data, male high school students with high GPAs and high study persistence attached significantly higher valence to goals in the distant future and perceived studying hard as more instrumental for reaching goals in the distant future and the "present," which was of an unspecified duration, than students with low GPAs and low study persistence (De Volder & Lens, 1982). Other studies also have found future time perspective to be related to school performance (Adelabu, 2008; Klineberg, 1967; O'Rand & Ellis, 1974; Peetsma, 2000; Shell & Husman, 2001; Zimbardo & Boyd, 1999; but cf. Dickstein, 1969). In addition, Murrell and Mingrone (1994) found that need for achievement, self-monitoring, and overall length of time diaries predicted future time perspective, adding support to the relation between future time perspective and general

achievement-related behavior. Despite the number of studies examining scholastic performance and future time perspective, few studies have looked at the relation between measures of intelligence and measures of future time perspective, and those that did found small positive or no correlations (Blatt & Quinlan, 1967; Mischel & Metzner, 1962; Prenda & Lachman, 2001). Thus it appears that, although educational attainment is positively related to a more extensive future time perspective (without speculating about the direction of causality), a significant relation to measures of general intellectual function has not been established.

In summary, the relations between the demographic variables surveyed here and delay discounting were generally the same for these variables and future time perspective. However, the consistency with which this similarity was seen was less compelling than in the previous section examining health-related characteristics. One reason for this may be that in the health-related characteristics section, differences between extreme groups provided the main focus, whereas the demographic studies often examine correlations within populations that exhibit a relatively restricted range of variability. However, it appears reasonable to suggest, based on the literature reviewed so far, that there are core similarities between delay discounting and future time perspective constructs that the respective measures are tapping. A strong test of this hypothesis would be to identify factors that can be manipulated to alter discounting and then determine whether future time perspective could be influenced by the same manipulation (and vice versa). Such studies have not been conducted, but in the following section, we examine studies that have attempted to manipulate the extent to which individuals discount delayed rewards and studies that have attempted to influence future time perspective.

Attempts to Manipulate Delay Discounting

Although there have been a number of attempts using pharmacological agents, virtually no study has reported successfully manipulating delay discounting directly. One exception is a study by de Wit, Enggasser, and Richards (2002), in which delay aversion was reduced following amphetamine administration. Similarly, few studies have attempted to manipulate cognitive functioning to influence delay discounting. In an early study using a within-subjects design, Hinson, Jameson, and Whitney (2003) reported that an augmented working memory load manipulation was associated with steeper discounting functions. Furthermore, the context and presentation of the task itself may affect delay discounting rates. For example, Loewenstein and Prelec (1993) found that when decisions were presented as a series of outcomes rather than as individual outcomes, people preferred outcomes that improved over time. This corresponds to an actual reversal of the conventional discounting of delayed outcomes. Also, studies have indicated that people show lower discounting rates for decisions that involve large, important outcomes (e.g., Chapman, 2002) or long delays (Roelofsma & van der Pligt, 2001). Based on this research, Ortendahl and Fries (2005) recommended framing health messages in terms of sequences of outcomes, with large and important outcomes or long delays, which should all induce lower implicit discount rates.

Attempts to Manipulate Future Time Perspective

Unlike delay discounting, future time perspective has not been the subject of any pharmacological intervention. However, cognitive interventions have been used to attempt to increase future time perspective. Savickas (1991) developed a Time Perspective Modification Intervention divided into three phases: orientation, differentiation, and integration. The orientation phase attempts to induce or increase future orientation and foster optimism about the future by administering the circles test (Cottle, 1967), in which participants are asked to draw circles representing past, present, and future and then discuss the results. The differentiation phase attempts to make the future feel real, reinforce positive attitudes toward planning, and prompt goal setting by asking students to respond to questions like "Who will you be?" and "What will you do?" (Kastenbaum, 1961), having them list events that might happen to them in the future (Wallace, 1956), and examining the implications and importance of their different life stages. The integration phase attempts to link present behavior to future outcomes, provide practice with planning skills, and heighten career awareness by using procedures in which students gain knowledge about the importance of planning and identifying achievement standards for each step in the path. Marko and Savickas (1998) administered this intervention to college freshmen in a training study and reported that it increased their future orientation, improved their sense of continuity between the past, present, and future, and enhanced their optimism about the future.

Similarly, Hall and Fong (2003) developed a time perspective intervention designed to provide participants with a conceptual framework for understanding why focusing on the immediate or short-term consequences of regular physical activity would lead them to conclude that physical activity is not worth the effort, whereas focusing on the long-term benefits would lead them to conclude that those benefits outweigh the costs. For example, one activity required group members to generate a list of immediate costs and benefits that one derives from physical activity, and then to contrast those short-term costs and benefits of physical activity with the balance of long-term costs and benefits of engaging in physical activity. The time perspective intervention also included a long-term goal-setting activity. This activity required participants to set lifetime fitness goals, followed by weekly and intermediate goals that were logically connected to these long-term goals.

Hall and Fong (2003) administered this time perspective intervention to young adults who signed up for fitness classes, with the goal of enhancing these participants' long-term thinking about physical activity. Participants of the intervention reported increased levels of physical activity 7 weeks after completion of the intervention, compared to a control group who participated in a goal-setting intervention (a cognitive-behavioral intervention that provided participants with the informational and structural components of the time perspective intervention, but without the thematic component of a long-term time perspective). In a second study with a larger sample, Hall and Fong (2003) demonstrated that these effects of the time perspective intervention extended to 6 months for self-reported physical activity and exercises. These findings suggest that the effects of health-behavior interventions may be enhanced by increasing participants'

long-term time perspective and that time perspective is causally associated with health behavior. The same conclusion also can be drawn from experiments that have manipulated people's time horizons in hypothetical decision scenarios and found that this manipulation affected the hypothetical decisions (e.g., Carstensen, Isaacowitz, & Charles, 1999; Fung, Carstensen, & Lutz, 1999; Lang & Carstensen, 2002). Thus, these studies suggest that future time perspective can be changed to some extent by cognitive interventions and that manipulations of future perspective can affect people's behavior and decision making.

Conclusions

The findings from the body of research reviewed in this article suggest that both steep delay discounting and a short future time perspective are associated with a range of problematic behavior, such as addictive disorders, risky behavior, poor school performance, and delinquency. This shared correlation suggests that the two concepts are themselves related, which appears to be the case when one examines both from a theoretical perspective and within healthy populations that differ on specific demographic characteristics. However, it also is apparent that the two constructs are not identical, because correlations are often relatively weak and in a few domains are absent (although a negative relation has never been reported). In addition, strong tests of the relation performed by determining whether manipulation of a single factor influences both in a similar way have not been attempted, though this review summarizes several protocols that could form the basis of future examinations of this question.

It also is unclear to what extent both delay discounting and future time perspective may be malleable enough to be affected by experimental manipulations, or if they may even be susceptible to long-term changes by means of cognitive interventions. The experiments by Marko and Savickas (1998) and Hall and Fong (2003) give reason to hope that cognitive interventions may indeed have the potential to extend people's future time perspective and help them reach their long-term goals. More of this type of research, however, clearly is needed for a better understanding of how interventions can lead to an individual's developing more of an extended future time perspective and whether the interventions also may lead to reduced delay discounting. Given the clinical significance of steep delay discounting as well as a short future time perspective, the question as to whether and how they can be changed has potential applied relevance with regard to prevention and modification of behaviors that are detrimental to individuals' health and well-being. This will be especially important if it becomes apparent that altering delay discounting functions or future time perspective alters the negative health-related behaviors associated with steeper discounting functions and limited future time perspective.

References

ADELABU, D. H. (2008). Future time perspective, hope, and ethnic identity among African American adolescents. *Urban Education, 43*, 347–360.

AINSLIE, G. W. (1974). Impulse control in pigeons. *Journal of the Experimental Analysis of Behavior, 21,* 485–489.

ALVOS, L., GREGSON, R. A., & ROSS, M. W. (1993). Future time perspective in current and previous injecting drug users. *Drug and Alcohol Dependence, 31*, 193–197.

BARNDT, R. J., & JOHNSON, D. M. (1955). Time orientation in delinquents. *The Journal of Abnormal and Social Psychology, 51*, 343–345.

BAUER, M., & CHYTILOVÁ, J. (2009). *The impact of education on the subjective discount rate in Ugandan villages.* Retrieved from SSRN eLibrary at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1369803

BLATT, S. J., & QUINLAN, P. (1967). Punctual and procrastinating students: A study of temporal parameters. *Journal of Consulting Psychology, 31*, 169–174.

BOND, M. J., & FEATHER, N. T. (1988). Some correlates of structure and purpose in the use of time. *Journal of Personality and Social Psychology, 55*, 321–329.

BORGHANS, L., & GOLSTEYN, B. (2006). Time discounting and the body mass index: Evidence from the Netherlands. *Economics and Human Biology, 4*, 39–61.

CARSTENSEN, L. L. (2006). The influence of a sense of time on human development. *Science, 312*, 1913–1915.

CARSTENSEN, L. L., ISAACOWITZ, D. M., & CHARLES, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *The American Psychologist, 54*, 165–181.

CARSTENSEN, L. L., & LANG, F. R. (1996). *Future orientation scale*. Unpublished manuscript, Stanford University.

CHAPMAN, G. B. (2002). Your money or your health: Time preferences and trading money for health. *Medical Decision Making, 22*, 410–416.

COTTLE, T. (1967). The circles test: An investigation of perception of temporal relatedness and dominance. *Journal of Projective Techniques and Personality Assessment, 31*, 58–71.

COTTLE, T. J., & KLINEBERG, S. L. (1974). *The present of things future*. New York: The Free Press.

COTTLE, T. J., & PLECK, J. H. (1969). Linear estimations of temporal extension: The effect of age, sex and social class. *Journal of Projective Techniques and Personality Assessment, 33*, 81–93.

D'ALESSIO, M., GUARINO, A., DE PASCALIS, V., & ZIMBARDO, P. (2003). Testing Zimbardo's Stanford Time Perspective Inventory (STPI)-Short Form. *Time & Society, 12*, 333–347.

DAUGHERTY, J. R., & BRASE, G. L. (2010). Taking time to be healthy: Predicting health behaviors with delay discounting and time perspective. *Personality and Individual Differences, 48*, 202–207.

DAVIDS, A., KIDDER, C., & REICH, M. (1962). Time orientation in male and female juvenile delinquents. *Journal of Abnormal and Social Psychology, 64*, 239–240.

DE VOLDER, M., & LENS, W. (1982). Academic achievement and future time perspective as a cognitive-motivational concept. *Journal of Personality and Social Psychology, 42*, 566–571.

DE WIT, H., ENGGASSER, J. L., & RICHARDS, J. B. (2002). Acute administration of d-amphetamine decreases impulsivity in healthy volunteers. *Neuropsychopharmacology, 27*, 813–825.

DICKSTEIN, L. S. (1969). Prospective span as a cognitive ability. *Journal of Consulting and Clinical Psychology, 33*, 757–760.

EYSENCK, S. B., & EYSENCK, H. J. (1978). Impulsiveness and venturesomeness: Their position in a dimensional system of personality description. *Psychological Reports, 43*, 1247–1255.

FELLOWS, L. K., & FARAH, M. J. (2005). Dissociable elements of human foresight: A role for the ventromedial frontal lobes in framing the future, but not in discounting future rewards. *Neuropsychologia, 43*, 1214–1221.

FIEULAINE, N., & MARTINEZ, F. (2010). Time under control: Time perspective and desire for control in substance use. *Addictive Behaviors, 35*, 799–802.

FINGERMAN, K. L., & PERLMUTTER, M. (1995). Future time perspective and life events across adulthood. *Journal of General Psychology, 122*, 95–111.

FORZANO, L. B., & LOGUE, A. W. (1994). Self-control in adult humans: Comparison of qualitatively different reinforcers. *Learning & Motivation, 25*, 65–82.

FUNG, H. H., CARSTENSEN, L. L., & LUTZ, A. M. (1999). Influence of time on social preferences: Implications for life-span development. *Psychology and Aging, 14*, 595–604.

GODOY, R., & JACOBSON, M. (1999). Covariates of private time preference: A pilot study among the Tsimane' Indians of the Bolivian rain forest. *Evolution and Human Behavior, 20*, 249–256.

GREEN, L., FRY, A. F., & MYERSON, J. (1994). Discounting of delayed rewards: A life-span comparison. *Psychological Science, 5*, 33–36.

GREEN, L., & MYERSON, J. (2004). A discounting framework for choice with delayed and probabilistic rewards. *Psychological Bulletin, 130*, 769–792.

GREENE, A. L., & WHEATLEY, S. M. (1992). "I've got a lot to do and I don't think I'll have the time": Gender differences in late adolescents' narratives of the future. *Journal of Youth and Adolescence, 21*, 667–686.

HALL, P. A., & FONG, G. T. (2003). The effects of a brief time perspective intervention for increasing physical activity among young adults. *Psychology and Health, 18*, 685–706.

HARRISON, G. W., LAU, M. I., & WILLIAMS, M. B. (2002). Estimating individual discount rates in Denmark: A field experiment. *The American Economic Review, 92*, 1606–1617.

HINSON, J. M., JAMESON, T. L., & WHITNEY, P. (2003). Impulsive decision making and working memory. *Journal of Experimental Psychology: Learning, Memory, & Cognition, 29*, 298–306.

HODGINS, D. C., & ENGEL, A. (2002). Future time perspective in pathological gamblers. *Journal of Nervous and Mental Disease, 190*, 775–780.

JOIREMAN, J., BALLIET, D., SPROTT, D., SPANGENBERG, E., & SCHULTZ, J. (2008). Ego depletion, consideration of future consequences, and decision-making preferences: Implications for the self-regulation of behavior. *Personality and Individual Differences, 45*, 15–21.

KASTENBAUM, R. (1961). The dimensions of future time perspective: An experimental analysis. *Journal of General Psychology, 65*, 203–218.

KEOUGH, K. A., ZIMBARDO, P. G., & BOYD, J. N. (1999). Who's smoking, drinking, and using drugs? Time perspective as a predictor of substance use. *Basic and Applied Social Psychology, 21*, 149–164.

KIRBY, K. N., PETRY, N. M., & BICKEL, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General, 128*, 78–87.

KIRBY, K. N., GODOY, R., REYES-GARCA, V., BYRON, E., APAZA, L., LEONARD, W., PEREZ, E., ET AL. (2002). Correlates of delay-discount rates: Evidence from Tsimane' Amerindians of the Bolivian rain forest. *Journal of Economic Psychology, 23*, 291–316.

KIRBY, K. N., WINSTON, G. C., & SANTIESTEBAN, M. (2005). Impatience and grades: Delay-discount rates correlate negatively with college GPA. *Learning and Individual Differences, 15*, 213–222.

KLINEBERG, S. L. (1967). Changes in outlook on the future between childhood and adolescence. *Journal of Personality and Social Psychology, 7*, 185–193.

KLINGEMANN, H. (2001). The time game: Temporal perspectives of patients and staff in alcohol and drug treatment. *Time Society, 10*, 303–328.

KOLLINS, S. H. (2003). Delay discounting is associated with substance use in college students. *Addictive Behaviors, 28*, 1167–1173.

KRUEGER, R. F., CASPI, A., MOFFITT, T. E., WHITE, J., & STOUTHAMER-LOEBER, M. (1996). Delay of gratification, psychopathology, and personality: Is low self-control specific to externalizing problems? *Journal of Personality, 64*, 107–129.

LANDAU, S. F. (1975). Future time perspective of delinquents and non-delinquents: The effect of institutionalization. *Criminal Justice and Behavior, 2*, 22–36.

LANG, F. R., & CARSTENSEN, L. L. (2002). Time counts: Future time perspective, goals, and social relationships. *Psychology and Aging, 17*, 125–139.

LESHAN, L. L. (1952). Time orientation and social class. *The Journal of Abnormal and Social Psychology, 47*, 589–592.

LIU, W., & AAKER, J. (2007). Do you look to the future or focus on today? The impact of life experience on intertemporal decisions. *Organizational Behavior and Human Decision Processes, 102*, 212–225.

LOGUE, A. W. (1988). Research on self-control: An integrating framework. *Behavioral & Brain Sciences, 11*, 665–709.

LOGUE, A. W., & KING, G. R. (1991). Self-control and impulsiveness in adult humans when food is the reinforcer. *Appetite, 17*, 105–120.

LOEWENSTEIN, G. F., & PRELEC, D. (1993). Preferences for sequences of outcomes. *Psychological Review, 100*, 91–108.

MACKILLOP, J., ANDERSON, E. J., CASTELDA, B. A., MATTSON, R. E., & DONOVICK, P. J. (2006). Divergent validity of measures of cognitive distortions, impulsivity, and time perspective in pathological gambling. *Journal of Gambling Studies, 22*, 339–354.

MACKILLOP, J., MATTSON, R. E., ANDERSON, E. J., CASTELDA, B. A., & DONOVICK, P. J. (2007). Multidimensional assessment of impulsivity in undergraduate hazardous drinkers and controls. *Journal of Studies on Alcohol and Drugs, 68*, 785–788.

MADDEN, G. J., & BICKEL, W. K. (Eds.). (2010). *Impulsivity: The behavioral and neurological science of discounting*. Washington, DC: American Psychological Association.

MADDEN, G. J., & JOHNSON, P. S. (2010). A delay-discounting primer. In G. J. Madden & W. K. Bickel (Eds.), *Impulsivity: The behavioral and neurological science of discounting* (pp. 11–37). Washington, DC: American Psychological Association.

MANGANIELLO, J. A. (1978). Opiate addiction: A study identifying three systematically related psychological correlates. *Substance Use & Misuse, 13*, 839.

MANWARING, J. L., GREEN, L., MYERSON, J., STRUBE, M. J., & WILFLEY, D. E. (2011). Discounting of various types of rewards by women with and without binge eating disorder: Evidence for general rather than specific differences. *The Psychological Record, 61*, 561–582.

MARKO, K. W., & SAVICKAS, M. L. (1998). Effectiveness of a career time perspective intervention. *Journal of Vocational Behavior, 52*, 106.

MISCHEL, W., & GRUSEC, J. (1967). Waiting for rewards and punishments: Effects of time and probability on choice. *Journal of Personality and Social Psychology, 5*, 24–31.

MISCHEL, W., & METZNER, R. (1962). Preference for delayed reward as a function of age, intelligence, and length of delay interval. *The Journal of Abnormal and Social Psychology, 64*, 425–431.

MITCHELL, S. H. (2003). Discounting the value of commodities according to different types of cost. In N. Heather & R. E. Vuchinich (Eds.), *Choice, behavioral economics and addiction: Theory, evidence and applications* (pp. 339–357). New York: Elsevier.

MOBINI, S., BODY, S., HO, M. Y., BRADSHAW, C. M., SZABADI, E., DEAKIN, J. F., ET AL. (2002). Effects of lesions of the orbitofrontal cortex on sensitivity to delayed and probabilistic reinforcement. *Psychopharmacology, 160*, 290–298.

MURRAY, H. A. (1943). *Thematic apperception test*. Cambridge, MA: Harvard University Press.

MURRELL, A., & MINGRONE, M. (1994). Correlates of temporal perspective. *Perceptual and Motor Skills, 78*, 1331–1334.

O'RAND, A., & ELLIS, R. A. (1974). Social class and social time perspective. *Social Forces, 53*, 53–62.

ODUM, A. L., MADDEN, G. J., BADGER, G. J., & BICKEL, W. K. (2000). Needle sharing in opioid-dependent outpatients: Psychological processes underlying risk. *Drug and Alcohol Dependence, 60*, 259–266.

ORTENDAHL, M., & FRIES, J. F. (2005). Framing health messages based on anomalies in time preference. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 11*, RA253–256.

PEETSMA, T. T. (2000). Future time perspective as a predictor of school investment. *Scandinavian Journal of Educational Research, 44*, 177–192.

PETRY, N. M., BICKEL, W. K., & ARNETT, M. (1998). Shortened time horizons and insensitivity to future consequences in heroin addicts. *Addiction, 93*, 729–738.

PETRY, N. M., & MADDEN, G. J. (2010). Discounting and pathological gambling. In G. J. Madden & W. K. Bickel (Eds.), *Impulsivity: The behavioral and neurological science of discounting* (pp. 273–294). Washington, DC: American Psychological Association.

PRENDA, K. M., & LACHMAN, M. E. (2001). Planning for the future: A life management strategy for increasing control and life satisfaction in adulthood. *Psychology and Aging, 16*, 206–216.

RACHLIN, H., & GREEN, L. (1972). Commitment, choice and self-control. *Journal of the Experimental Analysis of Behavior, 17*, 15–22.

RACHLIN, H., SIEGEL, E., & CROSS, D. (1994). Lotteries and the time horizon. *Psychological Science, 5*, 390–393.

RASMUSSEN, E. B., LAWYER, S. R., & REILLY, W. (2010). Percent body fat is related to delay and probability discounting for food in humans. *Behavioural Processes, 83*, 23–30.

REYNOLDS, B. (2006). A review of delay-discounting research with humans: Relations to drug use and gambling. *Behavioural Pharmacology, 17*, 651–667.

REYNOLDS, B., KARRAKER, K., HORN, K., & RICHARDS, J. B. (2003). Delay and probability discounting as related to different stages of adolescent smoking and non-smoking. *Behavioural Processes, 64*, 333–344.

ROELOFSMA, P. H., & VAN DER PLIGT, J. (2001). On the psychology of time preference and human decisions: Introduction to the special issue. *Acta Psychologica, 108*, 91–93.

ROTHSPAN, S., & READ, S. J. (1996). Present versus future time perspective and HIV risk among heterosexual college students. *Health Psychology, 15*, 131–134.

SAVICKAS, M. L. (1991). Improving career time perspective. In D. Brown & L. Brooks (Eds.), *Techniques of career counseling* (pp. 236–249). Boston: Allyn & Bacon.

SCHWEIGHOFER, N., TANAKA, S. C., & DOYA, K. (2007). Serotonin and the evaluation of future rewards: Theory, experiments, and possible neural mechanisms. *Annals of the New York Academy of Sciences, 1104*, 289–300.

SHAMOSH, N. A., & GRAY, J. R. (2008). Delay discounting and intelligence: A meta-analysis. *Intelligence, 36*, 289–305.

SHELL, D. F., & HUSMAN, J. (2001). The multivariate dimensionality of personal control and future time perspective in achievement and studying. *Contemporary Educational Psychology, 26*, 481–506.

SHIPP, A. J., EDWARDS, J. R., & LAMBERT, L. S. (2009). Conceptualization and measurement of temporal focus: The subjective experience of the past, present, and future. *Organizational Behavior and Human Decision Processes, 110*, 1–22.

SIEGMAN, A. W. (1961). The relationship between future time perspective, time estimation, and impulse control in a group of young offenders and in a control group. *Journal of Consulting Psychology, 25*, 470–475.

SILVERMAN, I. W. (2003). Gender differences in delay of gratification: A meta-analysis. *Sex Roles, 49*, 451–463.

SMART, R. G. (1968). Future time perspectives in alcoholics and social drinkers. *Journal of Abnormal Psychology, 73*, 81–83.

SMITH, P., BOGIN, B., & BISHAI, D. (2005). Are time preference and body mass index associated? Evidence from the National Longitudinal Survey of Youth. *Economics and Human Biology, 3*, 259–270.

STEIN, K. B., SARBIN, T., & KULIK, J. A. (1968). Future time perspective: Its relation to the socialization process and the delinquent role. *Journal of Consulting and Clinical Psychology, 32*, 257–264.

STEINBERG, L., GRAHAM, S., O'BRIEN, L., WOOLARD, J., CAUFFMAN, E., & BANICH, M. (2009). Age differences in future orientation and delay discounting. *Child Development, 80*, 28–44.

STRATHMAN, A., GLEICHER, F., BONINGER, D. S., & EDWARDS, C. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality & Social Psychology, 66*, 742–752.

TEAHAN, J. E. (1958). Future time perspective, optimism, and academic achievement. *Journal of Abnormal and Social Psychology, 57*, 379–380.

TROMMSDORFF, G., LAMM, H., & SCHMIDT, R. W. (1979). A longitudinal study of adolescents' future orientation (time perspective). *Journal of Youth and Adolescence, 8*, 131–147.

WALLACE, M. (1956). Future time perspective in schizophrenia. *Journal of Abnormal Psychology, 52*, 240–245.

WELLER, R. E., COOK, E. W., AVSAR, K. B., & COX, J. E. (2008). Obese women show greater delay discounting than healthy-weight women. *Appetite, 51*, 563–569.

WILSON, M., & DALY, M. (2006). Are juvenile offenders extreme future discounters? *Psychological Science, 17*, 989–994.

WITTMANN, M., LELAND, D. S., CHURAN, J., & PAULUS, M. P. (2007). Impaired time perception and motor timing in stimulant-dependent subjects. *Drug and Alcohol Dependence, 90*, 183–192.

WOHLFORD, P. (1968). Extension of personal time in TAT and story completion stories. *Journal of Projective Techniques & Personality Assessment, 32*, 268–280.

YI, R., MITCHELL, S. H., & BICKEL, W. K. (2010). Delay discounting and substance abuse. In G. J. Madden & W. K. Bickel (Eds.), *Impulsivity: The behavioral and neurological science of discounting* (pp. 191–211). Washington, DC: American Psychological Association.

ZHANG, L., & RASHAD, I. (2008). Obesity and time preference: The health consequences of discounting the future. *Journal of Biosocial Science, 40*, 97–113.

ZIMBARDO, P., & BOYD, J. N. (1999). Putting time in perspective: A valid, reliable, individual-differences metric. *Journal of Personality and Social Psychology, 77*, 1271–1288.

ZIMBARDO, P. G., KEOUGH, K. A., & BOYD, J. N. (1997). Present time perspective as a predictor of risky driving. *Personality and Individual Differences, 23*, 1007–1023.