

Psychometric Properties of Turkish Adolescent Time Inventory-Time Attitude (ATI-TA) Scores

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The Adolescent Time Inventory (ATI; Mello & Worrell, 2007) is a relatively new measure developed to assess several aspects of time perspective (e.g., time orientation, time attitudes). Time attitudes, one aspect of time perspective, refer to positive and negative feelings about the past, present, and future. In the current 2-sample paper, we examined the internal consistency, structural validity, and convergent validity of scores on the time attitude subscales (TA) of the Turkish ATI (Mello, Worrell, Şahin-Baltacı, & Tagay, 2015). Results from Sample 1 ($N = 244$) indicated that scores on 5 of the 6 Turkish ATI-TA subscales—Past Positive, Past Negative, Present Positive, Present Negative, and Future Positive—were internally consistent, and confirmatory factor analyses provided strong support for the structural validity of a 5-factor model as well as the hypothesized 6-factor model, even though internal consistency estimates for Future Negative scores (the sixth factor) were unacceptably low. Results from Sample 2 ($N = 350$) provided additional internal consistency and structural validity evidence for scores on the 5-factor model and also provided evidence of convergent validity with self-esteem, well-being, and optimism. Analyses also indicated that scores on the 2 past and 2 present subscales demonstrated configural, metric, and scalar invariance across samples, whereas the Future Positive scores only demonstrated metric invariance. We concluded that these 5 subscales can be used with Turkish adolescents and that the Future Negative subscale needs to be revised and validated in this national context.

Keywords: Adolescent Time Inventory, confirmatory factor analysis, time attitudes, Turkey, validity

Variables related to time have been studied in adolescent populations for several decades (e.g., Jessor, Donovan, & Costa, 1990; Lens & Gailly, 1980; Lens & Nuttin, 1985; Nurmi, 1991;

Nurmi, Seginer, & Poole, 1990; Scheier & Carver, 1985; Shipp, Edwards, & Lambert, 2009; Snyder, Lopez, Shorey, Rand, & Feldman, 2003; Snyder et al., 1996), and the majority of studies have focused on future-oriented constructs (e.g., future orientation, hope, optimism, perceived life chances, possible selves). Over the decades, researchers have shown that future-oriented constructs are associated with academic achievement (de Volder & Lens, 1982), delinquency (Oyserman & Markus, 1990), health behaviors (Hulbert & Lens, 1988; Jessor et al., 1990), high school graduation (Worrell & Hale, 2001), psychological well-being (Scheier, Carver, & Bridges, 1994), resilience (Wyman, Cowen, Work, & Kerley, 1993), and risk status (Worrell, Latto, & Perlinski, 1999).

This article was published Online First November 28, 2016.

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Despite the robust findings related to time constructs focused on the future, psychological researchers were initially interested in the broad construct of time perspective (Frank, 1939; Lewin, 1942, 1946), which includes foci on the past and present, in addition to the future. Indeed, one of the early measures of time perspective, the Time Attitude Scale (Nuttin, 1972), assessed attitudes toward the past, present, and future (Lens & Nuttin, 1985). However, this semantic differential scale was not broadly adopted. In 1999, Zimbardo and Boyd noted that there was a dearth of instruments that assessed all three dimensions of time. As these authors pointed out, discovering that an individual has a low orientation toward the future does not necessarily mean that that individual is oriented toward the present, and any broad measure of time perspective should assess all three time periods.

Consequently, Zimbardo and Boyd (1999) introduced the Zimbardo Time Perspective Inventory (ZTPI) to the literature. The ZTPI resulted in a renaissance of research on time perspective (see Stolarski, Fieulaine, & van Beek, 2015), including inspiring at least two new instruments, the Balanced Time Perspective Scale (Webster, 2011) and the Adolescent Time Inventory (ATI; Mello & Worrell, 2007). Multinational studies using the ZTPI (e.g., Sircova et al., 2014, 2015) indicate that time perspective is of tremendous research interest internationally, and a scale that can measure the construct validly within and across countries and languages will allow for *within*-country research and also facilitate cross-cultural and cross-national research. ZTPI scores have manifested psychometric concerns in adolescent samples specifically (e.g., Perry et al., 2015; Worrell & Mello, 2007) as well as in samples of Turkish undergraduates (e.g., Akirmak, 2014; Cinan & Doğan, 2013). Consequently, the goal of the current study was to assess the psychometric properties of scores on another measure of time perspective—the Adolescent Time Inventory-Time Attitude (ATI-TA; Authors, 2015) subscales—in samples of Turkish adolescents. To set the stage for the study, we briefly review the literature on Zimbardo and Boyd's (1999, 2008) time perspective theory and the ZTPI, as well as the literature on the

ATI and its theoretical foundation (Mello & Worrell, 2015).

Zimbardo's Time Perspective Theory and the ZTPI

Zimbardo and Boyd's (2008) model of time perspective is broad-based, incorporating "attitudes, beliefs, and values" (p. 52). Consequently, the ZTPI has items that assess motivation, emotion, cognition, beliefs, values, preferences, and behavior (Zimbardo & Boyd, 1999, 2008). Zimbardo and Boyd (1999, p. 1273) noted that the development of the ZTPI "was empirically driven" with "no a priori theoretical prediction of the number or characteristics of the factors." The final ZTPI (Zimbardo & Boyd, 1999) consisted of 56 items across five factors: (a) Past Negative (10 items), (b) Past Positive (9 items), (c) Present Hedonistic (15 items), (d) Present Fatalistic (9 items), and (e) Future (13 items). Zimbardo and Boyd (1999, 2008) also discussed a sixth construct called transcendental future; however, a transcendental future scale is not included in the ZTPI.

There is extensive convergent and discriminant validity support for ZTPI scores. ZTPI scores have been shown to be related to a variety of psychological constructs (e.g., aggression, depression, conscientiousness, sensation seeking; Zimbardo & Boyd, 1999) and to problematic behaviors such as excessive alcohol consumption (Keough, Zimbardo, & Boyd, 1999; McKay, Andretta, Magee, & Worrell, 2014) and risky driving (Zimbardo, Keough, & Boyd, 1997). Indeed, versions of the ZTPI have been used in 24 countries (see Sircova et al., 2014, 2015). However, some psychometric studies have indicated that ZTPI scores are not *consistently* reliable or structurally valid (e.g., Carelli, Wiberg, & Wiberg, 2011; Milfont, Andrade, Belo, & Pessoa, 2008). For example, Worrell and Mello (2007) found that the factor structure was not supported in a sample of American adolescents, a finding replicated by McKay et al. (2014) in a sample of British adolescents. Worrell, Mello, and Buhl (2013) also noted that another possible reason for the psychometric instability may be that several ZTPI subscales measure other constructs in addition to time (e.g., hedonism and present; fatalism and present; future and planning), a hypothesis supported by some subscales splitting

into two in structural validity analyses (e.g., the Present Hedonistic and Future scales in Crockett, Weinman, Hankins, & Marteau, 2009; the Future scale in Worrell & Mello, 2007).

The ATI and Its Conceptual Model

Mello and Worrell (2007) developed the ATI specifically to assess time perspective in adolescence. As with the ZTPI, Mello and Worrell (2015, p. 115) conceive of time perspective as “a cognitive and motivational construct that is individually varying” and inclusive of the three time periods. However, unlike Zimbardo and Boyd (1999); Mello and Worrell (2007) assessed differing aspects of time perspective using different operationalizations. Thus, the ATI, which operationalizes Mello and Worrell’s (2015) conceptual model, assesses (a) time meaning, (b) time frequency, (c) time relation, (d) time orientation, and (e) time attitudes, the specific focus of this study.

The ATI-TA subscales are the most similar to the ZTPI but differ from the ZTPI questions in several ways. First, ATI-TA scales measure attitudes *only* and do not attempt to assess other aspects of time perspective such as behavior and values. Second, they *only* include questions related to time. Third, the ATI-TA assesses positive and negative attitudes to the three time periods: Past Positive, Past Negative, Present Positive, Present Negative, Future Positive, and Future Negative. Worrell et al. (2013) indicated that the ATI-TA was constructed using theoretically driven item development based on a six-factor model, expert review, focus groups, and psychometric analyses, and ATI-TA scores have been found to be internally consistent and structurally valid in adolescent samples in Germany (Buhl & Linder, 2009; Worrell et al., 2013), the United States (Worrell et al., 2013), New Zealand (Alansari, Worrell, Rubie-Davies, & Webber, 2013), and the United Kingdom (McKay, Cole, Percy, Worrell, & Mello, 2015). Convergent validity evidence for ATI-TA scores has also been provided with self-esteem, hope, perceived life chances, optimism, perceived stress, and attitude toward school (Alansari et al., 2013; Andretta, Worrell, & Mello, 2014; Worrell & Mello, 2009).

Cluster analyses and latent profile analyses have been used to create time attitude profiles based on ATI-TA scores. Several interpretable

profiles have been found in adolescent samples in Germany (Buhl & Linder, 2009), New Zealand (Alansari et al., 2013), and the United States (Andretta et al., 2014; Andretta, Worrell, Mello, Dixson, & Baik, 2013). Importantly, these profiles have been related to educational expectations, attitudes toward schools and teachers, educational achievement, and psychological well-being (self-esteem and perceived stress), with individuals with more positive profiles reporting more adaptive outcomes than their peers with less positive profiles.

The Present Study

The decision to develop psychometrically robust versions of the ATI-TA for use in *individual* countries was informed by the findings on studies with the ZTPI, which suggest that operationalizations of time perspective may differ in different national and cultural contexts. The goal of the present study was to examine the internal consistency, structural validity, and convergent validity of Turkish-ATI-TA scores. It was hypothesized that Turkish ATI-TA scores would be internally consistent ($\alpha > .70$) and that the six-factor structure would yield fit indices in the acceptable or higher ranges based on confirmatory factor analyses (CFAs). Convergent analyses were conducted with measures of self-esteem, well-being, and optimism, with the expectation that positive subscales would be positively and *meaningfully* (i.e., $r > .30$) related to these constructs and negative subscales would have meaningful negative correlations with the constructs. Analyses were conducted in two independent samples.

Method

Participants

Sample 1 consisted of 244 adolescents (55.7% female) ranging in age from 15 to 18 years old ($M = 16.2$, $SD = 1.01$) attending Grades 9 to 12 in academic and vocational high schools in the Burdur region in Southwestern Turkey. Fifty-one percent ($n = 125$) of the participants were attending an academic school in an urban region and 49% ($n = 119$) were attending a vocational school in a rural region. Sample 2 consisted of 350 adolescents (57% female) ranging in age from 15 to 18 years old

($M = 15.8$, $SD = .87$) and attending academic and vocational high schools in the Burdur and Denizli regions in Turkey. Forty-four percent ($n = 155$) of participants were attending an academic school in an urban region and 55% ($n = 192$) were attending a vocational school in a rural region. Although no data on participants' socioeconomic status was collected, families of students attending academic schools are typically more affluent than families of students attending vocational schools.

Measures

In addition to the ATI-TA, we included three constructs that we expected to be related to time attitudes and time perspective based on past research, including self-esteem (Worrell & Mello, 2009; Zimbardo & Boyd, 1999), optimism (Worrell & Mello, 2009), and subjective well-being (Boniwell, Osin, Alex Linley, & Ivanchenko, 2010). Scores on these measures were expected to have positive associations with scores on the three positive time attitude subscales and negative associations with scores on the three negative subscales.

Adolescent Time Inventory-Time Attitudes. The ATI-TA consists of six 5-item subscales assessing Past Positive, Past Negative, Present Positive, Present Negative, Future Positive, and Future Negative attitudes. Responses are provided on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Internal consistency estimates for the scores are generally in the .70 to .90 range and CFAs have yielded fit indices in the acceptable to close ranges (Alansari et al., 2013; McKay et al., 2015; Worrell et al., 2013). As noted previously, ATI-TA scores are also correlated in meaningful ways with other psychological constructs such as self-esteem and perceived stress providing evidence of convergent validity (Andretta et al., 2013). Moreover, ATI-TA scores are not correlated with social desirability (Velasquez, Dixson, Worrell, & Mello, 2014).

The 30 ATI-TA items were translated independently from English to Turkish by three specialists who are fluent in both languages and have experience in both cultures. After the initial translation into Turkish was completed, the items were back-translated into English and the back-translated form and the original form were checked for equivalence of words and expres-

sions by 10 senior students obtaining a degree in English teaching. Next, the Turkish translation was reevaluated by three academics from the Guidance and Counseling Department. With both the students and the academics, disagreements were discussed and consensus achieved. The final version of the scale was administered to 40 high school students to check for intelligibility and age-appropriateness, and the students reported that they understood the items and found them acceptable.

Short Form of Coopersmith's Self-Esteem Inventory. The Coopersmith's Self-Esteem Inventory (CSEI) Short Form (Coopersmith, 1987) is a 25-question scale that measures trait self-esteem of adolescents in relation to their peers, parents, school, and personal interests. Each question is answered with either *like me* or *unlike me*, and scores can range from zero to 100, as the total raw score is multiplied by 100. Coopersmith reported test retest correlations of .88 for a 5-week period and .70 over a 3-year period (Blascovich & Tomaka, 1991). Bedeian, Teague, and Zmud (1977) reported Kuder-Richardson reliability estimates of .74 for male and .71 for female participants on the full Coopersmith, and Byrne (1983) reported correlations ranging from .58 to .60 with the Rosenberg Self-Esteem Scale scores. The CSEI was translated into Turkish by Pişkin (1996), who reported Kuder-Richardson reliability estimates of .76 and internal consistency alpha estimates of .81. Aksoy (1992) found the scores on the CSEI Short Form had a correlation of .65 with scores on Baymur's Self-Concept Inventory (Öner, 1997). CSEI Short Form scores were reliable in this sample (see Table 4).

Adolescents' Subjective Well-Being Scale. This Turkish well-being scale was developed by Eryilmaz (2009). The scale is composed of 15 items with responses provided on a 4-point Likert-type scale, ranging from 1 (*almost never*) to 4 (*all the time*). Exploratory factor analysis explained 61.6% of the variance across four dimensions: (a) satisfaction with family relationships, (b) satisfaction with relationships with important others, (c) positive affect, and (d) life satisfaction. The total score is the sum of the 15 items and it can range from between 15 and 60 points, with a higher total score indicating a higher level of subjective well-being. Eryilmaz reported an internal consistency estimate of .87 for the total score and concurrent validity of the

scores was established with the satisfaction with life construct. Well-being scores were reliable in this sample (see Table 4).

The Life Orientation Test. The Life Orientation Test (LOT; Scheier & Carver, 1985) was translated into Turkish by Aydin and Tezer (1991). The LOT is a 12-item self-report survey designed to measure global optimism on a 5-point scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). The LOT is composed of four positively worded items, four negatively worded (reverse scored), and four filler items that are not included in the scoring. Scores for optimism range from 0 to 32, with a higher score indicating greater optimism. A 4-week interval test–retest reliability coefficient of .77 ($N = 97$) was reported for LOT scores. Also, in a validity study of LOT scores with Beck Depression Inventory scores as a criterion, correlation coefficients of $-.56$ ($N = 50$) and $-.45$ ($N = 97$) were reported for two different samples of university students, respectively (Aydin & Tezer, 1991). Optimism scores were generally reliable in this sample (see Table 4).

Procedure

The data collection instruments were administered with the help of school counselors attending a Masters degree program in guidance and counseling. The surveys were administered to students from one class from each grade selected at random. Measures were administered to students in groups by researchers. Students were told that their responses would remain confidential and were asked to complete all of the questions on the measures. Demo-

graphic information was obtained through selected questions (i.e., gender, age, and grade), which were completed as part of the instruments. The survey took ~25–30 min to complete. Informed consent and assent was received for all students who volunteered to participate in the study.

Results

Sample 1

Preliminary analyses. Descriptive statistics for ATI-TA scores in Sample 1 are presented in Table 1. As can be seen in the table, means for positive subscales are generally higher than means for negative subscales. Additionally, the scores are not substantially skewed or kurtotic. Internal consistency estimates for scores on five of the six subscales are in the .70 to .80 range; however, scores on Future Negative had a much lower internal consistency in the .50 range. Eliminating Future Negative Item 10, which did not correlate well with the other items on that subscale, did not result in a substantial increase in reliability (see Table 1). Intercorrelations among the subscales were in keeping with the valence of the constructs—that is, positive and negative subscales scores were negatively correlated—and ranged from $|.26|$ to $|.72|$ ($p < .01$, $Mdn = |.46|$).

Structural analyses. CFAs were conducted using Mplus7 (Muthén & Muthén, 1998–2012), and the robust maximum-likelihood estimator (MLR) was used. Three models were examined in addition to the baseline model (Model 1). Model 2 consisted of two factors

Table 1
Descriptive Statistics for Turkish Adolescent Time Inventory-Time Attitude Scores in Sample 1

ATI-TA subscales	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	α	95% CI
Past Positive	3.60	.93	-.49	-.24	.78	.74–.82
Past Negative	2.42	1.05	.69	-.23	.83	.79–.86
Present Positive	3.53	.92	-.34	-.25	.81	.79–.85
Present Negative	2.44	.93	.29	-.34	.79	.74–.83
Future Positive	3.95	.89	-.83	.35	.81	.77–.85
Future Negative	2.23	.75	.83	1.01	.53	.43–.62
Future Negative ^a	2.20	.85	.88	1.04	.56	.47–.65

Note. $N = 244$. CI = confidence interval.

^a Based on 4 items.

based on *valence*, with the 15 positive items assigned to one factor and the 15 negative items to the second factor. Model 3 consisted of three factors reflecting the three *time periods*, past, present, and future. Model 4 examined the *theoretically expected* six-factor model underlying the ATI-TA. Multiple fit indices were used to evaluate the models (Byrne, 2012; Thompson, 2004), including the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA) and its 90% confidence interval, and the standardized root mean square residual (SRMR). CFI and TLI values greater than .90 are indicative of acceptable or good fit (Byrne, 2008; Marsh, Hau, & Wen, 2004), and values of these indices greater than .95 are indicative of close or excellent fit (Hu & Bentler, 1999). For the RMSEA and SRMR, values less than .08 are indicative of acceptable fit and values below .05 are indicative of close fit (Marsh et al., 2004).

CFA results are presented in Table 2. The two-factor model (valence) did not fit the data well, with three of the four fit indices being less than acceptable, but two of the fit indices for the three-factor model were in the acceptable range, and one was in the close range. The results for the six-factor theoretical model indicated that Item 25 on the Future Negative factor was compromising model fit. Additionally, scores on Item 10 (also on the Future Negative scale) yielded a standardized coefficient of .15; thus, the six-factor model was rerun excluding these two items. Fit indices for the final six-factor model based on 28 items yielded three fit indices in the close range and one in the acceptable range (see Table 2). Standardized coefficients, which ranged from .41 to .79, and their effect sizes are reported in Table 3. Omega coeffi-

cients for the six factors ranged from .53 to .87, and intercorrelations ranged from .1331 to .1911, *Mdn* = .58. As the omega coefficient for Factor 6 was quite low, we ran a model examining five factors—excluding Future Negative (Model 5). As can be seen in Table 2, all of the fit indices for this model were in the close range, with intercorrelations among the latent factors ranging from .1401 to .1911, *Mdn* = .58.

Sample 2

Study 2 was conducted to replicate and extend the results found in Study 1. Based on results from Sample 1, data were collected on the five structurally valid ATI-TA subscales, as well as self-esteem, well-being, and optimism. The descriptive statistics for ATI-TA were very similar to those for Sample 1 (see Table 4): positive subscales had higher means than negative subscales, scores were neither skewed nor kurtotic, intercorrelations (.131 to .165 [*Mdn* = 1.38]) were in keeping with the scales' valences, and internal consistency estimates were in the .70 to .80 range. Two-factor (valence), three-factor (time period), and five-factor models were examined using CFAs as in Sample 1. The fit indices for the two- and three-factor models were poor, but the fit indices for the five-subscale model were in the acceptable range (see Table 5). Item coefficients were $> .50$, with the exception of two Present Negative items: Past Positive (.71 – .74, $\omega = .85$), Past Negative (.51 – .61, $\omega = .75$), Present Positive (.62 – .82, $\omega = .87$), Present Negative (.44 – .72, $\omega = .77$), and Future Positive (.61 – .79, $\omega = .86$).

Given the acceptable fit of the five-factor model in the two independent samples, we then tested for configural invariance (same pattern of factors and factor loadings), metric invariance

Table 2
Fit Indices for ATI-TA Turkey Scores Derived From Confirmatory Factor Analyses (MLR) in Sample 1

Model	χ^2	<i>df</i>	CFI	TLI	RMSEA	(90% CI)	SRMR
1. Baseline model	2448.87**	435					
2. 2-Factors (Valence)	918.72**	404	.744	.725	.072	.066, .078	.082
3. 3-Factors (Time periods)	591.81**	402	.906	.898	.044	.036, .057	.064
4. 6-Factors (Theorized) ^a	387.42*	390	.972	.969	.025	.010, .036	.053
5. 5-Factors ^b	297.29	265	.981	.978	.022	.000, .035	.048

Note. *N* = 244. MLR = maximum-likelihood robust; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean square residual.

^a Model 4 only included three Future Negative items. ^b Model 5 did not include the Future Negative factor.

* $p < .05$. ** $p < .001$.

Table 3
Standardized Coefficients for Six-Factor Turkish ATI-TA Items in Sample 1

Factors	Coefficients	Effect size	Factors	Coefficients	Effect size
Past Positive ($\omega = .79$)			Past Negative ($\omega = .83$)		
3	.62	.38	6	.75	.56
9	.55	.30	12	.66	.43
21	.58	.34	15	.79	.62
24	.75	.56	18	.76	.58
30	.75	.56	27	.55	.30
Present Positive ($\omega = .82$)			Present Negative ($\omega = .79$)		
5	.78	.61	2	.70	.49
11	.75	.56	8	.55	.31
14	.64	.41	20	.64	.41
17	.58	.34	23	.72	.53
26	.67	.45	29	.65	.43
Future Positive ($\omega = .81$)			Future Negative ($\omega = .53$)		
1	.58	.33	4	.41	.17
7	.65	.42	16	.70	.49
13	.75	.57	22	.45	.20
19	.72	.51			
28	.70	.50			

Note. Omega (ω) estimates are based on the factor coefficients.

(factor loadings constrained to be equal), and scalar invariance (intercepts constrained to be equal) across the two samples. These results are also reported in Table 5. As can be seen, CFI, TLI, and SRMR values for the three levels of invariance were in the acceptable range and the RMSEA values were in the close range. We used two methods to see if the fit deteriorated with greater constraints: (a) Δ CFI tests proposed by both Cheung and Rensvold (2002) and Meade, Johnson, and Braddy (2008), who noted that these tests were able to detect lack of invariance and were not affected by sample size as are chi-square difference tests; and (b) the chi-square test.

Cheung and Rensvold suggested that a Δ CFI of greater than $-.01$ indicated a lack of invariance, and Meade et al. proposed using a Δ CFI of $.002$. As can be seen in Table 5, the value of the CFI was identical across the configural and metric invariance levels, and met the standards for invariance proposed by Cheung and Rensvold and Meade et al. However, scalar invariance did not meet Meade et al.'s more stringent cut-off (see Table 5). The chi-square analysis supported metric invariance, but not scalar invariance. Further examination revealed that scalar variance was supported by both Δ CFI tests and by the chi square test for scores on four subscales—Past

Table 4
Descriptive Statistics for Turkish Adolescent Time Inventory-Time Attitude Scores in Sample 2

Subscales	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	α	95% CI
Past Positive	3.64	.90	-.55	.30	.85	.82-.87
Past Negative	2.31	.80	-.06	-1.13	.72	.67-.76
Present Positive	3.50	.93	-.48	.01	.87	.85-.89
Present Negative	2.56	.82	.13	-.25	.76	.72-.80
Future Positive	3.71	.94	-.79	.57	.85	.83-.88
Self-Esteem	58.35	18.99	-.06	-.55	.76	.74-.81
Well-Being	47.20	10.10	-.89	1.19	.94	.93-.95
Optimism	25.05	5.04	.01	.16	.66	.60-.71

Note. *N* = 350. CI = confidence interval.

Table 5

Fit Indices for ATI-TA Turkey Scores Derived From CFAs (MLR) in Sample 2 and Invariance Analyses Across Samples 1 and 2

Model	χ^2	df	CFI	TLI	RMSEA	(90% CI)	SRMR	Model comparison	Δ CFI
1. Baseline Model	3055.23*	300							
2. 2-Factors (Valence)	964.95*	274	.749	.725	.085	.079, .091	.086		
3. 3-Factors (Time Periods)	883.14*	272	.778	.755	.080	.074, .086	.093		
4. 5-Factors	483.84*	265	.921	.910	.049	.042, .055	.058		
Invariance analyses									
5. Configural	783.48*	530	.943	.936	.040	.034, .046	.054		
6. Metric	803.73*	550	.943	.938	.039	.033, .045	.058	6–5	.000
7. Scalar	842.14*	620	.939	.936	.040	.034, .046	.060	7–6	–.004

Note. Sample 2 $N = 350$. MLR = maximum-likelihood robust; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean square residual. Metric invariance was supported, $\chi^2(20) = 18.99$, $p = .5225$, but scalar invariance was not supported, $\chi^2(20) = 40.80$, $p = .0039$.

* $p < .001$.

Positive, Past Negative, Present Positive, and Present Negative—but not for Future Positive scores, which only achieved metric invariance.

Convergent Validity Analyses

Bivariate correlations indicated that scores on the positive subscales had positive relationships with self-esteem, well-being, and optimism as hypothesized (see Table 6), and scores on negative subscales had negative relationships with those constructs. Eleven of the 15 correlations were $>.30$, indicating that the relationships were meaningful, in addition to being statistically significant (critical alpha after Bonferroni adjustment = .003). Past Negative scores were not meaningfully related to any of the other constructs, although the correlations were negative as expected.

Table 6

Correlations Between Turkish ATI-TA Scores and Other Variables in Sample 2 ($N = 350$)

Subscales	Self-Esteem	Well-Being	Optimism
Past Positive	.31*	.57*	.32*
Past Negative	–.19*	–.11	–.14
Present Positive	.40*	.63*	.47*
Present Negative	–.49*	–.23*	–.43*
Future Positive	.30*	.55*	.40*

* $p < .003$.

Discussion

In this study, we examined the internal consistency and structural validity of ATI-TA scores in two independent samples of Turkish adolescents. Results from Sample 1 indicated that scores on five of the six subscales—Past Positive, Past Negative, Present Positive, Present Negative, and Future Positive—were internally consistent, but internal consistency for scores on Future Negative suggested that half of the variance in those scores was error. Nonetheless, the six-factor ATI-TA model did achieve close fit, although the fit was better for the five-factor model excluding Future Negative scores. Results from Sample 2 provided additional internal consistency and structural validity support for the five-factor model, as well as evidence of convergent validity with measures of self-esteem, well-being, and optimism for Past Positive, Present Positive, Present Negative, and Future Positive scores. Strong invariance was found for past and present subscale scores.

Psychometric Properties and the Theoretical Model of ATI-TA Scores

Reliability. Internal consistency estimates, although different from structural validity, provide a ceiling for validity coefficients (Thompson, 2003), and five of the subscales had acceptable alpha and omega estimates. However, in

this study, Future Negative scores had an unacceptably low reliability. Although the internal consistency estimates for Future Negative scores have been low in some contexts—for example, .68 in Northern Ireland and .70 in Scotland (McKay et al., 2015)—internal consistency estimates for Future Negative scores have been stronger in other studies: .81 in Germany (Worrell et al., 2013), .82 in New Zealand (Alansari et al., 2013), and .81 in the US (Worrell et al., 2013). The results from Germany indicate that it is possible to obtain acceptable reliability estimates for Future Negative scores in a language other than English.

However, it is possible that assessing *future* constructs may be harder in some languages than in others. In their 10-country analysis, Worrell et al. (2015) reported internal consistency estimates $\geq .70$ for the past and present subscales in all 10 countries. However, internal consistency estimates were below .66 for Future Positive scores in two countries (Albania and Iran) and for Future Negative scores in four countries (Albania, Italy, Nigeria, and Peru). These findings, in conjunction with the results of this study, suggest that more concerted efforts may be required to develop a psychometrically robust scale assessing the future time constructs in some contexts.

In their 24-country analysis, Sircova et al. (2014) reported internal consistency estimates ranging from an average of .74 for scores on the 13-item original ZTPI Future scale to .64 on the 7-item reduced Future scale based on items that were acceptable in the 24 countries. Carelli et al. (2011) developed an 8-item Future Negative subscale for a six-factor Swedish version of the ZTPI; these scores yielded an alpha of .75. The internal consistency results for the 5-item Future Positive ATI-TA scores in this study and in previous analyses of the ATI-TA are comparable, indicating that acceptable internal consistency estimates can be obtained from subscales consisting of only five items.

Structural validity. Whereas exploratory factor analyses are associated with developing theory, CFAs are seen as *testing* theoretical models (Brown, 2006). Based on the Study 1 findings, the six-factor time attitude model proposed by Mello and Worrell (2015) passed the test, with three fit indices—CFI, TLI, and RMSEA—in the excellent range (Byrne, 2008; Hu & Bentler, 1999; Marsh et al., 2004), despite

the low reliability estimates for the future negative items. Thus, the results provide strong empirical support for ATI-TA's theoretical model. Findings from Sample 2 indicate that the ATI-TA (excluding Future Negative scores) can be used with adolescents in Turkey. Tests of invariance supported scalar invariance for four of the subscales and metric invariance for the fifth subscale (Future Positive), an issue that will need to be assessed in future studies. As with the internal consistency findings, the invariance analyses suggest that future time attitudes may operate differently than the past and present attitudes, or are more difficult to measure.

Although the structural validity analyses of ATI-TA scores in this study are applicable only to Turkish adolescents, in the context of other studies, they provide strong support for using these scores to assess time attitudes. These findings parallel those in the extant literature with ATI-TA scores in several countries including Germany, New Zealand, the United Kingdom, and the US. Moreover, examinations of the structure of scores on the 56-item ZTPI in samples from Australia (Worrell et al., 2016), Brazil (Milfont et al., 2008), Slovenia (Worrell et al., 2016), Sweden (Carelli et al., 2011), the United Kingdom (McKay et al., 2014), and the US (Worrell & Mello, 2007) have all yielded mixed or poor fit, as have scores on the 36-item, 24-country version of the ZTPI (cf. Sircova et al., 2014). It is possible that time perspective is too broad or varies so much across cultures and national boundaries that it is difficult for one instrument to assess the construct with one instrument cross-culturally, and the more robust findings for ATI-TA scores may be because time attitudes are a narrower construct than time perspective.

Convergent validity. The convergent validity findings also generally supported ATI-TA scores, based on both statistical significance and practical significance or effect size, except for Past Negative scores. The stronger associations of self-esteem with present and future time attitudes than with past time attitudes parallel results reported by Worrell and Mello (2009), indicating a similar pattern in the US and Turkey. The more modest correlations for Past Negative scores were unexpected, especially as Worrell and Mello (2009) found that Past Negative scores were statistically and meaningfully

related to both self-esteem and optimism. Thus, the results of this study may be anomalous, or may be affected by context, issues to be explored in future studies. Despite the smaller effect sizes, the direction of the Past Negative correlations with the other constructs were in the hypothesized direction.

Limitations and Conclusion

This study had several limitations. First, the participants were from schools in only two provinces and, although the classes were chosen at random, it will be important to validate ATI-TA scores in other regions of, and schools in, Turkey in larger samples. Second, the concurrent validation constructs—that is, self-esteem, well-being, and optimism—were all positive constructs, and it will be important to examine how the scores are related to other constructs such as depression and perceived stress.

Nonetheless, this study provides strong evidence in support of ATI-TA scores in Turkey, which is the 12th country in which these scores have been supported (Chisima, 2014; McKay et al., 2015; Worrell et al., 2015). It will be important to develop and validate a psychometrically sound Future Negative subscale in Turkish, so that all six subscales are included in the Turkish ATI-TA. A six-factor Turkish ATI-TA will allow researchers to see if similar time profiles emerge in Turkey as in other countries, and if they predict similar functioning. Working versions of the six ATI-TA subscales in several languages suggest that this important first task may be difficult to achieve but not impossible. The further validation of the ATI-Turkish will enable researchers to understand how Turkish adolescents think and feel about time, in keeping with Arnett's (2008) call for more studies of psychological constructs outside of the US.

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Received February 16, 2016

Revision received August 13, 2016

Accepted October 1, 2016 ■