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Trepidation and time: an examination of anxiety and thoughts and feelings about the past, present, and future among adolescents

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ABSTRACT

We examined relationships between general and specific anxiety symptoms and time perspective among adolescents and how these relationships varied by gender. Time perspective was conceptualized as a multidimensional construct and assessed with the following dimensions: time frequency, time attitudes, time orientation, and time relation. Multiple regression analyses indicated that participants ($N = 771$; $M_{age} = 15.82$, $SD = 1.23$; 54% female) with more anxiety (a) felt less positively about the present; (b) felt more negatively about the past, the present, and the future; and (c) thought the past was more important than the present and the future. Findings for specific anxiety subtypes were generally similar. Interactions between time perspective and gender indicated that more frequent thoughts about the past and the future may be associated with greater anxiety, especially for females. Results highlight the temporal qualities of anxiety and provide support for time perspective as a potential factor for understanding and supporting adolescents with anxiety.

Nearly a third of adolescents meet the diagnostic criteria for an anxiety disorder, with a quarter of these anxious individuals reporting severe levels of distress and impairment in their daily lives (Merikangas, He, Burstein, et al., 2010). Many more who do not meet the full criteria for a disorder still grapple with anxiety symptoms (Wittchen et al., 1998). Female adolescents, in particular, have been shown to have a higher prevalence of anxiety disorders than male adolescents, with research indicating rates that are double for females compared to males (Merikangas, He, Burstein, et al., 2010; Pine et al., 1998). Among adolescents, anxiety disorders have been shown to be associated with a host of adverse outcomes. For example, anxiety disorders were linked to lower social-emotional (Beidel et al., 2007; Mathews et al., 2016) and academic (Ranta et al., 2009) competence along with psychological distress in the form of suicidal behavior (Boden et al., 2007). Despite the wide prevalence and the serious implications of anxiety disorders, treatment has been found to reach only a minority of affected individuals (Merikangas, He, Brody, et al., 2010). Thus, it is crucial to identify new mechanisms for identifying and treating anxiety among this vulnerable population.

Time perspective is a promising candidate to inform the development of programs addressing anxiety in adolescence. This construct refers to the thoughts and feelings individuals have about the past, the present, and the future (Mello & Worrell, 2015; Zimbardo & Boyd, 1999). Time perspective builds on research that has examined future orientation (Nurmi, 1991; Steinberg et al., 2009) by expanding the concept to include the past, present, and future. Prior research has shown that time perspective is related to anxiety among adult participants (e.g., Zimbardo & Boyd, 1999). Moreover, studies have indicated that time perspective can be modified through interventions (Hall & Fong, 2003; Marko & Savickas, 1998). However, research on time perspective and anxiety among adolescents is notably absent from the literature. In this study, we sought to provide much-needed knowledge about how time perspective is associated with anxiety among adolescents.

Anxiety

Anxiety is an emotional response to a perceived threat involving apprehension and physical symptoms such as muscle tension and rapid heartbeat (American Psychological Association, 2018). Anxiety can range

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from brief mild symptoms to anxiety symptoms, which are generally characterized by extensive apprehension, avoidance behavior, and impaired functioning (Beesdo et al., 2009). Among adolescents, anxiety disorders have been associated with lower self-esteem (Maldonado et al., 2013), less effective social-emotional skills (Beidel et al., 2007; Mathews et al., 2016), and lower grade point averages (Ranta et al., 2009). At the extreme end, anxiety disorders have been linked to greater thoughts and attempts of suicide (Boden et al., 2007). Anxiety disorders have also been shown to co-occur with a range of debilitating conditions including other types of anxiety disorders, depression, conduct disorder, and alcohol dependence (Lewinsohn et al., 1997; Woodward & Fergusson, 2001). Moreover, prospective research has demonstrated that anxiety disorders in adolescence are associated with greater risks in adulthood for psychosocial issues such as increased chronic stress, poor coping skills, and lower life satisfaction (Essau et al., 2014). Anxiety disorders were also found to predict later negative mental health outcomes including other anxiety disorders, depression, and substance dependence (Woodward & Fergusson, 2001). Importantly, a wealth of research has been conducted to understand the range of diverse social, emotional, and physical factors that contribute to adolescents' experiences with anxiety (e.g., Feiss et al., 2019; Keles et al., 2020).

Anxiety disorder subtypes

The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013) provides diagnostic criteria for the following anxiety disorder subtypes. *Panic disorder* is characterized by recurrent panic attacks, which involve physical and psychological symptoms such as difficulties with breathing, chest pain, and fear of dying. *Generalized anxiety disorder* includes the core symptom of persistent and excessive worry about various everyday things or situations that interferes with normal functioning. *Separation anxiety disorder* involves the fear of being away from people with whom an individual is strongly attached, such as their primary caregiver. *Social anxiety disorder*, previously known as social phobia, is characterized by the fear of being embarrassed or rejected in social situations, which may result in avoidance behavior. Finally, *specific phobia* involves an intense fear toward a particular object or situation, such as school for school anxiety (American Psychiatric Association, 2017).

Anxiety and gender

Studies have consistently shown that female adolescents run a higher risk of developing anxiety disorders compared to male adolescents. In comparison to males, females reported symptoms for generalized anxiety disorder and specific phobia twice as often (Merikangas, He, Burstein, et al., 2010; Pine et al., 1998). Further, females indicate more severe symptoms than males for generalized anxiety disorder and social anxiety disorder (Hale et al., 2005) and tend to experience a greater number of co-occurring anxiety disorders compared to their male peers (Woodward & Fergusson, 2001).

Time perspective

Theory

Time-related constructs have been consistently shown to be associated with psychological well-being. These constructs include delay of gratification (Mischel, 1974) and consideration of future consequences (Strathman et al., 1994). For adolescents, future orientation has been shown to be particularly associated with numerous developmental outcomes including higher academic achievement and self-esteem (Honora, 2002; Nurmi, 1991) and lower risk-taking (Steinberg et al., 2009). Generally, these studies have indicated that there is a positive relationship between thinking about the future and health.

Time perspective extends future-oriented constructs by including the past, present, and future time periods (Mello, 2019; Mello & Worrell, 2015; Zimbardo & Boyd, 1999). This conceptualization underscores the value of including multiple time periods and does not presume that how one thinks or feels about the future reflects how they think about the past or present. Zimbardo and Boyd (1999) have examined mostly adult participants and have shown how time perspective is associated with a range of human phenomena including self-esteem, novelty seeking, and anxiety. More recently, a multi-dimensional model of time perspective was proposed that is specific to adolescents (Mello, 2019; Mello & Worrell, 2015). This model includes multiple dimensions that were designed to capture distinct aspects of time perspective. *Time frequency* indicates the frequency of thought about the past, present, and future. *Time attitudes* refer to positive and negative feelings about these time periods. *Time orientation* is defined as the relative importance placed on the time periods. *Time relation* indicates the perceived relationship between the past, present, and future.

Time perspective among adolescents

Mello and Worrell (2015) theorized that time perspective was relevant to adolescents given cognitive advances and identity formation. Specifically, they emphasized that the development of abstract and hypothetical thinking (Piaget, 1955, 1975) would facilitate adolescents' conceptualizations of time and their various selves from the different time periods. Furthermore, they drew from Erikson's (1968) theory of identity formation, the primary developmental task for adolescents, that necessitates a successful integration of their past, present, and future selves, to show that time perspective is salient in adolescence. Drawing from these theories, Mello and Worrell (2007) created The Adolescent and Adult Time Perspective Inventory (AATI) to assess the construct across the life span.

Research using the Mello and Worrell (2015) model has indicated meaningful relationships between the time perspective dimensions and a range of developmental outcomes. For example, studies have shown relationships between time perspective and psychological indicators of well-being such as self-esteem (Andretta et al., 2014), optimism, perceived life chances (Worrell & Mello, 2009), hope (Mello et al., 2013), perceived stress (Andretta et al., 2014), and mental well-being and psychosomatic symptomatology (Konowalczyk et al., 2018; Worrell et al., 2019). Studies using this model have shown that time perspective also predicts behavioral indicators of well-being such as academic achievement (Mello et al., 2009), risky behavior (McKay et al., 2018), and alcohol use (McKay et al., 2019).

Anxiety and time perspective

Theory

Anxiety has largely been conceptualized as a phenomenon that resides in the future time period (Beck, 1976; Hartocollis, 1972; Tellegen, 1985). For example, anxiety has been characterized as a state of distress in response to a threatening situation from the future (Hartocollis, 1972). Similarly, anxiety has been considered to be a result of anticipating future physical or psychological harm (Beck, 1976). Further, thoughts associated with high (versus low) affect have been described as future-oriented (Tellegen, 1985). Specifically, this research has indicated that thoughts related to anxiety—a state of high negative affect— were considered to involve a fearful curiosity for the future.

Research with adults

Research with adult participants has indicated mixed findings about the associations among time perspective dimensions and anxiety. For example, some research has shown that positive attitudes about the past were negatively associated with anxiety (Anagnostopoulos & Griva, 2012; Zimbardo & Boyd, 1999). Additional research has shown similar patterns. Specifically, negative attitudes about the past and the future were positively associated with anxiety (Anagnostopoulos & Griva, 2012; Åström et al., 2014; Zimbardo & Boyd, 1999). However, other studies indicated that positive attitudes about the past and the future were not related to anxiety (Åström et al., 2014; Papastamatelou et al., 2015).

Studies with constructs conceptually similar to time perspective dimensions have also indicated mixed findings. Specifically, a fatalistic attitude toward the present, characterized by the belief that present actions cannot influence the predestined future, has been shown to be positively associated with anxiety (Anagnostopoulos & Griva, 2012; Zimbardo & Boyd, 1999). However, two studies did not demonstrate a significant relationship between these particular constructs (Åström et al., 2014; Papastamatelou et al., 2015). Further, temporal recoverability, the desire to recover time from the past, was found to be positively associated with anxiety in a female sample. Specifically, in a pretend scenario in which participants had unlimited money to "purchase" time, those indicating greater anxiety were willing to pay significantly more for time from their historical past (i.e., before their birth; Achamamba, 1988). However, temporal dominance or the perceived relative importance of a time period were not associated with anxiety in female samples (Achamamba, 1988, 1990). Further, experiential time orientation—a concept similar to time frequency that is characterized as the predisposition to think about the past, the present, and the future—was shown to be unrelated to anxiety (Cottle, 1969).

Studies focusing on the future time period have reported discrepant findings regarding anxiety. For example, the tendency to plan for and accomplish future goals, which characterizes the future factor of the Zimbardo Time Perspective Inventory (ZTPI), was demonstrated to be negatively related to anxiety (Zimbardo & Boyd, 1999). Similarly, a study with a male sample showed that those diagnosed with generalized anxiety disorder indicated lower levels of the future factor of the ZTPI compared to their non-diagnosed counterparts (Papastamatelou et al., 2015). On

the other hand, Anagnostopoulos and Griva (2012) reported that these variables were not associated with one another. Taken together, the literature investigating the relationship between time perspective dimensions and anxiety symptoms is mixed. However, extant studies highlight the need for future research on these relationships as time perspective may be an important construct for understanding anxiety.

Research with adolescents

Studies on anxiety and time perspective that include adolescent participants are very limited. To our knowledge, there has been only one study assessing the relationship between time perspective and anxiety among adolescents (Wills et al., 2001). In this study, time perspective was measured with an adapted, developmentally appropriate version of the ZTPI for adolescents and focused on the assessment of orientations toward the present and the future. Items for present orientation measured disinterest in the past and an emphasis on enjoying the present over preparing for the future. Future orientation items assessed the tendency to plan for the future and work toward future goals. Psychological distress including anxiety was measured with a 10-item scale based on the Mental Health Inventory (Veit & Ware, 1983). Results indicated that present orientation, not future orientation, was positively associated with negative affective symptoms, including anxiety, whereas future orientation was not.

Gender

Despite the robust evidence of gender differences in anxiety (e.g., Merikangas, He, Burstein, et al., 2010; Pine et al., 1998), research investigating relationships between time perspective and anxiety across males and females has been sparse. One study examined gender differences for time perspective-related constructs, including temporal recoverability and temporal relatedness, in association with anxiety among young adult participants aged 18 to 23 (Cottle, 1969). The results showed that only males reporting greater anxiety were willing to pay more to re-live time from their personal past. They were also less likely to perceive the time periods to be related. It is important to note, however, that the sample was predominantly male (77.2%) and the used measures did not capture the full range of time perspective dimensions.

Present study

As described, studies on the relationships among time perspective dimensions and anxiety have included primarily adult samples and have generated very mixed findings (Achamamba, 1988, 1990; Anagnostopoulos & Griva, 2012; Åström et al., 2014; Cottle, 1969; Papastamatelou et al., 2015; Wills et al., 2001; Zimbardo & Boyd, 1999). One possible explanation for these discrepant findings may stem from the numerous ways that time perspective has been conceptualized. In this study, we sought to clarify these associations by examining how distinct dimensions of time perspective (i.e., time frequency, time attitudes, time orientation, and time relation) were associated with general and specific anxiety disorders (i.e., panic, generalized, separation, social, and school), and how these relationships differed by gender. We did not make formal hypotheses about these associations given the degree to which the literature was mixed.

Method

Participants

Participants included 771 adolescents ($M_{age} = 15.82$, $SD = 1.23$; 54% female). Adolescents were in grades 9 to 12 and the following racial/ethnic groups were self-reported: 41.76% Hispanic/Latino(a) American, 19.46% Asian American/Pacific Islander, 16.86% European American/White/Caucasian, 10.86% Multi-Ethnic or -Racial, 6.36% African American/Black, 2.98% "Other," and 0.39% American Indian/Alaskan Native. An additional 1.30% did not complete this survey item. Adolescents reported on their mother's level of education on a scale ranging from 1 (No High School Diploma/G.E.D.) to 6 (Doctorate degree [M.D./Ph.D./J.D.]). The sample average maternal education was 2.77 ($SD = 1.61$), which equates to just below an Associate's degree.

Measures

Anxiety

The 41-item Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1999) scale was used to assess overall anxiety and the specific disorder subtypes. Sample items include the following: "I am nervous" or "I worry about things working out for me." Response options were 0 (Not True or Hardly Ever True), 1 (Sometimes True), and 2 (Very True or Often True). A summed score was calculated for the scale to indicate the total level of

Table 1. Correlations and descriptive statistics for time perspective and anxiety variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Past TF	–														
2. Present TF	.30***	–													
3. Future TF	.27***	.33***	–												
4. Past Positive	-.02	.16***	.12*	–											
5. Past Negative	.21***	-.07	.01	-.57***	–										
6. Present Positive	-.13***	.21***	.09*	.48***	-.34***	–									
7. Present Negative	.28***	-.06	.04	-.27***	.56***	-.65***	–								
8. Future Positive	.03	.19***	.32***	.29***	-.09*	.54***	-.34***	–							
9. Future Negative	.08*	-.18***	-.16***	-.15***	.43***	-.35***	.58***	-.57***	–						
10. Total Anx.	.21***	-.04	.06	-.19***	.33***	-.29***	.31***	-.20***	.24***	–					
11. Panic Anx.	.12**	-.05	.01	-.19***	.32***	-.27***	.28***	-.18***	.25***	.91***	–				
12. General Anx.	.24***	.02	.12**	-.14***	.23***	-.30***	.32***	-.19***	.16***	.84***	.66***	–			
13. Separation Anx.	.12*	-.10*	.02	-.14***	.23***	-.13**	.14***	-.13**	.19***	.77***	.67***	.49***	–		
14. Social Anx.	.18***	-.02	.00	-.16***	.20***	-.22***	.21***	-.19***	.15***	.76***	.57***	.60***	.50***	–	
15. School Anx.	.15***	-.06	.02	-.19***	.30***	-.29***	.31***	-.20***	.25***	.77***	.73***	.55***	.57***	.44***	–
Mean	3.46	3.75	4.05	3.37	2.75	3.42	2.70	3.69	2.38	26.52	6.54	7.56	4.29	5.92	2.53
SD	0.96	1.00	0.97	0.79	0.90	0.75	0.82	0.82	0.84	16.67	5.89	4.74	3.46	3.75	1.99
Min, Max	1, 5	1, 5	1, 5	1, 5	1, 5	1.2, 5	1, 5	1.2, 5	1, 4.8	0, 78	0, 26	0, 18	0, 15	0, 14	0, 8

Note. Names for time frequency (TF), anxiety (Anx.), and standard deviation (SD) were abbreviated.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

anxiety, with greater scores indicating higher levels of anxiety ($\alpha = .95$). Summed scores were also generated for the subscales: panic ($\alpha = .89$), generalized ($\alpha = .87$), separation ($\alpha = .78$), social ($\alpha = .85$), and school ($\alpha = .67$). The SCARED has been shown to yield scores that are reliable and valid in studies with adolescent samples (Muris et al., 2002; Ohannessian, 2014). Lifetime prevalence rates for these anxiety disorder subtypes among adolescents have been reported as follows: 2.3% for panic disorder, 2.2% for general anxiety disorder, 7.6% for separation anxiety disorder, 9.1% for social phobia, and 19.3% for specific phobia (Merikangas, He, Burstein, et al., 2010).

Time perspective

The AATI (Mello & Worrell, 2007) was used to assess time perspective. Specifically, the time frequency, time attitudes, time orientation, and time relation dimensions of the AATI were included. *Time frequency* was measured with three items that assessed how often adolescents thought about the past, the present, and the future on a scale ranging from 1 (*Almost Never*) to 5 (*Almost Always*). Sample averages for the past, the present, and the future were generated, such that greater scores indicated more frequent thought about that time period. Time frequency items have been used with past adolescent samples to assess developmental outcomes, including risk taking and academic achievement (Mello et al., 2009, 2018).

Time attitudes were measured with 30 items assessing positive and negative attitudes toward each time period on a scale ranging from 1 (*Totally Disagree*) to 5 (*Totally Agree*). The six time attitudes subscales include *past positive* ($\alpha = .83$; "I have very happy memories of my childhood"), *past negative* ($\alpha = .85$; "I am not satisfied with my past"), *present positive* ($\alpha = .85$; "I am happy with my current life"), *present negative* ($\alpha = .85$; "I am not happy with my present life"), *future positive* ($\alpha = .88$; "I look forward to my future"), and *future negative* ($\alpha = .82$; "Thinking ahead is pointless"). Average scores were calculated for individual subscales, such that higher scores indicated greater positive or negative feelings toward each time period. The reliability and validity of the time attitudes subscales have been demonstrated extensively in studies examining developmental and adjustment outcomes with adolescent samples (Konowalczyk et al., 2018; McKay et al., 2019; Worrell et al., 2013).

Single-item scales were used to assess *time orientation* and *time relation* (see Tables 2 and 3 for illustrations, respectively). These scales included a unique format. Specifically, they contained several sets of

Table 2. Descriptive statistics for time orientation and its association with anxiety.

Time Orientation		Distribution Sample %	Females %	Anxiety score M(SD)	Anxiety regression model b	SE	B
1. Past		2.41	73.33	41.33(21.15)	11.01	4.85	0.10*
2. Present		7.08	47.92	21.97(16.37)	−8.14	3.16	−0.13**
3. Future		12.04	51.81	25.92(16.26)	−1.72	2.71	−0.03
4. Past-Future		14.73	66.32	33.44(16.77)	2.31	2.40	0.05
5. Past-Present		3.26	45.45	34.58(16.81)	7.33	3.91	0.09
6. Present-Future		43.06	59.31	23.13(14.40)	−6.07	1.91	−0.19**
7. Balanced		17.42	56.20	28.97(17.20)	Reference category		
Female	−	−	−	−	6.20	1.42	0.19***
F					5.80***		
R^2_{adj}					0.10		

Note. The linear regression model controlled for maternal education, adolescent age, and school affiliation.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

Table 3. Descriptive statistics for time relation and its association with anxiety.

Time relation		Distribution Sample %	Females %	Anxiety score M(SD)	Anxiety regression model b	SE	B
1. Unrelated		9.99	56.72	25.10(18.82)	−3.77	2.62	−0.07
2. Present-Future		29.82	52.29	24.89(15.29)	−2.90	1.82	−0.08
3. Linear		26.86	60.87	27.11(16.54)	−1.24	1.80	−0.04
4. Interrelated		33.33	63.84	28.52(16.34)	Reference category		
Female	−	−	−	−	6.24	1.45	0.19***
F					3.40***		
R^2_{adj}					0.04		

Note. The linear regression model controlled for maternal education, adolescent age, and school affiliation.
***$p < 0.001$.

circles that were individually labeled "past," "present," and "future." For time orientation, participants were asked to select the set of circles that best represented which time period(s) they believed to be the most important. The time orientation scale contained seven sets of circles of varying size, with larger circles indicating more important time periods. The sets of circles reflected the following emphases: past, present, future, past-future, past-present, present-future, and balanced (i.e., equal emphasis on all three time

periods). For time relation, participants are asked to select the set of circles that best represented how the time periods were related. The time relation scale contained four sets of circles with varying degrees of overlap among the three time periods. Response options represented the following time relations: unrelated, present-future, linear, and interrelated. The time orientation and time relation scales have been used in past research to investigate a range of adolescent developmental outcomes including self-esteem and risk behavior (Mello et al., 2013, 2018).

Demographics and controls

Adolescents' gender was self-reported and categorically coded for females (0 = male; 1 = female). We included maternal education, adolescents' age, and school affiliation as covariates (McLaughlin et al., 2012). Maternal education level was included in models as two categorical indicators (0 = Associate's degree or above; 1 = No High School Diploma/G.E.D; 2 = High School Diploma/G.E.D.). Self-reported age was included as a continuous variable. School affiliation was controlled by including a binary variable that indicated enrollment in one of two high schools, to account for any potential school level effects.

Procedure

Data were collected in 2016 from two public high schools in the Western United States. After receiving permission from the school administration, trained research assistants announced the study in classrooms. Interested adolescents were given a packet of materials that contained information about the study, a parental consent form, an adolescent assent form, and the study questionnaire. The study questionnaire was provided in a separate enclosed envelope so that it could be returned without identifying information. Students who returned completed materials were compensated $10.00. All study procedures were approved by the IRB at the university affiliated with the last coauthor (IRB #H15-33c).

Results

Analytic strategy

Descriptive statistics were conducted to examine distributions and associations among study variables. T-Tests were used to determine gender differences across study variables. Several ordinary least squares (OLS) multiple linear regression models were generated to examine whether each time perspective

dimension was associated with anxiety and if these associations were moderated by gender. In all models, maternal education, adolescents' age, and school affiliation were controlled. Significant interaction terms were explored through plotting and estimating simple slopes at low and high values (± 1 SD) based on means (Aiken & West, 1991). To account for the use of multiple tests, we used the Bonferroni correction within each time perspective dimension and across the anxiety subscales (Warner, 2007). The Bonferroni correction divides the p-value by the number of tests, therefore reducing the risk of Type 1 Errors. T-test and regression analyses were adjusted. All analyses were conducted in Stata (version 15.1).

Anxiety and time perspective

Correlations and descriptive statistics for the study sample are displayed in Table 1. Generally, there were medium to large correlations among the past, present, and future time frequency dimensions. There also were medium to large correlations among positive time attitudes and large correlations among negative time attitudes. Tables 2 and 3 display the sample distribution of the time orientation and time relation responses, respectively. For time orientation, the present-future option was the most commonly selected response, whereas the past was the least commonly selected. For time relation, the interrelated option was the most commonly selected response, whereas unrelated was the least commonly selected. The sample distribution across the time orientation and time relation response options are similar to those found in past adolescent samples (Mello et al., 2013).

Correlations between the time perspective dimensions and anxiety also are displayed in Table 1. There were small to medium positive correlations between past time frequency and the various anxiety scales. Further, there were consistent small to medium negative correlations between past positive, present positive, and future positive time attitudes and the anxiety scales. Conversely, there were consistent small to medium positive correlations between past negative, present negative, and future negative time attitudes and the anxiety scales. Finally, there were strong correlations among the anxiety indicators.

Results from regression analyses examining associations between each time frequency and time attitudes subscale and anxiety are displayed in Table 4. No main effects for past, present, or future time frequency emerged in predicting anxiety. However, past negative, present negative, and future negative time attitudes

Table 4. Linear regression models predicting anxiety with time frequency and time attitudes.

	Anxiety				
	b	SE	B	F	R^2_{adj}
Time frequency					
Past	0.09	1.14	0.01	7.94[t]	0.09
Female	5.35	1.40	0.17*		
Past x Female	5.68	1.52	0.24*		
Present	−1.47	1.09	−0.09	3.27[t]	0.03
Female	6.34	1.44	0.20*		
Present x Female	1.59	1.49	0.07		
Future	−1.10	1.06	−0.06	4.080[t]	0.04
Female	6.11	1.44	0.19*		
Future x Female	3.75	1.55	0.15*		
Time attitudes					
Past Positive	−2.39	1.44	−0.12	4.92[t]	0.05
Female	6.71	1.45	0.21*		
Past Positive x Female	−1.20	1.82	−0.05		
Past Negative	5.72	1.23	0.33*	10.02[t]	0.12
Female	6.43	1.40	0.20*		
Past Negative x Female	−1.02	1.56	−0.05		
Present Positive	−3.74	1.39	−0.17*	8.14[t]	0.09
Female	6.61	1.42	0.20*		
Present Positive x Female	−2.67	1.90	−0.09		
Present Negative	4.39	1.29	0.23*	9.39[t]	0.11
Female	6.57	1.40	0.20*		
Present Negative x Female	1.47	1.68	0.06		
Future Positive	−2.75	1.30	−0.13	6.36[t]	0.07
Female	7.36	1.45	0.23*		
Future Positive x Female	−2.28	1.82	−0.08		
Future Negative	4.15	1.28	0.21*	6.49[t]	0.08
Female	6.71	1.46	0.21*		
Future Negative x Female	0.04	1.74	0.00		

Note. All regression models controlled for maternal education, adolescent age, and school affiliation.
Model p-values:[t]$p < .05$. Bonferroni adjusted p-values: Time Frequency *$p < 0.017$ and Time Attitudes *$p < 0.008$.

were positively associated with anxiety, whereas present positive time attitudes were negatively associated with anxiety.

Findings from regression analyses investigating associations between each time orientation and time relation response option and anxiety are displayed in Tables 2 and 3, respectively. For time orientation, adolescents who were present and present-future oriented reported less anxiety, whereas adolescents who were past oriented reported more anxiety. There were no associations between the time relation responses and anxiety.

Anxiety, time perspective, and gender

Correlations among study variables and descriptive statistics for females and males are provided in Table 5. The direction and size of the correlations between and among the time perspective dimensions and anxiety scales were similar to those observed for the whole study sample. The gender distribution of the time orientation and time relation responses and the mean anxiety levels across these time perspective response options are displayed in Tables 2 and 3,

respectively. For time orientation, greater percentages of females selected the past, future, past-future, present-future, and balanced response options compared to males. Greater percentages of males, however, selected the present and past-present time orientation response options than females. For time relation, greater percentages of females selected all of the response options compared to males.

Results from t-test analyses examining gender differences across study variables are displayed in Table 5. Findings revealed that females reported thinking more frequently about the past and future compared to males. However, females and males reported similar positive and negative attitudes toward each time period. Regarding anxiety, females reported greater total, general, separation, social, and school anxiety symptoms than males. The size of these gender differences ranged from small to medium.

Across regression models, gender was a consistent predictor of anxiety (see Tables 2–4). Further, gender interacted with past time frequency and future time frequency to predict anxiety (Table 4). Plotting and probing these interactions with simple slope analyses suggested that there were positive relationships between past time frequency and anxiety (Figure 1A) and future time frequency and anxiety (Figure 1B), especially for females. Due to insufficient cell sizes in interaction term levels (i.e., less than 10 cases per cell; Tabachnick & Fidell, 2013; Wilson Van Voorhis & Morgan, 2007), interactions between time orientation and gender and between time relation and gender were not explored.

Anxiety subscales

Exploratory analyses were conducted to examine differences in the relationships among each time perspective dimension and the specific anxiety subscales. Similar to results from the primary analyses, across all models, females reported greater anxiety scores across the disorder subtypes. Further, a high degree of consistency was observed in the direction of effects, size of effects, and statistical significance when comparing the specific anxiety disorder findings to the findings from the total anxiety score model.

Discussion

The main objectives of the present study were to examine how anxiety was associated with time perspective among adolescents and how these relationships varied across gender. Despite the prevalence of anxiety disorders (Merikangas, He, Burstein, et al.,

Table 5. Correlations, descriptive statistics, and mean comparisons for female and male adolescents' time perspectives and anxiety.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Past TF	–	.41***	.31***	.15*	.09	.02	.21***	.17**	-.03	.02	-.04	.13*	-.11	.08	.05
2. Present TF	.15**	–	.46***	.18**	.01	.22***	-.01	.28***	-.19**	-.11	-.08	-.05	-.15*	-.10	-.03
3. Future TF	.14**	.15**	–	.15**	.02	.13*	.02	.38***	-.16**	-.10	-.11	.02	-.11	-.08	-.12
4. Past Positive	-.13**	.14**	.08	–	-.44***	.50***	-.21***	.35***	-.12	-.09	-.13*	-.06	-.04	-.08	-.12*
5. Past Negative	.32***	-.14**	-.03	-.65***	–	-.28***	.62***	-.08	.51***	.32***	.30***	.25***	.18**	.20**	.28***
6. Present Positive	-.23***	.20***	.04	.44***	-.35***	–	-.28***	.60***	-.29***	-.21**	-.17**	-.29***	-.09	-.17**	-.23***
7. Present Negative	.34***	-.10*	.07	-.31***	.49***	-.74***	–	-.28***	.59***	.22**	.16*	.29***	.12	.14*	.23***
8. Future Positive	-.09	.08	.24***	.22***	-.08	.48***	-.41***	–	-.51***	-.14*	-.13*	-.13*	-.09	-.13*	-.15*
9. Future Negative	.20***	-.17**	-.15*	-.16**	.38***	-.35***	.57***	-.62***	–	.23***	.24***	.13*	.24***	.10	.24***
10. Total Anx.	.33***	.00	.14*	-.17**	.27***	-.29***	.33***	-.240***	.21***	–	.92***	.84***	.83***	.78***	.77***
11. Panic Anx.	.22***	-.00	.11*	-.15**	.25***	-.28***	.32***	-.20***	.20***	.88***	–	.67***	.80***	.60***	.72***
12. General Anx.	.27***	.04	.14**	-.15**	.18***	-.26***	.32***	-.23***	.16**	.83***	.63***	–	.51***	.68***	.55***
13. Separation Anx.	.26***	-.07	.08	-.17**	.25***	-.12*	.14**	-.16**	.16**	.74***	.57***	.45***	–	.53***	.68***
14. Social Anx.	.23***	.02	.01	-.15**	.15**	-.22***	.23***	-.24***	.17**	.72***	.49***	.51***	.46***	–	.46***
15. School Anx.	.18***	-.07	.03	-.19***	.27***	-.29***	.33***	-.24***	.25***	.72***	.68***	.48***	.47***	.34***	–
Females Mean	3.59	3.83	4.21	3.43	2.73	3.44	2.70	3.78	2.35	28.39	6.73	8.35	4.57	6.28	2.71
(SD)	(.91)	(.96)	(.85)	(.80)	(.90)	(.72)	(.84)	(.78)	(.81)	(15.33)	(5.44)	(4.72)	(3.35)	(3.62)	(1.90)
Min, Max	1, 5	1, 5	1, 5	1, 5	1, 5	1.2, 5	1, 5	1.2, 5	1, 4.8	0, 78	0, 26	0, 18	0, 15	0, 14	0, 8
Males Mean	3.32	3.68	3.89	3.37	2.70	3.45	2.67	3.59	2.39	22.39	5.59	6.26	3.72	5.21	2.10
(SD)	(.96)	(1.03)	(1.03)	(.74)	(.85)	(.75)	(.79)	(.83)	(.86)	(16.48)	(5.75)	(4.41)	(3.49)	(3.70)	(1.96)
Min, Max	1, 5	1, 5	1, 5	1, 5	1, 5	1.2, 5	1, 5	1.2, 5	1, 5	0, 82	0, 26	0, 18	0, 16	0, 14	0, 8
Mean Difference Effect Size	.29*	.15	.34*	.07	.03	.01	.04	.24*	.05	.38*	.21	.46*	.25*	.29*	.31*

Note. Correlations for females are on the top panel and males are on the bottom panel and males are on the top. Names for time frequency (TF), anxiety (Anx.), standard deviation (SD), minimum (Min), and maximum (Max) were abbreviated. In the Mean Difference Effect Size row, the number represents the effect size and stars indicate the statistical significance of differences between genders. Bonferroni adjusted p-values for t-test analyses: Time Frequency *$p < 0.017$; Time Attitudes *$p < 0.008$; and Anxiety indicators *$p < 0.008$. P-values for correlations: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
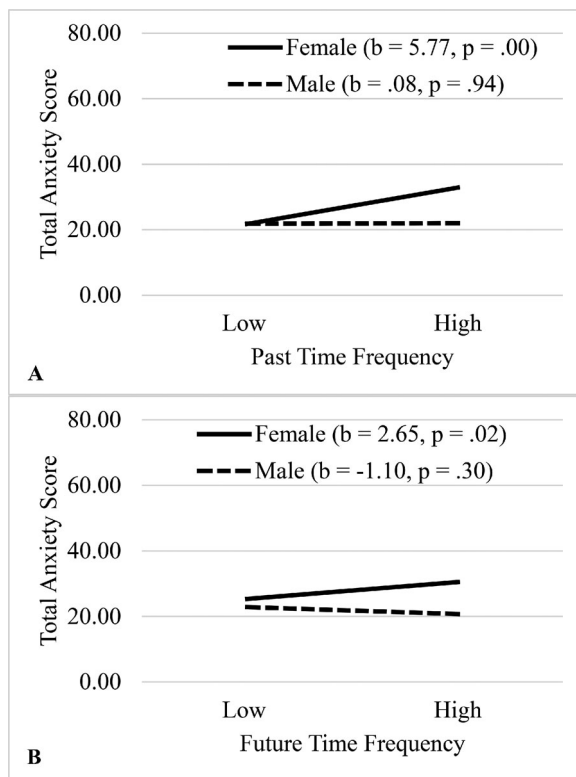
Figure 1. Estimated interactions between past time frequency and total anxiety (Part A) and future time frequency and total anxiety (Part B) for females and males. Low and high time frequency ranges represent ±1 *SD* around the mean. The unstandardized coefficient for each simple slope and the associated *p*-value are to the right of the slope labels. Maternal education, adolescent age, and school affiliation were controlled.

2010) and the salience of the time perspective construct for adolescents (Mello & Worrell, 2015), limited research has been conducted with this population. This study attempts to address this gap in the literature and demonstrates the potential of time perspective to contribute to the development of intervention programs addressing anxiety among adolescents.

Anxiety and time perspective

Findings from the current study indicated that particular time attitudes were related to anxiety. Adolescents who felt less positively toward the present and the future or more negatively toward the past, the present, and the future reported greater anxiety. These findings provide new information on how positive attitudes toward the present or the future or negative attitudes toward the present are associated with anxiety. These findings support previous studies showing negative attitudes toward the past and the future are associated with anxiety in adult samples (Anagnostopoulos & Griva, 2012; Åström et al., 2014; Zimbardo & Boyd, 1999). Further, these findings

complement research illustrating a positive relationship between fatalistic attitudes toward the present (negative in valence) and anxiety among adult participants (Anagnostopoulos & Griva, 2012; Zimbardo & Boyd, 1999).

Findings on time orientation provide a new understanding of the association between time perspective and anxiety. We used an assessment of time orientation that reflects a relative emphasis toward a particular time period *separate* from the valence. Specifically, results indicated that adolescents who thought the past was more important than the present and future reported greater anxiety than those who attributed equal importance to the three time periods. Conversely, adolescents who emphasized the present alone or the present and future over the other time periods reported lower anxiety. These results show that the view one has toward the time periods, independent of their positive and negative feelings, is meaningfully associated with anxiety. These findings align with Cottle's (1969) study and are consistent with prior research on conceptually similarly constructs, including temporal recoverability (Achamamba, 1988) and future orientation (Papastamatelou et al., 2015; Zimbardo & Boyd, 1999).

Discrepancies between our findings and extant research illustrate the value of assessing distinct qualities of time perspective. For example, findings on time orientation diverged with the positive association Wills et al. (2001) demonstrated between a present orientation and anxiety among adolescents. This may be due to the fact that the measure for present orientation used in prior research captured *both* an orientation and a negative attitude. For example, it included items such as "Get irritated at waiting" and "Bored when others talk about 'old times'." Thus, by assessing unique qualities of the broader construct we are able to generate a more accurate understanding of its relationship with anxiety.

Anxiety subtypes

The associations between time perspective and anxiety and between time perspective and the various anxiety disorder subtypes were generally similar. These findings suggest that anxiety may have a fundamental temporal basis despite the unique nature of threats that differentiate the individual conditions. This idea is supported by neuroimaging studies that implicate the involvement of the amygdala and the prefrontal cortex in threat assessment (Bishop, 2007). These are brain structures responsible for recalling fear-related

memories from the past and projecting future consequences of behaviors, respectively. Specifically, increased activity of the amygdala and habituation in the prefrontal cortex have been suggested to underlie the bias toward threat identification and to characterize anxiety.

Anxiety, time perspective, and gender

Gender differences were found in the association between anxiety and some of the time perspective dimensions. Specifically, we found that thinking more frequently about the past and the future may be associated with greater anxiety especially among females. This result extends prior research on future expectations to the past time period. For example, Greene and Wheatley (1992) showed that more proximal (versus distal) future expectations (e.g., goals and life events) were associated with greater distress including anxiety symptoms only among female adults. Our results indicate that this pattern may also be observed for the past time period. Gender differences in time perspective may be explained by a variety of social and cognitive processes. For instance, research suggests that females may be more likely to ruminate and engage in more brooding and reflection than males (Johnson & Whisman, 2013). This predisposition may contribute to gender differences. Moreover, gender-based societal expectations and distribution of occupational opportunities have been suggested to differentially shape how individuals think about their future (Seginer, 2009). Lastly, due to insufficient sample sizes for the interaction terms, however, we were unable to test our hypotheses with regard to time orientation and time relation. Needless to say, further research is needed to better understand how gender moderates the relationship between time perspective and anxiety.

Implications

Our findings have potential implications for intervention efforts aimed at reducing anxiety in adolescents by modifying their time perspective. Indeed, past research has demonstrated that interventions can modify time perspective and support positive outcomes. For example, compared to a control group, adolescents and young adults who were taught to think about multiple time periods indicated greater awareness about careers (Marko & Savickas, 1998). Similarly, interventions designed to facilitate adolescents' focus on the future have been associated with positive school outcomes compared to controls

(Oyserman et al., 2002). Results from this study suggest that interventions supporting positive time perspectives toward the past, the present, and the future may help adolescents with anxiety.

Limitations and future directions

This study had limitations which may be addressed in future research. First, larger samples should be recruited as insufficient cell sizes precluded the examination of gender moderation on some of the time perspective dimensions, including time orientation and relation. Second, the current study was not designed to test competing cognitive and attitudinal factors that may contribute to adolescents' anxiety. For example, future research should control for depressive symptoms and rumination to minimize confounding bias as studies have shown that anxiety symptoms commonly co-occur with depressive symptoms (e.g., Essau, 2003) and that rumination predicts increases in anxiety symptoms (Nolen-Hoeksema, 2000). Simultaneous exploration of time perspective and other known contributing factors to adolescents' anxiety will be important in future research to illuminate the unique role of time perspective in understanding this important health outcome. Third, a longitudinal research design should be implemented to enable the examination of the directionality of the relationship between time perspective and anxiety. Extant research on time perspective has largely been cross-sectional, and longitudinal data are needed to provide support for time perspective as a causal mechanism underlying human behaviors.

Conclusion

Time perspective was conceptualized as a multidimensional construct including time frequency, time attitudes, time orientation, and time relation. These dimensions were examined in association with anxiety among adolescents. Overall, for both general and specific anxiety disorders, results showed that adolescents who felt less positively and more negatively about the three time periods reported greater anxiety. Further, those that emphasized the past and girls with frequent thoughts about the past and the future reported greater anxiety. Our findings support the use of time perspective as a novel lens to illustrate the past, present, and future temporal qualities of anxiety and provide initial support for time perspective-based programs addressing anxiety among adolescents. Continued efforts to illuminate the temporal nature of

anxiety will advance our understanding of anxiety disorders and may contribute to the positive development of adolescents.

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