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"Even a broken clock is right twice a day": The case of the Zimbardo Time Perspective Inventory

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ABSTRACT

The number of ways in which Zimbardo Time Perspective Inventory (ZTPI) scores are operationalized has increased, and scores have begun to be used in clinical settings. A recent systematic review outlined how one operationalization, the deviation from a balanced time perspective (DBTP), was significantly associated with a range of outcomes. The review called for further investigation into the DBTP approach. Subsequently, a revised DBTP metric, the DBTP-R has been suggested. Using data from British, American, Japanese, and Slovenian samples, we asked several questions in the current study. First, we examined the structural validity of ZTPI scores using both traditional and auto-regressive approaches to see if context affects scoring. Consistent with the extant literature, results revealed serious problems with overall model fit for ZTPI scores. Then, we investigated the relationship between the DBTP and DBTP-R operationalizations of ZTPI scores and scores on a range of criterion variables. Although, broadly speaking, a DBTP score was significantly related to a range of other measures (adjusted for age and sex), results varied by sample and by outcome. DBTP-R models explained slightly more variance than DBTP models, and standardized beta values suggested that DBTP-R scores relate to criterion variables slightly more strongly than DBTP scores.

1. Introduction

The last decade has seen a surge in studies investigating the measurement and conceptualization of the construct broadly known as *time perspective* (e.g., Davis & Cernas-Ortiz, 2017; Sircova et al., 2014; Worrell et al., 2018). With over 1450 Scopus citations, the Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999) is, by some distance, the most widely used measure of time perspective. The ZTPI measures time perspective in five domains and ZTPI scores have been found to relate to a wide range of criterion variables, including life satisfaction and subjective well-being (Rönnlund & Carelli, 2018) and mental health (McKay et al., 2016a; Oyanadel & Buela-Casal, 2014). Additionally, ZTPI scores are being used in clinical practice (Sword et al., 2015).

1.1. Measurement and psychometric concerns

Despite its widespread use, concerns about the psychometric properties of the ZTPI remain (e.g., Davis & Cernas-Ortiz, 2017; Worrell et al., 2018), resulting in multiple, sample-specific shortened ZTPI versions (e.g., Orkibi, 2015; Orosz et al., 2017). The vast majority of studies that have examined the psychometric properties of the ZTPI have done so using independent clusters confirmatory factor analysis (IC-CFA). Recently, Ozkok et al. (2019) introduced the idea of autoregressive CFA (AR-CFA) in order to overcome what they described as "context effects" to item responses. Based on the extant literature (Krosnick, 1999; Schwarz, 2007), Ozkok et al. argued that when answering questionnaire items, respondents engage in a mental process involving a number of steps: (a) they must interpret the meaning of an item, (b) they retrieve

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beliefs or feelings relevant to the item, (c) they apply these to the individual item, and (d) they select a suitable response.

Traditional CFA approaches using IC-CFA do not allow for context effects, that is, responses to items being influenced by the order in which the items are responded to. Another issue is that IC-CFA characterises all non-zero cross loadings, regardless of how negligible they might be, as misspecifications. In most multidimensional psychology measures, expecting cross loadings to be zero is unrealistic. Although AR-CFA addresses the sequential process challenge, it does not account for the overly strict treatment of negligible cross-loadings as misspecifications. Exploratory Structural Equation Modelling (ESEM; Asparouhov & Muthén, 2009) addresses this latter concern and is being used more frequently to examine scores on multidimensional measures (e.g., McKay et al., 2016b).

Often however, the default, geomin rotation is used. Marsh et al. (2014) pointed out that ESEM is typically used in a confirmatory rather than exploratory sense and therefore, a target rotation is more appropriate, where cross-loadings are targeted to be zero rather than forced. This method outperforms the default geomin rotation for accuracy in Monte Carlo samples (Myers et al., 2016). Unfortunately, it is not possible to fit an autoregressive modelling approach with ESEM, as residual variances of indicators for EFA factors cannot be fixed in the way that would happen in a CFA. Previous examinations of some of these ZTPI scores with IC-CFAs and ESEMs have yielded poor fit and this pattern of results was expected. Our hypothesis was that better fit would be obtained by using AR-CFA models in all samples and ESEM models in samples where these had not been previously used.

One potential consequence of "context effects" is that responses to questionnaire items are influenced by mental representations activated in the response to previous items (Schwarz, 1999). It is possible that this might lead to more consistent responses to subsequent items, perhaps in the context where subsequent items are similar to the items answered previously (carryover effects; Etzel et al., 2021), or to more polarized responses, particularly where items are dissimilar to those previously answered (contrast effects; Etzel et al., 2021). We suggest that these effects are potentially at play in the ZTPI, and may result in psychometric biases as the cognitive processes employed to respond to a given item may influence the responses to subsequent items. Take the example of Items #15 and #16. Item #15 says, "*I enjoy stories about how things used to be in the 'good old times*'" (past positive). This is immediately followed by Item #16, '*Painful past experiences keep being replayed in my mind*' (past negative). It is entirely possible that a response to Item 16 could be moderated by having previously been primed to consider 'good' past memories. Given the constant switching between time frames in responding to ZTPI items, it seems plausible that these context effects might justifiably impact on responses to the ZTPI in its totality. The present study is the first to examine responses to ZTPI items using AR-CFA.

1.2. Application of ZTPI scores

Additional to on-going concerns about model fit are uncertainties about the operationalization of ZTPI scores. There is an increasing body of literature on the notion of a *balanced time perspective*, and relatedly, the way in which deviation from this balance is maladaptive (for a review, see Stolarski et al., 2020). Although the balanced time perspective (BTP) is defined as the ability to switch effectively between temporal horizons in response to situational and environmental demands, *balance* is said to be represented by relatively high scores on past positive, present hedonistic, and future and relatively low scores on past negative and present fatalistic.

After a variety of attempts to operationalize *balance* (Boniwell et al., 2010; Drake et al., 2008), Stolarski et al. (2011) introduced the deviation from a balanced time perspective (DBTP) approach. The DBTP approach relies on the use of two mean scores for each of the five ZTPI dimensions. The first is the observed (empirical) mean for each of the five ZTPI dimensions in a given sample or for a particular individual. The second is the hypothesized ideal (balanced) mean for each ZTPI dimension. These ideal mean scores were first developed based on scores from Zimbardo and Boyd's (2008) cross-cultural database. The ideal values employed were subsequently amended in 2012, again using scores from Zimbardo and Boyd's database (www.thetimeparadox.com/surveys) to be as follows: $M_{\text{Past Positive}} = 3.67$; $M_{\text{Past Negative}} = 2.10$; $M_{\text{Present Hedonistic}} = 4.33$; $M_{\text{Present Fatalistic}} = 1.67$; $M_{\text{Future}} = 3.69$ (means can range from 1 to 5). Using these mean scores, a DBTP value is derived as follows: $\text{DBTP} = \sqrt{({}_{o}\text{PP} - {}_{e}\text{PP})^2 + ({}_{o}\text{PN} - {}_{e}\text{PN})^2 + ({}_{o}\text{PH} - {}_{e}\text{PH})^2 + ({}_{o}\text{PF} - {}_{e}\text{PF}^2) + ({}_{o}\text{F} - {}_{e}\text{PF}^2)}$, where $_o$ is the ideal mean ZTPI dimension score and $_e$ is the observed mean value.

The present study is a secondary analysis of existing data, and to this extent is somewhat hampered by the prior selection of criterion variables. However, the relationship between time perspective and scores on the criterion variables herein has previously been examined elsewhere. A significant and meaningful relationship between scores on a variety of time perspective measures, and self-reported alcohol use has been observed across a range of studies (e.g., Barnett et al., 2013; Beenstock et al., 2011; Cole et al., 2016; Linden et al., 2014; Wells et al., 2018). In a study using the ZTPI as well as measures of time attitudes, consideration of future consequences, and temporal focus (McKay et al., 2018), we had previously reported that scores on the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) were meaningfully related to a range of temporal factors, but that, in terms of effect sizes, the relationship was relatively high between AUDIT score and scores on ZTPI present hedonistic and present fatalistic.

There is an extensive literature on the relationship between future time orientation and academic outcomes. These have essentially indicated that a higher future time perspective is significantly associated with school investment (e.g., De Bilde et al., 2011; Peetsma & Van der Veen, 2011) and the use of meta-cognitive learning strategies (e.g., De Bilde et al., 2011). For example, Peetsma (2000) reported that future time perspective in the domains of school career and professional career is a good predictor of school investment. In a meta-analysis of future time perspective studies, Andre et al. (2018) reported a modest association between future time perspective and educational outcomes ($r = 0.24$). Of note, these authors also reported a stronger association when the future time perspective construct included cognitive, affective, and behavioural aspects (as is the case with the ZTPI), rather than cognition or affect items only.

A detailed rationale for the potential relationship between sleep and time perspective is given by Rönnlund and Carelli (2018). Briefly, it is argued that both past negative and future negative time perspectives are related to processes which in turn interfere with sleep, namely rumination (e.g., Yeh et al., 2015) and worry (Kirkegaard Thomsen et al., 2003). Rönnlund and Carelli (2018) reported that in a sample of older adults ($N = 437$), scores on both past negative and future negative time perspectives were significantly related to self-reported sleep, adjusted for sex, age, and work status. These authors also highlighted the lack of comparable studies in the extant literature, and called for further investigation of the relationship between self-reported sleep and time perspective. Previous studies have also attested to the significant and meaningful relationship between both negative ZTPI dimensions and DBTP scores on the one hand, and scores on life satisfaction (Muro et al., 2017; Orkibi, 2015; Orkibi & Dafner, 2016; Rönnlund & Carelli, 2018) on the other.

Finally, for some researchers, subjective life expectancy has been conceptualized within the broader domain of time perspective using single question approaches concerning predicted longevity as a measure of future time perspective (FTP; e.g. Adams & Nettle, 2009; Wardle & Steptoe, 2003). However, research has revealed only small correlations between SLE and scores on future time perspective scales (e.g. Adams & Nettle, 2009), suggesting that although conceptually related, they are measuring different things (similar to the relationship between temporal depth and focus discussed previously). Elsewhere, (Wells et al., 2018),

we demonstrated that remaining in a positive time attitudes profile over two years in early adolescence was associated with a greater subjective life expectancy.

1.3. DBTP or DBTP-R?

More recently, Jankowski et al. (2020) proposed another set of optimal mean values for ZTPI dimensions in their development of the DBTP-R: $M_{\text{Past Positive}} = 5.0$; $M_{\text{Past Negative}} = 1.0$; *M*Present Hedonistic = 3.4; *M*Present Fatalistic = 1.0; *M*Future = 5.0. Based on the proposed mean values, these authors essentially made the ideal score more *extreme* for four of the five subscales. For example, the ideal mean past positive value has been changed from 3.67 to 5.00. However, the revised formula again seems intuitive insofar as (taking past negative as an example) the former equation using values from Zimbardo and Boyd's database, suggests that a mean past negative score of 2.10 is *more* adaptive than a past negative mean score of 1.0 (see McKay & Worrell, 2020).

The DBTP-R values are also an implicit acknowledgement that the idea of a balanced time perspective is less about psychological functioning and more about the association between ZPTI subscale scores and adaptive and maladaptive constructs. Take self-esteem and anxiety as examples of positive and negative constructs. Any derived score from these two constructs that included higher values of self-esteem and lower values of anxiety would result in positive associations with adaptive constructs such as life satisfaction and negative associations with constructs such as depression. Thus, for the DBTP-R score, the "positive" subscales (Past Positive and Future) are set at the highest possible value, the negative subscales (Past Negative and Present Fatalistic) are set at the lowest possible value, and Present Hedonism, which can be positive or negative, depending on context is set near the midpoint. We thus hypothesize that the DBTP-R scores would result in stronger associations with constructs, although the size of the differences with DBTP outcomes might not be substantial given the psychometric concerns with the ZTPI scores on which both derived scores are based.

2. Method

2.1. Participants

Participants in the United Kingdom (UK) *adolescent* 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. Schools were asked to provide one middle academic ability class group from each of school years 8 through 12.

Participants in the United States (U.S.) *adolescent* sample were 816 middle and high school students (aged 11–18 years; 46.6% male) attending a summer program for academically talented youth 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. Data collection in both countries was approved by the respective institutional review boards.

Participants from Japan were undergraduate students ($N = 220$; Male = 57 [25.9%]; $M_{\text{age}} = 20.95$ [$SD = 0.73$]) recruited from a University in urban area of Japan. Most of participants were enrolled in their 3rd year (2nd = 1 [0.5%], 3rd = 190 [86.4%], and 4th = 29 [13.2%]).

Participants in the Slovenian sample were a general population sample ($N = 424$; Male = 126 [29.7%]; $M_{\text{age}} = 20.80$ [$SD = 3.69$]), recruited as part of a student project. There were no incentives offered for participation in any case, and the study in Japan was approved by the University ethics committee. The Slovenian study was conducted in accordance with the national and institutional guidelines; ethical review and approval was not required.

2.2. Measures

The ZTPI (Zimbardo & Boyd, 1999) consists of 56 items across five subscales, with responses on a 5-point scale (1 = *very untrue of me*, 5 = *very true of me*): Past Positive (PP; 9 items; e.g., "It gives me pleasure to think about my past"), Past Negative (PN; 10 items; e.g., "I often think of what I should have done differently in my life"), Present Hedonistic (PH; 15 items; e.g., "Taking risks keeps my life from becoming boring"), Present Fatalistic (PF; 9 items; e.g., "Fate determines much in my life"), and Future (F; 13 items; e.g., "I make lists of things to do"). A higher mean score indicates a stronger endorsement of the construct. Reliability estimates have been stronger in adult samples (Zimbardo & Boyd, 1999) than in adolescent samples (Worrell & Mello, 2007), and structural validity evidence has been mixed (Worrell et al., 2018). However, there is stronger evidence of convergent and discriminant validity (Zimbardo & Boyd, 1999).

The Adolescent Alcohol Involvement Scale (AAIS; Mayer & Filstead, 1979) is a 14-item self-report screening measure for alcohol abuse in adolescents. It is a compilation of previously verified indicators of alcohol misuse. It functions as a research tool which helps identify adolescents whose alcohol use impacts adversely on psychological functioning, social relations, or family life. Questions are answered on a scale allowing for a highest possible score of 79. Total scores offer the following range of categories: abstainers = 0; normal (those who rarely drink) adolescents = 1–19; adolescents who drink but do not experience problems = 20–41; alcohol misusers = 42–57; alcoholic-like drinkers = 58–79. In the current study, due to low numbers in some categories, these were collapsed to *abstainers* = 0, *non-problematic drinkers* = 1–41, and *problematic drinkers* = 42–79.

For Subjective Life Expectancy (SLE), participants in the Northern Ireland sample answered a single question concerning their subjective probability of living to age 75 years. Age 75 years was chosen as it represents a minimum life expectancy for Northern Ireland residing males and females (Northern Ireland Statistics and Research Agency, 2015). Participants were asked, "On a scale of 0 to 100, where 0 equals no chance, and 100 equals definitely, how likely do you think that it is that you will live to be 75 years old?" Integer options (0, 5, 10, 15, 20, … 95, 100) were available between 0 and 100. This SLE assessment is similar to that used in other studies (e.g., Adams & Nettle, 2009; Wardle & Steptoe, 2003).

In the U.S. sample, participants were asked, "How many hours do you sleep each night on average?" Additionally, students reported their latest grade point average (GPA).

The Satisfaction with Life Scale (SWLS; Diener et al., 1985) was used in the Japanese study; it measures life satisfaction using five items (e.g., "The conditions of my life are excellent") rated on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*). The Japanese version of the SWLS, translated by Sumino (1994), was used in the present study. Sumino (1994) provided evidence for reliability and validity of scores for the Japanese version. The Life Satisfaction questions in the Slovenian study were taken from the nationwide research Youth 2010 Study (Lavrič, 2011). They were general questions rated on 5-point scale (1 = *I am not satisfied at all*, 5 = *I am completely satisfied*) asking about personal satisfaction with oneself, health, life in general, relationships with friends/parents/siblings, appearance.

2.3. Data analysis

Each data set was subjected to AR-CFA, and data sets that had not yet been examined with ESEM were also examined with that method. Analyses were conducted in MPlus Version 8.5 (Muthén & Muthén, 1998–2020). All models used the maximum-likelihood robust estimator to guard against deviation from multidimensional normality. For AR-CFA models, residuals for each observed variable were regressed on the preceding residual variable in the order in which they appear on the questionnaire (e.g., residual of Item 2 on residual of Item 1).

Table 1
Model fit indices for IC-CFA, AR-CFA, and ESEM-target in all samples.

Model	χ^2	*df*	CFI	TLI	RMSEA (90% CI)	SRMR	AIC	BIC
UK (n = 913)								
IC-CFA	4525.10	1474	.705	.692	.048 (.046, .049)	.069	146,433.99	147,291.37
AR-CFA	4066.56	1375	.740	.709	.046 (.045, .048)	.067	146,093.75	147,427.99
ESEM	2798.67	1270	.852	.821	.036 (.034, .038)	.035	144,826.84	146,666.83
USA (n = 815)								
IC-CFA	4491.79	1474	.643	.627	.050 (.048, .052)	.080	132,250.55	133,087.72
AR-CFA	3794.38	1375	.714	.679	.046 (.045, .048)	.075	131,597.16	132,899.94
ESEM	2653.56	1270	.836	.801	.037 (.035, .039)	.036	130,467.98	132,264.60
Slovenia (n = 424)								
IC-CFA	3749.25	1474	.637	.621	.060 (.058, .063)	.100	66,477.93	67,198.78
AR-CFA	3198.91	1375	.709	.674	.056 (.053, .058)	.095	65,979.20	67,100.97
ESEM	2408.74	1270	.818	.780	.046 (.043, .049)	.042	65,220.48	66,867.48
Japan (n = 220)								
IC-CFA	2653.47	1474	.571	.552	.061 (.057, .064)	.097	34,968.15	35,570.59
AR-CFA	2414.88	1375	.622	.577	.059 (.055, .063)	.094	34,888.83	35,826.34
ESEM	1930.12	1270	.760	.709	.049 (.044, .053)	.051	34,511.24	35,804.12

Note: IC-CFA = Intra-class confirmatory factor analysis; AR-CFA = autoregressive confirmatory factor analysis; ESEM = exploratory structural equation modelling.

Additionally, residuals within each latent variable were regressed on the residual of the preceding item from that latent variable (e.g., for the past positive latent variable, residual of Item 7 on residual of Item 2). For ESEM models, target rotation was used to target, but not force cross-loadings of zero. Model fit was adjudged using the absolute fit indices of root-mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) and incremental fit indices of comparative fit index (CFI) and Tucker-Lewis index (TLI). Following the recommendations of Perry et al. (2015), the adequacy of model fit was determined by RMSEA and SRMR being close to zero (i.e., <0.06) and CFI and TLI being close to or >0.90.

DBTP values were computed using both the 2012 DBTP and the 2020 DBTP-R formulae as described above. In the U.K. sample, DBTP scores were regressed on self-reported SLE using hierarchical regression, adjusted for year in school (proxy for age), type of school attended (Grammar [more academic focus] versus Secondary [more vocational focus]), and sex. DBTP scores were also examined in relation to AAIS scores based on the three categories, abstainers, non-problematic drinkers, or problematic drinkers. Multinomial logistic regression (reference category = non-problematic) was used to examine the relationship between alcohol-use status and DBTP, also adjusted for year in school and sex. In the analyses using Japanese and Slovenian participants, individual hierarchical regression models tested the relationship between DBTP-R and life satisfaction scores. In the U.S. sample, hierarchical regression, adjusted for age and sex, was used to examine the relationship between DBTP scores and both GPA and self-reported hours of sleep. We used Ferguson's (2009) effect size recommendations as a guide to interpreting results. All regression analyses were computed using Stata (v.16) software.

3. Results

3.1. Psychometric analyses

All samples had minimal missing data ($<0.01\%$) and no issues with outliers. Model fit indices are presented in Table 1. Model fit was unsatisfactory in all samples regardless of model. There was a marginal improvement in model fit from IC-CFA values when the AR-CFA method was applied (typical CFI increase of 0.05). The ESEM model with target rotation will always present improved model fit from CFA models by allowing more parameters to be estimated. Even so, fit was unsatisfactory for ESEM models, with many items not sufficiently loading onto their intended factor (βs < 0.30). Notwithstanding the deficits in model fit, we examined the association between DBTP-R scores and criterion variables.

3.2. U.K. validation results

Supplementary Table S1 displays the results of four hierarchical regression models examining the relationship between SLE and both operationalisations of DBTP, all adjusted for type of school attended, year in school, and sex. Of note, the overall amount of variance explained by each model was similar (adjusted $R^2 = 0.11$ and 0.09 for DBTP-R and DBTP models, respectively). In both models, type of school attended was not significantly related to SLE. Similarly, in all models, a greater SLE was significantly associated with being younger ($\beta = -0.14$ in both models) and being male ($\beta = -0.17$ [DBTP-R] and $\beta = -0.19$ [DBTP]). Although the results for both operationalisations of the DBTP were statistically significant, only the DBTP-R standardized beta of -0.23 attained Ferguson's (2009) recommended minimum threshold of 0.2, with the values for the DBTP falling short ($\beta = -0.18$).

Supplementary Table S2 displays the results of multinomial logistic regression analyses for alcohol use categories. As with SLE, the model which explained the most variance (pseudo R^2) was that employing the DBTP-R formula. Ferguson (2009) recommended an RRR value ≥ 2.0 as the minimum for practical significance. No RRR in the abstainer results attained that threshold. Results for abstainers showed that type of

school attended was non-significant in all models. Abstainers were more likely to be male, in a lower school year, and to report a lower DBTP in all models, with small effect sizes. In the comparison between non-problematic and problematic drinkers, only the RRR in models using the DBTP-R formula reached a practically significant threshold. Students engaged in problematic drinking reported a significantly higher DBTP-R with a moderate effect size (RRR $\geq$ 3.0; Ferguson, 2009). Type of school also was associated with problematic drinking with students in Secondary schools being more likely to be problematic drinkers (RRR $\geq$ 3.0) than students in Grammar schools.

3.3. U.S. validation results

Both DBTP operationalizations were significantly associated with self-reported hours of sleep and GPA in the U.S. sample, but with small effect sizes (see Table S3). With regard to hours of sleep, the amount of variance explained in all four models was small, but did reach Ferguson's (2009) minimally interpretable threshold (i.e., $R^2 \geq 0.04$). The beta values for DBTP using the 56-item ZTPI were the same for both the old and revised DBTP formulae. DBTP and DBTP-R values were similar and significantly associated with GPA, but adjusted R^2 values did not reach the minimum interpretable threshold.

3.4. Japanese and Slovenian validation results

There was a broadly similar pattern of results in both the Japanese and Slovenian samples such that in both cases, a greater amount of variance was explained by hierarchical regression models using DBTP-R ($R^2 = 0.33$ and 0.22, respectively) than for those using DBTP ($R^2 = 0.28$ and 0.16 respectively). Adjusting for sex and age, results among Japanese participants showed a significant negative relationship between DBTP-R ($\beta = -0.58$), and DBTP ($\beta = -0.54$) and life satisfaction scores. Adjusting for sex and age also, results in the Slovenian sample also showed a significant negative relationship between DBTP-R ($\beta = -0.47$), and DBTP ($\beta = -0.40$) and life satisfaction scores.

4. Discussion

Given the frequent use of the ZTPI in the extant time perspective literature, and in the context of concerns raised about the integrity of ZTPI scores (e.g., Davis & Cernas-Ortiz, 2017), we conducted an examination of the psychometric integrity of ZTPI scores using an analysis that allows for context effects, and we compared the two most recent iterations of a balanced time perspective.

4.1. Measurement concerns

The results from this study do not provide evidence in support of the factorial validity of ZTPI scores. We had hypothesized that contextual effects (previously described as carryover and/or contrast effects; Etzel et al., 2021) might be responsible for the poor fit reported for the ZTPI. It seemed intuitive that having to mentally switch between essentially opposing constructs (e.g., past negative and past positive) might have a detrimental effect on scoring. If the contextual effects of item ordering accounted for any variance, one would expect AR-CFA to present a significantly better model fit than has been observed using IC-CFA. The results however, show that AR-CFA failed to resolve model fit issues and considering results from other studies (e.g., Davis & Cernas-Ortiz, 2017; Sircova et al., 2014; Worrell et al., 2018), we conclude that the ZPTI does not match the theoretical model outlined by Zimbardo and Boyd (1999). Thus, although ZTPI scores have evidence of concurrent validity in some studies, it is not clear what these findings represent, as the ZTPI does not seem to be measuring past negative, past positive, present hedonistic, present fatalistic, and future time perspective well. In the absence of other evidence, the findings herein call the use of the ZPTI into question.

4.2. DBTP or DTTP-R?

Notwithstanding this major limitation, we compared results of the relationship between scores on criterion variables and both DBTP and DBTP-r scores. Given the recency of one of the operationalizations (Jankowski et al., 2020), this study is the first to make the latter set of comparisons. Overall, results showed that a greater DBTP was significantly associated with adolescent alcohol use, subjective live expectancy, average number of hours slept per night, GPA, and life satisfaction. However, in some cases, the effect sizes for this relationship were small and results differed both by sample and criterion variable.

The results for subjective life expectancy were clear and unambiguous. Those self-reporting a greater likelihood of living to age 75 also reported a significantly reduced DBTP, adjusted for year in school, type of school attended, and sex. Further, the two results using the DBTP-R scores (Jankowski et al., 2020) attained a minimally interpretable effect size, whereas DBTP scores did not. Therefore, the hypothesis that the DBTP-R formula would yield more robust results was supported.

A broadly similar pattern of results was observed for the alcohol-specific analyses. Here, the total amount of variance explained was higher for the model using the DBTP-R formula. In a context where alcohol use has not been found to be particularly strongly related to DBTP (Stolarski et al., 2020), these results showed that DBTP-R scores were significantly related to problematic alcohol use in a theoretically consistent way. Self-reporting as an abstainer, compared to a non-problematic drinker, was significantly related to a lower DBTP (therefore being closer to ideal), whereas self-reporting as a more problematic drinker was significantly related to a greater DBTP.

The results from the U.S. sample were less clear-cut, with no real evidence for more variance explained for any particular DBTP operationalization. It is possible that these results merely reflect the fact that neither self-reported sleep nor GPA are particularly strongly related to time perspective, or it may be that more objective operationalizations of these outcomes would yield different results. All the results showed that the relationship between DBTP and these measures was statistically significant with small effects, although the significant relationship between a lower DBTP and better sleep is in keeping with findings reported elsewhere (see Stolarski et al., 2020). Finally, the results from Japan and Slovenia also point to DBTP-R models explaining more overall variance, with DBTP-R scores being slightly more strongly related to life satisfaction scores than DBTP scores.

4.3. Broader considerations and conclusion

The results of the present study need to be understood and interpreted in the context of a broader, ongoing debate about the ZTPI, and the use of both the idea of a *balanced time perspective* and the associated DBTP. In the first instance, the psychometric properties of ZTPI scores continue to be questioned (Davis & Cernas-Ortiz, 2017; Temple et al., 2019), with sample-specific, shortened versions not yielding supportive evidence beyond the studies in which they are developed (e.g., Sircova et al., 2014; Temple et al., 2019). The internal consistency estimates for ZTPI scores in the present study were all satisfactory, perhaps because they were based on the complete original subscales. McKay and Worrell (2020) highlighted the fact that the psychometric properties of ZTPI scores were problematic in many of the manuscripts retained for the Stolarski et al. (2020) review.

Relatedly, the temporal psychology field needs to reconsider a previously asked question (McKay et al., 2019), namely, the degree to which the idea of a balanced time perspective and by extension, the DBTP, are mere exercises in empiricism. Although Zimbardo and Boyd's *balanced time perspective* idea is intuitive, this profile rarely emerges in empirical studies. Relatedly, it appears self-evident that an individual reporting low negative and high positive scores (as in the DBTP formulae) would report more adaptive functioning, with more extreme values being more adaptive as shown with the DBTP-R in this study.

However, in reality, for whom is such a situation representative? A balanced time perspective is based on a derived score and it is unlikely that there are many people reporting these scores. If the DBTP is merely measuring deviation from an unrealistic psychological reality, it is difficult to know how either DBTP or DBTP-R scores advance our understanding of human psychology. Should we create balanced profiles based on other positive and negative constructs such as self-esteem and perceived stress? Although the results of some studies seem intuitive, it is worth remembering that even a broken clock looks correct twice daily.

CRediT authorship contribution statement

Michael T. McKay: Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing. **Frank C. Worrell:** Conceptualization, Writing – original draft, Writing – review & editing. **John L. Perry:** Data curation, Formal analysis. **Yuta Chishima:** Writing – review & editing. **Urška Zivkovic:** Writing – review & editing. **Zena Mello:** Writing – review & editing. **Jon C. Cole:** Writing – review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2021.111157.

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