


The Assessment of Time Attitudes Among Adolescents and Young Adults With the Polish Adolescent and Adult Time Inventory – Time Attitude Scale (AATI-TA-Polish)

Aneta Przepiórka¹ , Agata Błachnio¹, Tomasz Jankowski¹, Zena R. Mello², and Frank C. Worrell³

¹Institute of Psychology, The John Paul II Catholic University of Lublin, Poland

²Department of Psychology, San Francisco State University, CA, USA

³Graduate School of Education, The University of California, Berkeley, CA, USA

Abstract: In this paper, we examined the dimensionality, reliability, structural validity, and convergent validity of scores on the Adolescent and Adult Time Inventory – Time Attitude Scale (AATI-TA) in a sample of 989 Polish adolescents and young adults. Two studies were conducted. In Study 1, confirmatory factor analyses supported both the original 6-factor model (Past Positive, Past Negative, Positive Present, Negative Present, Future Positive, and Future Negative) and an alternative time-valence model with two factors related to valence (Positivity and Negativity) and three temporal factors (Past, Present, and Future). Study 1 results also provided evidence of invariance between adolescents and adults up to latent means. AATI-TA scores were also found to be invariant by gender and national context with scores from American adolescents. AATI-TA scores also yielded satisfactory reliability estimates. In Study 2, the incremental validity of AATI-TA scores over the contributions of ZTPI scores was assessed for and demonstrated with satisfaction with life and self-esteem. Overall, the results suggest that the Polish version of the AATI-TA yields psychometrically sound scores in Polish adolescents and adults.

Keywords: time perspective, the Adolescent and Adult Time Inventory – Time Attitude Scale, confirmatory factor analyses, age invariance, incremental validity



Time is an essential attribute of reality and human cognition. People use time categories to describe events and situations and place these on timelines from the past to the present to the future (Lewin, 1942). Indeed, all experience is ordered in relation to time (Mello & Worrell, 2015; Nuttin, 1972) and time perspective plays an important role in human functioning (Zimbardo & Boyd, 1999). Time perspective is defined as the degree to which people conceptualize and evaluate events in relation to the past, present, and future (Fraisie, 1963; Nuttin, 1984; Zimbardo & Boyd,

1999). This paper reports on the psychometric properties of scores on a Polish version of the Adolescent and Adult – Time Attitudes Scale (AATI-TA; Mello & Worrell, 2007) in two different studies.

In the first study, we examined the internal consistency and structural validity of AATI-TA scores. We also examined the invariance of AATI-TA scores by gender, age (adolescents vs. adults), and nationality (American vs. Polish). In the second study, we examined incremental validity of AATI-TA scores in predicting self-esteem and satisfaction with life after controlling for Zimbardo Time Perspective Inventory (ZTPI) scores, the most frequently used measure of time perspective. As there have been some studies highlighting (a) problems with the reliability and structural validity of the ZTPI scores in several cultural contexts (Sircova

et al., 2015; Worrell, Temple, et al., 2018) and (b) the utility of measuring a future negative construct (Carelli et al., 2011) as the ZTPI did not assess it, we were interested in validating AATI-TA scores in this study. The AATI-TA offers a full range of time attitudes, including positive and negative ones, and AATI-TA scores have been more robust in other cultural contexts (McKay, Healy, et al., 2020).

The AATI-TA (Mello & Worrell, 2007) is a 30-item, self-report rating-scale developed to assess positive and negative attitudes toward the past, present, and future: Past Positive, Past Negative, Present Positive, Present Negative, Future Positive, and Future Negative. AATI-TA scores have been shown to be associated with several adaptive temporal measures, including hope, optimism, and perceived life chances (Worrell & Mello, 2009), and with several measures related to mental well-being, including depression and anxiety (Cole et al., 2017) and perceived stress and self-esteem (Worrell & Mello, 2009). Moreover, time attitude profiles are strong predictors of a range of psychological constructs, including hopelessness, past discrimination, and expected discrimination based on gender, ethnicity/race, and socioeconomic status (Worrell & Andretta, 2019).

Evidence in support of AATI-TA scores has been reported in various cultural contexts, including Germany (Buhl & Lindner, 2009; Worrell et al., 2013), New Zealand (Alansari et al., 2013), the United States (Worrell et al., 2013), Scotland and Northern Ireland (McKay et al., 2015), Japan (Chishima et al., 2017), Turkey (Çelik et al., 2017; Şahin-Baltacı et al., 2017), Spain (Konowalczyk et al., 2018), Nigeria (Mello et al., 2019), Italy (Donati et al., 2019; Worrell et al., 2020), Albania (Worrell et al., 2020), and Uruguay (Vásquez-Echeverría et al., 2020). Despite the psychometric strengths of the AATI-TA, scores on the Future Negative scale have not worked as well in some studies in some contexts, including Italy and Albania (Worrell et al., 2020), Nigeria (Mello et al., 2019), and Turkey (Şahin-Baltacı et al., 2017).

Study 1

The main aim of Study 1 was to examine the internal consistency and structural validity of scores on the AATI-TA – Polish (Mello et al., 2014) in a sample of adolescents and adults in Poland. We also examined gender and age (adolescent vs. adult) invariance of the AATI-TA scores. We assessed invariance across national contexts, comparing the results based on the Polish sample with data from the American sample used in the original structural validity study introducing the AATI-TA (Worrell et al., 2013). We hypothesized that reliability estimates for subscale scores would be in the .70 or higher range based on a recent meta-analysis (McKay, Healy, et al., 2020) and that the

6-factor structure would yield the strongest fit compared to the 2-factor (valence) or 3-factor (time period) models given prior research in this area (Mello et al., 2016; Worrell, McKay, et al., 2018). We also tested an alternate (valence and time) model to assess the contention that time attitudes are a multidimensional construct specific to particular time periods and valences. We hypothesized that configural, metric, and scalar invariance between adolescents and adults would be supported for the scores. Finally, we hypothesized that configural, metric, and scalar invariance would be supported between scores in this sample and scores in the American sample.

Method

Participants and Procedure

Polish participants consisted of 684 students (495 women) aged 12–35 years old ($M = 19.15$, $SD = 3.58$) from different regions of Poland. There were 340 adolescents aged 12–19 and 344 young adults aged 20–35. The researchers sent letters to schools and universities in different parts of Poland asking for their participation in the study. If the administration of an institution agreed to take part in the project, the researchers visited the students in classrooms or lecture halls to ask for their participation. In the case of adolescents, the researchers obtained informed consent from their parents to participate in the study and assent from the adolescents; university students provided informed consent for their own participation. Data were collected anonymously. No compensation or incentive for participation was offered. The study was approved by the ethics committee at the University of Lublin.

American participants consisted of 300 adolescents (39.7% female, $n = 119$) from three school districts and a summer program in the US, spanning rural, urban, and suburban areas in the Western half of the country. They ranged in age from 12 to 19 ($M = 16.06$, $SD = 1.25$) and came from several ethnic-racial groups: African American ($n = 33$; 11%), American Indian ($n = 3$; 1%), Asian American ($n = 76$; 25.3%), European American ($n = 123$; 41.1%), Chicano/Latino ($n = 31$; 10.3%), Multi-ethnic ($n = 28$; 9.3%), and other ($n = 5$; 1.7%). These participants reported coming from middle-class families on average, and parental consent and participant assent were required to participate. The study was approved by the university's institutional review board of the first author in the Worrell et al. (2013) study. These data, which were used in Worrell et al. (2013), were requested from the authors.

Measures

Time Perspective

The AATI-TA consists of six 5-item subscales: Past Positive ("I have very happy memories of my childhood"), Past

Negative (“My past makes me sad”), Present Positive (“I am pleased with the present”), Present Negative (“My current life worries me”), Future Positive (“My future makes me smile”), and Future Negative (“Thinking about my future makes me sad”). Responses are provided on a 5-point Likert scale ranging from 1 (= *totally disagree*) to 5 (= *totally agree*). AATI scores have yielded internal consistency estimates primarily in the .70–.90 range and acceptable fit statistics for the hypothesized 6-factor model (e.g., Worrell et al., 2013), as well as evidence of convergent and discriminant validity (e.g., Chishima et al., 2019; Worrell & Mello, 2009).

Translation of the scale followed a traditional back-translation procedure (Van de Vijver, 2016). Preliminary translation of the scale from English to Polish was made by one of the authors of the manuscript, and the back-translation to English was done by a professional English translator who has broad knowledge in psychology and has collaborated on many translations from English to Polish. Authors of the original version of the AATI-TA reviewed the back-translation and deemed it satisfactory, suggesting no changes.

Data Analytic Plan

To assess the factor structure of AATI-TA – Polish scores, we used confirmatory factor analysis (CFA) to compare models. First, we estimated the most common models that have been assessed, including two (valence: positive and negative), three (temporal: past, present, and future), and six (theorized: positive past, negative past, positive present, negative present, positive future, and negative future) latent factors. We also estimated a time-valence model that included five factors. Three correlated factors related to the temporal dimension of the items (i.e., past, present, and future) and two correlated factors related to the valence of items (i.e., positive or negative); each item was assigned to both a time factor and a valence factor.

For each of the models, we used the robust maximum likelihood estimator to compute the parameters and assessed their adequacy with the χ^2 test, the root-mean-square error of approximation (RMSEA), the comparative fit index (CFI; Bentler, 1990; Steiger, 1990), the Akaike information criterion (AIC; Akaike, 1973), and the Bayesian information criterion (BIC; Burnham & Anderson, 2004). Although Hu and Bentler (1999) suggested using .95 as minimum CFI value for good fit, several researchers have pointed out that these values are too stringent in social science research where many factors are based on item-level indicators (e.g., Marsh et al., 2004; Perry et al., 2015). Thus, we accepted CFI values equal to or higher than .90 as well as RMSEA values lower than .08 as indicative of acceptable model fit; excellent fit was determined by CFI values equal to or higher than .95 as well as RMSEA values lower than .05 (Bentler, 1990; Browne & Cudeck,

1993). Lower AIC and BIC values were also indicative of better fit.

To compare the relative fit of the models, we used two kinds of difference indices: χ^2 and CFI. The analyses were performed with the lavaan package (Version 0.6-3; Rosseel, 2012). For each of the AATI-TA subscales, we computed three indices of the reliability: Cronbach’s α , McDonald’s ω , and the information function based on item response theory. Cronbach’s α is a classic coefficient and has been used in most studies of AATI-TA scores, including a recent meta-analysis (McKay, Healy, et al., 2020). Thus, we included it to allow for comparisons with other studies of the AATI-TA. In addition to alpha, we computed McDonald’s omega coefficient to estimate the reliability of the AATI-TA subscales and IRT test information value as an index of the scale reliability across the latent trait values. To compute reliability, we used the following R packages: psych (Revelle, 2021) and ltm (Rizopoulos, 2006) with the Graded Response model based on ordinal polytomous data.

To evaluate model invariance, we tested differences in χ^2 values and differences in CFI and RMSEA values. We used the lavaan package (Version 0.6-3; Rosseel, 2012) in R software (Version 3.5.2; R Development Core Team, 2014) and maximum likelihood estimation. We checked configural, weak, strong, strict, latent variances, and latent means invariance in several steps. If χ^2 for the more constrained model was higher than χ^2 for the less constrained model, but $\Delta\chi^2$ was nonsignificant, or the $\Delta\text{CFI}/\Delta\text{RMSEA}$ did not differ by more than .01 (Chen, 2007), we accepted the models as invariant.

Results

We ran the first series of four non-nested models on the whole Polish sample. Model 1 examined positive and negative attitudes (2 factors), Model 2 examined past, present, and future attitudes (3 factors), Model 3 examined the hypothesized 6-factor model, and Model 4 examined a time-valence model with two valence factors (positive and negative) and three temporal factors (past, present, and future; see Table 1). The CFI and RMSEA for the 2-factor model indicated poor fit, with fit increasing for the 3-factor model, which still had poor fit based on the CFI and RMSEA. The 6-factor model, on which the AATI-TA is premised, had good fit based on the CFI and excellent fit based on the RMSEA. Coefficients for the items in the 6-factor model were interpreted using Comrey and Lee’s (1992) recommendations: < .32 (trivial), .32–.44 (poor), .45–.54 (fair), .55–.62 (good), .63–.70 (very good), and > .70 (excellent). Only one of the coefficients for the 6-factor model (Item 25) was in the fair range; the other 29 coefficients were in the good to excellent range (see Figure 1). Intercorrelations among the factors ranged from –.82 to .64.

Table 1. Confirmatory factor analysis results for AATI-TA scores

Model	χ^2	df	CFI	RMSEA [CI 90%]	AIC	BIC
2-Factor	3,397.24*	404	.63	.120 [.116–.124]	55,634	56,050
3-Factor	1,834.46*	402	.83	.081 [.078–.085]	53,375	53,799
6-Factor	924.23*	390	.94	.049 [.045–.053]	52,132	52,611
Time-valence	763.87*	371	.96	.043 [.039–.048]	51,964	52,530

Note. AATI-TA = Adolescent and Adult Time Inventory – Time Attitudes; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; CFI = Comparative Fit Index. The 2-factor model examines Positive and Negative latent factors; the 3-factor model examines Past, Present, and Future latent factors; the 6-factor model examines the theorized model proposed by Mello and Worrell (2007); and the Time-Valence model includes two factors based on valence (positive and negative) and three factors based on time period (past, present, and future). * $p < .001$.

The time-valence model (see Figure 2) had excellent fit based on the CFI and RMSEA and fit the data significantly better than the 6-factor model, $\Delta AIC = -168$, $\Delta BIC = -81$. For the past and present factors, all but one of the 20 coefficients exceeded .40. In the case of the future factor, 6 of the 10 items exceeded .40, and three items (4, 10, and 25) had very low coefficients (–.14, –.14, and –.28, respectively), with the negative valence factor carrying the bulk of the variance for those items (.78, .86, .37, respectively). The correlation between the past and the present factors was moderate ($r = .42$, $p < .001$), but the future factor did not correlate with either the past ($r = .05$, $p = .60$) or the present ($r = .17$, $p = .21$) factor. Factors representing positive and negative valence were strongly correlated ($r = -.60$, $p < .001$), reflecting the bi-polar nature of the constructs. We included diagrams of the 6-factor model (Figure 1), which is the most common solution, and the time-valence model (Figure 2), examined here for the first time. Because the time-valence structure yielded the best fit, we conducted the invariance analyses regarding age, gender, and culture on this model.

Next, we examined the internal consistency of AATI-TA subscale scores. Alpha estimates of internal consistency were acceptable to high, ranging from .79 for Future Negative scores to .89 for Past Negative and Present Positive scores (Figure 1). Omega estimates based on the factor coefficients in Figure 1 were also high: Past Positive ($\omega = .82$), Past Negative ($\omega = .86$), Present Positive ($\omega = .85$), Present Negative ($\omega = .86$), Future Positive ($\omega = .85$), and Future Negative ($\omega = .83$).

Figure 3 presents test information functions for each of the AATI-TA scales. Values of test information cannot be interpreted in terms of absolute values (Hambleton & Swaminathan, 1985); therefore, we cannot present cut-off values indicating acceptable reliability. However, because an ability metric for each of the scales is the same, their information functions can be compared, and measurement precision can be estimated within different levels of the same latent trait. Both positive and negative time attitude scales are most reliable for the moderate values of the latent traits (between –1 and 1 z scores). However, the positive scales are more reliable for lower values (to –2 z

score), whereas the negative scales are more reliable for the higher values of (up to 2 z score) the latent traits. The most reliable scales – in terms of test information – are Present Positive (56.22), Present Negative (45.09), and Past Negative (45.98). Compared to them, the Future Positive scale contained less information (38.82), and the Past Positive and Future Negative scales contained the least amount of information (31.18 and 30.91, respectively).

Model Invariance Across Age Groups

Although the original version of the AATI-TA was developed with adolescents in mind, the scale has been used in several studies with adults (Cole et al., 2017; Donati et al., 2019; Mello et al., 2016). To see if AATI-TA scores performed similarly in Polish adolescents and young adults, we performed invariance analyses. Table 2 presents the results of the multigroup analysis for the time-valence model. Six models specified on different levels of invariance were fit to the data: configural, metric, scalar, strict, latent variances, and latent means.

These six models based on the levels of invariance were fit to the data for the time-valence model. Configural invariance was confirmed with the same fit indices for both the adolescent and young adult samples: $\chi^2(371) = 666.94$, $p < .001$, CFI = .94, RMSEA = .05, and $\chi^2(371) = 753.19$, $p < .001$, CFI = .94, RMSEA = .05, respectively. Metric invariance (weak) was also confirmed. However, the model with constrained item intercepts (scalar/strong invariance) fit significantly worse than the model without that constraint. After examination of modification indices, we removed the invariance constraint from the Item 5 intercept and found support for partial invariance. Similarly, to obtain partial strict invariance, we had to release constraints from variances of Items 4 and 5. The invariance of latent variances and latent means did not require any further modifications. These findings suggest that AATI-TA scores on the time-valence model are partially invariant across age.

Model Invariance Across Gender

We also analyzed gender invariance. Table 2 presents the results of the 2-group analysis for the time-valence model. As with age, we specified six models on different levels of

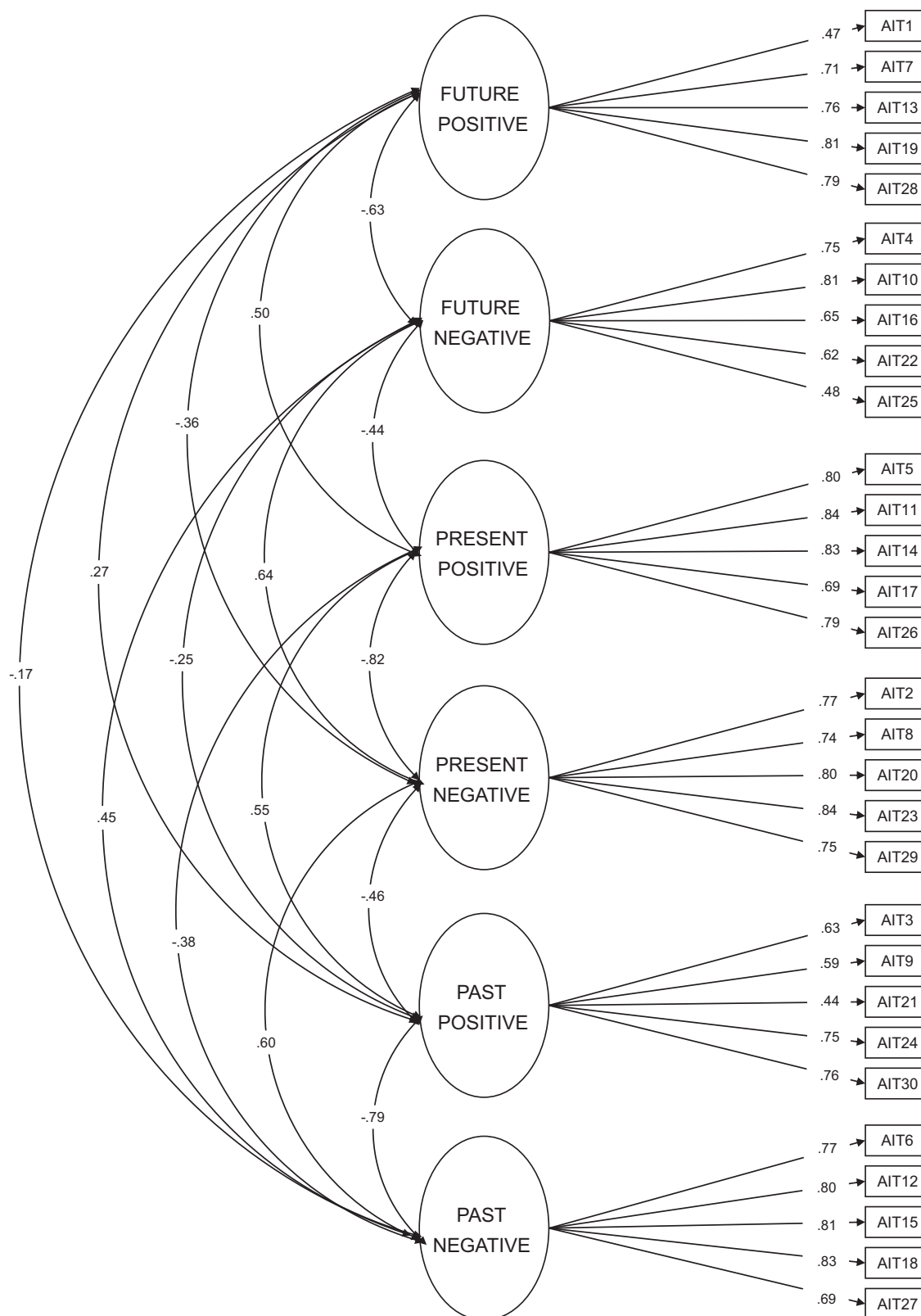


Figure 1. A 6-factor structure of the AATI-TA scales.

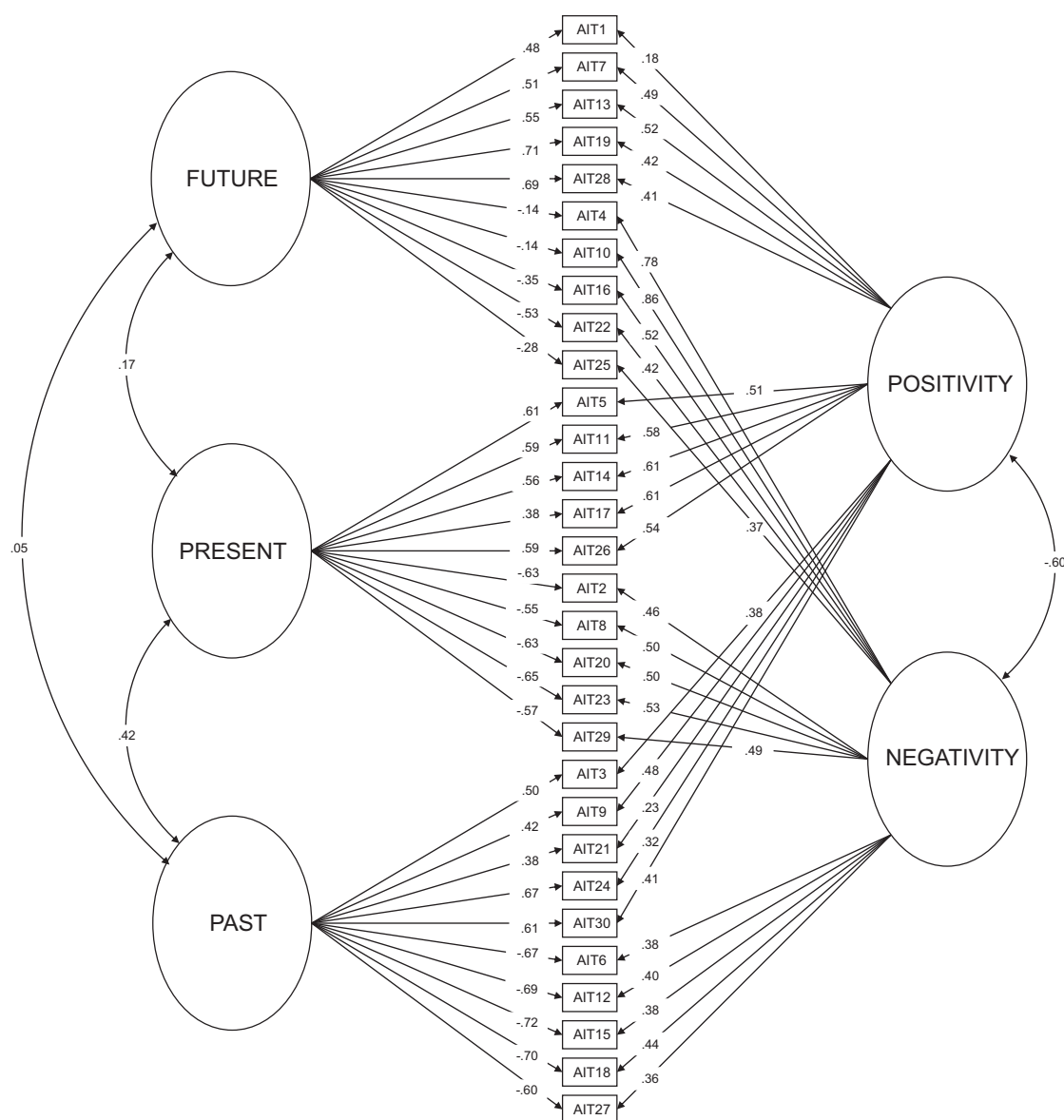


Figure 2. A time-valence structure of the AATI-TA scales.

invariance. The fit indices for the time-valence model ranged from acceptable to excellent in the female and male samples: $\chi^2(371) = 819.02$, $p < .001$, CFI = .95, RMSEA = .05, and $\chi^2(371) = 601.83$, $p < .001$, CFI = .92, RMSEA = .06, respectively. All invariance models fit the data with no differences between models regarding changes in fit indices exceeding the acceptable values. These findings suggest that AATI-TA scores are invariant across gender and can be used to compare males and females.

Model Invariance Across Countries

To assess the invariance of the AATI-TA scores across national contexts, we used the Polish data from the adolescent sample in this study and data from the American ado-

lescent sample in the original structural validity study introducing the AATI-TA (see Table 3). As before, the time-valence solution was used as the baseline model. The time-valence model had acceptable fit indices in both the Polish and American samples: $\chi^2(371) = 666.94$, $p < .001$, CFI = .94, RMSEA = .05, and $\chi^2(371) = 697.65$, $p < .001$, CFI = .92, RMSEA = .05, respectively. However, scores from both countries demonstrated only configural invariance. Inspection of modification indices suggested that both samples differ in almost half of the item loadings on each of the factors. There were also substantial differences (i.e., above-accepted limits) between scalar and metric invariance and between strict and scalar invariance. These results suggest that AATI-TA works differently in

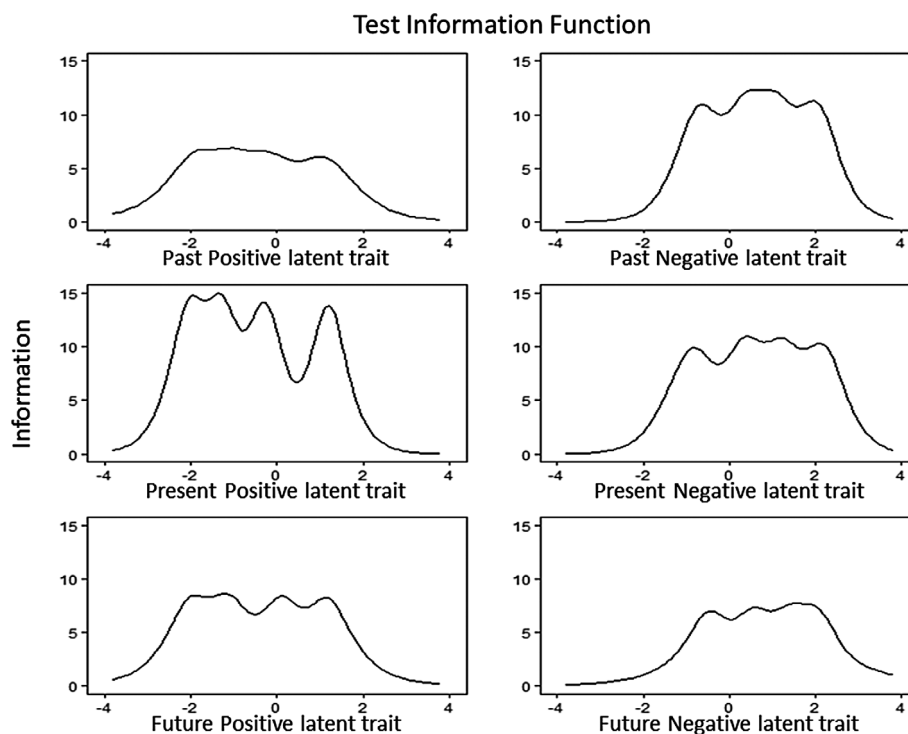


Figure 3. Test information functions for scores on each of the AATI-TA scales.

Table 2. Fit statistics for measurement invariance of AATI-TA scores (time-valence model) across age and gender

Model invariance	χ^2	df	CFI	RMSEA	$\Delta\chi^2$	Δdf	ΔCFI	$\Delta RMSEA$
Measurement invariance of AATI-TA scores across adolescents (12–19) and young adults (20–35)								
Adolescents	666.93	371	.939	.052	–	–	–	–
Young Adults	753.19	371	.943	.055	–	–	–	–
Configural	1,420.12	742	.942	.054	–	–	–	–
Metric	1,499.39	797	.939	.053	55.18	55	–.003	–.001
Scalar	1,539.59	822	.938	.052	41.24*	25	–.001	–.001
Scalar ^a	1,534.28	821	.938	.052	35.78	24	–.001	–.001
Strict	1,639.97	851	.932	.054	57.27*	30	–.006	.002
Strict ^b	1,611.98	850	.934	.053	41.49	29	–.004	.001
Latent variances	1,613.95	855	.934	.053	1.36	5	.000	.000
Latent means	1,615.82	860	.935	.052	1.76	5	.001	–.001
Measurement invariance of AATI-TA scores across genders								
Female	819.02	371	.949	.050	–	–	–	–
Male	601.83	371	.916	.062	–	–	–	–
Configural	1,420.85	742	.941	.053	–	–	–	–
Metric	1,484.42	797	.940	.052	38.22	55	–.001	–.001
Scalar	1,509.23	822	.940	.051	25.19	25	.000	–.001
Strict	1,569.86	852	.938	.051	34.57	30	–.002	.000
Latent variances	1,574.27	857	.938	.051	3.51	5	.000	.000
Latent means	1,581.91	862	.937	.051	7.36	5	–.001	.000

Note. ^aInvariance constraint was removed from the Item 5 intercept. ^bInvariance constraints were removed from the variances for Items 4 and 5. AATI-TA = Adolescent and Adult Time Inventory – Time Attitudes; CFI = Comparative Fit Index; df = Degree of Freedom; RMSEA = Root-Mean-Square Error of Approximation.

Table 3. Fit statistics for measurement invariance of AATI-TA scores (time-valence model) in Polish and American samples

Model invariance	χ^2	df	CFI	RMSEA	$\Delta\chi^2$	Δdf	ΔCFI	$\Delta RMSEA$
Configural	1,364.58	742	.931	.053	–	–	–	–
Metric	1,458.26	769	.923	.056	73.92*	27	–.008	.003
Scalar	1,731.73	822	.899	.061	189.97*	53	–.024	.005
Strict	1,911.88	852	.882	.065	93.85*	30	–.018	.004
Latent variances	1,919.05	857	.882	.065	5.90	5	.000	.000
Latent means	1,969.12	862	.877	.066	31.04*	5	–.005	.001

Note. AATI-TA = Adolescent and Adult Time Inventory – Time Attitudes; CFI = Comparative Fit Index; df = Degree of Freedom; RMSEA = Root-Mean-Square Error of Approximation. * $p < .001$.

Poland and the US. In other words, although the factor structure of AATI-TA scores is similar in Poland and the United States, the meaning of the factors may be different.

Discussion

Overall, the findings from the psychometric analyses provided strong support for scores on the AATI-TA scale. Internal consistency estimates for subscale scores ranged from good to excellent, and both the 6-factor and a time-valence model (three temporal factors and two valence factors) had an acceptable fit. However, the time-valence model had the best fit. Moreover, this study is the only one in the literature in which the time-valence model has been examined. Scores based on the time-valence model were invariant across gender and age (adolescence and young adulthood), although in the invariance analyses, the time-valence model was only partially invariant across the developmental levels. The time-valence model achieved configural variance across countries.

These findings mirror those of Mello et al. (2016) and Donati et al. (2019). Mello et al. (2016) found scalar invariance on five of the six subscales (excluding Future Negative) for young and middle aged adults in the US. Donati et al. reported invariance by gender and partial invariance by age (adolescent and young adult) to the level of error variances/covariances in Italy. Thus, the findings in Poland are comparable to findings in two other countries. Moreover, in contrast to the notion that time perspective changes across the life span (Erikson, 1968), invariance analyses indicated that time attitudes are consistent from adolescence into adulthood. These results also differ from findings showing that the structure of the Polish ZTPI scores differs across three age groups: 18–27, 28–39, and 40–65 years old (Sobol-Kwapińska et al., 2016).

Study 2

There were two major aims in Study 2. First, we replicated the time-valence structure of AATI-TA in an independent sample. Second, we examined the incremental validity of

AATI-TA subscales beyond ZTPI scores to predict satisfaction with life and self-esteem. We expected that Past Positive (+), Past Negative (–), and Present Fatalistic (–) scores on the ZTPI would be meaningfully correlated (i.e., $\beta \geq .20$; Ferguson, 2009) with self-esteem scores in the directions indicated in parentheses based on results reported by Zimbardo and Boyd (1999). We also expected that AATI-TA scores would be meaningfully associated with self-esteem scores (Worrell & Mello, 2009). Given the lack of studies including both the ZTPI and AATI-TA, it was unclear how much variance is shared between these two sets of scores. Thus, although we expected that AATI-TA scores would yield variance beyond ZTPI scores in predicting both satisfaction with life and self-esteem, we did not provide hypotheses for specific subscales. Betas of .20 or higher were interpreted as meaningful (Ferguson, 2009).

Method

Participants and Procedure

Participants were recruited from public schools in three different Polish regions: Lublin, Warszawa, and Poznań. The final sample consisted of 305 Polish participants aged 13–21 years ($M = 16.82$, $SD = 1.26$), 208 of whom were female. The research project received approval from the institutional review board. Participation in the study was voluntary and anonymous. Potential participants were informed about the study and were asked if they wished to participate.

Measures

Time Perspective

The 30-item Polish AATI-TA (Mello et al., 2014) used in Study 1 was also administered in Study 2. The internal consistency estimates of AATI-TA scores in this study were as follows: Past Positive ($\alpha = .80$, $\omega = .82$), Past Negative ($\alpha = .85$, $\omega = .87$), Present Positive ($\alpha = .82$, $\omega = .85$), Present Negative ($\alpha = .84$, $\omega = .70$), Future Positive ($\alpha = .80$, $\omega = .85$), and Future Negative ($\alpha = .71$, $\omega = .79$).

We also collected data using the short version of the ZTPI (Zimbardo & Boyd, 1999), adapted into Polish by Cybis et al. (2012). The short ZTPI-Polish consists of 15

items assessing 5 subscales. The Past Negative scale assesses negative thoughts and feelings about the past ($\alpha = .78$, $\omega = .78$ in the current study). The Present Hedonistic scale assesses a focus on pleasure in the “here and now” ($\alpha = .64$, $\omega = .53$). The Future subscale assesses a tendency to plan for the future ($\alpha = .58$, $\omega = .64$). The Past-Positive subscale assesses positive thoughts and feelings about the past ($\alpha = .39$, $\omega = .46$), and the Present Fatalistic subscale assesses the belief that life is determined by fate ($\alpha = .53$, $\omega = .56$). Participants respond using a 5-point Likert-type scale (1 = *very untrue*, 5 = *very true*).

Self-Esteem

To measure self-esteem, we administered the Rosenberg Self-Esteem Scale (RSES) adapted into Polish by Laguna et al. (2007). The RSES consists of five positively worded items and five negatively worded items that have to be recoded. The total score provides an overall evaluation of a person's self-esteem. Participants respond to the items on a 4-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*). Cronbach's α for RSES scores in this study was .78, and McDonald's ω was .83.

Satisfaction With Life

The Satisfaction with Life Scale (SWLS; Diener et al., 1985) consists of five items. It was adapted into Polish by Juczyński (2012). Respondents rate the items on a seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*), and SWLS scores in this study yielded a Cronbach's α of .79 and McDonald's ω of .84.

Results

Descriptive statistics and correlations among the variables are presented in Table 4. The pattern of correlations provides evidence of convergent and discriminant validity. The past and present scales of the AATI-TA have statistically and practically significant associations ($r > |.30|$) with the past subscales of the ZTPI. AATI-TA scores were also meaningfully associated with self-esteem scores. On average, AATI-TA scores had higher correlations with self-esteem and satisfaction with life.

Factor Structure of AATI-TA

To replicate the time-valence structure of AATI-TA scores, we used CFA with robust maximum-likelihood extraction, as in Study 1. Fit indices were in the acceptable range: $\chi^2(371) = 672.19$, $p < .001$, CFI = .93, RMSEA = .05 (90% CI [.045, .05]). These findings indicate that the structure of the AATI-TA scores is similar across samples.

Incremental Validity

As noted in the Method section, the internal consistency coefficients of for several ZTPI scores were low. Although

this may be due in part to the fact that the scales consist of only three items each, we examined the factor structure of ZTPI scores before examining incremental validity. A CFA (with robust maximum-likelihood estimator) of ZTPI scores resulted in poor fit – $\chi^2(80) = 279.28$, $p < .001$, CFI = .77, RMSEA = .09 (90% CI [.08, .10]) – but an exploratory factor analysis (minimum residual solution with oblimin rotation performed in psych package; Revelle, 2021) yielded an interpretable five-factor structure (number of extracted factors was based on the parallel analysis in psych package; Revelle, 2021). Table E1 (see Electronic Supplementary Material, ESM 1) contains the structure coefficients. Items had their highest coefficients on their assigned scales, with salient coefficients ranging from .32 to .79. Two items had cross-loadings $> .30$.

To assess the incremental validity of AATI-TA scales, we used two criterion variables: satisfaction with life and self-esteem. These constructs are well-known indices of well-being, and convergent validity with other measures of well-being is well-established (e.g., Diener et al., 1999). We entered satisfaction with life and self-esteem as dependent variables in separate hierarchical regression analyses. As the ZTPI is the most frequently used measure of time perspective in the literature, ZTPI factor scores were entered in Step 1, and AATI-TA factor scores were entered in Step 2 to see if time attitudes added incremental variance beyond the variance explained by the ZTPI subscales (see Table 5). Table E2 (see ESM 1) contains the results of the hierarchical analyses only for AATI-TA scores.

Alessandri et al. (2015) suggested that method factors can also have psychological meaning. Therefore, we decided to test independent effects of positivity and negativity factors on satisfaction with life and self-esteem, and the independent effects of temporal orientations on these variables. We used factor scores instead of raw scores based on the time-valence structure of AATI-TA scores. Beginning with satisfaction with life, ZTPI scores, entered in Block 1, explained 10% of the variance in that construct (Table 5; all values are based on adjusted R^2), with Past Positive, Present Hedonistic, and Future having meaningfully interpretable β s. Adding the three AATI-TA temporal scales resulted in a significant increase in variance explained, $F(3) = 19.14$, $p < .001$, $\Delta R^2 = 12\%$. The Positivity and Negativity factors entered in Block 3 also resulted in a significant increase in variance, $F(2) = 46.96$, $p < .001$, $\Delta R^2 = 20\%$. The final model explained 42% of the variance in satisfaction with life scores, and six factors had meaningfully interpretable coefficients: Present Hedonistic (ZTPI), Future (ZPTI), Past (AATI-TA), Present (AATI-TA), Future (AATI-TA), and Positivity (AATI-TA).

The pattern was similar for self-esteem scores (see Table 5). ZTPI scores, entered in Block 1, explained 18% of the variance in self-esteem scores, although only Past

Table 4. Descriptive statistics and correlations for study variables

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Past P_A	3.58	0.75													
2. Past N_A	2.25	0.85	−0.74***												
3. Pres P_A	3.68	0.67	0.42***	−0.37***											
4. Pres N_A	2.28	0.78	−0.49***	0.50***	−0.77***										
5. Futr P_A	3.49	0.73	0.36***	−0.34***	0.38***	−0.35***									
6. Futr N_A	2.20	0.73	−0.32***	0.41***	−0.39***	0.54***	−0.60***								
7. Pres_H_Z	3.79	0.86	0.20**	−0.12	0.25***	−0.14*	0.12	−0.20**							
8. Pres_F_Z	2.56	0.83	−0.10	0.15*	−0.08	0.19**	−0.19**	0.32***	0.03						
9. Futr_Z	3.05	0.92	0.08	−0.05	0.11	−0.13	0.26***	−0.12	−0.09	−0.12					
10. Past P_Z	3.46	0.75	0.53***	−0.41***	0.18**	−0.27***	0.28***	−0.15*	0.14*	−0.05	0.12				
11. Past N_Z	2.85	1.09	−0.48***	0.59***	−0.31***	0.46***	−0.27***	0.22***	0.00	0.24***	−0.09	−0.28***			
12. SWLS	4.05	1.11	0.31***	−0.21***	0.47***	−0.45***	0.17**	−0.23***	0.05	−0.10	0.28***	0.25***	−0.16*		
13. SE	2.78	0.45	0.48***	−0.37***	0.50***	−0.53***	0.35***	−0.39***	0.27***	−0.24***	0.22***	0.27***	−0.42***	0.57***	

Note. Pres P_A = Present Positive (AATI); Pres N_A = Present Negative (AATI); Futr P_A = Future Positive (AATI); Futr N_A = Future Negative (AATI); Past P_A = Past Positive (AATI); Past N_A = Past Negative (AATI); Pres_H_Z = Present Hedonistic (ZTPI); Pres_F_Z = Present Fatalistic (ZTPI); Past P_Z = Past Positive (ZTPI); Past N_Z = Past Negative (ZTPI); Futr_Z = Future (ZTPI); SWLS = Satisfaction with Life Scale; SE = Self-Esteem. * $p < .05$; ** $p < .01$; *** $p < .001$.

Negative contributed meaningfully. Adding the three AATI-TA temporal scales explained an additional 7% of the variance in self-esteem, $F(3) = 11.96$, $p < .001$, and the positivity and negativity factors in the Step 3 added another 15% of variance in self-esteem, $F(2) = 32.84$, $p < .001$. The final model explained 40% of the variance in self-esteem. Only Present and Positivity had meaningful β s; no ZTPI scale had a $\beta \geq .20$.

Discussion

The main aims of Study 2 were to replicate the factor structure of AATI-TA scores and examine the incremental validity of AATI-TA scores beyond ZTPI scores with self-esteem and satisfaction with life. The factor structure was replicated in this independent sample, and results also supported the incremental validity of AATI-TA scores while controlling ZTPI scores in predicting life satisfaction and self-esteem.

General Discussion

The main purpose of the two studies was to report on the psychometric properties of scores on the Polish adaptation of the AATI-TA (Mello et al., 2014), which is used to assess positive and negative attitudes toward each time period. The studies yielded four major findings. First, the scores on the Polish translation of the six-AATI-TA scores showed good internal consistency in both studies. Second, although the theorized 6-factor model in the literature yielded acceptable fit indices, a time-valence model consisting of three temporal factors (past, present, future) and two

valence factors (positivity vs. negativity) resulted in better fit in Study 1, and the time-valence model also yielded acceptable fit in Study 2.

Third, the time-valence model for AATI-TA Polish scores showed (a) gender invariance up to the level of latent means, (b) full metric invariance between adolescents and young adults, and (c) partial invariance between adolescents and young adults (two variance constraints released) up to the level of latent means, but only configural invariance between scores from adolescents in Poland and scores from adolescents in the United States. Fourth, AATI-TA scores provided incremental variance beyond the contributions of ZTPI scores in explaining both satisfaction with life and self-esteem scores. In addition to providing psychometric support for the 6-factor AATI-TA model in Poland, this study is the first to suggest that there may be a viable alternative to the 6-factor model underlying AATI-TA scores. These findings are discussed in the subsequent paragraphs.

Psychometric Results

Factor Structure of AATI-TA Scores

The 6-factor structure of the AATI-TA is well-established. Since it was first introduced to literature in a German sample by Buhl and Lindner (2009), evidence in support of the 6-factor structure has been reported in 13 other countries, including Albania, Italy, Japan, Luxembourg, New Zealand, Nigeria, Slovenia, Spain, Turkey, the United Kingdom, the United States, and Uruguay (see McKay, Healy, et al., 2020, Vásquez-Echeverría et al., 2020), and recently supported in a meta-analysis (McKay, Healy, et al., 2020). The McKay, Healy, et al. (2020) meta-analysis also provided support for the internal consistency of scores on the

Table 5. Hierarchical regression analyses for Satisfaction with Life and Self-esteem as criterion variables (with ZTPI and AATI-TA scores)

Predictors	Satisfaction with Life								
	Step 1			Step 2			Step 3		
	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
	Adjusted $R^2 = .10$			$\Delta R^2 = .12$ ($p < .001$)			$\Delta R^2 = .20$ ($p < .001$)		
Past Neg (ZTPI)	-.05	.09	-.04	.14	.09	.11	.21	.08	.16
Fut (ZTPI)	.26	.09	.20	.25	.08	.19	.26	.07	.20*
Pres Hed (ZTPI)	-.37	.10	-.29*	-.41	.09	-.32*	-.40	.08	-.31*
Pres Fat (ZTPI)	-.05	.09	-.03	-.07	.08	-.05	-.03	.08	-.02
Past Pos (ZTPI)	.35	.11	.25*	.22	.11	.16	.11	.09	.07
Past (AATI)	–	–	–	.08	.18	.03	.47	.16	.21
Pres (AATI)	–	–	–	.95	.16	.44*	.75	.14	.35*
Fut (AATI)	–	–	–	-.37	.14	-.17	.47	.12	-.25
Pos (AATI)	–	–	–	–	–	–	3.12	.51	.46*
Neg (AATI)	–	–	–	–	–	–	-.04	.41	-.01
	Self-esteem								
	Adjusted $R^2 = .18$			$\Delta R^2 = .07$ ($p < .001$)			$\Delta R^2 = .15$ ($p < .001$)		
Past Neg (ZTPI)	-.16	.03	-.31*	-.10	.04	-.20	-.08	.03	-.15
Fut (ZTPI)	.04	.03	.07	.03	.03	.05	.03	.03	.06
Pres Hed (ZTPI)	-.04	.04	-.08	-.04	.04	-.08	-.04	.03	-.07
Pres Fat (ZTPI)	-.06	.03	-.10	-.06	.03	-.10	-.03	.03	-.06
Past Pos (ZTPI)	.09	.04	.16	.04	.04	.06	-.01	.04	-.01
Past (AATI)	–	–	–	-.01	.07	-.01	.12	.07	.13
Pres (AATI)	–	–	–	.27	.06	.32*	.21	.06	.25*
*Fut (AATI)	–	–	–	.03	.06	.03	-.02	.05	-.02
Pos (AATI)	–	–	–	–	–	–	.84	.21	.31*
Neg (AATI)	–	–	–	–	–	–	-.25	.17	-.11

Note. Pres Hed = Present Hedonistic; Pres Fat = Present Fatalistic; Past Pos = Past Positive; Past Neg = Past Negative; Pres Pos = Present Positive; Pres Neg = Present Negative; Fut Pos = Future Positive; Fut Neg = Future Negative; Pos = Positivity; Neg = Negativity. Bolded coefficients met the minimally interpretable effect size. * $p < .05$.

six theorized AATI-TA factors, which were replicated in this study. To the extent that omega estimates are less biased than α estimates of reliability, the results also suggest that α is not substantially underestimating reliability for AATI-TA scores, in keeping with the findings in the literature.

However, since the earliest studies of AATI-TA (e.g., Worrell et al., 2013), questions have been about the high intercorrelations between subscales representing the same time period (e.g., Past Positive and Past Negative), with concerns about the possible independence of these scores. Indeed, in one study examining the scores longitudinally (i.e., Worrell, McKay, et al., 2018), the scores for the positive and negative time attitudes had to be modeled separately due to multicollinearity. High intercorrelations between Past Positive and Past Negative, Present Positive and Present Negative, and Future Positive and Future Negative were also evident in the current study. To date, these concerns have been addressed by looking at both 2-factor (valence) models and 3-factor (time period) models, and the 6-factor model has always yielded a superior fit.

However, in the current study, in addition to running separate valence and time period models, a time-valence

model, which incorporates both valence and time period, was examined for the first time, and the time-valence structure yielded a better fit than the 6-factor model, although the 2- and 3-factor models yielded poorer fit as in previous research. The fact that both the 6-factor and time-valence models are viable indicates that more research is needed on the AATI-TA's factor structure and also increases the importance of theory and other criteria that need to be considered in examining the viability of measurement models. For example, the intercorrelation between the Positivity and Negativity factors was substantial but explained less than 50% of the variance in those scores, indicating a considerable amount of unique variance. The intercorrelations among the time factors – Past, Present, and Future – were even smaller, again suggesting considerable unique variance in each of the factors.

Interestingly, four of the five Future Negative items had low coefficients on the Negativity factor, in keeping with the fact that the Future Negative factor has posed more challenges than the others (McKay, Worrell, et al., 2020). It is also worth pointing out that the time-valence model does not necessarily invalidate or replace the 6-factor

model. For example, it is not clear if the time-valence model can be scored easily or can be used to create time-attitude profiles. All of these issues raise interesting questions for future research.

Invariance of AATI-TA Structure

Analyses of scores based on the 6-factor AATI-TA model in past studies have provided support for gender invariance in adolescents and adults (Donati et al., 2019; Konowalczyk et al., 2018; Vásquez-Echeverría et al., 2020; Worrell, McKay, et al., 2018), age invariance between younger and older adolescents (Konowalczyk et al., 2018), and between adolescents and young adults (Donati et al., 2019; Mello et al., 2016; Vásquez-Echeverría et al., 2020). The results of gender and age invariance analyses on the time-valence model indicate that this model of the AATI-TA can also be used to compare adolescents and young adults. Having a tool to assess time perspective invariance across gender and especially age is important as time perspective and the emphasis put on some time dimensions may change with age and developmental tasks (Erikson, 1968). Other than the structure, the time-valence AATI-TA model was not invariant across countries, suggesting that these scores are operating differently. An investigation of the invariance of the 6-factor model across countries is warranted. Moreover, additional research examining convergent and discriminant validity of AATI-TA scores in Poland and the US to see if these external patterns are operating similarly will be useful.

Incremental Validity

The contributions of AATI-TA scores in predicting life satisfaction and self-esteem were also meaningful after controlling for ZTPI scores. In both cases, AATI-TA scores predicted substantial amounts of variance beyond ZTPI scores, providing evidence of incremental validity for these scores. Four of the five factors in the time-valence model predicted satisfaction with life beyond the contributions of the ZTPI. This result is in keeping with other studies where time perspective also predicted life satisfaction above personality traits (Przepiórka et al., 2020; Stolarski & Matthews, 2016; Zhang & Howell, 2011). The predictive validity of positive past has been supported in different age groups, including younger adults (Gao, 2011) and older adults (Desmyter & De Raedt, 2012).

Present and Positivity were the significant AATI-TA predictors of self-esteem based on the time-valence model. This pattern resembles findings in a previous study (Worrell & Mello, 2009), where Present Positive time attitudes had higher correlations with self-esteem than Past and Future Positive attitudes. In previous studies using the ZTPI, Past Negative and Present Fatalist correlated negatively with self-esteem, whereas Past Positive correlated positively with

self-esteem. In another study, Wills et al. (2001) found that future orientation positively correlated with self-esteem. Among adolescents specifically, Past Negative, Present Hedonistic, and Future Negative have been significant predictors of self-esteem (Ortuño & Vasquez, 2013), reflecting the pattern of the relationships among variables in the present study.

Limitations and Future Directions

This study had several limitations. First, the study was cross-sectional; longitudinal data are needed to assess the stability of AATI-TA scores over time. Second, several scores on the ZTPI had reliability estimates indicative of substantial error variance, perhaps because the short version of the scale was used in the study. Although scores of short scales are less reliable than scores of longer scales, short scales have a number of advantages for research purposes. On the other hand, inferences drawn from scores with low internal consistency estimates are less likely to replicate. Third, there were more females than males in each of the two samples; although the gender proportions reflect the actual proportions in schools and colleges where females constitute the majority of the student body, it is worth noting that the scores have been examined in fewer males.

In future studies, we should also analyze the structure among different age groups, including older adults. Moreover, analyzing the psychometric properties of scores on temporal measures in cross-cultural studies is long overdue. Both the ZTPI and the AATI-TA are in use in several different national and cultural contexts. Given that time perspective is considered a general construct that is not limited by nationality or culture, it will be important to assess the comparability of these measures across cultural contexts (Siricova et al., 2015). Finally, time attitude profiles have been identified in several countries and may be more predictive of well-being and distress than time attitude scores (Worrell & Andretta, 2019). Thus, time profiles should be examined in Poland.

Conclusion

Although well-established in the measurement literature (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2018), there is a growing recognition of the importance of using instruments that yield reliable scores and valid inferences in research on attitudinal constructs. The present investigation of time attitude scores on the AATI-TA revealed a viable time-valence structure characterized by two general valence factors (Positivity

and Negativity) and three-time factors (Past, Present, and Future). Although this structure yielded better fit indices than the 6-factor structure, fit indices for the 6-factor structure were in the acceptable range and factor coefficients were stronger on that model. These results suggest that it will be important to compare both of these models in future studies. Results also indicated that AATI-TA scores are reliable and structurally valid in adolescents and young adults, and the results are comparable for the most part with the original study introducing the AATI-TA (Worrell et al., 2013). In this study, the psychometric characteristics of AATI-TA scores add Poland to the list of countries in Europe (i.e., Albania, Germany, Italy, Luxembourg, Slovenia, Spain, and the United Kingdom) in which the AATI-TA can be used.

The present study provides evidence in support of using the AATI-TA across different age and gender groups. In addition to supporting the validity of scores on this measure, these results also highlight that research on time attitudes can be conducted in different cultures. As noted previously, results that are based on psychometrically poor scores are less likely to replicate. Thus, the findings support the reliability and validity of AATI-TA scores in this study are positive for research in time perspective, especially given the ongoing psychometric concerns raised about the ZTPI (e.g., Worrell, Temple, et al., 2018).

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at <https://doi.org/10.1027/1015-5759/a000671>

ESM 1. Table E1: Results of an exploratory factor analysis of ZTPI items. Table E2: Hierarchical regression analyses for satisfaction with life and self-esteem as a criterion variables

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Publication Ethics

The ethics committee approved the study at the University of Lublin, Poland.

Open Data

We report how we determined our sample size, all measures in the study, and all analyses, including all tested models. We report exact *p* values, effect sizes, and 95% confidence or credible intervals.

Open Data: I confirm sufficient information for an independent researcher to reproduce all the reported results, including codebook if relevant (Przepiórka et al., 2021; <https://osf.io/4dhku>, <https://osf.io/57as9>).

Open Materials: I confirm sufficient information for an independent researcher to reproduce all the reported methodology (Przepiórka et al., 2021).

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ORCID

Aneta Przepiórka

 <https://orcid.org/0000-0001-6722-7355>

Aneta Przepiórka

The John Paul II Catholic University of Lublin

Institute of Psychology

Al. Ractawickie 14

20-950 Lublin

Poland

aneta.przepiorka@gmail.com

aneta.przepiorka@kul.pl

Table E1. *Results of an Exploratory Factor Analysis of ZTPI Items*

<i>Row</i>	Past Negative	Future	Present Hedonistic	Present Fatalistic	Past Positive
ZTPI11	0.79	0.1	0	0	0.04
ZTPI7	0.74	-0.09	0.02	0.01	-0.07
ZTPI10	0.67	-0.04	0.03	0.07	-0.04
ZTPI14	-0.09	0.71	0.08	0.01	-0.01
ZTPI13	0.1	0.68	0	0	0.09
ZTPI4	0.07	0.43	-0.41	-0.1	-0.01
ZTPI15	0.09	0.07	0.62	0.04	0
ZTPI9	0.12	0.18	0.54	-0.1	0.25
ZTPI1	0.13	-0.18	0.39	-0.04	0.29
ZTPI12	0.01	0.25	0.24	0.56	-0.06
ZTPI5	0.04	-0.21	-0.21	0.56	0.01
ZTPI2	0.12	-0.03	-0.04	0.52	0.08
ZTPI8	-0.05	0.09	0.16	-0.02	0.61
ZTPI3	-0.33	-0.02	-0.1	0.07	0.47
ZTPI6	0.2	0.03	-0.27	-0.02	0.32

Note. Bolded coefficients represent the three assigned items for each factor.

Table E2. *Hierarchical Regression Analyses for Satisfaction with life and Self-esteem as a Criterion Variables (only with AATI-TA scores)*

Satisfaction with Life									
<i>Predictors</i>	Model 1 (adj. $R^2 = .23$)			Model 2 (adj. $R^2 = .15$)			Model 3 (adj. $R^2 = .36$)		
	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>B</i>	<i>SE</i>	<i>Beta</i>
Past (AATI)	-	-	-	0.05	.17	.02	0.33	.15	.14*
Pres (AATI)	-	-	-	0.94	.16	.44*	0.70	.14	.33*
Fut (AATI)	-	-	-	-0.22	.14	-.10	-0.39	.13	-.18*
Pos (AATI)	3.23	.55	.48*	-	-	-	3.17	.52	.47*
Neg (AATI)	-0.04	.45	-.01	-	-	-	0.03	.42	.01
Self-esteem									
<i>Predictors</i>	adj. $R^2 = .21$			adj. $R^2 = .20$			adj. $R^2 = .37$		
	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>B</i>	<i>SE</i>	<i>Beta</i>
Past (AATI)	-	-	-	.08	.07	.08	.16	.06	.17*
Pres (AATI)	-	-	-	.31	.06	.37*	.24	.06	.28*
Fut (AATI)	-	-	-	.05	.06	.06	-.00	.05	-.01
Pos (AATI)	.90	.22	.34*	-	-	-	.79	.21	.30*
Neg (AATI)	-.35	.18	-.16	-	-	-	-.35	.17	-.16*

Note. Pres Hed = Present Hedonistic, Pres Fat = Present Fatalistic, Past Pos = Past Positive, Past Neg = Past Negative, Pres Pos = Present Positive, Pres Neg = Present Negative, Fut Pos = Future Positive, Fut Neg = Future Negative, Pos = Positivity, Neg = Negativity. Bolded coefficients met the minimally interpretable effect size. $*p < .05$.