



Introducing an instrument to assess time orientation and time relation in adolescents



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A B S T R A C T

Keywords:

Time perspective
Time orientation
Time relation
Adolescents
Measure
Academic outcomes
Risky behaviors

We report on two studies that examine new instruments that assess time orientation and time relation in adolescents. These concepts refer to how individuals think about the past, the present, and the future, with time orientation defined as the emphasis one gives toward each time period and time relation defined as the degree one perceives that the time periods are related to one another. Study 1 showed that time orientation predicted academic achievement and self-esteem and time relation predicted academic achievement and hope. Study 2, which included revised versions of the instruments, replicated most findings and demonstrated that both time orientation and time relation were related to engaging in risky behaviors. As hypothesized, in both studies, there were no gender differences in time orientation or time relation. These instruments provide a new way to assess how adolescents' perceive time and how this relates to their development and behavior.

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Time perspective is a cognitive-motivational construct that broadly refers to thoughts and attitudes toward the past, the present, and the future (Lewin, 1942; Mello, 2013; Zimbardo & Boyd, 1999, 2008). Scholars have operationalized the construct in a variety of ways. For example, attitudes toward a particular time period have predicted psychological outcomes (Buhl & Linder, 2009; Zimbardo & Boyd, 1999) and risky-behaviors (Henson, Carey, Carey, & Maisto, 2006; Kruger, Reischl, & Zimmerman, 2008), and frequent thinking about each time period has been associated with academic achievement (Mello, Worrell, & Andretta, 2009).

Other ways to conceptualize time perspective that may predict human behavior include time orientation and time relation. Time *orientation* refers to the emphasis one gives toward each time period, whereas time *relation* refers to the degree one perceives the time periods are related to one another (Mello, 2013). Cottle (1967) created a projective test to assess these two concepts in adults. Given that adolescence is a fruitful developmental period for intervention and that time perspective has the potential to foster healthy behaviors (McKay, Cole, Sumnall, & Goudie, 2012), we sought to extend research on these two dimensions of time perspective—time orientation and time relation—to adolescents. In two studies, we examine how scores on these constructs vary by gender and their relationships with academic achievement, psychological outcomes, and risky behaviors.

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Time perspective theories

Time perspective has been described as a multidimensional, cognitive-motivational construct with a particular salience in adolescence (Mello, 2013). Scholars have argued that thoughts and attitudes toward the past, the present, and the future vary among individuals and that this variation predicts human behavior (Lewin, 1942; Mello, 2013; Zimbardo & Boyd, 1999, 2008). Time perspective has been most commonly operationalized as attitudes toward each time period (Worrell, Mello, & Buhl, 2011; Zimbardo & Boyd, 1999). However, Mello (2013), based on a review of the extant literature, has proposed that time perspective also includes time orientation and time relation. Time orientation is defined as the emphasis one places on the past, the present, or the future. This concept stems from Cottle's (1967) notion of dominance, in which he postulated that a particular time period may dominate an individual's thinking.

Time relation refers to the degree to which individuals perceive the time periods as related to one another. This concept may elucidate motivation, especially if individuals understand that prior experiences (the past) contribute to today's behavior (the present) and, in turn, may affect tomorrow (the future). Time relation was described by Cottle (1967) as perceived relatedness among the time periods. This notion is illustrated in an adolescent's idea about time: "Well, I think it's kind of like steps, the past can influence the future, but you have to think about the past in the present to influence the future" (Mello, Bhadare, et al., 2009; p. 547).

Adolescence is an important period of the lifespan to investigate time orientation and time relation, given developmental changes that occur at this age. Adolescents mature in cognitive capacities including the understanding of time (Piaget, 1955) and engage in the process of identity formation, which includes the integration of past, present, and future selves (Erikson, 1968). Thus, scholars have posited adolescence may result in a shift in thinking about time compared to childhood and adulthood (Lewin, 1942; Mello, 2013). Indeed, most examinations of time perspective in adolescents focus on the future, rather than the past or present.

In summary, extant theory and empirical research suggest that time perspective is an important psychological construct (Mello, 2013; Zimbardo & Boyd, 1999, 2008) and that there is meaningful individual variation in time constructs like time orientation and time relation (Cottle, 1967; Mello, 2013). Drawing from this assertion, scores are thought to vary more among individuals than between genders, and these scores should predict developmental outcomes, such as academic achievement, psychological outcomes, and risk taking.

Time perspective instruments

The Circles Test

In 1967, Cottle published the Circles Test, a projective instrument used to assess temporal dominance and relatedness. Participants (modal age = 19) were asked to draw circles depicting (a) the importance they placed on the past, the present, and the future and (b) how these time periods were interrelated. Drawn circles were then coded. Dominance (importance) was determined by evaluating the size of the circles, whereas relatedness was assessed with the degree of overlap among the drawn circles. Sixty-five percent of the sample drew circles indicating that the future was most important (a future orientation), followed by about 10% who indicated a present orientation, and about 7% who indicated a past orientation. With regards to time relation, about 63% drew circles of the past, the present, and the future that were not touching, indicating that they viewed the time periods as unrelated. About 26% indicated that time periods were continuous (i.e., touching but not overlapping), and about 11% reported an integrated perspective toward time, by drawing circles that were overlapping or embedded in one another.

We could locate only a few studies that have used the Circles Test (Cottle, 1967) with adolescents or children. Haldeman (1993) conducted a study with 13–17 year-olds. Results indicated that 61% drew future-oriented circles, 19% drew present-oriented circles, 4% drew past-oriented circles, and 16% were undifferentiated in size. Through follow-up questions, Haldeman determined that a majority of participants who were categorized as future oriented also indicated that they (a) thought mostly about their future, (b) thought about the future when making decisions, and (c) enjoyed dreaming about their future more than the past or the present. Bruno (1996) demonstrated that a future-oriented circle configuration was the most frequent drawing in children, followed by a balanced orientation toward the past, the present, and the future.

Most studies with The Circles Test (Cottle, 1967) have included college students. Koenig (1972) reported that 38% drew circle configurations that were oriented toward the future and a similar number showed the time periods as interrelated. Achamamba (1988a) found that 68% were future-oriented, 17% were present-oriented, and 14% were past-oriented, and 60% indicated that the time periods were unrelated. Other studies have included adults, such as Brown and Herring (1998), who reported that a majority of participants drew unrelated circles, in a study of individuals aged 22–65. Thompson and Fitzpatrick (2008) showed that among participants aged 25 and older, 43% were future-oriented and 72% depicted unrelated time periods.

Other instruments

Other scholars have created instruments designed to assess constructs similar to time orientation and time relation. Zimbardo and Boyd (1999) developed the Zimbardo Time Perspective Inventory (ZTPI) with college students to assess both an

orientation *and* an attitude toward the past, the present, and the future. The instrument comprises five subscales: Past Positive, Past Negative, Present Hedonistic, Present Fatalistic, and Future. As the names indicate, the ZTPI assesses more than an orientation toward time. The Present Hedonistic subscale “reflects a risk-taking attitude toward time and life” (Zimbardo & Boyd, 1999, p. 1275), the Present Fatalistic subscale indicates that the “future is predestined” (Zimbardo & Boyd, 1999, p. 1278), and the Future subscale includes items on planning, as well as future-related behaviors. Most important to the current study, ZTPI scores have been shown to have relatively low reliability estimates and structural validity concerns in adolescent samples (Worrell & Mello, 2007).

Other instruments have included the Time Orientation Scale (TOS; Bowles, 1999), which was designed with adolescents to assess clarity about the past, the present, and the future; the Temporal Focus Scale (TFS; Shipp, Edwards & Lambert, 2002), which measures attention toward the past, the present, and future, and was created with individuals aged 25–52. Lastly, Fortunato and Furey (2010) created the TimeStyle Inventory (TSI) with participants aged 18–52 to assess past, present, and future thinking. The authors indicate that the past refers to memory, the present refers to the integration of the past and the future, and the future refers to the hypothetical.

In sum, extant time orientation and time relation instruments are limited in their application to adolescents, and there are additional concerns related to coding and the conceptualization of time constructs. Cottle's (1967) measure was normed with adults and has been mostly employed with adult samples (Achamamba, 1988a; Thompson & Fitzpatrick, 2008). Although a few studies have included children or adolescents (Bruno, 1996; Haldeman, 1993), the coding of drawn circle configurations makes the instrument burdensome to administer. Further, various coding schemes have been used, with data sometimes coded only for future dominance (Haldeman, 1993; Koenig, 1972), excluding the past and the present. The TOS (Bowles, 1999) was developed with adolescents, although it assesses clarity about each time period, rather than the relative emphasis or relationships among the time periods. Lastly, although the ZTPI (Zimbardo & Boyd, 1999), the TFS (Shipp et al., 2002), and the TSI (Fortunato & Furey, 2010), focus on multiple time periods, they were developed with college students and they assess constructs that are different from time orientation and time relation, such as attitudes, attention, and memory about the past, the present, and the future.

Demographic differences and developmental outcomes

Gender

In most studies, time orientation and time relation scores have been shown to be similar across genders. Researchers have reported this pattern in adolescents (Haldeman, 1993; Tismer, 1987) and adults (Thompson & Fitzpatrick, 2008). Bowles (1999) demonstrated that male and female adolescents did not differ in how clearly they thought about the past, the present, and the future. However, the relationship *between* time orientation and time relation was shown to vary by gender in one study (Cottle, 1967). The more that women were oriented toward the future, the less interrelated they perceived the past, the present, and the future, whereas time orientation and time relation were not related for men. Most recently, Andretta, Worrell, Mello, Dixon, and Baik (2013) found that male and female adolescents did not differ in attitudes toward the past, the present, and the future.

Academic outcomes

The evidence on the relationship of time orientation and time relation to academic outcomes is mixed. In one study, Cottle (1967) found that time orientation and time relation were not related to mathematics and verbal aptitude, but in another study, he reported that time relation was positively associated with valuing achievement (Cottle, 1969). Achamamba (1988b) showed that cognitive abilities were positively associated with both an orientation toward the future and with perceiving time periods as related to one another, and Getsinger (1975) found that time relation was positively associated with intelligence in a study of college students. Haldeman (1993) showed that an orientation toward the future was positively associated to grade point average (GPA), when drawn circle configurations were coded dichotomously, with one category comprising future oriented circles and the other category including the remaining circles. Zimbardo and Boyd (1999) indicated that the Future subscale scores were positively associated with the number of hours spent studying in a week. Bowles (1999) found the relationship between clarity about time periods and academic achievement varied across age. Specifically, a positive association was observed between present orientation and academic achievement among early adolescents. Among middle-adolescents, the past was inversely associated and the present positively associated with academic achievement, whereas for older adolescents, only the present was positively associated with academic achievement.

Psychological outcomes

Some researchers have reported an association between time relation and anxiety, with more unrelated circle configurations being drawn by individuals with higher anxiety (Cottle, 1969; Getsinger, 1975). However, a relationship was not observed between time orientation and anxiety in one study (Achamamba, 1988a). Although, other studies have shown that an orientation toward the future was positively associated with optimism and hopefulness (Haldeman, 1993), and that optimism was negatively related to a past focus and positively related to a present and future focus (Shipp et al., 2002).

Risky behaviors

Few scholars have investigated the relationship between these time constructs—time orientation and time relation—and risky behaviors. Koenig (1972) examined time relation, time dominance, and cigarette smoking in a sample of college students. Results indicated that participants who smoked were less likely to draw circle configurations that included an orientation toward the future or a related view of the past, the present, and the future. Students identified by teachers as at-risk for poor school behaviors were also less likely to draw circles indicating a future orientation than their counterparts (Bruno, 1996).

Researchers examining risky behaviors have assessed its association with constructs akin to time orientation and time relation. Brock and Giudice (1963) conducted an experimental study where participants reported temporal perceptions and were given an opportunity to take money out of an open purse. Results indicated that those who stole described stories less projected into the future compared to their counterparts. Less of an orientation toward the future was also reported by participants who injected drugs compared to their non-injecting counterparts (Alvos, Gregson, & Ross, 1993). Risk-taking was positively related to a focus on the present and the future, and was not related to focusing on the past (Shipp et al., 2002).

Studies using the ZPTI (Zimbardo & Boyd, 1999) have shown that higher future scores have been related to less sexual activity (Rothspan & Read, 1996), less tobacco use (Henson et al., 2006), less aggression (Kruger et al., 2008), and fewer risky behaviors (Schechter & Francis, 2010). Scores on the ZPTI's Present Hedonistic scale are also positively related to engaging in a range of risky behaviors such as risky driving, using tobacco, drinking alcohol, and drug use (Keough, Zimbardo, & Boyd, 1999; Zimbardo, Keough, & Boyd, 1997), although it is not clear if these behaviors are more related to hedonism or a present orientation. Most recently, McDade et al. (2011) reported that perceived life chances, a future-oriented construct, was negatively related to cigarette use.

The present studies

In these two studies, we posed the following research questions. First, how do adolescents vary in time orientation and time relation? Drawing from the limited prior studies (Achamamba, 1988a; Cottle, 1967; Haldeman, 1993; Thompson & Fitzpatrick, 2008), we expected that the majority of adolescents would report an orientation toward the future and would perceive time periods as unrelated to one another. Second, how do adolescent females and males vary in time orientation and time relation? We expected that males and females would report similar patterns of time orientation and time relation based on the patterns shown in extant studies (Cottle, 1969). Third, how does variation in time orientation and time relation predict academic and psychological outcomes and risk taking? Although extant findings are mixed and are based on different instruments than the one used in this study, there is some evidence that future oriented (Bruno, 1996; Haldeman, 1993; Koenig, 1972) and related circle configurations (Cottle, 1969; Getsinger, 1975) will be associated with these outcomes. Thus, we expected to observe such patterns in these studies.

Study 1

Method

Participants

The sample included 301 adolescents (40% female). Participants were aged 12–19 ($M = 16.07$, $SD = 1.25$), with 4 (1.3%) older than 18. Analyses controlling for age did not result in any differences in findings; thus, results are presented without age controlled. Although a sample of convenience, recruitment was designed to obtain a diverse sample, including target schools in two different urban districts, a rural district, and a summer program at a major research university. These strategies yielded a sample with over 20% underrepresented ethnic minorities and a range of socioeconomic status (SES) levels. Self-reported racial/ethnic groups were African American ($n = 33$; 11%), Asian American ($n = 76$; 25%), European American ($n = 123$; 41%), Hispanic ($n = 31$; 10%), Native American ($n = 3$; 1%), and Multi-ethnic/Other ($n = 34$, 11%). On average, participants reported their SES as middle-class ($M = 4.20$, $SD = 1.29$) on a scale ranging from 1 (*poor*) to 7 (*wealthy*).

Measures

Academic achievement

Academic achievement was measured by self-reported GPA ($M = 3.36$, $SD = 0.65$). Adolescents have been shown to be a reliable source for reporting academic information (Crockett, Schulenberg, & Petersen, 1987).

Psychological outcomes

We used two instruments to assess psychological outcomes. First, we included the Children's Hope Scale (Snyder et al., 1997), a 6-item instrument that assesses individuals' beliefs that they can come up with workable means to goals and initiate and sustain motivation to complete these goals (e.g., "When I have a problem, I come up with lots of ways to solve it"). Response options ranged from 1 (*None of the time*) to 6 (*All of the time*), with higher scores indicating greater perceived ability to attain goals. Hope scores have been reliable and valid in past research (Snyder et al., 1997). In this study, hope scores had acceptable internal consistency, $\alpha = .82$. An average score of non-missing values was generated for analyses ($M = 4.18$, $SD = 0.87$).

Second, we included the Rosenberg Self-Esteem scale (Rosenberg, 1965). This 10-item scale measures an individual's global self-esteem (e.g., "I feel that I have a number of good qualities"). Response options ranged from 1 (*Strongly Disagree*) to 4 (*Strongly Agree*), with greater scores indicating higher self-esteem ($M = 3.07, SD = 0.54$). Five of the 10 items are reverse-coded. Other researchers have reported strong internal consistency estimates ($\alpha = .91$; Sinclair et al., 2010) and validity coefficients for self-esteem scores (Worrell, 2000). Internal consistency for self-esteem scores in this sample were acceptable, $\alpha = .83$.

Time orientation

A preliminary version of the time orientation section of the Adolescent Time Inventory (ATI; Mello & Worrell, 2007) was used to assess adolescents' orientations toward the past, the present, and the future. Orientation was indicated by the size of the circle, with larger circles reflecting more importance being accorded to time periods. Participants indicated which of a set of four circle configurations best described the level of importance they gave to the past, the present, and the future. Specific circle configurations were generated based on a review of the literature (e.g., Cottle, 1967). Participants were given an opportunity to draw their own set of circles if none of those shown reflected their orientation. Appendix A, Figs. 1–4, shows the version used in Study 1. The option to draw circles is not shown.

Time relation

The time relation section of the ATI (Mello & Worrell, 2007) was used to measure the degree to which individuals perceived the past, the present, and the future to be related to one another. The relationship among time periods was represented by the overlap of the circles. The three figures presented were identified as linear related, unrelated, and interrelated, in keeping with the literature (e.g., Cottle, 1967). Participants could draw their own configuration if none of those shown reflected their conception of the relationships among time periods. Appendix B, Figs. 1–3, shows the version used in Study 1. The option to draw circles is not shown.

Procedure

Data were collected from several public high schools in the Mountain and Western United States and a summer program for academically talented adolescents in a Western state. Participation was solicited with an invitation letter to students and their parents. Study materials were distributed to individuals who returned signed consent and assent forms. In some contexts, students completed the forms in their classes, and in others, they completed the forms at home and returned them to school. All students who returned the study materials were compensated \$10.00 for their participation.

Results

Time orientation

Table 1 presents the findings with regard to time orientation. Contrary to our hypothesis, the majority of the sample selected present-future (60%), followed by the past-future (21%), the present (11%), and the future (8%) options. Most participants (80%; $n = 240$) chose an existing figure. The rest (18%; $n = 53$) drew a variety of circle combinations, with the most frequent depicting evenly sized—that is, balanced—circles ($n = 19$). With regards to gender, cross-tabulations indicated that males' and females' choice of time orientations did not differ significantly, $\chi^2(4) = 0.25, p = .97$. ANOVA results indicated statistically significant variation in academic achievement, $F(3, 210) = 3.56, p < .05, \eta^2 = .05$, and self-esteem, $F(3, 236) = 2.98, p < .05, \eta^2 = .04$, by time orientation, although effect sizes were small, as indicated. Adolescents who were present-future oriented had significantly higher GPAs than those who were present oriented ($d = .59$; note that all d values are corrected for bias). Participants who were present-future oriented also had significantly higher self-esteem than those who were past-future oriented ($d = .48$).

Time relation





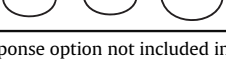
Table 2 shows that 53% of the sample selected an interrelated view of time periods, followed by 35% who saw time periods as linearly related, and 12% who chose the unrelated time periods option. The majority of the sample (89%; $n = 269$) selected an existing figure. Among those who drew their own circle configurations, the most commonly drawn consisted of the past positioned alone and the present and future overlapping ($n = 4$). Genders did not vary with regards to time relation, $\chi^2(3) = 1.94, p = .59$.

However, ANOVA indicated that variation in time relation was related to academic achievement, $F(2, 239) = 7.51, p < .001, \eta^2 = .06$, and hope, $F(2, 266) = 3.13, p < .05, \eta^2 = .02$. Students who selected the interrelated and linear related figures had significantly higher GPAs than those who selected the unrelated figure ($d = .57$ and $d = .48$, respectively), and those who selected the linear related figure had significantly greater hope scores than those who selected the unrelated ($d = .48$) figure. Time relation was not meaningfully related to self-esteem $F(2, 266) = 1.14, p = .32$.

Discussion

In this study, we examined adolescents' responses to an instrument assessing individual variation in time orientation and time relation. The majority of the sample selected the present-future orientation, and a fifth chose the past-future

Table 1
Time orientation distribution, demographic variation, and relationship with developmental outcomes.

Time Orientation Response Options	Distribution		Female		Academic Achievement		Hope		Self-Esteem		Risk
	Study 1 %	Study 2 %	Study 1 %	Study 2 %	Study 1* M(SD)	Study 2 M(SD)	Study 1 M(SD)	Study 2 M(SD)	Study 1* M(SD)	Study 2** M(SD)	Study 2*** M(SD)
1 Balanced 	N/A	29	N/A	55	N/A	3.07 (0.89)	N/A	4.19 (0.91)	N/A	3.07 (.56) ^c	1.71 (.61)
2 Present-Future 	60	55	39	56	3.47 (0.58) ^a	3.12 (0.80)	4.20 (0.79)	4.14 (0.84)	3.12 (.51) ^b	3.11 (.50) ^c	1.65 (.53) ^d
3 Past-Future 	21	4	42	56	3.41 (0.60)	3.07 (0.76)	4.02 (0.98)	3.92 (0.99)	2.87 (.56) ^b	2.92 (.59)	1.75 (.50)
4 Present 	11	6	37	43	3.05 (0.87) ^a	3.13 (0.66)	4.24 (1.00)	3.77 (0.79)	3.08 (.47)	2.93 (.57)	1.97 (.74) ^d
5 Future 	8	6	42	44	3.20 (0.66)	2.82 (1.08)	4.27 (0.92)	4.15 (1.03)	2.99 (.63)	2.81 (.54) ^c	1.94 (.83) ^d

Note. N/A = response option not included in study. Percentages do not sum to 100 due to rounding. Female percentages are reported per response option. Bonferroni tests used for comparisons.





^a2 > 4, *p* < .03. ^b2 > 3, *p* < .03. ^c1 > 5 and 2 > 5, *p* < .04. ^d2 < 4 and 2 < 5, *p* < .02.

p* < .05. *p* < .01. ****p* < .001.

orientation. Less than 10% chose future orientation, which contrasts with past research in which the majority of adolescents and adults drew future oriented configurations (Bruno, 1996; Cottle, 1967; Haldeman, 1993). These results raise questions about the difference in response options. Research in which respondents drew their own circles resulted in a future emphasis, whereas when given the option of future–other combinations, these were chosen overwhelmingly. The findings suggest that adolescents in this study are neither present-oriented nor future-oriented exclusively, but rather concerned about the future in combination with other periods. With regard to time relation, almost 90% of the sample viewed the time periods as interrelated, like a Venn diagram, or linearly related, with the past connecting to the present and the present connecting to the future. This finding also represents a shift from the results reported by Cottle (1967), where the majority reported unrelated circles, when circle configurations were drawn rather than chosen.

As hypothesized, there were no gender differences in either time orientation or time relation, but both were related to outcomes. Time orientation was related to academic achievement and self-esteem, but not to hope, with the present-future orientation indicating the more positive relationships. Time relation was related to academic achievement and hope, but it was not related to self-esteem; in this case, the interrelated choice was associated with more positive outcomes. This set the stage for Study 2, where we sought to replicate these findings after revising the instruments.

Table 2
Time relation distribution, demographic variation, and relationship with developmental outcomes.

Time Relation Response Options	Distribution		Female		Academic Achievement		Hope		Self-Esteem		Risk
	Study 1 %	Study 2 %	Study 1 %	Study 2 %	Study 1*** M(SD)	Study 2*** M(SD)	Study 1* M(SD)	Study 2*** M(SD)	Study 1 M(SD)	Study 2* M(SD)	Study 2* M(SD)
1 Interrelated 	53	38	41	59	3.41 (0.61) ^a	3.26 (0.81) ^b	4.19 (0.82)	4.30 (0.81) ^d	3.08 (.54)	3.12 (.51)	1.64 (.57) ^e
2 Linear Related 	35	20	42	55	3.50 (0.62) ^a	3.18 (0.77) ^b	4.34 (0.89) ^c	4.09 (0.92)	3.14 (.55)	3.09 (.58)	1.70 (.61)
3 Present-Future Related 	N/A	33	N/A	52	N/A	2.92 (0.83) ^b	N/A	4.02 (0.88) ^d	N/A	3.02 (.53)	1.73 (.53)
4 Unrelated 	12	10	34	44	2.97 (0.76) ^a	2.79 (0.89) ^b	3.91 (0.93) ^c	3.93 (0.96) ^d	2.95 (.51)	2.93 (.54)	1.86 (.71) ^e

Note. N/A = response option not included in study. Percentages do not sum to 100 due to rounding. Female percentages are reported per response option. Bonferroni tests used for comparisons.

^a1 > 4 and 2 > 4, *p* < .004. ^b1 > 3, 1 > 4, 2 > 3, and 2 > 4, *p* < .03. ^c2 > 4, *p* < .05. ^d1 > 3 and 1 > 4, *p* < .003. ^e4 > 1, *p* < .03.

p* < .05. *p* < .01. ****p* < .001.

Study 2

In Study 2, we posed the same research questions as Study 1. However, we used a revised version of the time orientation and time relation instruments that included the most frequently drawn configurations from participants who drew their own configurations in Study 1. Specifically, we added the balanced time orientation (three circles of equal size; See Appendix A, Fig. 5) and the past alone/present-future overlapping option for time relation (See Appendix B, Fig. 4). We sought to replicate findings from Study 1 in a larger sample, and to extend research on time orientation and time relation to include adolescents' risky behaviors.

In 1999, Zimbardo and Boyd contended that a balanced time orientation was optimal, psychologically. This claim has received support in studies of college students (Boniwell, Osin, Linley, & Ivanchenko, 2010). We postulate that individuals with the healthiest developmental outcomes will be those who hold a balanced perspective, followed by those who are oriented toward two time periods (future and one other), and, finally, those who are oriented toward a single time period. Thus, we hypothesized that individuals choosing a balanced orientation would report higher hope and self-esteem scores and lower risk scores than individuals with other orientations. Based on Study 1, we hypothesized that time relation will be associated with developmental outcomes by the degree of relatedness, with the individuals who perceive relationships among the time periods having more developmental outcomes than peers choosing other configurations. And as in Study 1, we hypothesized that males and females would not differ significantly on time orientation or time relation.

Method

Participants

The sample included 748 (54% female) adolescents aged 11–20 ($M = 15.71$, $SD = 1.53$), with 5 (.01%) older than 18. Analyses with age did not change findings; thus, age was not controlled. This was also a sample of convenience, but as in Study 1, we targeted schools with a range of demographic profiles. Self-reported racial/ethnic groups were African American ($n = 31$; 4%), Asian American ($n = 93$; 12%), European American ($n = 266$; 36%), Hispanic ($n = 78$; 10%), Native American ($n = 129$; 17%) and Multi-ethnic/Other ($n = 112$, 15%). On a scale ranging from 1 (*poor*) to 7 (*wealthy*), the average self-reported SES was ($M = 3.77$, $SD = 1.09$).

Measures and procedure

The same measures were used for academic achievement ($M = 3.07$, $SD = 0.85$), hope ($\alpha = .81$; $M = 4.14$, $SD = 0.87$), and self-esteem ($\alpha = .84$; $M = 2.63$, $SD = 0.27$) as in Study 1. However, time orientation included an additional response option (a balanced orientation) with three identically sized circles for the past, the present, and the future (see Appendix A, Fig. 5). Time relation also included an additional response option that depicted the past alone and the present and the future overlapping (see Appendix B, Fig. 4). Lastly, risky behaviors were measured using a 14-item questionnaire that assessed how frequently adolescents' engaged in risk behaviors (e.g., "Have you ever got in trouble with the police?"). Response options ranged from 1 (*Never*) to 5 (*Very Often*). An average score of non-missing values was generated ($\alpha = .88$; $M = 1.71$, $SD = 0.59$). The instrument has yielded reliable scores with adolescents (Worrell & Hale, 2001), and at-risk youth obtain significantly and meaningfully higher scores than youth who are not at-risk (Worrell, 2007). We employed the same procedure in recruiting participants and in administering the study surveys as in Study 1.

Results

Time orientation

Distributions for time orientation responses and gender are displayed in Table 1. The majority of the sample selected the present-future figure, with balanced being chosen by a little less than a third. Genders did not vary among the time orientation responses, $\chi^2(4) = 4.47$, $p = .35$. ANOVAs indicated that time orientation was not related to academic achievement, $F(4, 616) = 1.13$, $p = .34$ or hope $F(4, 715) = 2.37$, $p = .05$, but was related to self-esteem, $F(4, 719) = 4.54$, $p < .01$, $\eta^2 = .02$. Students with a balanced or present-future orientation reported higher self-esteem scores than those with an orientation toward the future ($d = .47$ & $.57$, respectively). Additionally, ANOVA showed that students with an orientation toward a single time period—namely the present or the future—had higher risk scores than those with a combined present-future orientation, $F(4, 720) = 4.77$, $p < .001$, $\eta^2 = .03$, $d = .41$ and $.49$, respectively. Although scores for students who chose a balanced orientation were not significantly different statistically from other groups of students on hope and risky behavior, these students did report more hope and fewer risk behaviors than students with a present orientation based on effect size (hope, $d = .49$; risk behaviors, $d = .38$).

Time relation

Table 2 shows that more than 30% of the participants selected interrelated and present-future related, with 20% or less selecting linear related and unrelated circles. As expected, females and males did not differ in time relation, $\chi^2(3) = 5.72$, $p = .13$. However, ANOVA indicated that academic achievement, $F(3, 616) = 9.36$, $p < .001$, $\eta^2 = .04$, hope, $F(3, 714) = 6.01$, $p < .001$, $\eta^2 = .02$, and self-esteem, $F(3, 718) = 2.96$, $p < .05$, $\eta^2 = .01$ did vary significantly across time relation choices. Students who thought of time as interrelated or linearly related had higher GPAs than those who thought of time as

present-future related or unrelated, with Cohen's d values ranging from .32 to .57 ($Mdn = .45$). Similarly, those who thought about time as interrelated had higher hope scores than those who thought time was present-future related ($d = .33$) or unrelated ($d = .44$). Time relation was also related to risk behaviors, with participants who thought time periods were unrelated reporting higher risk scores than those who reported time as interrelated, $F(3, 719) = 3.01, p < .05, \eta^2 = .01, d = .37$.

Discussion

Findings in Study 2 replicated those in Study 1, with more than half of the participants oriented toward *both* the present and the future, followed by about a third who had a balanced orientation. About a third of the participants' perceived time as interrelated, and another third saw a connection between the present and the future independent of the past. Males and females did not differ in either time orientation or time relation. In this study, time orientation was related to self-esteem and risk behaviors but not to academic achievement and hope, and time relation was related to academic achievement, hope, self-esteem, and risk behaviors.

General discussion

Time perspective has been described as a powerful predictor of human behavior (Lewin, 1942; Mello, 2013; Zimbardo & Boyd, 1999, 2008) and a salient topic for understanding adolescents (Mello, 2013). Current research has examined how *attitudes* toward the past, the present, and the future have predicted academic and psychological outcomes and substance use (Henson et al., 2006; Mello, Bhadare, et al., 2009; Mello, Worrell, et al., 2009), but time orientation and relation are rarely studied. Although Cottle (1967) proposed a unique way to conceptualize and measure these constructs, his instrument is used quite infrequently. We extended Cottle's ideas on time orientation, the emphasis one gives toward each time period, and time relation, the degree one perceives time periods are related to one another, and developed new instruments to assess these concepts.

However, whereas Cottle (1967, 1969) asked participants to draw circle configurations (using a projective methodology), we offered them fixed configurations from which to choose, a more objective methodology. There has been considerable controversy about the use of projective tests related to the reliability of the scores and validity of the inferences drawn (Hilsenroth, 2004; Leichtman, 2004; Seitz, 2001). Although some of these concerns can be alleviated with the use of objective and well-validated coding schemes, the Circles Test (Cottle, 1967) raises additional concerns as the stimuli that have to be coded—respondents' drawings—are not standard or standardized. Thus, even with an objective coding system, the Circles Test (Cottle, 1967) can be misinterpreted on the basis of the respondents' facility in drawing circles. In this study, we used circles of a standard size (small, large) and examined the scores with regards to gender, academic and psychological outcomes, and risky behaviors in adolescents. We now briefly discuss the findings in each of these areas.

Individual variation

Consistent with theoretical discussions (Lewin, 1942; Mello, 2013; Zimbardo & Boyd, 1999), results showed similar individual variation in time orientation and time relation across both studies. Time orientation results suggest that the majority of adolescents have present-future orientations, followed by a balanced orientation. As noted, these findings differ from earlier studies using the original Circles Test (1967). However, they also differ from the majority of studies, which contend that adolescents are primarily future oriented (Landau, 1976; Nurmi, Liiceanu, & Liberska, 1999). This difference may be because adolescents are frequently asked to choose one among the time periods, rather than being able to choose combined periods as in the current study.

The time relation findings yielded similar results. They showed that most adolescents viewed time periods as interrelated and that few reported an unrelated view. This finding is also strikingly different from most results with college students and other adult samples in which the majority of participants drew unrelated circles (Achamamba, 1988a; Brown & Herring, 1998; Cottle, 1967; Thompson & Fitzpatrick, 2008). Since there are no other studies of time relation measured in this way in adolescents, it is not clear if these results are anomalous or represent a developmental difference in time relations between adolescents and adults. Given that the instruments are new, it will be important for research to replicate these patterns and to conduct comparative studies involving different developmental stages as well as longitudinal studies to examine age-related change. Validity studies also need to be conducted with these instruments and existing measures that assess time perspective.

Gender

Our study extends findings on gender in adults to adolescents. Specifically, similar to prior research with adults (Thompson & Fitzpatrick, 2008), we demonstrated that adolescent males and females do not differ on time orientation and time relation. Our findings are also similar to studies with adolescents that employed Cottle's (1967) original projective test (Haldeman, 1993; Tismer, 1987). Combined, the evidence shows adolescent males and females are quite similar to each other in time orientation and time relation.

Academic outcomes

A relationship between time orientation and academic achievement was observed only in Study 1, with adolescents who were oriented solely toward single time periods reporting lower GPAs than their counterparts who were oriented toward multiple time periods. There are also mixed findings in the literature (Cottle, 1967; Haldeman, 1993). One problem with this literature is that different measures of time orientation have been used. Research is needed that employs the same measure of time orientation.

Time relation was related to academic achievement in both studies; adolescents who perceived the time periods to be interrelated reported higher GPAs than their counterparts who perceived the time periods to be unrelated. This finding is consistent with previous research that utilized projective methods (Cottle, 1969). One interpretation of this finding is that adolescents who are able to consider how past actions are connected with current and future states are more likely to be motivated in school. This finding is supported by expectancy-value theory, which purports that adolescents are motivated to achieve outcomes in the present when they perceive that such outcomes have value for the future (Eccles & Wigfield, 2002). However, the results suggest that the past may also play a role, as individuals who chose the present-future related configuration had lower GPAs than those who chose configurations in which all three time periods are related.

Psychological outcomes

Two psychological constructs—self-esteem and hope—were examined in relation to time orientation and time relation. Researchers have proposed that a *balanced* orientation toward time is ideal (Boniwell et al., 2010; Zimbardo & Boyd, 1999). Results from Study 1 and 2 indicate that self-esteem was highest for adolescents who chose the present-future orientation and lowest for adolescents who chose the past-future orientation. These results suggest that the balanced orientation is not necessarily the only optimal orientation toward time.

Time orientation was not related to hope scores in either study. It is possible that a relationship may exist between these two constructs in clinical populations, as research with adult inpatients aged 18–60 has shown future orientation to be negatively related to depression (Breier-Williford & Bramlett, 1995). Time relation was related to self-esteem and hope in both studies, with the interrelated and linear related views of the time periods associated with higher self-esteem and hope than the present-future related and the unrelated views. The group with the unrelated view had the lowest scores across both constructs. These results are consistent with past research examining time relation and anxiety (Cottle, 1969), and the fact that the majority of adolescents do not have unrelated views of time is a potentially positive sign for their psychological well being.

Risky behaviors

As described by theory (Lewin, 1942; Mello, 2013; Zimbardo & Boyd, 1999), differences in time orientation and time relation predicted risky behaviors in adolescents. Specifically, adolescents who were oriented to the present-only or future-only engaged in more risky behaviors than their counterparts, and adolescents with a present-future orientation engaged in the fewest risky behaviors. The current findings support the contention that a present orientation is a risk factor for risk behavior, but suggest that this is not the only time orientation that is risky. The future alone also yielded higher risk, and the orientation related to the least risky behavior was not balanced but present-future. These findings also highlight the importance of focusing on multiple time periods, in contrast with research that has focused exclusively on the future time period (Nurmi, 1991). The results suggest that a different pattern of results emerges when time is conceptualized in terms of the past, the present, and the future.

With regards to time relation, adolescents who perceived the past, the present, and the future as unrelated reported engaging in more risky behaviors than their counterparts, whereas those who viewed the three time periods as interrelated engaged in the fewest risky behaviors. These results parallel prior findings of studies that have employed other instruments (Henson et al., 2006; Koenig, 1972; Kruger et al., 2008). It would be useful for research to replicate these findings with adolescents who engage in other risky-behaviors, such as substance use.

Limitations and conclusions

These two studies are not without limitations. First, the research design was cross-sectional, which limits our ability to assess developmental changes. Longitudinal research that includes multiple age-groups would be beneficial in highlighting how the observed relationships change with age. Second, all variables were self-reported. Future research should include reports from multiple observers of adolescents, such as parents and teachers. Third, the sample in Study 2 did not engage in a lot of risky behaviors. It is possible that larger effects would be observed in at-risk and delinquent populations that engage in more risky behaviors. Finally, the results of this study warrant replication given that the data were drawn from convenience samples and that some findings were not the same across the two studies.

Limitations notwithstanding, the study yielded some interesting results. We examined two new instruments designed to assess time orientation and time relation in two independent samples of adolescents, and evidence from the two

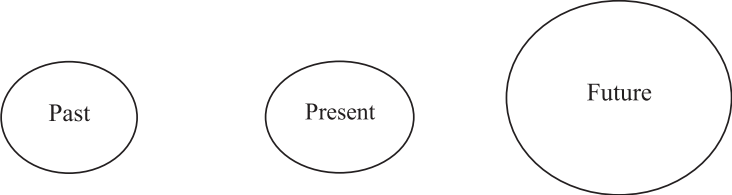
studies indicates that the instruments yielded scores that were generally consistent in distribution and gender variation, and were related to academic achievement, hope, self-esteem, and risky behaviors. In sum, time orientation and time relation are promising concepts for expanding our understanding of time perspective's relationship to adolescent development and behavior, and these new instruments may be useful tools in that endeavor.

Appendix A

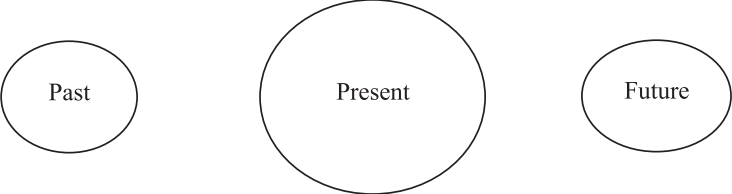
Time orientation

Instructions: Select **one** figure below that shows how **important** the past, the present, and the future are to you, with larger circles being more important to you.

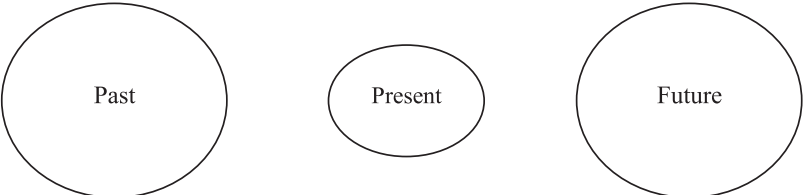
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Figure 1. 

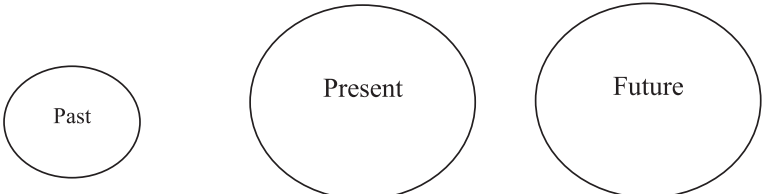
.....

Figure 2. 

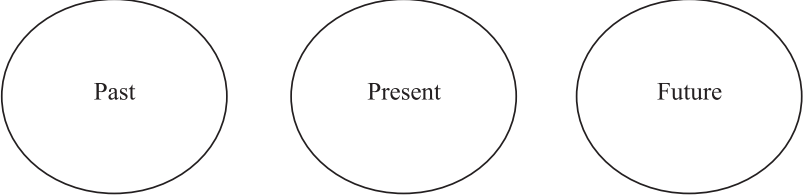
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Figure 3. 

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Figure 4. 

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Figure 5. 

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Appendix B

Time relation

Instructions: Select **one** figure below that shows how you view the **relationship** among the past, the present, and the future.

Figure 1.

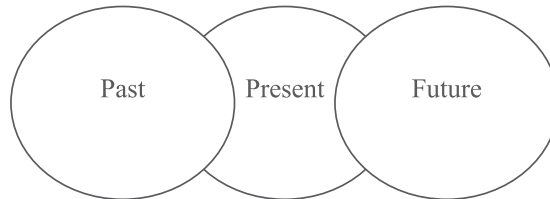


Figure 2.

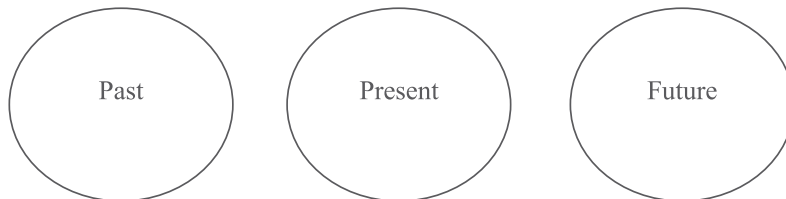


Figure 3.

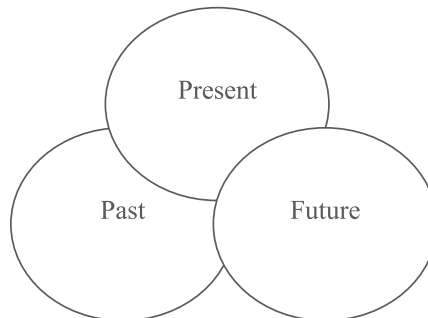
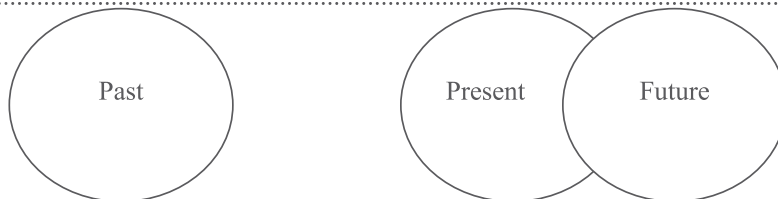


Figure 4.



References

- Achamamba, B. (1988a). Anxiety and temporal experience. *Journal of Indian Psychology*, 7, 1–6.
- Achamamba, B. (1988b). Perceptions of time and cognitive efficiency. *Journal of Psychological Researches*, 33, 63–67.
- Alvos, L., Gregson, R., & Ross, M. (1993). Future time perspective in current and previous injecting drug users. *Drug and Alcohol Dependence*, 3, 193–197. [http://dx.doi.org/10.1016/0376-8716\(93\)90072-X](http://dx.doi.org/10.1016/0376-8716(93)90072-X).
- Andretta, J. R., Worrell, F. C., Mello, Z. R., Dixson, D. D., & Baik, S. H. (2013). Demographic group differences in adolescents' time attitudes. *Journal of Adolescence*, 36, 289–301.
- Boniwell, I., Osin, E., Linley, A. P., & Ivanchenko, G. V. (2010). A question of balance: time perspective and well-being in British and Russian sample. *The Journal of Positive Psychology*, 5, 24–40. <http://dx.doi.org/10.1080/17439760903271181>.
- Bowles, T. (1999). Focusing on time orientation to explain adolescent self-concept and academic achievement: part II testing a model. *Journal of Applied Health Behavior*, 1, 1–8.

- Breier-Williford, S., & Bramlett, R. K. (1995). The perspective of substance abuse patients: comparison of the scales in Stanford Time Perspective Inventory, Beck Depression Inventory, and Beck Hopelessness Scale. *Psychological Reports, 77*, 899–905. <http://dx.doi.org/10.2466/pr0.1995.77.3.899>.
- Brock, T. C., & Giudice, C. D. (1963). Stealing and time orientation. *Journal of Abnormal and Social Psychology, 66*, 91–94. <http://dx.doi.org/10.1037/h0042834>.
- Brown, R. B., & Herring, R. (1998). The circles of time: an exploratory study in measuring temporal perceptions within organizations. *Journal of Managerial Psychology, 13*, 580–602.
- Bruno, J. E. (1996). Time perceptions and time allocation preferences among adolescent boys and girls. *Adolescence, 31*, 109–126.
- Buhl, M., & Linder, D. (2009). Time perspectives in adolescence: measurement, profiles and links with personality characteristics and scholastic experience. *Diskurs Kindheits und Jugendforschung, 2*, 197–216.
- Cottle, T. J. (1967). The Circles Test: an investigation of perceptions of temporal relatedness and dominance. *Journal of Projective Techniques & Personality Assessment, 31*, 58–71. <http://dx.doi.org/10.1080/10091651X.1967.10120417>.
- Cottle, T. J. (1969). Temporal correlates of the achievement value and manifest anxiety. *Journal of Counseling and Clinical Psychology, 5*, 541–550. <http://dx.doi.org/10.1037/h0028290>.
- Crockett, L. J., Schulenberg, J. E., & Petersen, A. C. (1987). Congruence between objective and self-report data in a sample of young adolescents. *Journal of Adolescent Research, 2*, 383–392. <http://dx.doi.org/10.1177/074355488724006>.
- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*, 109–130. <http://dx.doi.org/10.1146/annurev.psych.53.100901.135153>.
- Erikson, E. (1968). *Identity: Youth and crisis* (1st ed.). New York, NY: Norton.
- Fortunato, V. F., & Furey, J. T. (2010). The theory of mind time: the relationships between thinking perspective and time perspective, 48, 436–441. <http://dx.doi.org/10.1016/j.paid.2009.11.015>.
- Getsinger, S. H. (1975). Temporal relatedness: personality and behavioral correlates. *Journal of Personality Assessment, 39*, 405–408. http://dx.doi.org/10.1207/s15327752jpa3904_14.
- Haldeman, D. H. (1993). *The Cottle Circle Test: Its validity for identifying adolescent time perspective*. Unpublished dissertation, State College, PA: The Pennsylvania State University.
- Henson, J. M., Carey, M. P., Carey, K. B., & Maisto, S. A. (2006). Associations among health behaviors and time perspective in young adults: model testing with boot-strapping replication. *Journal of Behavioral Medicine, 29*, 127–137. <http://dx.doi.org/10.1007/s10865-005-9027-2>.
- Hilsenroth, M. J. (2004). Projective assessment of personality and psychopathology: an overview. In M. J. Hilsenroth, D. L. Segal, & M. Hersen (Eds.), *Personality assessment: Vol. 2. Comprehensive handbook of psychological assessment* (pp. 283–296). Hoboken, NJ: Wiley.
- 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 Psychology, 21*, 149–164. <http://dx.doi.org/10.1207/s15324839951036498>.
- Koenig, F. (1972). Perception of time and cigarette smoking among college students. *Perceptual and Motor Skills, 34*, 621–622. <http://dx.doi.org/10.2466/pms.1972.34.2.621>.
- Kruger, D. J., Reischl, T. M., & Zimmerman, M. A. (2008). Time perspective as a mechanism for functional developmental adaptation. *Journal of Social, Evolutionary, and Cultural Psychology, 2*, 1–22.
- Landau, S. F. (1976). Delinquency, institutionalization, and time orientation. *Journal of Consulting and Clinical Psychology, 44*, 745–759. <http://dx.doi.org/10.1037/0022-006X.44.5.745>.
- Leichtman, M. (2004). Projective tests: the nature of the tasks. In M. J. Hilsenroth, D. L. Segal, & M. Hersen (Eds.), *Personality assessment: Vol. 2. Comprehensive handbook of psychological assessment* (pp. 297–314). Hoboken, NJ: Wiley.
- Lewin, K. (1942). Time perspective and morale. In K. Lewin (Ed.), *Resolving social conflicts and field theory in social science* (pp. 80–93). Washington, DC: American Psychological Association.
- McDade, T. W., Chyu, L., Duncan, G. J., Hoyt, L. T., Doane, L. D., & Adam, E. K. (2011). Adolescents' expectations for the future predict health behaviors. *Social Science Medicine, 73*, 391–398. <http://dx.doi.org/10.1016/j.socscimed.2011.06.005>.
- McKay, M. T., Cole, J. C., Sumnall, H. R., & Goudie, A. J. (2012). Framing health messages for adolescents: should we use objective time periods, temporal benchmarks, or both? *Journal of Youth Studies, 15*, 351–368. <http://dx.doi.org/10.1080/13676261.2012.663897>.
- Mello, Z. R. (in press). The past, the present, and the future: A conceptual model of time perspective in adolescence. *Time perspective: Theory, research and application: Essays in Honor of Philip G. Zimbardo*.
- Mello, Z. R., Bhadare, D., Fearn, E. J., Galaviz, M. M., Hartmann, E. S., & Worrell, F. C. (2009). The window, the river, and the novel: examining adolescents' conceptions of the past, the present, and the future. *Adolescence, 44*, 539–556.
- Mello, Z. R., & Worrell, F. C. (2007). *The adolescent time inventory-English*. Berkeley: University of California. Retrieved from: <http://www.uccs.edu/zmello/ati.html>.
- Mello, Z. R., Worrell, F. C., & Andretta, J. R. (2009). Variation in how frequently adolescents think about the past, the present, and the future in relation to academic achievement. *Research on Child and Adolescent Development [Diskurs Kindheits- und Jugendforschung], 2*, 173–183.
- Nurmi, J. E. (1991). How do adolescents see their future? A review of the development of future orientation and planning. *Developmental Review, 11*, 1–59. [http://dx.doi.org/10.1016/0273-2297\(91\)90002-6](http://dx.doi.org/10.1016/0273-2297(91)90002-6).
- Nurmi, J. E., Liiceanu, A., & Liberska, H. (1999). Future-oriented interests. In F. D. Alsaker, & A. Flammer (Eds.), *The adolescent experience: European and American adolescents in the 1990s* (pp. 85–98). Mahwah, NJ: Lawrence Erlbaum.
- Piaget, J. (1955). The development of time concepts in the child. In P. H. Hoch, & J. Zubin (Eds.), *Psychopathology of childhood* (pp. 34–44). New York, NY: Grube and Stratton.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Rothspan, S., & Read, S. J. (1996). Present versus future time perspective and HIV risk among heterosexual college students. *Healthy Psychology, 15*, 131–134. <http://dx.doi.org/10.1037/0278-6133.15.2.131>.
- Schecter, D., & Francis, C. M. (2010). A life history approach to understanding youth time preference. *Human Nature, 21*, 140–164. <http://dx.doi.org/10.1007/s12110-010-9084-2>.
- Seitz, J. A. (2001). A cognitive-perceptual analysis of projective tests used with children. *Perceptual and Motor Skills, 93*, 505–522. <http://dx.doi.org/10.2466/PMS.93.5.505-522>.
- Shipp, A. J., Edwards, J. R., & Lambert. (2002). Conceptualization and measurement of temporal focus: the subjective experience of the past, present, and future. *Organizational Behavior and Human Decision Processes, 110*, 1–22. <http://dx.doi.org/10.1006/obhd.2001.2988>.
- Sinclair, S. J., Blais, M. A., Gansler, D. A., Sandberg, E., Bistis, K., & LoCicero, A. (2010). Psychometric properties of the Rosenberg Self-Esteem Scale: overall and across demographic groups living within the United States. *Evaluation & the Health Professions, 33*, 56–80. <http://dx.doi.org/10.1177/0163278709356187>.
- Snyder, C. R., Hoza, B., Pelham, W. E., Rapoff, M., Ware, L., Danovsky, M., et al. (1997). The development and validation of the Children's Hope Scale. *Journal of Pediatric Psychology, 22*, 339–421. <http://dx.doi.org/10.1093/jpepsy/22.3.399>.
- Thompson, C. W., & Fitzpatrick, J. J. (2008). Positive health practices and temporal perspective in low-income adults. *Journal of Clinical Nursing, 17*, 1708–1717. <http://dx.doi.org/10.1111/j.1365-2702.2007.02224.x>.
- Tismer, K. G. (1987). Psychological aspects of temporal dominance during adolescence. *Psychological Reports, 61*, 647–654. <http://dx.doi.org/10.2466/pr0.1987.61.2.647>.
- Worrell, F. C. (2000). The reliability and utility of self-concept instruments with at-risk populations. *The Journal of At-Risk Issues, 7*(1), 31–41.
- Worrell, F. C. (2007, Spring). Talented students and resilient at-risk students: similarities and differences [Electronic version]. *Gifted Children, 1*(2), 2–5. Retrieved from: <http://docs.lib.purdue.edu/giftedchildren/vol1/iss2/2/>.
- Worrell, F. C., & Hale, R. L. (2001). The relationship of hope in the future and perceived school climate to school completion. *School Psychology Quarterly, 16*, 370–388. <http://dx.doi.org/10.1521/scpq.16.4.370.19896>.

- Worrell, F. C., & Mello, Z. R. (2007). Reliability and validity of Zimbardo Time Perspective Inventory scores in academically talented adolescents. *Educational and Psychological Measurement*, 67, 487–504. <http://dx.doi.org/10.1177/0013164406296985>.
- Worrell, F. C., Mello, Z. R., & Buhl, M. (2011). Introducing English and German versions of the Adolescent Time Attitude Scale (ATAS). *Assessment*. <http://dx.doi.org/10.1177/1073191110396202>. Advance online publication.
- Zimbardo, P. G., & Boyd, J. N. (1999). Putting time in perspective: a valid, reliable individual-difference metric. *Journal of Personality and Social Psychology*, 77, 1271–1288. <http://dx.doi.org/10.1037/0022-3514.77.6.1271>.
- Zimbardo, P. G., & Boyd, J. N. (2008). *The time paradox: The new psychology of time that will change your life*. New York, NY: Free Press.
- 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. [http://dx.doi.org/10.1016/S0191-8869\(97\)00113-X](http://dx.doi.org/10.1016/S0191-8869(97)00113-X).