Multistudy Report

A Theoretical Approach to Resolving the Psychometric Problems Associated With the Zimbardo Time Perspective Inventory

Results From the USA, Australia, Slovenia, and the United Kingdom

Frank C. Worrell,[1] Elizabeth C. Temple,[2] Michael T. McKay,[3] Urška Živkovič,[4] John L. Perry,[5] Zena R. Mello,[6] Bojan Musil,[4] and Jonathan C. Cole[3]

[1] Cognition and Development, University of California, Berkeley, CA, USA
[2] School of Health Sciences and Psychology, Federation University, Ballarat, Australia
[3] Department of Psychological Sciences, University of Liverpool, UK
[4] Department of Psychology, University of Maribor, Slovenia
[5] Department of Sport, Health and Exercise Science, University of Hull, UK
[6] Department of Psychology, San Francisco State University, San Francisco, CA, USA

Abstract: The Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999) assesses five time-related constructs – Past Negative (PN), Past Positive (PP), Present Fatalistic (PF), Present Hedonistic (PF), and Future (F) – and is one of the most frequently used time measures in the extant literature. Versions of the ZTPI have been translated into a variety of languages, but the psychometric support for ZTPI scores remains contested. We examined the internal consistency, structural validity, and convergent validity of scores on a version of the ZTPI that consisted only of items that specifically referenced time constructs, the ZTPI-TP. Participants consisted of five samples of adolescents and adults from four countries: Australia (653 adults), Slovenia (425 adolescents and adults), the United Kingdom (913 adolescents; 455 adults), and the United States (815 adolescents). Structural validity analyses provided stronger support for ZTPI-TP scores than for ZTPI scores, and convergent validity evidence also provided support for ZTPI-TP scores. However, analyses revealed that the PF and PH factors were still problematic, especially with regard to factor coefficients and internal consistency estimates. We concluded that the ZTPI-TP can form the basis for a more robust version of the ZTPI.

Keywords: time perspective, reliability, validity, Zimbardo Time Perspective Inventory, ZTPI

Time perspective is a multidimensional construct that assesses the influence that cognitions and affect about the past, present, and future have on individual functioning. To date, the Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999) is one of the most widely used instruments to assess the construct. Indeed, the ZTPI has been translated into several languages, and there are validation studies in the literature on scores in English (Worrell & Mello, 2007), French (Apostolidis & Fieulaine, 2004), Spanish (Díaz-Morales, 2006), Swedish (Carelli, Wiberg, & Wiberg, 2011), and Portuguese (Milfont, Andrade, Belo, & Pessoa, 2008). Zimbardo and Boyd also reported strong concurrent validity evidence for ZTPI scores with a variety of constructs.

Despite the frequent use of the ZTPI, there is mixed evidence regarding the psychometric properties of ZTPI scores. Although both Apostolidis and Fieulaine (2004) and Díaz-Morales (2006) reported support for the five-factor structure based on exploratory factor analyses (EFAs) in samples of 419 university students and 756 adults, respectively, studies using confirmatory factor analyses (CFAs) have been less supportive. Worrell and Mello (2007) reported poor fit indices in a sample of 815 American adolescents (comparative fit index [CFI] = .636), Milfont et al. (2008) reported poor fit indices (goodness-of-fit index [GFI] = .74 and CFI = .70) in a sample of 247 Brazilian university students, and Carelli et al. (2011)

obtained a CFI of .63 in a sample of 419 Swedish adults. Internal consistency estimates have also been mixed, with some authors reporting moderate to high alpha coefficients for ZTPI scores (e.g., Apostolidis & Fieulaine, 2004 [$.65 \leq \alpha \leq .84$]; Carelli et al., 2011 [$.70 \leq \alpha \leq .79$]) and others reporting lower estimates (e.g., Milfont et al., 2008 [$.46 \leq \alpha \leq .67$]).

A number of attempts have been made to create shorter forms of the ZTPI. These include 15-item (McKay, Andretta, Magee, & Worrell, 2014; Zhang, Howell, & Bowerman, 2013), 25-item (Laghi, Baiocco, Liga, Guarino, & Baumgartnet, 2013), and 36-item (Sircova et al., 2014) versions, as well as an earlier version of the ZTPI, the 22-item Stanford Time Perspective Inventory (D'Alessio, Guarino, De Pascalis, & Zimbardo, 2003). However, scores on these shorter versions have also received mixed psychometric support in subsequent studies (McKay, Worrell, Temple, Perry, & Cole, 2014; McKay et al., 2015; Sircova et al., 2014).

Previous attempts to create a short form of the ZTPI have all used data-driven approaches (e.g., using the highest loading items or permitting correlated error terms to improve fit). These approaches are problematic insofar as adequate fit is then only sample-specific, and the findings do not replicate. For example, the factorial validity and reliability of a recent 15-item short-form of the ZTPI (the SZTPI-15; Zhang et al., 2013) were not well supported in a subsequent study (McKay, Worrell, et al., 2014). This problem is not specific to the ZTPI and appears to be common in time perception measures. For example, in their development of the Consideration of Future Consequences Scale-14, Joireman, Shaffer, Balliet, and Strathman (2012) allowed seven correlated error terms between items in order to achieve a good-fitting model for a hypothesized two-factor structure. However, a subsequent study failed to support the two-factor structure and had to permit an additional correlated error term in order to achieve good fit (Khachatryan, Joireman, & Casavant, 2013).

With specific reference to the ZTPI, some have previously argued that the scale is problematic because some items are measuring constructs such as fatalism, hedonism, and planning rather than time perspective (e.g., Crockett, Weinman, Hankins, & Marteau, 2009; Seijts, 1998; Shipp, Edwards, & Schurer-Lambert, 2009; Worrell & Mello, 2007; Worrell, Mello, & Buhl, 2013). For example, ZTPI Item 18, "It upsets me to be late for appointments," is hypothesized to assess future orientation, although it could be argued that it in fact measures conscientiousness. Similarly, several items hypothesized to measure present hedonism appear to measure impulsivity and risk-taking, such as "I do things impulsively" (#8) and "Taking risks keeps my life from becoming boring" (#31). Indeed, Worrell and Mello (2007) reported that the Future subscale split into two factors, which they labeled Future and Future Planning. Similarly, in Crockett et al.'s examination of the 22-item version, they identified four factors – Future, Hedonism, Conscientiousness, and Present – two of which were not time-related constructs. However, the hypothesis that problems with the ZTPI may be related to the inclusion of items that do not measure time perspective remains untested.

Time perspective is considered an important psychological construct in adolescent and adult populations (Stolarski, Fieulaine, & van Beek, 2015), and the ZTPI has been put forward as the *best* way to measure the construct. For example, in a recent study examining ZTPI scores in samples of convenience from 24 countries, Sircova et al. (2014) concluded that the five ZTPI scores are (a) "valid and reliable index[es] of individual differences in time perspective" (p. 1) and (d) "the 'gold standard' for further research on time perspective" (p. 9). Not only are these claims in conflict with some of the evidence for ZTPI scores in the literature (e.g., Carelli et al., 2011; McKay, Worrell, et al., 2014, McKay et al., 2015), they are not supported by the results Sircova et al. reported. Sircova et al.'s invariance indices for ZTPI scores across countries (N = 10,765) were in the acceptable range for the root mean square error of approximation (RMSEA; .057) and standardized root mean square residual (SRMR; .062), but not for the CFI (.86). These discrepancies need to be examined empirically (American Educational Research Association, American Psychological Association and National Council on Measurement in Education, 2014).

The Current Study

Given the failure of data-driven approaches in modifying the ZTPI and the criticisms about multiple constructs being measured on ZTPI subscales (Crockett et al., 2009; Shipp et al., 2009; Worrell et al., 2013), the present multisample study tested both the original five-factor, 56-item version of the scale, and a five-factor model consisting only of items that contained *time-specific* words or phrases (e.g., the past, tomorrow, on time, the moment). This study was also prompted in part by studies of a more recent instrument with items that focus only on time, the Adolescent Time Inventory-Time Attitudes (ATI-TA; Worrell & Mello, 2007). Fit indices for the structure of ATI-TA scores have been strong in Germany (N = 316; RMSEA = .033; SRMR = .050; CFI = .965; Worrell et al., 2013), New Zealand (N = 579; RMSEA = .041; SRMR = .055; CFI = .955; Alansari, Worrell, Rubie-Davies, & Webber, 2013), and the United States (N = 300; RMSEA = .037; SRMR = .059; CFI = .944; Worrell et al., 2013), and ATI-TA scores have demonstrated strong invariance between the US and Germany (RMSEA = .037; SRMR = .057; CFI = .949; Worrell et al., 2013).

Thus, in this study of the ZTPI, all items that did not refer to time explicitly were eliminated. For example, items such as "I've made mistakes in the past that I wish I could undo" (#27) or "I try to live my life as fully as possible, one day at a time" (#17) were retained. However, items such as "I make lists of things to do" (#43) or "Often luck pays off better than hard work" (#53) were not included. We hypothesized that this time-based approach would yield a more *theoretically-consistent* version of the measure with psychometrically sound scores.

Our aim was to generate an instrument that assesses time perspective *independent* of other psychological constructs. Thus, we examined the structural validity of scores on the original ZTPI and the structural validity and internal consistency of scores on the temporal-phrasing ZTPI (the ZTPI-TP). We also investigated the convergent and discriminant validity of the ZTPI-TP with constructs used to validate the ZTPI, including consideration of future consequences, aggression, self-esteem, attachment, alcohol use, and mental health (Keough, Zimbardo, & Boyd, 1999; Zimbardo & Boyd 1999). The study included five samples from four countries – Australia, Slovenia, the United Kingdom, and the United States – and different developmental periods, although we present the results in combined tables for ease of comparison and interpretation. Four of the samples were samples of convenience collected by time perspective researchers in the four countries, and one sample, the British adolescents, consisted of a sample of adolescents recruited to reflect the population.

The primary questions in this study were psychometric: Do time-specific ZTPI scores show evidence of internal consistency, structural validity, and convergent and discriminant validity? If time perspective is to be a useful cross-cultural construct for research and application (Stolarski et al., 2015), the scores need to be measured with integrity in *each* national context before they can be compared (International Test Commission, 2005). Thus, the five samples provided a robust examination of the cross-cultural validity claims being made for ZTPI scores (Sircova et al., 2014), and two of the countries in the current study – the US and the UK – were among those represented in Sircova et al.'s study. If the ZTPI is indeed the gold standard of time perspective measurement cross-culturally, the psychometric evidence should be supportive of the scores.

Method

Participants

Data from five independent samples – two from the United Kingdom (UK), and one each from the United States (US), Australia, and Slovenia – were analyzed. Participants in the first UK sample were 913 pupils (aged 11–16 years; 49.8% male) from High schools in Northern Ireland recruited by purposive sampling to reflect the overall demographics of the area. Participants in the second UK sample were 455 University undergraduates (aged 18–25 years; 49.7% male) recruited from Universities in Liverpool through opportunistic and snowball sampling. Participants in the US sample were 816 academically talented adolescents (aged 11–18 years; 46.6% male) attending a summer program at a research university in a Western state. Students were accepted into the summer program using several criteria, including school achievement, teacher recommendations, and an academic product. Participants were predominantly in the 7th–11th grades.

The 697 participants in the Australian sample were a general population sample (aged 17–70 years, M = 29.45; 67.8% female) recruited online through social media (e.g., Facebook, forums) via email snowballing, and through posts placed on university learning management systems (e.g., Moodle, Blackboard). Participants in the Slovenian sample were 425 adolescents and young adults (aged 15–29 years, M = 20.80; 70.4% female) who completed an online questionnaire sent to them via email or social media (e.g., Facebook).

Measures

Time Perspective

The ZTPI (Zimbardo & Boyd, 1999) is a 56-item scale measuring the five factors of time perspective: Past Negative (PN), Past Positive (PP), Present Fatalistic (PF), Present Hedonistic (PH), and Future (F). PN reflects a negative or aversive view of the past and PP reflects a warm, sentimental attitude toward the past. Scores on PH reflect an orientation toward present pleasure with little concern for future consequences whereas PF describes a helpless and hopeless attitude toward the future and their life, and F indicates behavior dominated by striving for future goals and rewards. Responses were on a 5-point Likert-type scale from 1 (= *very unlike me*) to 5 (= *very like me*). The five-factor structure was supported using EFAs and confirmatory factor analyses (CFAs), and inter-subscale correlations were generally low ($|.09| \leq r \leq |.38|$). Convergent and discriminant validity were established based on meaningful correlations in the hypothesized directions with several constructs, including aggression, depression, self-esteem, and trait anxiety (Zimbardo & Boyd, 1999).

Twenty-five Items were retained from the original ZTPI (Table 2; Zimbardo & Boyd, 1999) in the ZTPI-TP: five PN items – 16, 22, 27, 36, and 50 (e.g., #16 – Painful past experiences keep being replayed in my mind); five PP items – 2, 7, 11, 15, and 25 (e.g., #7 – It gives me pleasure to think about my past; five PH items – 12, 17, 19, 28, and 46

(e.g., #19 – Ideally, I would live each day as if it were my last); four PF items – 37, 39, 47, and 52 (e.g., #39 – It doesn't make sense to worry about the future since there is nothing I can do about it anyway); and six F items – 6, 13, 21, 24, 40, and 56 (e.g., #13 – Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play). All authors were in agreement about the items to be retained.

Consideration of Future Consequences

The Consideration of Future Consequences Scale (CFCS; Strathman, Gleicher, Boninger, & Edwards, 1994) is a 12-item scale made up of five positively worded items and seven negatively worded items. Responses were on a 5-point Likert-type scale from 1 (= *very unlike me*) to 5 (= *very like me*). As in other studies (e.g., Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008), in this study, the positively worded items were summed to yield a CFC-F (future) score (e.g., I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes), indicating active consideration of future consequences. The negatively worded items were not reverse-scored and were summed to yield a CFC-I (immediate) score (e.g., I only act to satisfy immediate concerns, figuring the future will take care of itself), so that CFC-I scores reflect active consideration of immediate consequences or a present orientation. Strathman et al. reported internal consistency estimates for CFSC scores in college student samples ranging from 0.80 to 0.86, a 2-week test-retest reliability coefficient of .76, and a 5-week test-retest reliability coefficient of .72 (α current study = .78 for CFC-F and .81 for CFC-I).

Aggression

The Aggression Questionnaire (AQ; Buss & Perry, 1992) consists of 29 items and assesses four constructs. The verbal aggression subscale has five items (α = .72; α in the current study = .68; e.g., I often find myself disagreeing with people), physical aggression consists of nine items (α = .85; current α = .89; e.g., If somebody hits me, I hit back), anger has seven items (α = .83; current α = .85; e.g., I have trouble controlling my temper), and hostility consists of eight items (α = .77; current α = .85; e.g., I am suspicious of overly friendly strangers). Respondents use a 5-point Likert-type scale from 1 (= *very unlike me*) to 5 (= *very like me*). AQ subscales have had their strongest correlations with impulsiveness, assertiveness, and competitiveness, with anger correlating most highly with impulsiveness. Buss and Perry also reported acceptable test-retest coefficients ($.72 \leq r \leq .80$). In the present study, subscale scores were summed to yield an overall aggression score (α = .79).

Self-Esteem

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1989) is a 10-item self-report measure of global self-esteem (five items are reverse-scored). Responses are given on a 4-point Likert-type scale from 1 (= *strongly disagree*) to 4 (= *strongly agree*). RSES scores have yielded strong reliability and validity coefficients across different samples with α coefficients ranging from 0.72 to 0.83 (Gray-Little, Williams, & Hancock, 1997; α in the current study = .82; e.g., I am able to do things as well as most other people).

Relationships With Parents

The Parents Scale of the Inventory of Parent and Peer Attachment-Revised (IPPA-R; Gullone & Robinson, 2005) was used to assess adolescents' perceptions of the positive and negative affective and cognitive dimensions of relationships with their parents, particularly how well these figures serve as sources of psychological security. Responses are on a 5-point Likert-type scale from 1 (= *almost never true*) to 5 (= *almost always true*). The parental scale has 28 items that are distributed across three subscales: parental trust (10 items, α = .77; current α = .77; e.g., I trust my parents), parental communication (10 items, α = .77; current α = .84; e.g., I feel silly or ashamed when I talk about my problems with my parents), and parental alienation (8 items, α = .77; current α = .72; e.g., I don't know who I can depend on).

Psychological Well-Being in the UK

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was used to measure the levels of anxious and depressive symptomatology in the UK. As the HADS assesses cognitive symptoms, it is not influenced by the physiological impact of the student lifestyle (e.g., alcohol consumption). The HADS produces scores for anxiety (HADS-A; e.g., I can sit at ease and feel relaxed) and depression (HADS-D; e.g., I have lost interest in my appearance) on separate subscales with scores ranging from zero to 28. Scores of 11 or more on either scale indicate clinically significant levels of depression and anxiety (Crawford et al., 2001; Snaith & Zigmond, 1994). Scores on both subscales of the HADS have been shown to be valid and internally consistent (HADS-A: α = .83; HADS-D: α = .82), with equal levels of sensitivity (.80) and specificity (.80; see Bjelland et al., 2002). Internal consistency estimates in the present study were as follows: HADS-A α = .84; HADS-D α = 88.

Alcohol Use

The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) was used to assess problematic alcohol use. AUDIT is a 10-item questionnaire (e.g., How often do you have a drink containing alcohol?) with valid and reliable scores across different contexts and cultures (e.g., de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009; Reinert & Allen, 2007). When used to detect problematic alcohol use in a population of university undergraduates, AUDIT

demonstrated good sensitivity (.94) and specificity (.92; Adewuya, 2005). The reliability estimate for AUDIT scores in the present study was .83.

Psychological Well-Being in Australia

The 18-item version of the Mental Health Inventory (MHI-18; McHorney, Ware, Rogers, Raczek, & Lu, 1992; Ware, Manning, Duan, Wells, & Newhouse, 1984) was used to assess psychological well-being in Australia. Participants responded to statements across four subscales to indicate how often they have felt certain ways during the past four weeks using a 6-point scale (1 = *all of the time*, 6 = *none of the time*): depression (MHI-D, four items; e.g., Did you feel depressed?), anxiety (MHI-A, 5 items; e.g., Have you been anxious or worried?), loss of behavioral/emotional control (MHI-B, 4 items; e.g., Have you been in firm control of your behaviour, thoughts, emotions, feelings?), and positive affect (MHI-P, 4 items; e.g., Have you felt cheerful, light-hearted?). Subscale raw scores are converted to index scores with a range of 0–100, where higher scores are indicative of higher levels of the psychological construct (e.g., a higher MHI-D score indicates higher levels of depression symptomology and a higher MHI-P score indicates higher levels of positive affect). MHI-18 scores have been found to have good reliability and validity (McHorney et al., 1992; Ware et al., 1984), and the reliability estimates of subscale scores in the present study were good: MHI-D $\alpha = .91$; MHI-A $\alpha = .86$; MHI-B $\alpha = .87$; and MHI-P $\alpha = .86$.

The revised version of the Experiences in Close Relationships Questionnaire (ECR-R; Fraley, Waller, & Brennan, 2000) was used to assess adult attachment orientation. Participants responded to 36 items on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*), indicating how they felt about someone with whom they were in a relationship. Two subscale scores are calculated – attachment anxiety (ECR-Ax, 18 items; e.g., I often worry that my partner doesn't really love me) and attachment avoidance (ECR-Av, 18 items; e.g., I find it difficult to allow myself to depend on romantic partners) – both with scores ranging from 0 to 7, where higher scores indicate higher levels of attachment insecurity. ECR-R scores have been shown to have good levels of internal consistency (Fraley et al., 2000), and the reliability of the subscale scores in the present study was high (ECR-Ax $\alpha = .95$; ECR-Av $\alpha = .94$).

Procedure and Statistical Analyses

Three of the four countries in this study were English-speaking and the studies in those countries used the original ZTPI items. In Slovenia, the CFCS and ZTPI were translated into Slovenian using recommended practices (Geisinger, 2003). In addition to translating items into Slovenian and back-translating them into English, the translated items were examined to assure that the Slovenian items retained the same meaning as in English (International Test Commission, 2005). This process indicated that the Slovenian translations were satisfactory.

The ZTPI was included in every sample. Other measures were administered as follows. In the UK adolescent sample, self-esteem was included in eight schools (n = 735; 81%), aggression in three schools (n = 333; 36%), and parental attachment in two schools (n = 133; 15%). The Australian study included problematic alcohol use (n = 371; 53%), psychological well-being (n = 213; 31%), and adult attachment orientation (n = 463; 66%), and the Slovenian study included consideration of future consequences. Finally, the UK university study included an assessment of anxiety and depression. Participants in the two UK samples completed paper-and-pencil surveys in their home classrooms, and participants in the US samples completed paper-and-pencil surveys on their own time and returned them to the classroom. The Australian and Slovenian participants completed the survey online.

Model fit was assessed using both CFAs and exploratory structural equation modeling (ESEM) in Mplus 7 (Muthén & Muthén, 1998–2012) with the MLM estimator to account for departure from multivariate normality. ESEM (see Asparouhov & Muthén, 2009) integrates confirmatory and exploratory factor analysis (Weisner & Schandling, 2013). However, ESEM differs from standard CFA in that all factor loadings are estimated, while observing various constraints necessary for model identification, and factor loading matrices can be rotated. Marsh et al. (2009) have argued that ESEM is a viable alternative to CFA for psychological scales composed of indicators with many nonzero cross-loadings.

Also referred to as the Satorra-Bentler χ^2, the MLM maximum likelihood parameter estimates with standard errors and a mean-adjusted chi-square (χ^2) test statistic that is robust to non-normality. We assessed a five-factor model for the ZTPI (56 items) and the ZTPI-TP (25 items). An oblique geomin rotation, as recommended by Marsh et al. (2009), with an epsilon value of 0.5 and ML estimation were used in all ESEM analyses. These options are recommended when there are more than four response categories (Beauducel & Herzberg, 2006) and data may not be normally distributed (Bentler & Wu, 2002).

The indices used to test model fit were χ^2, CFI, the Tucker-Lewis index (TLI), RMSEA, and SRMR. Although Hu and Bentler (1999) have recommended stringent cut-offs for fit indices (i.e., > .95 for CFI and TLI, < .06 for RMSEA, and < .08 for SRMR), Perry and colleagues (2013) suggested that strict adherence to these cut-off values often leads to erroneous results, as factor loadings in social sciences are typically lower (see, e.g., Heene, Hilbert, Draxler, Ziegler, & Bühner, 2011; Marsh, Hau, & Wen, 2004). We also

Table 1. CFA and ESEM fit indices for ZTPI scores

	$\chi^2_{s\text{-}b}$	*df*	CFI	TLI	SRMR	RMSEA (90% CI)
CFA						
American sample	4,484.84*	1,474	.65	.63	.08	.050 (.048, .052)
Australian sample	4,297.11*	1,474	.61	.59	.08	.058 (.055, .059)
British adolescent	4,517.21*	1,474	.71	.70	.07	.048 (.046, .049)
British University	3,629.35*	1,474	.66	.65	.08	.057 (.054, .059)
Slovenian sample	3,789.61*	1,474	.65	.63	.10	.060 (.058, .063)
ESEM						
American sample	3,100.73*	1,270	.82	.79	.04	.041 (.040, .044)
Australian sample	2,843.40*	1,270	.81	.77	.04	.047 (.044, .048)
British adolescent	3,068.98*	1,270	.85	.82	.04	.040 (.038, .041)
British University	2,832.84*	1,270	.78	.73	.04	.052 (.049, .055)
Slovenian sample	2,678.21*	1,270	.82	.78	.04	.050 (.048, .054)

Notes. ZTPI = Zimbardo Time Perspective Inventory; CFA = Confirmatory Factor Analysis; ESEM = Exploratory Structural Equation Modeling. *$p < .05$.

Table 2. Number of standardized estimates > .50 for CFA and ESEM analyses for ZTPI scores

	American (*n* = 815)		Australian (*n* = 653)		British adolescent (*n* = 913)		British University (*n* = 455)		Slovenian (*n* = 425)	
	CFA	ESEM	CFA	ESEM	CFA	ESEM	CFA	ESEM	CFA	ESEM
PN (10 items)	5	4	6	0	4	4	7	7	9	4
PP (9 items)	4	3	4	3	5	5	4	4	4	4
PF (9 items)	3	3	3	0	3	1	4	4	3	3
PH (15 items)	2	2	4	3	4	2	7	4	8	2
F (13 items)	4	3	3	3	6	4	7	4	7	6

Notes. ZTPI = Zimbardo Time Perspective Inventory; PN = Past Negative; PP = Past Positive; PF = Present Fatalistic; PH = Present Hedonistic; F = Future.

examined standardized parameter estimates. 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). Additionally, Spearman's ρ correlations were computed between time perspective measures and other psychosocial measures. These latter analyses were performed in SPSS V.20.

Results

Structural Validity Analyses

Table 1 displays the results of both CFA and ESEM model fit analyses for scores on the 56-item ZTPI. Results of the CFAs yielded mixed results. The SRMR and RMSEA values in the ESEM analyses were good; however, the CFI and TLI values were well below the minimally acceptable (> .90) threshold. Table 2 summarizes the numbers of items among the original 56 which loaded > .50 in all five samples in both analyses. Fewer than half of the 56 items met this criterion, with percentages doing so in each sample as follows for CFAs/ESEMs: British Adolescent = 39.3/28.6%; American = 32.1/26.8%; Australian = 35.7/16.0%; Slovenian = 55.4/33.9%; British University = 41.1/33.9%.

Table 3 displays the results of both CFA and ESEM model fit analyses for scores on the 25-item ZTPI-TP. Results of the CFAs revealed poor fit for the data. However, results for the ESEM models were all good (< .08/.05) for the SRMR and RMSEA values, and acceptable (> .90) to good (> .95) for the CFI values. Moreover, in these models, substantive cross-loadings (i.e., > .30) were rare. The British Adolescent sample did not have any cross-loadings. The American, and Australian, and British University samples yielded just two cross-loadings each, and the Slovenian sample had three. All samples converged with the exception of the British University sample in ESEM analysis, in which Item 39 created a linear dependency. Consequently, this item was removed from this particular model to enable convergence and model estimation. Table 4 summarizes the numbers of items which loaded > .50 in all five samples in both analyses. As can be seen, on only one occasion (CFA in Slovenian sample) did all items load > .50 on their hypothesized factor. Loadings for the PH and PF factors were particularly problematic.

Running invariance analyses on models that fail to achieve satisfactory model fit is counterintuitive, as the increasingly constrained models will further harm model fit. However, to examine the relative strengths of the original and temporal-phrasing scores across national contexts, we conducted invariance testing on the ZTPI and the ZTPI-TP. Invariance was assessed across all five samples (N = 3,261). First, configural invariance was assessed by replicating the CFA-ICM (independent cluster model) across all samples. Second, factors were constrained to test

Table 3. CFA and ESEM fit indices for ZTPI-TP scores

	$\chi^2_{s\text{-}b}$	*df*	CFI	TLI	SRMR	RMSEA (90% CI)
CFA						
American sample	1,304.80*	265	.64	.60	.08	.069 (.066, .073)
Australian sample	912.76*	265	.77	.74	.07	.062 (.057, .066)
British adolescent	1,157.40*	265	.71	.67	.07	.060 (.057, .064)
British University	730.00*	265	.76	.73	.07	.062 (.057, .067)
Slovenian sample	929.53*	265	.69	.65	.11	.078 (.071, .082)
ESEM						
American sample	496.63*	185	.91	.86	.03	.047 (.041, .050)
Australian sample	339.03*	185	.95	.93	.03	.038 (.030, .042)
British adolescent	368.35*	185	.95	.92	.02	.035 (.028, .038)
British University	347.26*	166[a]	.91	.86	.03	.049 (.042, .056)
Slovenian sample	340.42*	185	.94	.90	.03	.044 (.037, .052)

Notes. ZTPI-TP = Zimbardo Time Perspective Inventory-Temporal Phrasing; CFA = Confirmatory Factor Analysis; ESEM = Exploratory Structural Equation Modeling.
[a]Item 29 created a linear dependency in this model and was removed to enable convergence. *$p < .05$.

Table 4. Number of standardized estimates > .50 for CFA and ESEM analyses for ZPTI-TP scores

	American (*n* = 815)		Australian (*n* = 653)		British adolescent (*n* = 913)		British University (*n* = 455)		Slovenian (*n* = 425)	
	CFA	ESEM	CFA	ESEM	CFA	ESEM	CFA	ESEM	CFA	ESEM
PN (5 items)	3	2	3	4	3	3	3	3	3	2
PP (5 items)	2	3	3	2	2	2	3	2	5	3
PF (4 items)	0	0	1	1	0	0	3	1	3	1
PH (5 items)	0	0	1	1	1	0	4	0	1	2
F (6 items)	3	2	2	3	3	3	2	2	3	3

Notes. ZTPI-TP = Zimbardo Time Perspective Inventory-Temporal Phrasing; PN = Past Negative; PP = Past Positive; PF = Present Fatalistic; PH = Present Hedonistic; F = Future.

Table 5. Invariance analyses of ZTPI and ZTPI-TP scores

Model	χ^2	*df*	$\Delta\chi^2$	Δdf	CFI	TLI	SRMR	RMSEA (90% CI)
56-Item ZTPI								
Configural invariance	20,539.93*	7,370	–	–	.674	.660	.080	.052 (.052, .053)
Metric invariance	21,525.91*	7,574	985.98	204	.655	.649	.085	.053 (.052, .054)
Scalar invariance	26,511.23*	7,778	4,985.32	204	.537	.542	.091	.061 (.060, .062)
Residual invariance	27,323.07*	7,798	811.84	20	.517	.523	.104	.062 (.061, .063)
25-Item ZTPI-TP								
Configural invariance	5,053.77*	1,325	–	–	.712	.674	.080	.066 (.064, .068)
Metric invariance	5,433.40*	1,405	379.63	80	.689	.668	.084	.066 (.064, .068)
Scalar invariance	6,916.61*	1,485	1,483.21	80	.581	.577	.092	.075 (.073, .077)
Residual invariance	7,699.26*	1,505	782.65	20	.522	.524	.110	.079 (.078, .081)

Notes. ZTPI = Zimbardo Time Perspective Inventory; ZTPI-TP = Zimbardo Time Perspective Inventory-Temporal Phrasing. *$p < .001$.

metric invariance. Third, we examined scalar invariance by constraining factors and item intercepts. Finally, residual variance was tested by factors, item intercepts, and factor means. Results are displayed in Table 5. As can be seen, CFI and TLI indices were poor, the SRMR and RMSEA were marginal, providing no support for configural invariance. Model invariance is supported by little or no change in model fit on the increasingly constrained models. Cheung and Rensvold (2002) suggested $\Delta CFI \leq .01$, although Meade, Johnson and Braddy (2008) recommended a much stricter criterion of $\Delta CFI \leq .002$ to support invariance. Even by the more liberal criterion proposed by Cheung and Rensvold, ZTPI and ZTPI-TP scores did not achieve even weak invariance across the samples.

Internal Consistency for ZTPI-TP Scores

Table 6 displays the results of internal reliability (α and ω) estimates for scores on the five factors of the ZTPI-TP. Overall, these reliability estimates were modest to moderate and generally similar. Employing a value of .60 as acceptable, only 12 of the 25 alpha coefficients and 15 of the omega coefficients were acceptable and only PN scores

Table 6. Alpha (α) and Omega (ω)[a] estimates for ZTPI-TP scores

	PN		PP		PF		PH		F	
	α	ω	α	ω	α	ω	α	ω	α	ω
British adolescent	.63	.64	.63	.67	.26	.31	.50	.47	.67	.67
American	.72	.72	.57	.60	.44	.44	.44	.43	.63	.63
Australian	.76	.77	.72	.73	.46	.47	.45	.43	.63	.63
Slovenia	.78	.79	.66	.68	.50	.51	.61	.60	.55	.54
British University	.73	.74	.48	.69	.38	.58	.48	.42	.47	.64
Median values	.73	.77	.63	.68	.44	.47	.48	.43	.63	.63

Notes. ZTPI-TP = Zimbardo Time Perspective Inventory-Temporal Phrasing; PN = Past negative; PP = Past Positive; PF = Present Fatalistic; PH = Present Hedonistic; F = Future.
[a]Omega estimates are based on the coefficients from the confirmatory factor analyses (CFAs).

Table 7. Concurrent validity correlations ($p < .01$) for ZTPI-TP scores

	Past negative	Past positive	Present fatalistic	Present hedonistic	Future
Slovenia					
Con. of future consequences-immediate	–	–	.42	.25	−.44
Con. of future consequences-future	–	–	–	–	.37
British University					
HADS-Anxiety	.33	–	–	–	–
HADS-Depression	.32	–	.22	–	−.26
AUDIT-Alcohol use disorders	–	–	.20	.24	−.28
Australia					
MHI-Anxiety	.57	−.44	.30	–	–
MHI-Depression	.57	−.37	.31	–	–
MHI-Behavioral/emotional control	.53	−.42	.33	–	–
MHI-Positive affect	−.54	.48	−.32	.25	–
AUDIT-Alcohol use disorders	.19	–	.15	–	−.18
ECC-R-Attachment anxiety	.44	−.20	.29	.13	–
ECC-R-Avoidance anxiety	.27	−.20	.20	–	–
British adolescent					
Parental attachment	−.34	–	−.25	–	.33
Self-Esteem	−.35	–	–	–	–
Aggression	.38	−.28	.31	–	−.32

Notes. ZTPI-TP = Zimbardo Time Perspective Inventory-Temporal Phrasing; Con = Consideration; HADS = Hospital Anxiety and Depression Scale; AUDIT = Alcohol Use Disorders Identification Test; MHI = Mental Health Inventory; ECC-R = Revised Experiences in Close Relationships Questionnaire.

showed evidence of acceptable internal consistency across the five samples. Internal consistency estimates were acceptable in three or four samples for PP and F scores, and in one sample for PH scores. PF scores, which were based on only four items, did not achieve an acceptable internal consistency in any sample (see Table 6).

Concurrent Validity for ZTPI-TP Scores

In the final set of analyses, we examined the relationship of ZTPI-TP subscale scores to other psychological constructs. Table 7 includes all correlations that were statistically significant at the .01 level, although we only interpret correlations that had medium effect sizes (i.e., $\geq$ .30). In the Slovenian sample, PF scores were positively related to immediate consequences and F scores were positively related to future consequences and negatively related to immediate consequences. In the British University sample, PN scores had positive relationships with anxiety and depression scores. The other significant correlations had theoretically congruent relationships but were less than .30.

In the Australian sample, PN and PF had meaningful positive correlations with anxiety, depression, and behavioral/emotional control, and meaningful negative correlations with positive affect, although the PN correlations were substantially higher (> .20) than the PF correlations. PP scores were meaningfully related to these same four constructs, but positively related to positive affect and negatively related to anxiety, depression, and behavioral/emotional control. The only other meaningful correlation in the Australian sample was a positive relationship between PN scores and attachment anxiety. Finally, in the British Adolescent sample, PN was negatively related to parental attachment and self-esteem, but positively related to aggression. PF was positively related to aggression, and F was positively related to parental attachment and negatively related to aggression. PH did not have meaningful associations with any measures.

Discussion

A growing body of research has raised questions about the psychometric properties of ZTPI scores (e.g., Crockett et al., 2009; Shipp et al., 2009; Worrell & Mello, 2007), with authors reporting a variety of factor solutions and problems with particular items. In response, a number of attempts have been made to create shortened forms of the scale through data-driven methods (e.g., Sircova et al., 2014; Zhang et al., 2013). However, these short forms have generally not been supported in subsequent analyses (e.g., McKay, Worrell, et al., 2014; McKay et al., 2015). In the present study, we employed a theoretical rationale based on previous criticisms of ZTPI item content and tested a shortened form of the scale – the ZTPI-TP – which contained 25 items that included only temporal phrasing. The totality of results suggests that this version of the ZTPI might be considered an answer, but not the definitive answer to the psychometric and theoretical issues within the ZTPI.

Psychometric Properties of ZPTI and ZTPI-TP Scores

First of all, using CFA, results of factorial validity for the full 56-item version of the scale were suboptimal with the highest CFI and TLI values falling well short of the threshold of acceptable fit. The CFI and TLI indices improved with the use of ESEM, although the values were all still suboptimal. Factorial validity results for the ZTPI-TP using CFA were also poor. However, with the use of ESEM, fit indices for ZTPI-TP scores in all five samples were adequate to good. Additionally, the concurrent validity of this shortened temporal-phrasing version could be described as moderate to good, with ZTPI-TP scores having correlations in the expected directions with constructs correlated with ZTPI scores (see Zimbardo & Boyd, 1999) across four of the five samples. These findings suggest that there are at least two problems with ZTPI scores. First, they are measuring multiple constructs as critics have suggested, and second, their variance is distributed across too many constructs. Removing the non-temporal items solves the first problem, but not the second, which is why the ESEM fit indices are so much better than CFA fit indices for ZTPI-TP scores, but not for ZTPI scores.

A third concern is internal consistency. The reliability coefficients for ZTPI-TP scores differed substantially by factor. Even employing a low minimum threshold for internal consistency, the results did not provide support for the PH and PF factors and provided modest support for the PP and F factors. In only one case, PN, there was an α value greater than .60 across all five samples, with alphas for scores on four of the five samples > .70. Elsewhere, Streiner (2003) highlighted (a) that Cronbach's α values are directly influenced by the number of items used (such that it is more difficult to achieve a higher α with fewer items), and (b) that higher and lower Cronbach's α values can be the result of the topic under investigation. Taking the example of the ZTPI-TP, and the breadth of its item content, a person might endorse PN16, "Painful past experiences keep being replayed in my mind" (indicating having suffered negative experiences), but not PN27, "I've made mistakes in the past that I wish I could undo" (indicating that they have not, in their view, made regrettable mistakes). However, omega estimates, which are based on factor coefficients, also reveal concern with the internal consistency of ZTPI-TP subscale scores.

One issue is that ZTPI items tap a broad range of behaviors, attitudes, and cognitions. Nonetheless, items are attempting to capture the same construct on a single factor need to meet a minimum threshold of internal consistency to allow for replication of results (Thompson, 2003) and for interpreting inferences based on the scores (American Educational Research Association et al., 2014). Moreover, four to six items on a well-constructed scale can produce alpha estimates in the .70–.90 range (e.g., the constructs used for concurrent validity in this study).

Conclusion and Future Research

As in much of the literature on the ZTPI, four of the samples in this study were samples of convenience and instruments were administered in different ways. Although these differences might be limitations in another study, given the broad claims being made for ZTPI scores (Sircova et al., 2014), this diversity of samples and approaches is a strength in the current study. Given the results of this study, we are not in a position to recommend use of the ZTPI-TP as yet another shortened version of the ZTPI. Rather, we suggest using the ZTPI-TP items alone as the basis for the revision of the ZTPI, given its existing widespread use, and that consideration be given to the addition of new items that complement the more robust current ones. A longer scale consisting of carefully-selected, time-focused items may yield more acceptable CFA results and stronger internal consistency estimates. The popularity of the ZTPI in the time perspective literature highlights the need for scales that assess all three time periods, and the interest in time perspective is likely to grow, given recent studies highlighting its utility and predictive validity with a variety of constructs (e.g., Joireman et al., 2012; McKay, Andretta, et al., 2014).

Shipp et al. (2009) described time perspective as an overarching construct within which other more narrow constructs existed, and Lasane and O'Donnell (2005) underlined the fact that the construct has cognitive, affective, and behavioral dimensions (cf. Zimbardo & Boyd 1999). However, it may be that time perspective is so broad that

the singular measurement of it is too ambitious. Thus, the creation of latent variables based on scores on more specific aspects of time perspective (e.g., temporal depth, time attitudes, consideration of future consequences, temporal focus, possible selves) may be a more robust way to assess this more overarching construct.

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Frank C. Worrell
Cognition and Development
4511 Tolman Hall, #1670
University of California
Berkeley, CA 94720-1670
USA
Tel. +1 (510) 643-4891
E-mail frankc@berkeley.edu

