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Age Differences in Future Orientation and Delay Discounting

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Age differences in future orientation are examined in a sample of 935 individuals between 10 and 30 years using a delay discounting task as well as a new self-report measure. Younger adolescents consistently demonstrate a weaker orientation to the future than do individuals aged 16 and older, as reflected in their greater willingness to accept a smaller reward delivered sooner than a larger one that is delayed, and in their characterizations of themselves as less concerned about the future and less likely to anticipate the consequences of their decisions. Planning ahead, in contrast, continues to develop into young adulthood. Future studies should distinguish between future orientation and impulse control, which may have different neural underpinnings and follow different developmental timetables.

According to popular stereotype, young adolescents are notoriously shortsighted, oriented to the immediate rather than the future, unwilling or unable to plan ahead, and less capable than adults at envisioning the longer term consequences of their decisions and actions. This myopia has been attributed to a variety of underlying conditions, among them, the lack of formal operational thinking (Greene, 1986), limitations in working memory (Cauffman, Steinberg, & Piquero, 2005), the slow maturation of the prefrontal cortex juxtaposed with the increase in reward salience concomitant with the hormonal changes of puberty (Steinberg, 2008), and the fact that, relative to the amount of time they have been alive, an extension of time into the future is subjectively experienced by an adolescent as more distant than is the same amount of time to an adult (i.e., 10 years into the future is nearly twice one's life span to a young adolescent but only one fourth of one's life span to a 40-year-old; W. Gardner, 1993). Whatever the cause, youthful shortsightedness has been implicated as a cause of the poor judgment and risky decision making so often evinced by young people, used as a rationale to place legal restrictions on the choices adolescents are permitted to make, and suggested as one explanation for the general ineffectiveness of educational interventions designed to persuade adolescents to avoid various health-compromising behaviors, such as smoking, binge drinking, or unprotected sex (Steinberg, 2007).

Developmental psychologists interested in youthful shortsightedness have generally studied it under the rubric of ''future orientation.'' This term has been used to refer to a collection of loosely related affective, attitudinal, cognitive, and motivational constructs, including the ability to imagine one's future life circumstances (Greene, 1986; Nurmi, 1989a), the length of time one is able to project one's imagined life into the future (''temporal extension''; Lessing, 1972), the extent to which one thinks about or considers the future (''time perspective''; Cauffman & Steinberg, 2000), the extent to which one is optimistic or pessimistic about the future (Trommsdorff & Lamm, 1980), the extent to which one believes there is a link between one's current decisions and one's future well-being (Somers & Gizzi, 2001), the extent to which one believes he or she has control over his or her future (McCabe & Barnett, 2000), and the extent to which one engages in goal setting or planning (Nurmi, 1989b). These varied but potentially interrelated definitions indicate that future

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orientation, as it has been operationalized in developmental studies, has components that are cognitive (e.g., the extent to which one thinks about the future), attitudinal (e.g., the extent to which one prefers long-term, as opposed to short-term, goals), and motivational (e.g., the extent to which one formulates plans to achieve long-term goals; see also Nurmi, 1991; Nuttin, 1985). Although, as noted above, some researchers also have included an evaluative dimension of future orientation in their measures or models (e.g., the extent to which an adolescent is optimistic or pessimistic about the future; Trommsdorff & Lamm, 1980), this strikes us as an entirely different phenomenon and one that is more likely linked to differences between individuals in their personalities and life circumstances (e.g., their degree of depression, their available resources) than to developmental factors.

Studies of future orientation among adolescents have examined both age and individual differences in one or more components of the phenomenon. With respect to age differences, although the literature is surprisingly sparse, the suggestion that adolescents become more future oriented as they get older generally has been supported across studies that have varied considerably in their methodology (see reviews in Furby & Beyth-Marom, 1992; Greene, 1986; Nurmi, 1991). First, compared to young adolescents, older adolescents think more and report planning more about the developmental tasks of late adolescence and young adulthood, such as completing their education and going to work, and older adolescents are better able than younger ones to talk about future-oriented emotions such as fear or hope (Nurmi, 1991). Second, questionnaire-based studies of future orientation that include items such as, ''I often do things that don't pay off right away but will help in the long run,'' generally find that individuals' tendency to think about and consider the future increase with age (e.g., Cauffman & Steinberg, 2000). Finally, a few studies have examined adolescents' attentiveness to future considerations when making decisions. For example, in a study examining age differences in legal decision making in which individuals were presented with hypothetical dilemmas (e.g., how to respond to a police interrogation when one has committed a crime), Grisso et al. (2003) found that younger adolescents (11- to 13-year-olds) were significantly less likely to recognize the long-term consequences of various decisions than were adolescents 16 and older.

On the other hand, studies have not found consistent age differences in future orientation when the construct is operationalized in terms of individuals' ability to project themselves in the future (i.e., ''temporal extension''). In an early study of the phenomenon, Lessing (1972) reported no age differences in temporal extension in a sample of 9- to 15-year-old girls. In contrast, Greene (1986) found an age-related increase in the *number* of future events mentioned by the adolescents and college students in her sample but no age differences in their length of time extension. Trommsdorff, Lamm, and Schmidt (1979) found an increase in temporal extension over adolescence with respect to personality and occupation (i.e., older individuals were able to project their personality and occupation over a relatively longer period), but not with respect to other domains, such as physical health or appearance; this finding is consistent with other reports that the extent and nature of age differences in future orientation vary as a function of the specific aspects of life asked about and the way in which future orientation is operationalized (Nurmi, 1992). In Nurmi's (1991) study of 10- to 19-year-olds in Finland, for example, although there were age-related increases in reports of future hopes, fears, and goals, there were *decreases* with age in individuals' extension of themselves into the future. As Nurmi, Poole, and Kalakoski (1994) suggest, as individuals age, they come to understand the difficulty in making realistic long-term predictions about their future, and their projections become more conservative. As any parent or teacher will attest, a 4-year-old is likely to be much more confident about what her life will be like when she is an adult than is a 16-year-old. Temporal extension, it seems to us, is a poor measure of future orientation.

Studies of individual differences, as opposed to age differences, have examined the links between future orientation and a diverse array of factors. Three broad themes emerge from this work. First, individuals from more advantaged backgrounds (as indexed by socioeconomic status [SES] or level of education) score higher on measures of future orientation than their less advantaged counterparts (Nurmi, 1987, 1992). Second, there are few consistent gender differences in future orientation, and those that are found are typically domain specific (e.g., in the projection of future occupational vs. family roles; Nurmi et al., 1994; Poole & Cooney, 1987; Somers & Gizzi, 2001). Finally, individuals whose behavior would suggest a weaker orientation to the future (e.g., delinquent youth, youth who engage in relatively more risky activity) score lower on measures of future orientation than their peers (Cauffman et al., 2005; Somers & Gizzi, 2001; Trommsdorff et al., 1979). Probably the safest conclusion one can draw from this literature is that differences among individuals in their attitudes, motives, and beliefs about the future are considerable and vary a great deal as a function of factors in addition to age or developmental stage.

On the whole, then, with the exception of the specific phenomenon of temporal extension, it appears that individuals become more oriented to the future as they mature. There are three important limitations to the extant literature, however. First, the self-report measures employed often do not systematically distinguish among the cognitive, attitudinal, and motivational aspects of future orientation, a distinction that is important for understanding age differences in the phenomenon. In the present study, we analyze data derived from a self-report measure of future orientation designed to distinguish among three related, but different, phenomena: time perspective (whether one thinks about the future), anticipation of future consequences (whether one thinks through the likely future outcomes of one's decisions before deciding), and planning ahead (whether one makes plans before acting).

A second limitation in the existing literature concerns the age ranges studied. With only a few exceptions (e.g., Cauffman & Steinberg, 2000; Grisso et al., 2003; Lewis, 1980; Nurmi, 1991), studies of age differences in future orientation rarely involve samples that span a very wide age range. Given the fact that some have speculated that adolescents' relatively stronger orientation to the immediate than that of adults is due to developmental changes in reward processing at puberty and to the gradual maturation of self-regulatory competence that is ongoing into the mid-20s (Steinberg, 2008), it is important to study preadolescents, adolescents, and young adults simultaneously. In the present study, we examine age differences in future orientation over two decades of the life span, in a sample ranging in age from 10 to 30.

A third limitation of extant studies of future orientation is that they rely mainly on individuals' self-characterizations. Although older individuals describe themselves as more oriented to the future than younger ones, this may reflect developmental differences in self-perceptions. Given the widely held stereotype of adolescents as exceedingly shortsighted, it is entirely plausible that adolescents' descriptions of themselves as relatively more oriented to the immediate than the long term are largely a reflection of their internalization of this cultural belief. It is therefore important to ask whether age differences in self-reports of future orientation are paralleled in age differences in behavior. In the present study, in addition to our use of a new self-report measure of future orientation, we assess the construct using a behavioral paradigm known as *delay discounting*.

The delay discounting paradigm is widely used by behavioral economists and social and clinical psychologists in the assessment of individuals' preference for future versus immediate outcomes. In this paradigm, the respondent is asked to choose between an immediate reward of less value (e.g., $400 today) and a variety of delayed rewards of more value (e.g., $700 1 month from now? $800 6 months from now?), and the outcome of interest is the extent to which respondents prefer the delayed and more valuable reward over the immediately available but less valuable one. In other words, the task assesses individuals' ability to pit long-term benefits against immediate gains, a decision that individuals of different ages face frequently (e.g., Should I go to the party or study for my SATs? Should I get a job after high school or enroll in college and go into debt? Should I save for my retirement or enjoy all of my earnings now?).

It is not clear whether performance on delay discounting tasks reflects impulse control, orientation toward a future goal, or a combination of both. Although the task is usually described as one designed to measure impulsivity (e.g., Green, Myerson, & Ostaszewski, 1999), recent work on the neural underpinnings of delay discounting task performance indicate that the task actually activates two different brain systems: one that mediates impulsivity and reward seeking (localized mainly in limbic and paralimbic areas) and one that mediates the sort of deliberative and abstract reasoning presumed to undergird future orientation (localized mainly in lateral prefrontal cortical areas; McClure, Laibson, Loewenstein, & Cohen, 2004). One model for understanding delay discounting behavior is that of a competition between these two systems, in which predominance of the former leads to preference for immediate rewards and predominance of the latter leads to preference for delayed ones. If this is the case, delay discounting behavior should be correlated negatively with measures of impulsivity and positively with measures of future orientation. Given recent evidence of developmental change in both brain systems during adolescence (Casey, Getz, & Galvan, 2008; Steinberg, 2008), the age differences in future orientation reported by previous investigators are explicable, but whether these differences are due to decreases in impulsivity during adolescence, increases in orientation to a future goal, or a combination of the two is not clear.

In addition to revealing how strongly oriented an individual is to immediate versus future outcomes, the delay discounting paradigm can also be used to estimate the *rate* at which a future reward is discounted, known as the *discount function*, by repeating the trials of reward choices, holding the value of the delayed reward constant, but varying the duration of the delay (e.g., 1 day, 1 week, 1 month, 3 months, 6 months, 1 year). Studies of humans, nonhuman primates, and other animals indicate that the shape of the discount function as applied to many types of decision making is not linear, but hyperbolic, with smaller delayed rewards at shorter intervals discounted much more steeply than larger rewards at longer intervals. For example, the difference between waiting 1 versus 2 days for a reward of $1 versus $2 is subjectively experienced as greater than the difference between waiting 364 versus 365 days for a reward of $999 versus $1,000, even though in each case, the difference in delay periods (1 day) and rewards ($1) are identical. Researchers find that discount functions are not significantly different for real as compared to hypothetical rewards, which underscores the relevance of the delay task to actual decision making (e.g., Johnson & Bickel, 2002; Lagorio & Madden, 2005; Madden, Begotka, Raiff, & Kastern, 2003).

Although the hyperbolic delay function is found across individuals, the steepness with which delayed rewards are discounted varies among them. Relatively steeper discounting indicates that the point at which the participant prefers the immediate reward to the delayed reward occurs at lower values of the immediate reward and at shorter delay times—in other words, less preference for the larger delayed reward. Figure 1 shows two theoretical discount functions (one steep and the other less so) from a hypothetical study in which participants are asked to choose between a reward of $1,000 whose delivery is delayed by some specified time period (graphed along the x-axis) and a smaller reward delivered immediately. The lines show the discounted value of $1,000 (i.e., the smaller amount the participant would settle for) at various delay periods, ranging from 1 day to 365 days. An individual whose pattern of choices is described by the steeper function is relatively more drawn to immediate rewards, even if they are smaller, than is an individual whose pattern follows the less steep function; as the graph illustrates, the former individual discounts the value of $1,000 quite a bit after just a short delay period.

There is a large empirical literature, mainly involving adults and often with clinic samples, examining individual differences in discount rates. For example, a number of studies have found steeper discounting functions among various substance abusers, such as alcoholics, drug addicts, or heavy smokers, than among those of matched control groups (e.g., Bickel,

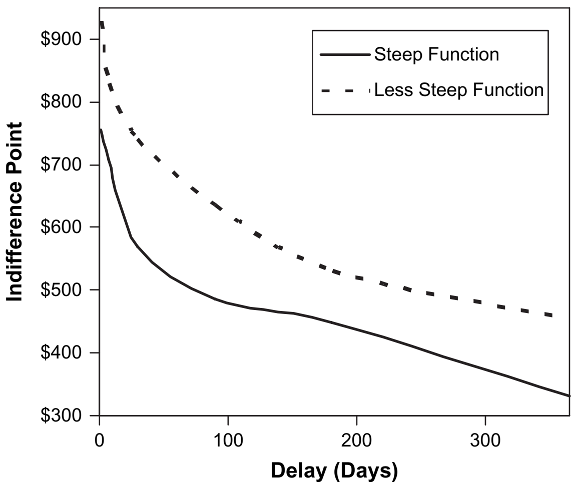

Figure 1. Illustration of steep and less steep discount functions over delays from 1 to 365 days.

Odum, & Madden, 1999; Madden, Petry, Badger, & Bickel, 1997; Petry, 2002; Vuchinich & Simpson, 1998). Studies also find steeper discount functions among impulsive individuals and among individuals of relatively lower intelligence (de Wit, Flory, Acheson, McCloskey, & Manuck, 2007). Individuals' discount rates show significant short-term stability (Ohmura, Takahashi, Kitamura, & Wehr, 2006).

Given the literature on age differences in future orientation discussed earlier, one would hypothesize that relative to adults, adolescents would evince a lower indifference point and a steeper discount function in delay discounting task performance, reflecting their putatively weaker orientation to the future. To our knowledge, however, only one study has examined age differences in delay discounting during childhood and adolescence (Scheres et al., 2006), and only one program of work has examined age differences in delay discounting during adolescence and adulthood. In the Scheres et al. (2006) study, children (ages 6 through 11 years) evinced steeper discounting than adolescents (ages 12 through 17 years). In the work comparing adolescents and adults, 12-year-olds (N = 12) showed a steeper discount function than college students (average age = 20, N = 12), who in turn showed a slightly steeper function than older adults (average age = 68, N = 12), but all age groups showed the same, widely reported hyperbola-like discount function, leading the researchers to conclude that age differences in the discount function were quantitative rather than qualitative (Green, Fry, & Myerson, 1994; Green et al., 1999). A second study, comparing younger adults (average age 33, N = 20) and older adults (average age 71, N = 20), did not find age differences in the discount rate, however (Green, Myerson, Lichtman, Rosen, & Fry, 1996). Together, these studies suggest that developmental differences in delay discounting might be more apparent in childhood and adolescence than in adulthood, but more research, with larger samples, is clearly needed.

In the present study, we examine age differences in future orientation using both a self-report measure and the delay discounting paradigm. We hypothesize that relative to adults, adolescents will report a weaker orientation to the future and evince both a lower indifference point and a steeper discount function on the delay discounting task. Furthermore, we hypothesize that age differences in delay discounting are linked to age differences in self-reported future orientation. Finally, we ask whether age differences in delay discounting are mediated by age differences in impulsivity, in orientation to the future, or both.

Method

Participants

The present study employed five data collection sites: Denver (Colorado), Irvine (California), Los Angeles, Philadelphia, and Washington, DC. The sample includes 935 individuals between the ages of 10 and 30 years, recruited to yield an age distribution designed both to facilitate the examination of age differences within the adolescent decade and to compare adolescents of different ages with three specific groups of young adults: (a) individuals of traditional college age (who in some studies of decision making behave in ways similar to adolescents; M. Gardner & Steinberg, 2005); (b) individuals who are no longer adolescents but who still are at an age during which brain maturation is continuing, presumably in regions that subserve orientation toward long-term goals (Giedd et al., 1999); and (c) individuals who are older than this putatively still-maturing group. Six individuals were dropped because of missing data on one or more key demographic variables. For purposes of data analysis, age groups were created as follows: 10–11 (N = 116), 12–13 (N = 137), 14–15 (N = 128), 16–17 (N = 141), 18–21 (N = 148), 22–25 (N = 136), and 26–30 (N = 123) years, yielding a sample for the present analysis of N = 929.

The sample was evenly split between males (49%) and females (51%) and was ethnically diverse, with 30% African American, 15% Asian, 21% Latino(a), 24% White, and 10% Other. Participants were predominantly working and middle class. Each site contributed an approximately equal number of participants, although site contributions to ethnic groups were disproportionate, reflecting the demographics of each site.

Procedure

Prior to data collection, all site project directors and research assistants met at one location for several days of training to ensure consistent task administration across data collection sites. The project coordinators and research assistants conducted on-site practice protocol administrations prior to enrolling participants.

Participants were recruited via newspaper advertisements and flyers posted at community organizations, Boy's and Girl's clubs, churches, community colleges, and local places of business in neighborhoods targeted to have an average household education level of "some college" according to 2000 U.S. Census data. Individuals who were interested in the study were asked to call the research office listed on the flyer. Members of the research team described the nature of the study to the participant over the telephone and invited those interested to participate. Given this recruitment strategy, it was not possible to know how many participants saw the advertisements, what proportion responded, and whether those who responded are different from those who did not.

Data collection took place either at one of the participating university's offices or at a location in the community where it was possible to administer the test battery in a quiet and private location. Before beginning, participants were provided verbal and written explanations of the study, their confidentiality was assured, and their written consent or assent was obtained. For participants who were younger than 18 years, informed consent was obtained from either a parent or a guardian.

Participants completed a 2-hr assessment that consisted of a series of computerized tasks designed to measure several executive functions (Tower of London, Stroop, Iowa Gambling Task), a set of computer-administered self-report measures, a demographic questionnaire, and several tests of general intellectual function (e.g., digit span, verbal fluency). The computerized tasks were administered in individual interviews. Research assistants were present to monitor the participant's progress, reading aloud the instructions as each new task was presented and providing assistance as needed. To keep participants engaged in the assessment, participants were told that they would receive $35 for participating in the study and that they could obtain up to a total of $50 (or, for the participants younger than 14 years, an additional prize of approximately $15 in value) based on their performance on the video tasks. In actuality, we paid all participants aged 14 – 30 years the full $50 and all participants aged 10 – 13 years received $35 plus the prize. This strategy was used to increase the motivation to perform well on the tasks but ensure that no participants were penalized for their performance. All procedures were approved by the institutional review board of the university associated with each data collection site.

Measures

Of central interest in the present analyses are our demographic questionnaire, the assessment of IQ, a self-report measure of impulsivity, a self-report measure of future orientation, and the delay discounting task. Given the findings of previous research linking future orientation to risk taking, we also describe the measure used to assess various types of risk behavior, but we use data from this measure only to validate the future orientation instrument.

Demographics. Participants reported their age, gender, ethnicity, and household education. Individuals younger than 18 years reported their parents' education, whereas participants 18 and older reported their own educational attainment, both of which were used as a proxy for SES. The age groups did not differ with respect to gender or ethnicity but did differ (modestly) with respect to SES. As such, all subsequent analyses controlled for this variable.

Intelligence. The Wechsler Abbreviated Scale of Intelligence (WASI) Full-Scale IQ Two-Subtest (Wechsler, 1999) was used to produce an estimate of general intellectual ability based on two (Vocabulary and Matrix Reasoning) of the four subtests. The WASI can be administered in approximately 15 min and is correlated with the Wechsler Intelligence Scale for Children (r = .81) and the Wechsler Adult Intelligence Scale (r = .87). It has been normed for individuals between the ages of 6 and 89 years. Because there were small but significant differences between the age groups in IQ and because performance on the delay discounting task has been found to vary with IQ, this variable was controlled in all subsequent analyses.

Impulsivity. A widely used self-report measure of impulsivity, the Barratt Impulsiveness Scale, Version 11 (Patton, Stanford, & Barratt, 1995), was part of the questionnaire battery; the measure has been shown to have good construct, convergent, and discriminant validity. Based on inspection of the full list of items (the scale has six subscales comprising 34 items) and some exploratory factor analyses, we opted to use only 18 items (α = .73) from three 6-item subscales: motor impulsivity (e.g., ''I act on the spur of the moment''), inability to delay gratification (e.g., ''I spend more money than I should''), and lack of perseverance (e.g., ''It's hard for me to think about two different things at the same time''); correlations among the three subscales in this sample are r = .36 for motor impulsivity and lacks delay of gratification, r = .32 for lacks delay of gratification and lacks perseverance, and r = .51 for motor impulsivity and lacks perseverance). Each item is scored on a 4-point scale *(rarely/never, occasionally, often, almost always/always)*, with higher scores indicative of greater impulsivity. The three subscales we elected not to use measure attention (e.g., ''I am restless at movies or when I have to listen to people''), cognitive complexity (''I am a great thinker''), and self-control, which the instrument developers describe as assessing ''planning and thinking carefully'' (Patton et al., 1995, p. 770). We could not replicate the six-factor structure of the scale in our sample—which is not surprising, given that the psychometrics of this version of the scale were derived from data pooled from samples very different from ours in age and circumstances: introductory psychology undergraduates, psychiatric patients, and prisoners. In addition, we concluded that ''attention'' and ''cognitive complexity'' were not components of impulsivity as we conceptualized the construct, and that ''self-control,'' as operationalized in this scale, overlapped too much with the planning subscale of our future orientation measure (the subscales are in fact correlated at r = .33, $p < .001$) and would thus make it difficult to examine the independent relations of impulsivity and future orientation to delay discounting. Confirmatory factor analysis indicated that a one-factor 18-item scale provided an adequate fit to the data within each age category and for the sample as a whole (normed fit index [NFI] = .912, comparative fit index [CFI] = .952, and root mean square error of approximation [RMSEA] = .033).

Risk behavior. Our battery also included a self-report measure of risk processing adapted from one developed by Benthin, Slovic, and Severson (1993). Respondents are presented with eight potentially dangerous activities (i.e., riding in a car with a drunk driver, having unprotected sex, smoking cigarettes, vandalism, shoplifting, going into a dangerous neighborhood, getting into a fight, and threatening or injuring someone with a weapon) and asked about their experience with the activity, as well as a series of questions concerning their perceptions of the activity's riskiness, dangerousness, and costs and benefits. For purposes of validating the future orientation instrument, we use only the items that ask about actual experience and created an unweighted item composite indicating degree of engagement in risky behavior.

Future orientation. A 15-item self-report measure (α = .80) of future orientation was developed for this program of research. Items were generated by a group of developmental psychologists with expertise in adolescent psychosocial development and pilot tested with small samples of high school students and college undergraduates. Slight revisions in wording were made on the basis of these pilot studies. Following a format initially developed by Harter (1982) to minimize socially desirable responding, the measure presents respondents with a series of 10 pairs of statements separated by the word *BUT* and asks them to choose the statement that is the best descriptor. After indicating the best descriptor, the respondent is then asked whether the description is *really true* or *sort of true*. Responses are then coded on a 4-point scale, ranging from *really true* for one descriptor to *really true* for the other descriptor and averaged. Higher scores indicate greater future orientation. Future orientation, with IQ controlled, is unrelated to performance on any of the executive function tasks administered to the present sample.

Items were grouped into three, 5-item subscales: *time perspective* (e.g., "Some people would rather be happy today than take their chances on what might happen in the future BUT Other people will give up their happiness now so that they can get what they want in the future"; α = .55); *anticipation of future consequences* (e.g., "Some people like to think about all of the possible good and bad things that can happen before making a decision BUT Other people don't think it's necessary to think about every little possibility before making a decision"; α = .62); and *planning ahead* (e.g., "Some people think that planning things out in advance is a waste of time BUT Other people think that things work out better if they are planned out in advance"; α = .70). The relatively low alpha coefficients for these subscales is likely due to the small numbers of items that compose each; nonetheless, appropriate caution should be taken when using them as separate measures. However, a confirmatory factor analysis indicated that a model with these three intercorrelated 5-item subscales provided a satisfactory and better fit to the data (CFI = .959, NFI = .924, RMSEA = .033) than one with one 15-item factor (CFI = .899, NFI = .865, RMSEA = .052), despite the higher alpha of the 15-item scale (the test of the difference between the models is significant, χ^2_{diff} = 137.488, df_{diff} = 3, p < .001). The full instrument, along with scoring instructions, is reprinted in the Appendix. Examination of the intercorrelations among the subscales supports the view that these three aspects of future orientation are related but not identical (time perspective with anticipation of future consequences, r = .44; time perspective with planning ahead, r = .44; anticipation of future consequences with planning ahead, r = .55).

Patterns of correlations between scores on the future orientation scale and other self-report instruments in the study battery support the validity of the measure. For example, future orientation scores are significantly correlated with responses to items from the Zuckerman Sensation-Seeking Scale that concern planning ahead (e.g., "I very seldom spend much time on the details of planning ahead," r = –.40, p < .001; "Before I begin a complicated job, I make careful plans," r = .42, p < .001) but not with items that concern thrill seeking (e.g., "I like to have new and exciting experiences and sensations even if they are a little frightening," r = –.01, *ns*). Similarly, future orientation scores are significantly correlated with items from the Barratt Impulsivity Scale that concern planning and thinking about the future (e.g., "I plan what I have to do," r = .41, p < .001; "I try to plan for my future," r = .44, p < .001; "I like to think about how my life will be in the future," r = .44, p < .001), but not with items that index nonchalance ("I am carefree and happy-go-lucky," r = .02, *ns*), inattentiveness (e.g., "I don't pay attention," r = .00, *ns*), or fickleness (e.g., "I change my friends often," r = –.05, *ns*). In addition, and consistent with other studies, in our sample, future orientation scores are positively correlated with SES (r = .09, p < .01) and negatively correlated with risk taking (r = –.22, p < .001). The negative correlation between future orientation and risk taking is even stronger (r = –.32, p < .001) among the adults in our sample (aged 18 and older), who presumably have relatively more opportunities to engage in certain risky behaviors, such as smoking, riding in cars driven by intoxicated drivers, and engaging in unprotected sex. In the present sample, the correlation between future orientation and IQ is quite modest, suggesting that the measure is not simply a proxy for intelligence (r = .10, p < .01).

Delay discounting. The delay discounting task was administered on a laptop computer (The task took about 10 min to complete.). In our adaptation of the task, the amount of the delayed reward was held constant at $1,000. We varied the time to delay in six blocks (1 day, 1 week, 1 month, 3 months, 6 months, and 1 year), presented in a random order. For each block, the starting value of the immediate reward was $200, $500, or $800, randomly determined for each participant. The respondent was then asked to choose between an immediate reward of a given amount and a delayed reward of $1,000. If the immediate reward was preferred, the subsequent question presented an immediate reward midway between the prior one and the zero (i.e., a lower figure). If the delayed reward was preferred, the subsequent question presented an immediate reward midway between the prior one and the $1,000 (i.e., a higher figure). Participants then worked their way through a total of nine ascending and descending choices until their responses converged and their preference for the immediate and delayed reward are equal, at a value reflecting the ''discounted'' value of the delayed reward (i.e., the subjective value of the delayed reward if it were offered immediately; Green, Myerson, & Macaux, 2005), referred to as the ''indifference point'' (Ohmura et al., 2006). An individual with a relatively lower indifference point and/or a relatively higher (steeper) discount rate is relatively more oriented toward the immediate than the future. For each individual, we computed the indifference point for each delay interval, the average indifference point, and the discount rate. As in previous studies, delay discounting is correlated with intelligence: In the present sample, the correlation between IQ and individuals' average indifference point is $r = .31$, $p < .001$, and the correlation between IQ and individuals' discount rate is $r = -.27$, $p < .001$. The correlation between individuals' average indifference point and their discount rate is, as expected, negative, $r = -.41$, $p < .001$, given that individuals with a higher discount rate are more likely to prefer smaller, immediate rewards. With IQ controlled, delay discounting performance is unrelated or only marginally related, $r \approx .10$ to performance on the measures of executive functioning included in the test battery.

Results

Age Differences in Self-Reported Future Orientation

A multiple analysis of covariance, with age, gender, and ethnicity as independent variables; IQ and SES as covariates; and the three subscales of the future orientation measure as intercorrelated outcomes revealed significant main effects for age, gender, and ethnicity, but no significant two- or three-way interactions among these predictors (we set the alpha level for tests of interactions for this and all other analyses at $p < .01$, given the large sample size).

As expected, future orientation increases with age, multivariate, $F(18, 2508) = 3.42$, $p < .001$, with significant differences seen on planning ahead, $F(6, 836) = 6.56$, $p < .001$, $\eta_p^2 = .04$; time perspective, $F(6, 836) = 2.62$, $p < .05$, $\eta_p^2 = .02$; and anticipation of future consequences, $F(6, 836) = 4.63$, $p < .001$, $\eta_p^2 = .03$. Table 1 presents the mean and standard error for total future orientation scores and for each of the three subscales for each age group, adjusted for group differences in IQ and SES. Mean scores for the three subscales are presented in Figure 2.

As Figure 2 shows, the pattern of age differences is not identical across the three subscales. Multiple regression analyses were used to examine linear and curvilinear (quadratic) relations between the future orientation subscales and the age. On the measure of planning ahead, there is a significant linear trend ($\beta = .194$, $t = 5.925$, $p < .001$), as predicted, but a significant curvilinear trend as well ($\beta = .469$, $t = 3.037$, $p < .01$), indicating a decline in planning between ages 10 and 15 ($r = -.12$, $p < .05$), but an increase in planning from age 15 on ($r = .21$, $p < .001$). On the subscales measuring time perspective and the anticipation of future consequences, only the linear trend is

Table 1
Mean Future Orientation Subscale and Total Scale Scores by Age Group

Dependent variable	Age group	*M*	*SE*
Planning	10–11	2.825_{abc}	.082
	12–13	2.662_{a}	.073
	14–15	2.626_{a}	.099
	16–17	2.763_{ab}	.068
	18–21	2.911_{abc}	.068
	22–25	3.138_{abc}	.066
	26–30	3.039_{abc}	.071
Temporal orientation	10–11	2.495_{ac}	.080
	12–13	2.644_{abc}	.071
	14–15	2.683_{abc}	.096
	16–17	2.722_{abc}	.066
	18–21	2.810_{bc}	.065
	22–25	2.855_{bc}	.064
	26–30	2.731_{abc}	.069
Anticipation of future consequences	10–11	2.859_{ac}	.078
	12–13	2.780_{ac}	.069
	14–15	2.875_{abc}	.094
	16–17	2.963_{abc}	.064
	18–21	3.018_{abc}	.064
	22–25	3.116_{ab}	.062
	26–30	3.199_{b}	.067
Future orientation total scale	10–11	2.726_{a}	.064
	12–13	2.695_{a}	.057
	14–15	2.728_{ac}	.077
	16–17	2.816_{abc}	.053
	18–21	2.913_{abc}	.053
	22–25	3.036_{b}	.051
	26–30	2.990_{bc}	.055

Note. Scores adjusted for group differences in IQ and socioeconomic status. Cells not sharing a subscript are significantly different at $p < .05$ or better.

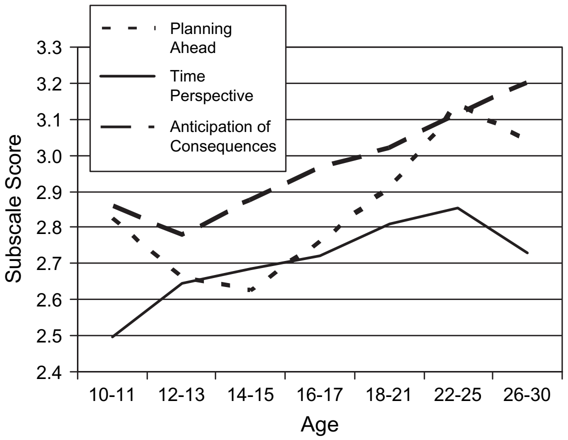

Figure 2. Age differences in planning ahead, time perspective, and anticipation of future consequences.

significant ($\beta = .105$, $t = 3.174$, $p < .01$ and $\beta = .204$, $t = 6.322$, $p < .001$, respectively). Post hoc pairwise Bonferroni-adjusted comparisons were conducted in order to examine the curvilinear trend in the planning data. These comparisons indicate significantly lower planning scores among adolescents between 12 and 15 than among younger or older individuals; these age differences did not vary as a function of gender or ethnicity.

Although not a central focus of this report, we also find small but significant gender differences on all three subscales, with females outscoring males. Ethnic differences are significant only on the planning subscale, with African Americans outscoring all other groups, whose scores do not differ. Scores on the time perspective and anticipation of future consequences subscales (but not the planning ahead subscale) are significantly correlated with IQ; none of the three subscales is correlated with SES.

Age Differences in Delay Discounting

Indifference point. As noted earlier, the indifference point is the amount at which the subjective value of the short-term reward is equivalent to that of the delayed reward. A repeated measures analysis of covariance (ANCOVA) was conducted with age, gender, and ethnicity as between-subjects factors; IQ and SES as covariates; and individuals' indifference points at the six time intervals (1 day, 1 week, 1 month, 3 months, 6 months, and 1 year) as the within-subjects factor. As in virtually all studies of delay discounting, we find a main effect of the repeated time factor, Greenhouse – Geisser $F(5, 3555) = 6.64$, $p < .001$, $\eta_p^2 = .01$, indicating that individuals' indifference points decline as the delay interval increases. Although there are significant age differences in *average* indifference points, $F(6, 832) = 5.90$, $p < .001$, $\eta_p^2 = .04$, with younger individuals demonstrating lower indifference points than older ones, we do not find a significant interaction between the repeated time factor and age, nor do we find significant interactions between the repeated time factor and gender, ethnicity, IQ, or SES, suggesting that individuals of different ages, sexes, and ethnic groups, socioeconomic backgrounds, and intelligence levels show comparable patterns of discounting over the delay intervals examined here. Average indifference points are positively related to IQ but not SES or gender. We also find small but significant ethnic differences in average indifference points, with African Americans demonstrating a relatively lower indifference point, and Asian Americans demonstrating a relatively higher indifference point, than other groups.

As Table 2 and Figure 3 indicate, there is a near-consistent break point across all delay intervals in average indifference points around age 14 or 15, with individuals aged 13 and younger generally reporting

Table 2
Discounted Value (Indifference Point) of $1,000 at Varying Delay Intervals and Average Indifference Point as a Function of Age

	Delay interval						
Age	1 day*	1 week*	1 month*	3 months*	6 months	1 year†	Average value*
10 – 11 years	745_a	711_a	631_{ab}	492_a	421_{ac}	391_{abc}	565_a
12 – 13 years	756_a	707_a	570_a	485_a	447_a	331_{ab}	549_a
14 – 15 years	890_b	796_{ab}	606_{abc}	569_{ab}	460_{ac}	343_{abc}	611_{ab}
16 – 17 years	905_b	832_b	702_{bc}	614_b	498_{ac}	423_{ac}	662_{bc}
18 – 21 years	930_b	828_b	742_{abcd}	636_b	530_{bc}	452_{ac}	686_{bc}
22 – 25 years	919_b	822_b	719_{abcd}	607_b	479_{abc}	424_{ac}	662_{bc}
26 – 30 years	884_b	813_b	691_{abcd}	637_b	547_{bc}	442_{ac}	669_{bc}

Note. Values not sharing subscripts with other values in the same column are significantly different at $p < .05$ or better.
†$p < .10$ for comparison of age groups. *$p < .001$ for comparison of age groups.

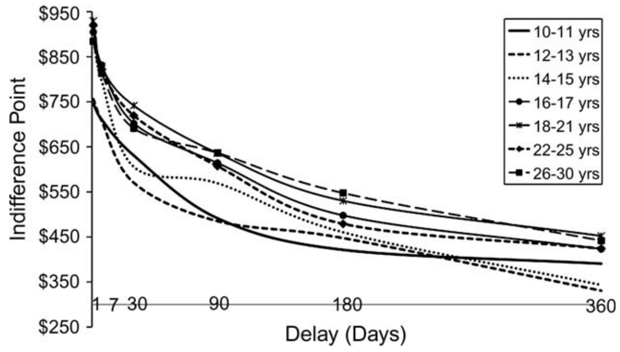

Figure 3. Age differences in discount function.

lower indifference points than individuals aged 16 and older and individuals aged 14 and 15 years falling somewhere in between. That is, there are no significant age differences in average indifference points among individuals aged 16 and older, and no differences between the 10- and 11-year-olds and the 12- and 13-year-olds, based on Bonferroni-adjusted pairwise comparisons.

Discount rate. The discount rate (k) was computed using the standard equation, $V = A/(1 + kD)$, where V is the subjective value of the delayed reward (i.e., the indifference point), A is the actual amount of the delayed reward, D is the delay interval, and k is the discount rate. In the current study, as is usually the case, the distribution of k was highly positively skewed (4.47); accordingly, we employed a natural log transformation to reduce skewness to an acceptable level (−.271).

An ANCOVA, with age, gender, and ethnicity as independent variables; IQ and SES as covariates; and the discount rate (k) as the outcome resulted in a significant effect for age, $F(6, 832) = 6.62$, $p < .001$, $\eta_p^2 = .05$, with significant differences, as indicated by Bonferroni-adjusted pairwise comparisons, between individuals aged 13 and younger, on the one hand, and those aged 16 and older, on the other; as with average indifference points, individuals aged 14 and 15 fell between the two extremes and did not differ from younger or older individuals (see Figure 4). Younger individuals evince a relatively steeper function, indicating a relatively weaker future orientation. As in the analysis of indifference points, there are no significant age differences in the steepness of individuals' discount rate after age 16. Thus, adolescents aged 13 and younger will accept a smaller reward than individuals aged 16 and older in order to obtain the reward sooner, and, relative to older individuals, younger adolescents are more likely to do so at lower amount in order to get the reward even sooner. This pattern of age differences did not vary as a function of gender or ethnicity. Discount rate is negatively related to IQ but unrelated to SES or gender. In addition, we found a small but significant difference in discount rates between Asian and African American individuals, with Asians evincing a less steep (i.e., more future oriented) discount function than African Americans.

Consistent with previous research, we find that a hyperbolic discount function fits the data well. Across all age groups, R^2 for the hyperbolic function based on the median indifference point at each delay is .987, $p < .001$. Also consistent with past research, we find that a hyperbolic function fits the data well for each age group (the R^2s for the hyperbolic function based on median indifference points at each delay are .984, .990, .982, .905, .971, .971, and .991 for ages 10 – 11, 12 – 13, 14 – 15, 16 – 17, 18 – 21, 22 – 25, and 26 – 30, respectively); Green et al. (1999; Table 1) report R^2s of .995 and .996 for children (average age 12) and young adults (average age 20), respectively. As have other researchers, we also find that an exponential function also fits the data well, both for the sample as a whole and for each age group (with virtually identical R^2s to those derived from a hyperbolic

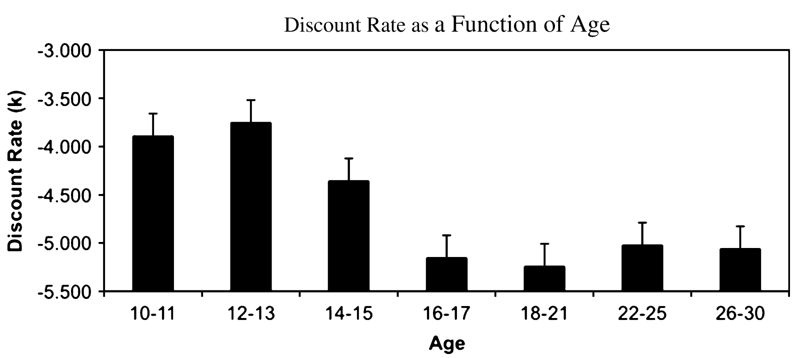

Figure 4. Discount rate as a function of age.

function) and that both the hyperbolic and the exponential functions provide a superior fit than a linear function for each age group. Thus, age differences in discounting are more a mater of quantity (i.e., in the steepness of the curve) than quality (i.e., in the shape of the curve; see also Green et al., 1994).

Relation Between Self-Reported Future Orientation and Delay Discounting

Because this is the first study to simultaneously assess future orientation via self-report and behavioral measures, we were interested in examining the relation between our measure of future orientation and the measures derived from the delay discount paradigm. Table 3 shows the bivariate and partial correlations (with age and IQ controlled, in order to ensure that any significant correlations are not attributable to the fact that the measures are significantly correlated with these variables) between the overall future orientation score, the three subscales of the future orientation questionnaire, and the two primary outcomes derived from the delay discounting task: the average indifference point and the discount rate. As the table indicates, scores on the self-report measure of future orientation and behavioral measures are significantly, albeit modestly, correlated, although more strongly and more consistently for the subscales measuring time perspective or the anticipation of future consequences than for the planning subscale. Indeed, in a multiple regression analysis in which the three future orientation subscales are used to simultaneously predict individuals' indifference point (with age and IQ controlled), the temporal orientation and anticipation of future consequences scores are predictive, but scores on the planning ahead subscale are not ($\beta = .126$, $t = 3.39$, $p < .001$; $\beta = .161$, $t = 4.03$, $p < .001$; and $\beta = -.059$, $t = 1.49$, *ns*, respectively). In a comparable analysis predicting discount rate, temporal orientation and anticipation of consequences scores predict discount rates in the expected direction (more future-oriented individuals discount delayed values less steeply), whereas planning scores are inexplicably related to discount rate in the opposite direction (more planful individuals discount delayed values *more* steeply; $\beta = -.164$, $t = 4.39$, $p < .001$; $\beta = -.130$, $t = 3.25$, $p < .001$; and $\beta = .096$, $t = 2.41$, $p < .05$, respectively).

Do Age Differences in Future Orientation or Impulsivity Explain Age Differences in Delay Discounting Performance?

We noted in the Introduction that performance on the delay discounting task has been traditionally linked to impulsivity but that recent neurobiological evidence paints a more complicated picture, with delay discounting linked both to brain systems regulating impulse control and those regulating the sort of abstract, deliberative reasoning implied by an orientation to the future. Studies of brain development show continued maturation during adolescence of brain systems that subserve both processes (Steinberg, 2008). Because adolescence is a time of increases in impulse control (Galvan, Hare, Voss, Glover, & Casey, 2007; Leshem & Glicksohn, 2007) and, as documented in the present report, in future orientation, it is possible that age differences in delay discounting are mediated by age differences in impulsivity, age differences in orientation to the future, or both.

In order to examine whether future orientation or impulsivity mediates age differences in delay discounting, we conducted two hierarchical multiple regression analyses, in which we regressed either the average indifference point or the discount rate on age, impulsivity, and future orientation, entered into the equation in that order, and controlling for IQ and SES. (Given the correlation of .33 between impulsivity and future orientation scores, it was important

Table 3
Zero-Order and Partial Correlations (With Age and IQ Controlled) Between Future Orientation Scale and Subscales and Delay Discounting Measures

	Average indifference point		Discount rate	
	Zero order	Partial	Zero order	Partial
Future orientation (full scale)	.18***	.14***	−.15***	−.12***
Planning ahead	.08*	.05	−.05	−.01
Temporal orientation	.17***	.16***	−.18***	−.16***
Anticipation of consequences	.18***	.15***	−.15***	−.11***

Note. *N*s vary from 919 to 924.
**p* < .05. ****p* < .001.

to examine the impact of future orientation after controlling for impulsivity, so as to isolate that aspect of future orientation that may be related to impulse control rather than a genuine orientation to the future.) Our interest was in testing whether the relation between age and delay discounting was diminished when impulsivity was added into the equation and whether the relation between age and delay discounting was further diminished by the addition of future orientation into the model, with impulsivity left in the equation so as to test the mediating role of future orientation above and beyond any aspect of future orientation that is related to impulsivity. In each case, a Sobel test was used to assess the extent and statistical significance of mediation (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

The results of these analyses indicate that age differences in delay discounting are significantly mediated by differences in orientation to the future but not by differences in impulsivity. With impulsivity added to the equation, the decline in the impact of age on the average indifference score is trivial (from $\beta = .208$ to $\beta = .199$, $z = 1.73$, *ns*), as is the decline in the impact of age on discount rate (from $\beta = -.212$ to $\beta = -.203$, $z = 1.52$, *ns*). In contrast, with future orientation added to the equation (i.e., controlling for impulsivity), the impact of age on average indifference point declines significantly from $\beta = .208$ to $\beta = .177$ ($z = 3.12$, $p < .01$). Similarly, with future orientation added to the equation, the impact of age on discount rate also declines significantly from $\beta = -.212$ to $\beta = -.187$ ($z = 3.652$, $p < .001$). Thus, age differences in aspects of psychological functioning that the future orientation measure captures which are unrelated to impulsivity partially explain why adolescents discount delayed rewards more than adults.

Discussion

By their own self-characterization, and as reflected in their performance on a standard delay discounting task, adolescents are less oriented to the future than are adults. This relatively weaker future orientation is apparent across several different indices, including individuals' self-reported likelihood of planning ahead, the extent to which they say that they think about the future, and their reported inclination to anticipate the future consequences of their actions before acting, as well as in their preferences for smaller rewards that are delivered sooner over larger ones delivered at a more distant time point. These age differences, which do not vary by gender or ethnicity, are consistent both with stereotypic portrayals of youthful myopia and with prior work on self-reported future orientation using a variety of operationalizations of the construct.

Recent studies documenting continued maturation into the mid-20s of brain regions associated with foresight and planning (Casey, Tottenham, Liston, & Durston, 2005) have prompted new interest in studying the development of these psychological phenomena. The current study indicates, however, that the construct, "future orientation," is multidimensional and warrants a more differentiated operationalization than that employed in many previous studies. Scientists interested in charting the course of this phenomenon should bear in mind that different aspects of future orientation may follow different developmental trajectories and reach adult levels of maturity at different ages.

To our knowledge, this is the largest study to examine age differences in delay discounting and the first to look simultaneously at delay discounting and self-reported future orientation. Our delay discounting findings support and extend those reported in previous smaller scale studies, which have reported age differences in discounting between very young adolescents (age 12) and both young adults (age 20) and the elderly (age 68; Green et al., 1994, 1999) but not between adults in their 30s and those in their 70s (Green et al., 1996); as in these other studies, age differences in discounting are more quantitative (i.e., the steepness of the curve) than qualitative (i.e., the hyperbolic shape of the curve). According to our findings, differences between adolescents and adults, both in their indifference points and in their discount rate, are limited to those between individuals aged 13 and younger versus those aged 16 and older, suggesting that the period between 13 and 16 may be especially important for the development of the specific capacities that underlie discounting behavior, and, as we shall argue, affect individuals' relative preference for longer term versus immediate rewards. The development of a relative preference for larger, delayed rewards appears to follow a timetable that is more similar to the development of time perspective or the anticipation of future consequences than to the development of planning ahead, although further research using more varied behavioral tasks is indicated. This account is consistent with our finding that relative preference for a larger but delayed reward is correlated with temporal orientation and the anticipation of future consequences but not with planning ahead. It is also consistent with recent work suggesting that different aspects of future orientation have different neural bases (Fellows & Farah, 2005).

Our findings also bear on discussions of whether adults' more future-oriented performance on delay discounting tasks reflects better impulse control, a stronger future orientation, or a combination of the two. In particular, our examination of whether future orientation or impulsivity mediated age differences in indifference points and discount rates suggested a pattern in which future orientation, but not impulsivity, partially explains differences in delay discounting between adolescents and adults. The suggestion that developmental differences in delay discounting performance are more closely linked to the development of future orientation than to impulse control must be tempered somewhat by the fact that our measures of impulsivity and future orientation are based on individuals' self-reports, and, as well, by the fact that the correlations between future orientation scores and delay discounting performance are small in magnitude. It would appear, however, that although *individual* differences in delay discounting may be linked both to differences in impulse control and in orientation to the future, *age* differences in delay discounting during adolescence and adulthood are due, at least in part, to differences in the ways in which adolescents and adults evaluate immediate versus longer term rewards and not to differences in impulse control. It is also important to note that the amount of variance in delay discounting performance explained by the combination of the future orientation and impulsivity measures is small, indicating that other factors (e.g., reward sensitivity, attentional processes) also contribute to task performance. Further research on age differences in delay discounting should examine other possible mediators.

The differential relation between delay discounting and future orientation versus impulsivity is helpful in drawing a distinction between delay discounting and delay of gratification, a paradigm which, in contrast to delay discounting, has been used often in prior developmental research (e.g., Mischel & Ebbesen, 1970). In the conventional delay of gratification paradigm, there is but one choice—between an immediate reward and a delayed one; no attempt is made to systematically vary delay or reward amounts within the same participant's testing in order to calibrate the degree and rate with which a delayed reward is discounted. Delay of gratification tasks are clearly considered to measure impulse control (terms such as *self-control, self-discipline, and self-regulation* pervade writings on delay of gratification). Although there has been some discussion in the literature as to whether the source of self-control that permits some individuals to wait longer than others in order to receive a larger reward is mainly a function of individual differences in impulse regulation (and where adaptive functioning is neither undercontrolled nor overcontrolled) as opposed to differences in the cognitive competencies employed in order to resist a tantalizing reward (and where more competence is clearly better; see Funder & Block, 1989, for a discussion), the overarching theme in these studies concerns individuals' abilities to manage themselves. Our findings indicate that the delay discounting task likely measures something different from self-management, however, and suggest that developmentalists, especially those interested in the development of future orientation, might profitably incorporate this paradigm into their work. It would also be useful to study delay of gratification and delay discounting within the same sample, to specifically test the hypothesis that the former, but not the latter, is linked to impulsivity.

Because the present findings are based on cross-sectional data, one must be cautious about drawing conclusions about patterns of development over time. Nevertheless, the differential pattern of age differences observed here with respect to planning ahead, where age differences are seen well into early adulthood, versus temporal orientation, the anticipation of future consequences, and delay discounting, where age differences are not seen beyond middle adolescence, as well as the stronger association between delay discounting and future orientation as opposed to impulsivity, is consistent with an emerging consensus concerning a dual systems model of adolescent brain development (Casey et al., 2008; Steinberg, 2008). According to this model, changes in reward seeking (including changes in relative preferences for immediate vs. longer term rewards) are mediated by a "socioemotional" network, which undergoes extensive remodeling early in adolescence and which is localized in limbic and paralimbic areas of the brain, including the amygdala, ventral striatum (nucleus accumbens), orbitofrontal cortex, medial prefrontal cortex, and superior temporal sulcus. In contrast, changes in impulse control and planning are mediated by a "cognitive control" network, which is mainly composed of the lateral prefrontal and parietal cortices and those parts of the anterior cingulate cortex to which they are interconnected, and which matures more gradually and over a longer period of time, into early adulthood (Steinberg, 2007). The present study suggests that adolescents' relatively greater preference for immediate rewards, as indexed by their performance on the delay discounting task, as well as their weaker orientation to the future and their lesser sensitivity to the longer term consequences of their actions may be more strongly related to arousal of the socioemotional network than to immaturity in cognitive control, a finding consistent with the observation that the neural underpinnings of impulsivity differ from the underpinnings of temporal discounting (Fellows & Farah, 2005). Future research, using brain-imaging techniques, should compare adolescents' and adults' patterns of brain activity during delay discounting task performance in order to better distinguish between these two underlying processes.

Questions about whether and to what extent adolescents and adults differ in their orientation to the future have been central in discussions about the legal regulation of adolescents and critical to debates about such diverse phenomena as adolescents' rights to autonomous medical decision making (Scott & Woolard, 2004) and the constitutionality of the juvenile death penalty (Steinberg & Scott, 2003). Yet, although "future orientation" is invoked in discussions of different policy questions, a close inspection of the way in which the term is used shows that it may refer to very different capacities in different contexts. When future orientation is raised in discussions of adolescents' abortion rights, for example, it is largely with reference to adolescents' ability to rationally anticipate the future consequences of their decisions (American Psychological Association, 1989). When it is applied to discussions of the criminal culpability of juveniles, though, it often refers to their capacity for premeditation or planfulness (*Roper v. Simmons*, 2005). To the extent that these aspects of future orientation are not the same thing, it is important to be careful about how arguments that make reference to it are framed. If future orientation is a multidimensional construct composed of a loosely linked set of capacities that develop along different timetables, the application of research on its development must be sufficiently nuanced to link specific aspects of future orientation to specific policy questions (see Steinberg, Cauffman, Woolard, Graham, & Banich, in press).

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Appendix: Future Orientation Scale

	Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
1.	❑	❑	Some people like to plan things out one step at a time	**BUT**	Other people like to jump right into things without planning them out beforehand	❑	❑
2.	❑	❑	Some people spend very little time thinking about how things might be in the future	**BUT**	Other people spend a lot of time thinking about how things might be in the future	❑	❑
3.	❑	❑	Some people like to think about all of the possible good and bad things that can happen before making a decision	**BUT**	Other people don't think it's necessary to think about every little possibility before making a decision	❑	❑
4.	❑	❑	Some people usually think about the consequences before they do something	**BUT**	Other people just act-they don't waste time thinking about the consequences	❑	❑
5.	❑	❑	Some people would rather be happy today than take their chances on what might happen in the future	**BUT**	Other people will give up their happiness now so that they can get what they want in the future	❑	❑
6.	❑	❑	Some people are always making lists of things to do	**BUT**	Other people find making lists of things to do a waste of time	❑	❑
7.	❑	❑	Some people make decisions and then act without making a plan	**BUT**	Other people usually make plans before going ahead with their decisions	❑	❑
8.	❑	❑	Some people would rather save their money for a rainy day than spend it right away on something fun	**BUT**	Other people would rather spend their money right away on something fun than save it for a rainy day	❑	❑
9.	❑	❑	Some people have trouble imagining how things might play out over time	**BUT**	Other people are usually pretty good at seeing in advance how one thing can lead to another	❑	❑
10.	❑	❑	Some people don't spend much time worrying about how their decisions will affect others	**BUT**	Other people think a lot about how their decisions will affect others	❑	❑

11.	❑	❑	Some people often think what their life will be like 10 years from now	**BUT**	Other people don't even try to imagine what their life will be like in 10 years	❑	❑
12.	❑	❑	Some people think that planning things out in advance is a waste of time	**BUT**	Other people think that things work out better if they are planned out in advance	❑	❑
13.	❑	❑	Some people like to take big projects and break them down into small steps before starting to work on them	**BUT**	Other people find that breaking big projects down into small steps isn't really necessary	❑	❑
14.	❑	❑	Some people take life one day at a time without worrying about the future	**BUT**	Other people are always thinking about what tomorrow will bring	❑	❑
15.	❑	❑	Some people think it's better to run through all the possible outcomes of a decision in your mind before deciding what to do	**BUT**	Other people think it's better to make up your mind without worrying about things you can't predict	❑	❑

Scoring: All items are scored left to right on a scale of 1-4. Reverse score items 1, 3, 4, 6, 8, 11, 13, and 15, so that higher scores indicate a stronger future orientation.

Future Orientation total score is the unweighted average of all 15 items.

Planning Ahead is the unweighted average of items 1, 6, 7, 12, and 13.

Time Perspective is the unweighted average of items 2, 5, 8, 11, 14.

Anticipation of Future Consequences is the unweighted average of items 3, 4, 9, 10, 15.