Article

The Japanese Version of the Adolescent Time Inventory–Time Attitudes (ATI-TA) Scale: Internal Consistency, Structural Validity, and Convergent Validity

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Abstract

In this study, we translated the Adolescent Time Inventory–Time Attitudes (ATI-TA) scale into Japanese and examined the internal consistency and structural and convergent validity of ATI-TA scores in a sample of 383 Japanese high school students aged 15 to 18 years. The ATI-TA consists of six subscales assessing two valences (positive and negative) for each of three time periods (past, present, and future). Internal consistency estimates for scores on the ATI-TA were over .79. Confirmatory factor analysis indicated that a six-factor model yielded the best fit to scores. Correlations among ATI-TA scores, time attitudes assessed by the semantic differential method, educational career planning, and self-esteem were consistent with our hypotheses. Our results provide evidence that scores on the Japanese version of the ATI-TA are reliable and valid, and thus potentially useful for research in this cultural context.

Lewin (1951) defined time perspective as "the totality of the individual's views of his psychological future and his psychological past existing at a given time" (p. 75). By this definition, time perspective is essentially an umbrella term for a multifaceted construct (Shipp, Edwards, & Schurer-Lambert, 2009), which more specifically assesses the influence of time with respect to valence, attitudes, orientation, extension, affect, focus, and speed (Lasane & O'Donnell, 2005; Mello & Worrell, 2015). In this study, we focus only on time attitudes, consistent with recent interest in measuring adolescents' feelings toward each time period and in assessing developmental changes during adolescence (e.g., Perry et al., 2015; Worrell, Mello, & Buhl, 2013). Time attitudes consist of emotions and evaluative feelings toward the past, present, and future, and are the most frequently studied time perspective constructs (Mello & Worrell, 2015; Nurmi, 1991; Seginer, 2008; Shipp et al., 2009; Zimbardo & Boyd, 1999).

Measuring Time Attitudes

There are two other major time attitude measures that assess multiple time periods. The Time Attitude Scale (TAS; Nuttin, 1985) consists of semantic differential items and has subscales assessing positive attitudes toward past, present, and future. The TAS provides one score for each subscale, reflecting a positive or a negative attitude as measured on a bipolar scale. It assesses time length, time closeness, and time changes, in addition to time attitudes. The Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999) is currently the most frequently used measure of time attitudes in the literature. It consists of five subscales—Past Positive, Past Negative, Present Hedonistic, Present Fatalistic, and Future—and has been translated into several languages including Japanese. Despite its frequent use, Worrell et al. (2013) highlighted measurement and construct concerns with the ZTPI. Regarding measurement concerns, research using a Brazilian sample showed inadequate internal consistency estimates for ZTPI scores (Milfont, Andrade, Belo, & Pessoa, 2008), a concern also found in an Italian sample (D'Alessio, Guarino, De Pascalis,

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& Zimbardo, 2003). Structural validity support for ZPTI scores from several confirmatory factor analyses (e.g., Milfont et al., 2008; Shimojima, Sato, & Ochi, 2012; Worrell & Mello, 2007; Zimbardo & Boyd, 1999) has been variable and inconsistent.

With respect to construct concerns of ZPTI scores, Worrell and Mello (2007) argued that there may be issues with the time constructs assessed by ZPTI subscales. As the names of the Present Hedonistic and Present Fatalistic subscales suggest, these subscales assess constructs such as risk taking and pessimism, respectively, in addition to attitudes toward the present. This mixture of constructs is reflected in convergent and structural validity analyses of ZPTI scores. For example, Worrell and Mello (2007) found that ZPTI future items split into factors labeled future and future planning, and that the structure of ZTPI scores was only partially supported in an adolescent sample. They also reported that ZPTI scores had low correlations with scores on other time-related constructs.

Time Attitudes in Adolescence

Adolescence is a particularly important period in which to investigate time perspective, given the developmental changes that occur at this age (Mello & Worrell, 2015; Nurmi, 1991, 2005). Aspects of cognitive development suggest that adolescence is an important period in the development of time perspective. Research on cognitive abilities indicates that adolescents are capable of abstract and hypothetical thought (Piaget, 1955); these abilities enable the consideration of time perspective. Abstract thinking is necessary to simultaneously consider the past, present, and future and for the individual to place themselves hypothetically in various time periods of their life. By the concrete-operations stage and the formal-operations stage, most individuals have a reasonably well-developed sense of the future and basic planning skills, although these skills develop further during adolescence (Nurmi, 1991) and continue to do so until the early 20s (Dreher & Gerter, 1987). Erikson (1968) also indicated that adolescence is the crucial developmental period in which individuals form their identity. He described identity formation as the primary developmental task of adolescence, whereby identity is achieved through the integration of one's past, present, and future selves. Although time attitudes may be studied across the life span, the developmental qualities of adolescence make this age group especially appropriate to examine this topic.

Moreover, researchers have found that time attitudes have correlations with adaptive and maladaptive functioning in samples of adolescents. Positive time attitudes have meaningful associations with academic achievement (Adelabu, 2007; Wyman, Cowen, Work, & Kerley, 1993), educational outcomes (Andretta, Worrell, & Mello, 2014), psychological well-being (Andretta et al., 2014; Seginer,

2008; Worrell & Mello, 2009), self-efficacy (McKay, Percy, Cole, Worrell, & Andretta, 2016), career decisions (Ferrari, Nota, & Soresi, 2010), relational styles and engagement (Molinari, Speltini, Passini, & Carelli, 2016), and negative time attitudes have statistically and practically significant positive associations with perceived stress (Andretta et al., 2014), risky behavior (Laghi, Baiocco, D'Alessio, & Gurrieri, 2009; Laghi, Liga, Baumgartner, & Baiocco, 2012), and alcohol use in early adolescence (McKay et al., 2016). Consequently, it is important to be able to measure the time attitudes of adolescents robustly so that these topics may be examined in this age group specifically.

The Adolescent Time Inventory–Time Attitudes Scale

One of the more promising measures of time attitudes in terms of score reliability and validity is the Adolescent Time Inventory–Time Attitudes Scale (ATI-TA; Mello & Worrell, 2007; Worrell et al., 2013). This 30-item scale assesses both negative and positive attitudes toward the past, present, and future. ATI-TA scores have been examined in adolescent samples in the United States (Andretta et al., 2014; Andretta, Worrell, Mello, Dixson, & Baik, 2013; Worrell et al., 2013), Germany (Buhl & Linder, 2009; Worrell et al., 2013), New Zealand (Alansari, Worrell, Rubie-Davies, & Webber, 2013), and the United Kingdom (McKay, Cole, Percy, Worrell, & Mello, 2015). Internal consistency estimates for the subscale scores based on the alpha coefficient have almost always exceeded .70, with omega estimates being even higher. Moreover, structural validity analyses have supported the theorized six-factor structure in all four national contexts.

Furthermore, although originally developed for and validated in adolescent samples, ATI-TA scores have recently been validated in adult samples. Mello et al. (2016) provided the field with psychometric evidence that the ATI-TA can be appropriately employed across adulthood in a cross-sectional study of early, middle, and older adults, with ages ranging from 18 to 85 years. They noted that a measure which yields valid and reliable scores for adolescents and adults will enable researchers to conduct cross-sectional and longitudinal studies that illustrate how time perspective changes in relation to age.

In terms of convergent validity, Worrell and Mello (2009) reported strong relationships between scores on the future-oriented subscales of the ATI-TA and other future-related variables, such as hope, optimism, and perceived life changes. McKay et al. (2015) found moderate correlations between ATI-TA scores and scores assessing academic, social, and emotional self-efficacy. Andretta et al. (2014) also found that ATI-TA scores had moderate correlations with self-esteem ($|.36|$ to $|.46|$) and modest to moderate correlations with perceived stress ($|.23|$ to $|56|$). Importantly,

ATI-TA scores have been used to create time attitude profiles in several contexts, including Germany (Buhl & Linder, 2009), New Zealand (Alansari et al., 2013), the United States (Andretta et al., 2013; Andretta et al., 2014), and the United Kingdom (McKay et al., 2016), and these profiles have been found to have stronger relationships with outcomes than individual ATI-TA scores.

Current Time Perspective Research in Japan

In 2014, the Cabinet Office of the Japanese Government reported that Japanese youths aged 13 to 29 years are likely to see their future more negatively than youths in other developed countries. For instance, the affirmation rate to the question, "Are you hopeful about your future," was lower in Japan (61.6%) than in the United States (91.1%), the United Kingdom (89.8%), and Germany (82.4%). However, these results were obtained by using one item without examining its reliability and validity. Therefore, a scale of time attitudes that can be used in all of these contexts will help us better understand this construct in youths in Japan as well as how Japanese youth compare to youth in other national contexts.

In Japan, time attitudes have been investigated using several scales to date, including the Experiential Time Perspective Scale (ETPS) developed by Shirai (1994, 1997). The ETPS measures time perspective and consists of four subscales: acceptance of past, self-fulfillment, goal-directedness, and hopefulness. However, this scale is used predominately in Japan. Moreover, its scores have not been validated in other cultural contexts. Japanese researchers who are interested in cross-cultural studies of time perspective will benefit from a scale with scores that have been validated in other countries.

Shirai (1997) translated the TAS (Nuttin, 1985) into Japanese and examined the reliability and validity of the Japanese version of the TAS. Despite theorized correlations with subscales of the ETPS, two psychometric issues emerged. First, one item for attitudes toward present and three items for attitudes toward future were omitted from the Japanese TAS due to low item-total correlations. Therefore, we cannot simply compare Japanese scores with those obtained in other countries. Second, the Japanese TAS items include expressions that are difficult for adolescents to fully comprehend. Thus, the Japanese TAS has measurement issues when used in research with adolescents.

Shimojima et al. (2012) translated the 56-item ZTPI into Japanese and examined the scores' reliability and structural validity. The theorized five factors were extracted through exploratory factor analysis with results being more supportive after omitting 13 additional items. However, confirmatory factor analyses were less supportive, with scores showing poor fit for the 56-item version (comparative fit index [CFI] = .595, goodness-of-fit index [GFI] = .782,

adjusted GFI = .764, and root mean square error of approximation [RMSEA] = .056) and the reduced 43-item version (CFI = .681, GFI = .829, AGFI = .810, RMSEA = .057). Alpha values for subscale scores from the 43-item version ranged from .65 to .76, and alpha values for subscale scores from the 56-item version were not reported. These results indicate that the Japanese version of the ZTPI has some issues with internal consistency and structural validity. Sircova et al. (2014) undertook a 24-country study of the structural validity and invariance of ZTPI scores, including a Japanese sample. However, the Japanese sample was removed from analysis because of bias in more than two items (see also Sircova et al., 2015). Research on time attitudes in Japan requires a scale with reliable and valid scores, and such a scale would also allow Japanese researchers to contribute to the larger international body of research on time attitudes and time perspective more generally.

The Present Study

To address the lack of a robust measure of time attitudes in Japan, we translated the ATI-TA into Japanese and examined the internal consistency, structural validity, and convergent validity of ATI-TA scores. To examine internal consistency, we calculated both alpha and omega values for scores on the six factors. Regarding the structural validity of the ATI-TA, using previous studies as guides (e.g., Alansari et al., 2013; McKay et al., 2015; Worrell et al., 2013), we examined two-factor, three-factor, and six-factor models using confirmatory factor analyses, hypothesizing that the six-factor model would result in the best fit to the data.

We also examined the association of ATI-TA scores with scores on three other psychological constructs to assess convergent validity. The first construct was time attitudes assessed with the TAS (Nuttin, 1985). Although Japanese TAS scores have had some concerns about item wording and reliability, we adapted the current version of the TAS for the present study and did not experience these issues, as we note below. As noted previously, the TAS measures time-related attitudes toward the past, present, and future using a semantic differential response scale. Therefore, we expected TAS scores to have strong relationships with subscales of the ATI-TA from the same time period.

The second construct was educational career planning. Worrell and Mello (2009) found that scores on hope and perceived life changes, which are clearly future related, had significantly stronger relationships to future-time attitudes than to past and present attitudes. However, there are no Japanese versions of these scales, so we decided to use educational career planning as a future-oriented variable. Numerous studies have suggested that career planning is associated with other future-oriented variables, such as career decision self-efficacy and high levels of goal-setting

(Rogers, Creed, & Glendon, 2008), career goals (Rogers & Creed, 2011), and optimism (Bardick, Bernes, Magnusson, & Witko, 2006; Creed, Patton, & Bartrum, 2002).

The third construct was self-esteem, a variable assessing well-being. Andretta et al. (2014) and Worrell and Mello (2009) showed that all six time attitudes are correlated with self-esteem, with correlations consistent with the valence of the attitudes: Positive attitudes had positive correlations with self-esteem and vice versa.

We hypothesized that both alpha and omega internal consistency estimates would be .70 or higher for ATI-TA subscale scores, and that the six-factor model would achieve more acceptable fit than the other models. Additionally, we hypothesized that (a) ATI-TA scores would be related to all TAS scores, (b) only ATI-TA attitudes toward the future would be related to educational career planning, and (c) all six subscales would be related to self-esteem scores with moderate correlations.

Method

Participants

Participants were recruited from three public high schools in urban and rural areas in the Kanto district in Japan. The final sample consisted of 382 Japanese adolescents (166 female [43.3%], 216 male) aged 15 to 18 years (M_{age} = 16.22 years, SD = 1.44). They were enrolled in Grades 10 to 12 (10 = 36.9%, 11 = 33.2%, and 12 = 30.0%). Five participants did not respond to the age, gender, and grade questions. Participants were also asked to indicate their plans after graduation using a question from Andretta et al. (2014), namely, "What is your career plan after you graduate your high school?" Responses were chosen from one of four options: employment, vocational school/junior college, 4- or 6-year college, and undecided. Most participants (97.1%) planned to attend 4- or 6-year colleges after graduation, 2.4% were undecided, 0.5% planned to attend vocational/junior college, and no one selected employment. As previously found (Worrell & Mello, 2009), age and grade were not correlated significantly with any subscales of the ATI-TA ($r = -.09$ to .08, *ns*).

Procedure

Ethical approval was gained for this study (Ref. 25-156) from the University of Tsukuba research ethics committee. Following approval, the first author contacted the school principals and met with teacher representatives at the high school to explain the research, and provided them with participant information sheets containing details of the research. Subsequently, student participants completed the questionnaires anonymously at a time that was convenient for the class teachers in June or July of 2015. We specified in the cover sheet and class teachers also announced that responses were voluntary, that it was acceptable to refuse to answer or to stop responding, and that there would be no consequences in the event of refusal to answer or ceasing to respond. Once the questionnaires had been completed, they were couriered back to the first author. Data were analyzed using the statistical software packages SPSS and M*plus* Version 7.11 (Muthén & Muthén, 1998-2012). Some items were negatively worded and hence needed to be reverse-scored prior to analyses.

Measures

Adolescent Time Inventory–Time Attitudes (ATI-TA). The ATI-TA is the attitude subsection of the Adolescent Time Inventory (Mello & Worrell, 2007; Worrell et al., 2013). The ATI-TA consists of 30 items split into six 5-item subscales: (a) Past Positive ("My past is full of happy memories"), (b) Past Negative ("My past makes me sad"), (c) Present Positive ("I am happy with my current life"), (d) Present Negative ("I am not satisfied with my life right now"), (e) Future Positive ("I am excited about my future"), and (f) Future Negative ("Thinking about my future makes me sad"). ATI-TA items are rated on a 5-point Likert-type scale from 1 (*totally disagree*) to 5 (*totally agree*). Scores for items on each subscale are summed and divided by five to yield a mean score. As previously noted, ATI-TA scores have been shown to be internally consistent and structurally valid in the United States and Germany (Worrell et al., 2013), New Zealand (Alansari et al., 2013), and the United Kingdom (McKay et al., 2015). There is also evidence of convergent and discriminant validity for ATI-TA scores (Andretta et al., 2014; Worrell & Mello, 2009).

The original English version of the ATI-TA was translated into Japanese using a translation and back-translation process (Brislin, 1986). First, a professional translator translated the ATI-TA into Japanese. Second, the three native Japanese including authors of this article checked the Japanese items and corrected them to read more naturally, as necessary. Third, another professional translator translated those items into English. Finally, the authors who developed the original ATI-TA confirmed that the back-translated and original items had the same meaning.

Time Attitude Scale (TAS). The TAS (Nuttin, 1985; for the Japanese version see Shirai, 1997) consists of 70 items, which are rated on 7-point semantic differential scales. The subscales are past (20 items), present (25 items), and future (25 items). We chose three items for each subscale (unpleasant–pleasant, unhappy–happy, and dark–light) because scores on the full Japanese version are not reliable. We used three criteria for selecting items. First, the items were those classified as global affective evaluations by Nuttin (1985). Second, the same items could be used to assess time

Table 1. Descriptive Statistics for Adolescent Time Inventory–Time Attitude Scores in a Japanese Sample.

	M	SD	Skew	Kurtosis	α	95% CI (α)	ω
Past Positive	3.68	0.78	−0.50	0.18	.87	[.85, .89]	.87
Past Negative	2.57	0.87	0.43	−0.13	.83	[.80, .86]	.84
Present Positive	3.71	0.75	−0.17	−0.38	.85	[.82, .87]	.85
Present Negative	2.47	0.77	0.14	−0.50	.81	[.78, .84]	.82
Future Positive	3.52	0.78	−0.28	−0.02	.88	[.86, .90]	.89
Future Negative	2.30	0.67	0.27	−0.11	.79	[.76, .83]	.80

Note. CI = confidence interval. Omega estimates are based on the coefficients from the six-factor model, which are reported in Table 3.

attitudes across three time periods. Third, the items were not difficult for Japanese adolescents to understand. Cronbach's alphas for the scores on the TAS subscale version used in this study were .92 for past, .93 for present, and .95 for future items.

Educational Career Planning (ECP). We assessed career planning using a subscale of the Educational Career Maturity Attitude Scale (Sakayanagi, 1986). This measure consists of 15 items, which are rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The subscales consist of educational career concern, autonomy, and planning. Sakayanagi (1993) did not examine the reliability and validity of scores on the individual subscales, but calculated a total educational career maturity score by summing the three subscale scores. We did not include the subscales of autonomy and concern because it was difficult to build hypotheses of correlations between those subscales and time attitudes toward the future. An example of a career autonomy item is "I investigate the school character of my preferred school by myself," whereas a career concern item is "Recently I have been thinking about my direction after graduation." In contrast, based on previous studies, we predicted that positive attitudes toward future would be correlated positively with career planning. For example, Hirschi (2014) found that dispositional hope is positively related to career planning (*r* = .30 in university students and *r* = .41 in workers). Similarly, Kenny, Walsh-Blair, Blustein, Bempechat, and Seltzer (2010) showed that work hope is positively related to career planning among urban adolescents (*r* = .63).

Therefore, we used only the planning subscale, which consists of four items: "I almost know the pathway to enter my preferred school," "I have an idea of what school I will enter in the future," "My preferred school will not change because I considered carefully," and "I have selected my preferred school, and I'm striving to enter that school now." Although this subscale consisted of five items originally, Nagaoka and Matsui (1999) noted that one item ("It is important to plan and prepare to enter my preferred school") had an extremely low factor loading, so we omitted the

item. Scores on the 4-item scale yielded strong internal consistency in the current sample (α = .89).

Rosenberg Self-Esteem Scale (RSES). The RSES (Rosenberg, 1965) measures global self-esteem using 10 items (e.g., "I feel that I have a number of good qualities"), which are rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The Japanese Version of the RSES was translated by Yamamoto, Matsui, and Yamanari (1982), and was used in the present study. Yamamoto et al. (1982) provided reliability and validity evidence in support of RSES scores in a Japanese sample. In the current sample, the scores demonstrated acceptable internal consistency (α = .84).

Results

Descriptive Statistics

Means and standard deviations of ATI-TA scores are presented in Table 1. As can be seen, subscale means fell between 2.0 and 4.0, with standard deviations in the 0.6 to 0.9 range. Subscale distributions were neither skewed nor kurtotic. Cronbach's alpha and McDonald's omega were used to assess the internal consistency of scores on the six subscales. Cronbach's alpha estimates for the whole sample were in the .79 to .87 range, with confidence intervals ranging from .76 to .90. Omega estimates, based on coefficients from the six-factor structure, were in the .80 to .89 range. Alpha estimates were also produced for males (.78 ≤ α ≤ .87), females (.81 ≤ α ≤ .89), and students in Grades 10 (.78 ≤ α ≤ .87), 11 (.81 ≤ α ≤ .88), and 12 (.75 ≤ α ≤ .89), with all of the estimates falling in the acceptable range. Correlations among scores (Table 2) were consistent with theory and previous research (Worrell et al., 2013). For example, correlations between positive and negative subscales were negative, and correlations within valence groupings (i.e., positive/positive, negative/negative) were positive. Correlations were in the medium to high range, with the highest correlations occurring between items in the same time period (e.g., Past Positive and Past Negative).

Table 2. Correlation Matrix for Adolescent Time Inventory–Time Attitude.

		1	2	3	4	5	6
1.	Past Positive	—	−.69*	.35*	−.29*	.43*	−.44*
2.	Past Negative	−.52*	—	−.46*	.60*	−.32*	.51*
3.	Present Positive	.31*	−.40*	—	−.90*	.46*	−.51*
4.	Present Negative	−.23*	.50*	−.76*	—	−.39*	.55*
5.	Future Positive	.40*	−.29*	.43*	−.34*	—	−.87*
6.	Future Negative	−.36*	.41*	−.43*	.43*	−.74*	—

Note. Correlations below the diagonal are for the manifest variables and above the diagonal are for latent variables from six-factor model (Model 5), which is reported in Table 3 and represented in Figure 1.
*$p < .001$.

Table 3. Fit Indices for the ATI-TA Scores Derived From Confirmatory Factor Analyses.

| Model	χ^2s-b	df	CFI	TLI	RMSEA	90% CI
1. Null	5183.35*	435				
2. Two-factor (valence)	2625.95*	404	.532	.496	.120	[.116, .124]
3. Three-factor (time periods)	1384.09*	402	.793	.776	.080	[.075, .085]
4. Six-factor (theorized)	988.69*	390	.874	.859	.063	[.058, .068]
5. Six-factor (modified)[a]	775.25*	387	.921	.911	.051	[.046, .056]

Note. ATI-TA = Adolescent Time Inventory–Time Attitude; s-b = Satorra–Bentler; CFI = comparative fit index; df = degrees of freedom; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval.
[a]Included three pairs of correlated errors.
*$p < .001$.

Confirmatory Factor Analyses

We examined four models: (a) a null model, (b) a two-factor model (15 Positive and 15 Negative items), (c) a three-factor bipolar time period model (10 Past, 10 Present, and 10 Future items), and (d) the six-factor model with five items per subscale. We used maximum likelihood parameter estimates with standard errors and the Satorra–Bentler (1994) scaled chi-square, which corrects for nonnormality in the data. This estimator has been used to examine ATI-TA scores in the United States, Germany, and New Zealand. Although ATI-TA subscale distributions are not skewed, individual ATI-TA item distributions are sometimes skewed or kurtotic. Consistent with best practice (Byrne, 2012; Thompson, 2004), several indicators of fit were used to evaluate the models. These included (a) the CFI (Bentler, 1990), which takes sample size into account; (b) the Tucker–Lewis index (TLI), which takes model complexity into account; and (c) the RMSEA, as well as a 90% confidence interval around RMSEA. RMSEA is an index of misfit, with smaller values indicating better fit.

CFI and TLI values greater than .90 are indicative of acceptable fit, and values of these indices greater than .95 are indicative of close fit. RMSEA values less than .08 are indicative of acceptable fit and values below .05 are indicative of close fit (Marsh, Hau, & Wen, 2004). Heene, Hilbert, Draxler, Ziegler, and Bühner (2011) suggested that factor loadings in social sciences are typically relatively low. Accordingly, factor loadings for CFA were interpreted using Comrey and Lee's (1992) recommendations (i.e., >.71 = excellent, >.63 = very good, >.55 = good, >.45 = fair, and >.32 = poor).

CFA results are presented in Table 3. The null model (Model 1) was rejected, as the chi-square to degrees of freedom ratio was the highest in this model. Neither the two-factor model (Model 2) based on valence nor the three-factor time period model (Model 3) provided good fit to the data, with all of the fit indices falling well short of acceptable fit. However, the RMSEA for Model 4 was acceptable and CFI and TLI values for Model 4 were better than for the other

models. Given the high intercorrelations among some of the latent factors, we used modification indices to examine sources of poor fit. These indicated that error terms related to three pairs of similar items resulted in substantial misfit: two Past Positive items ("I have very happy memories of my childhood" and "I have good memories about growing up"), two Future Negative items ("I doubt I will make something of myself" and "I don't think I'll amount to much when I grow up"), and a Present Positive and Present Negative item ("Overall, I feel happy with my life right now" and "I am not happy with my present life"). As can be seen in Table 3, allowing these three errors to correlate resulted in all of the fit indices being in the acceptable range, and the six-factor model was accepted. Factor coefficients for the six-factor model (Model 5) are presented in Figure 1. As can be seen, 22 of the coefficients were in the very good to excellent range, 6 were in the good range, and only 2 were in the fair range. The error correlation between the two Past Positive items was .51, between the two Future Negative items was .45, and between the Present Positive and Present Negative item was −.48.

Convergent Validity

Bivariate correlations between scores on ATI-TA factors and scores on TAS subscales, educational career planning, and self-esteem are displayed in Table 4. As hypothesized, correlations between ATI-TA and TAS scores were strongest between scores assessing the same time period, ranging from |.61| to |.76|. As Shirai (1997) recommended, we also calculated partial correlations for TAS subscales to adjust for moderate correlations among them ($r = .39$-.48, $p < .001$). As can be seen in Table 4, adjusting the correlations resulted in 10 of the 12 non–time-congruent correlations dropping below .15, and all of them falling below .30. The partial correlations between TAS past scores and the Past Positive and Past Negative scores of
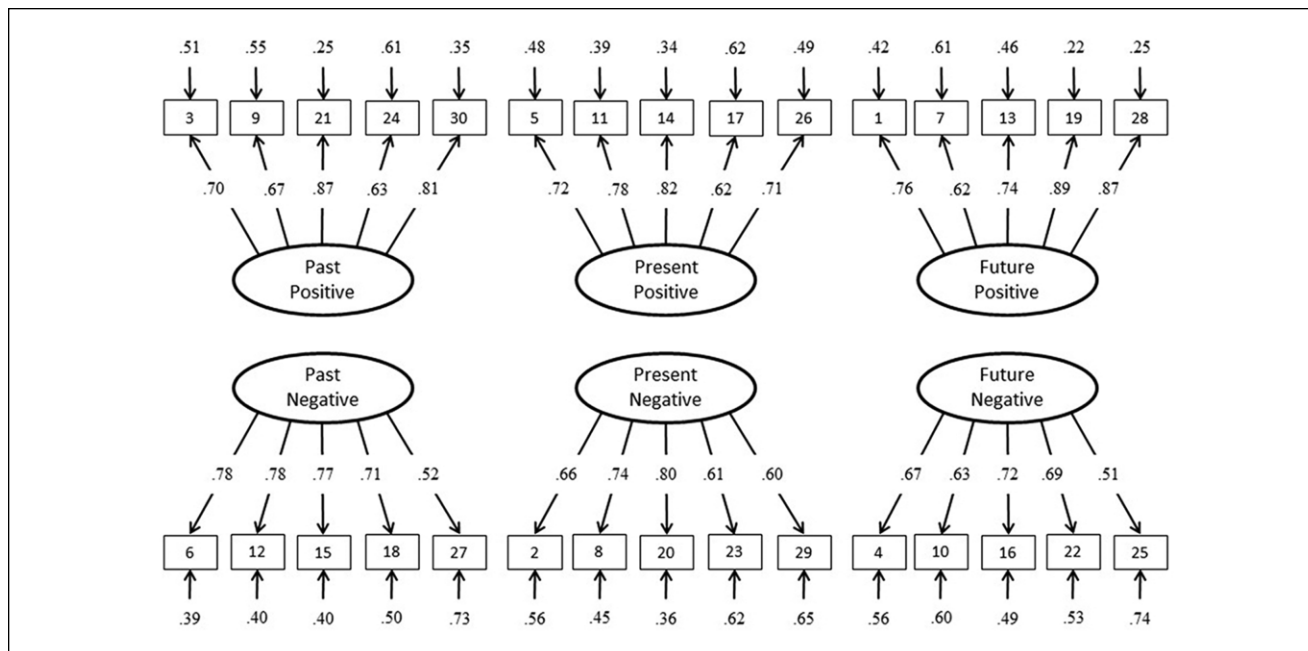
Figure 1. Six-factor model for Adolescent Time Inventory–Time Attitude scores.
Note. All coefficients are standardized robust likelihood parameter estimates. Correlations among the latent variables were calculated and are reported above the diagonal in Table 2.

Table 4. Correlation Between ATI-TA, TAS, ECP, and RSES.

	TAS						ECP	RSES
	Past		Present		Future			
	r	pr	r	pr	r	pr	r	r
1. Past Positive	.76*	.72*	.31*	−.05	.36*	.12	.02	.23*
2. Past Negative	−.61*	−.55*	−.30*	−.04	−.27*	−.06	.02	−.45*
3. Present Positive	.32*	.04	.70*	.64*	.32*	−.02	.04	.41*
4. Present Negative	−.31*	−.04	−.66*	−.59*	−.29*	.02	−.06	−.42*
5. Future Positive	.33*	.02	.49*	.22*	.72*	.62*	.30*	.52*
6. Future Negative	−.32*	−.01	−.49*	−.25*	−.68*	−.57*	−.30*	−.63*

Note. ATI-TA = Adolescent Time Inventory−Time Attitude; TAS = Time Attitude Scale; ECP = Educational Career Planning; RSES = Rosenberg Self-Esteem Scale; Partial correlations (*pr*) were calculated after adjusting for the other two TAS subscale scores.
*$p < .001$.

the ATI-TA were significantly higher than correlations with other subscales of ATI-TA ($z = 7.96$-12.36, $p < .001$). Partial correlations between TAS present and the present positive and present negative ATI-TA scores were significantly higher than correlations with others subscales ($z = 5.81$-9.89, $p < .001$), and partial correlations between TAS future and the two ATI future scores were higher than correlations with the other subscales ($z = 7.25$-9.70, $p < .001$).

Also as hypothesized, only the positive and negative future subscales of the ATI-TA were meaningfully correlated (i.e., $\geq|.30|$) with educational career planning.

Absolute correlations between ECP and future positive and future negative scores were significantly higher than the other correlations ($z = 3.43$-3.99, $p < .01$). Self-esteem scores were significantly correlated with all six time attitude subscales, with five correlations in the medium to large range; only the correlation with Past Positive had a small effect size. Absolute correlations between the RSES and Past Positive scores of the ATI-TA were lower than the other RSES/ATI-TA correlations ($z = 2.77$-6.98, $p < .01$). Consistent with theory, positive time attitudes were positively related to self-esteem, whereas negative time attitudes had inverse relationships with this construct. These

results provide strong convergent validity support for ATI-TA scores.

Discussion

The purpose of this study was to translate the ATI-TA into Japanese and to test the reliability and validity of its scores. Results indicated that scores for the six subscales had moderate to high reliability and evidence of convergent and structural validity. Below, we discuss these findings and the implications of these results for research into time attitudes, as well as the limitations of this study.

Reliability

Alpha and omega estimates provided clear evidence of internal consistency for ATI-TA scores. These estimates are similar to, or higher than, those reported in previous studies (e.g., McKay et al., 2015). Moreover, these estimates were also similar across gender and grade-level groups. Score on some Japanese versions of time attitude scales, for example, the TAS and ZTPI, have exhibited lower reliability. The Japanese version of the ATI-TA does not have this concern. Although the reliability estimates are acceptable, it will be necessary to show that the internal consistency of ATI-TA scores is similar across other subgroups that are often compared (e.g., socioeconomic status or educational level).

Structural Validity

The CFAs indicated that a six-factor model provided better fit than alternative model formulations, such as a two-factor solution based on attitudinal valence (positive/negative) and a three-factor solution based on time orientation (past/present/future). Nevertheless, from a theoretical viewpoint, one might argue that the six-factor model fit was marginal: Although RMSEA was below .08, the CFI and TLI were below .90. However, Perry, Nicholls, Clough, and Crust (2015) suggested that strict adherence to goodness-of-fit cutoff values often leads to erroneous results. Moreover, Furr (2011) recommended that researchers examine modification indices to make useful revisions, with emphasis on considering associations among items' error terms if the initial hypothesized model fits poorly.

As one example, he included three relevant parameters among the items' error terms based on the size of the modification indices and on the conceptually meaningful fact that three items had commonality. Following Furr's (2011) recommendation, we used modification indices, which indicated that error terms related to three pairs of similar items resulted in substantial misfit. The pairs were from the same time period and the errors were interpretable because of their common language in the items: The past pairs included the word "memories," and the present pair included the word "happy." Thus, we consider the six-factor model supported. However, previous studies have reported better model fit without these modifications (e.g., McKay et al., 2015; Worrell et al., 2013). We believe there are several possible reasons for this discrepancy, such as differences in time perception, cultural background, response style, and so forth. In future research, we need to examine from multiple viewpoints why poorer fit occurred in this study.

Overall, the Japanese version of the ATI-TA showed a simple and consistent factor structure, with large coefficients across all factors. The six-factor structure identified in this study confirms that reported in adolescent populations in the United States, Germany (Worrell et al., 2013), New Zealand (Alansari et al., 2013), and the United Kingdom (McKay et al., 2015). The six-factor solution further supports the theoretical position that negative and positive attitudes toward specific time periods represent distinct, although related, attitudinal dimensions rather than opposite ends of a single dimension. It is possible for adolescents to look forward to the future while simultaneously having doubts and concerns about what the future may hold for them.

Convergent Validity

Relationships between ATI-TA and TAS scores were as hypothesized. That is, the two past-related subscales of the ATI-TA were strongly correlated with the past subscale of the TAS and the results were similar for the present- and future-oriented subscales. Furthermore, results showed nonmeaningful (i.e., $r < .30$) partial correlations between different time periods (i.e., past positive to present and future). Moderate correlations were present between educational career planning and future positive and future negative scores. These results concur with previous studies of career adaptability (Hirschi, 2014; Kenny et al., 2010). For high school students to plan an educational path requires them to think about their near future, that is, when they will graduate high school. We also found moderate correlations between five of the ATI-TA subscale scores and self-esteem scores. These results are consistent with previous studies (e.g., Worrell & Mello, 2009). Although the correlation with Past Positive scores was less than .30, Andretta et al. (2014) and Worrell and Mello (2009) also reported that the Past Positive ATI-TA subscale had the lowest correlation with self-esteem. These results provide convergent validity evidence in support of Japanese ATI-TA scores.

Limitations

This study has several limitations. First, the samples were obtained from high schools in a limited number of geographical regions in Japan. Additionally, some previous

studies of ATI-TA scores have included younger students (e.g., aged 12 or 13 years; Alansari et al., 2013; McKay et al., 2015; Worrell et al., 2013; Worrell & Mello, 2009). Thus, Japanese ATI-TA scores need to be confirmed in larger and more diverse samples, including junior high school students in early adolescence. Second, we need to assess ATI-TA and ZPTI scores in the same study and examine the relationships between the subscales of the two scales because numerous studies of time attitudes have used the ZTPI. Such a study would allow further assessment of convergent validity. Third, ATI-TA scores need to be examined for predictive validity with respect to educational outcomes, psychological well-being, and other constructs of importance in adolescence (Andretta et al., 2014).

Future Directions

Despite these limitations, the present study makes a valuable contribution by translating a time attitude inventory into Japanese and establishing the reliability and validity of the scores, thus providing a tool that may be useful for cross-cultural studies. The support for the six-factor model will allow Japanese researchers to examine the associations between time attitudes and other constructs in Japan and see if the direction and size of these relationships are similar to findings from other national contexts. Although our data provide evidence that the internal consistency of scores or correlations between scores are similar to previous studies, we cannot conclude with certainty that the factor structure is the same as that in other countries.

We need to examine whether scores on the Japanese version of the ATI-TA are invariant by comparing them with scores obtained in samples from other countries. In particular, demonstrating scalar equivalence among versions in other languages will help determine whether scores can be compared directly. To date, ATI-TA scores have been shown to be invariant between Germany and the United States (Worrell et al., 2013) and between Scotland and Northern Ireland (McKay et al., 2015). Additionally, age-invariance of ATI-TA scores has been examined (Mello et al., 2016) in samples of adults. The results showed that the ATI-TA yields reliable scores and a valid structure across adulthood and five of the six subscales are invariant across early and middle adults. It will be useful to examine the invariance between adolescents and adults directly. In summary, we need to examine invariance among demographic groups in Japan, which was precluded by the small sample sizes in this study. It will be important for future studies to include samples of sufficient size to allow for invariance analyses.

Another important task for future studies is to examine time attitude profiles. Indeed, several studies using the ZTPI have extracted time perspective profiles using cutoff methods and cluster analysis (Boniwell, Osin, Linley, &

Ivanchenko, 2010; Drake, Duncan, Sutherland, Abernethy, & Henry, 2008). Additionally, recent studies using the ATI-TA have incorporated cluster analysis and latent class analysis, yielding results that could not be obtained from simple correlations (Alansari et al., 2013; Andretta et al., 2013; Andretta et al., 2014; Buhl & Linder, 2009). These findings suggest that the use of a person-centered approach to examine time attitude profiles in Japanese samples may highlight cultural similarities or differences with respect to time attitudes. Now that the validity of ATI-TA scores has been established in Japan, it will also be important to study how these scores relate to instruments that have been used only in Japan such as the ETPS, and to see if ATI-TA and ETPS scores yield similar findings.

Time attitude profiles have potentially important clinical applications. For example, although individual time attitude scores have moderate correlations with self-esteem and perceived stress (Andretta et al., 2014), these researchers reported very different results for time attitude profiles. Andretta et al. (2014) identified five time attitude profiles, which they labeled Positives, Optimists, Balanced, Pessimists, and Negatives.[1] They found that Positives had statistically and practically significant lower levels of perceived stress than did Negatives ($d = 1.64$) and Pessimists ($d = 0.71$), as did Balanced and Optimistic adolescents ($d = 1.22$ and 0.71, respectively). Positives, Balanced, and Optimists also reported higher levels of self-esteem than did Negatives ($d = 2.10$, 1.29, and 2.35, respectively) and Pessimists ($d = 1.48$, 0.70, and 0.68, respectively). It is possible that time attitude profiles may also have relationships with anxiety, depression, and other psychopathology constructs, as these have been associated with time perspective scores (Zimbardo & Boyd, 1999).

Conclusion

Prior to the current study, there was no Japanese time attitude scale that yielded reliable and valid scores. The results of this study provide psychometric support for ATI-TA scores in Japan. There are several implications of this study. First, an instrument that can be used to assess adolescents' time attitudes reliably in Japan will allow researchers to ask questions about this construct and its impact on Japanese adolescents, and see if the patterns of findings are similar to other nations. For example, time attitudes are correlated with several important constructs in adolescence including educational and developmental outcomes and engaging in risky behavior. Will the findings show similar patterns of relationships in Japan? Additionally, ATI-TA scores have been used to identify time attitude profiles in several countries, and it will be important to know if Japanese adolescents fall into similar time attitude profile groups.

The ATI-TA has been translated into over 10 languages and the reliability and validity of its scores have been

confirmed in several national contexts (e.g., Alansari et al., 2013; McKay et al., 2015; Worrell et al., 2013). Thus, the purpose of the current study was to translate the ATI-TA into Japanese and to examine the internal consistency and structural and convergent validity of these scores. Results in a sample of high school students provided strong support for all of the psychometric properties that were examined. Based on these results, we conclude that the Japanese version of the ATI-TA is psychometrically sound and can be used to study time attitudes in Japan.

Declaration of Conflicting Interests

Funding

Note

1. They labeled the profile with high positive attitudes and low negative attitudes toward all three time periods as "Positives" and used the "Optimist" label for the profile with high negative attitudes and low positive attitudes toward the past, alongside high positive attitudes and low negative attitudes toward the future. Similarly, they labeled the profile defined by high negative attitudes and low positive attitudes toward all three time periods "Negatives" and assigned the "Pessimists" label to the profile with average positive and negative attitudes to the present and high negative and low positive attitudes toward the future. The "Balanced" profile had generally average attitudes.

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