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Validation of Zimbardo Time Perspective Inventory Short Form in the Indian Context

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Abstract: ***The present study tried to validate the short form of Zimbardo time perspective inventory (Orosz et al.,2017), originally developed by Zimbardo and Boyd (1999) in the Indian context. 187 engineering students (159 boys and 28 girls) belonging to the School of Computer Science and Engineering, of Lovely Professional University, Phagwara, Punjab, India, were part of the study. The retained and inter-related five factors, with 16 items, using exploratory factor analysis, explained 51.313 percent of variance in the measured construct and had internal consistency reliability Cronbach's alpha of 0.671. The Greatest lower bound reliability is between (0.822,1). The extracted factors moderately represented the time perspective construct, when subjected to confirmatory factor analysis using SPSS AMOS ver.23. The result indicate the need of conducting further replication studies of the shorter version of ZTPI developed by Orosz et al. (2017) in multiple contexts and cultures for the eventual addressing of the validation related issues of Zimbardo time perspective inventory.***

Keywords: Time Perspective, Future Time Perspective, Zimbardo Time Perspective Inventory, Zimbardo Time Perspective Inventory Short Form, Zimbardo Time Perspective Inventory Indian Validation

1. Introduction

Time perspective (TP) is defined as the process using which individuals separate the passing of their personal experiences into mental time periods involving the past, the present and the future (Zimbardo and Boyd, 1999; Nuttin, 1964). The dimensions of this vital construct, influence various facets of life health (Guthrie et al. 2009; Adams and White 2009; Carstensen and Fredrickson 1998; Hall and Fong 2003; Rothspan and Read 1996), self-esteem (Worrell and Mello 2009), identity formation (Luyckx et al. 2010), stress perception (Worrell and Mello 2009; Zimbardo and Boyd 1999), use of substance (Keough et al. 1999; Wills et al. 2001) and coping (Wills et al. 2001; Beiser and Hyman 1997).

The most commonly used instrument to measure time perspective is the 56 items Zimbardo Time Perspective Inventory (Zimbardo and Boyd, 1999). It is found to be a valid tool to measure this construct with its five dimensions, Future (F), Present Fatalistic (PF), Present Hedonistic (PH), Past Positive (PP) and Past Negative (PN) in a host of countries across the world (Sircova et al., 2014). However, the tool is notorious for its volatile factorial validity across cultures (Crockett et al., 2009; Perry et al., 2015; McKay et al., 2015). This led to the emerging of a culture of developing shortened version of this scale (Temple et al., 2017).

Three recently developed short scales of time perspective are the 20 items Hebrew version which retained four items from each of the five factors of the original scale (Orkibi, 2015), the 15 items Czech and Slovak version with three items per factor (Kost et al., 2016) and the 17 items Hungarian version (Orosz et al., 2017).

The present study is intended to initiate the validation study of the latest shorter version of the "Zimbardo time perspective inventory" in a culturally diverse nation like India. The Hungarian version of ZTPI is chosen owing to the comprehensiveness of the items in covering the five known dimensions of time perspective and for its newness.

2. Method

2.1 Sample

The 17 items shortened version of the ZTPI tool was administered on 215 engineering students of computer science stream from the School of computer science and engineering, Lovely Professional University, Pahgwara, Punjab, India. After removing the 28 outliers, the total sample size was 187 consisting of 28 girls and 159 boys. The average age of these students is 19 years. The students of the study were selected using simple random sampling technique.

2.2 Measure

The Hungarian version of Zimbardo time perspective inventory had four items (22, 25, 34, 50) from the original scale belong to Past Negative factor, three items (31, 42, 46) belong to the factor Present Hedonism, three items (15, 20, 29) belong to Past Positive dimension, four items (13, 21, 40, 45) belong to Future and three items (37, 38, 39) belong to Present Fatalism dimension respectively, and removed the remaining 39 items from the full scale version of Zimbardo and Boyd (1999). The five factors were inter-related and have acceptable internal consistency reliability (0.68 – 0.73) when applied on younger and older samples, which good model fit indices (CMIN/DF=3.22, RMSEA – 0.04, CFI = 0. 953, TLI = 0.941 and SRMR = 0.039). The responses of the items range from "Very Uncharecteristic = 1" to "Very Characteristic = 5" on a five point Likert scale.

2.3 Procedure

The Head of the Department of the School of Computer Science and Engineering was contacted and a formal meeting of the research scholar with the Head was arranged. The purpose of the data collection was explained. After receiving the permission from the Head of the department, the research scholar contacted the vice-head of the department to obtain the time-table of the sections from second and third computer science engineering. On visiting the scheduled class, the faculty was informed of the purpose of the formal visit and cooperation was sought. The students were instructed about the purpose of the visit, confidentiality of the collected data and on how to fill the instrument. Post distribution of the tool, the student took fifteen to twenty minutes to fill and return the same to the researcher.

3. Results

Table 1: Descriptive Statistics of the 16 Items:

	Mean	Std. Deviation	Analysis N
ZTP1	3.3155	1.01702	187
ZTP2	3.3262	1.10983	187
ZTP3	3.2620	1.20072	187
ZTP4	2.9947	1.18457	187
ZTP5	3.4652	1.25836	187
ZTP6	3.4599	1.27095	187
ZTP7	3.3957	.98569	187
ZTP8	3.8770	.95650	187
ZTP9	3.4064	1.10986	187
ZTP10	3.9412	.96262	187
ZTP12	3.2139	1.23010	187
ZTP13	3.4652	1.08391	187
ZTP14	3.4706	1.00158	187
ZTP15	3.3529	1.25875	187
ZTP16	2.6310	1.15828	187
ZTP17	2.7914	1.25909	187

Exploratory Factor Analysis

Principal component analysis extraction method, varimax rotation method and coefficient absolute value of 0.32 were selected before running the exploratory factor analysis.

The determinant obtained was 0.077 which is well above the cut off value of 0.00001, which implied that the rest of the data was valid enough for conducting factor analysis. The KMO sampling adequacy was 0.658 and just above the cut off value of 0.6, which meant that sample subjects considered in the study were sufficient enough. The significant result of Barlett's test of sphericity, allowed further extraction of the factors from the correlation matrix S.

Six factors were extracted from the data by the SPSS Statistics software Ver. 23. Hong's Parallel analysis test was conducted to identify the factors of the variable, using Monte Carlo PCA software. It is because the eigen values of the six factors generated by SPSS were greater than the critical eigen values of the six factors generated by Parallel analysis software.

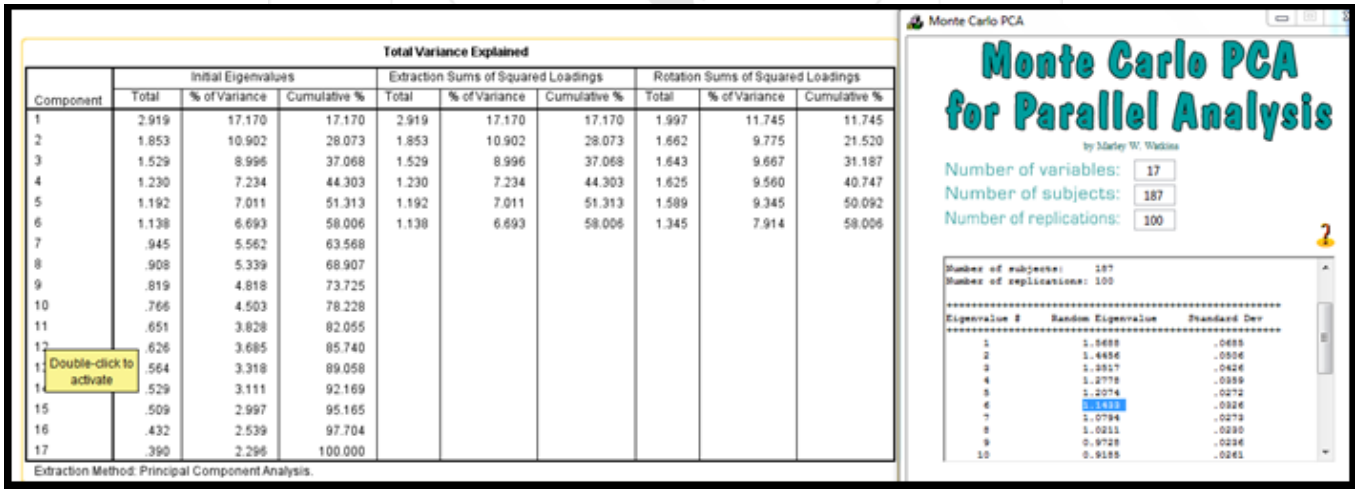


Figure 1: Hong's Parallel Analysis for Factor Extraction

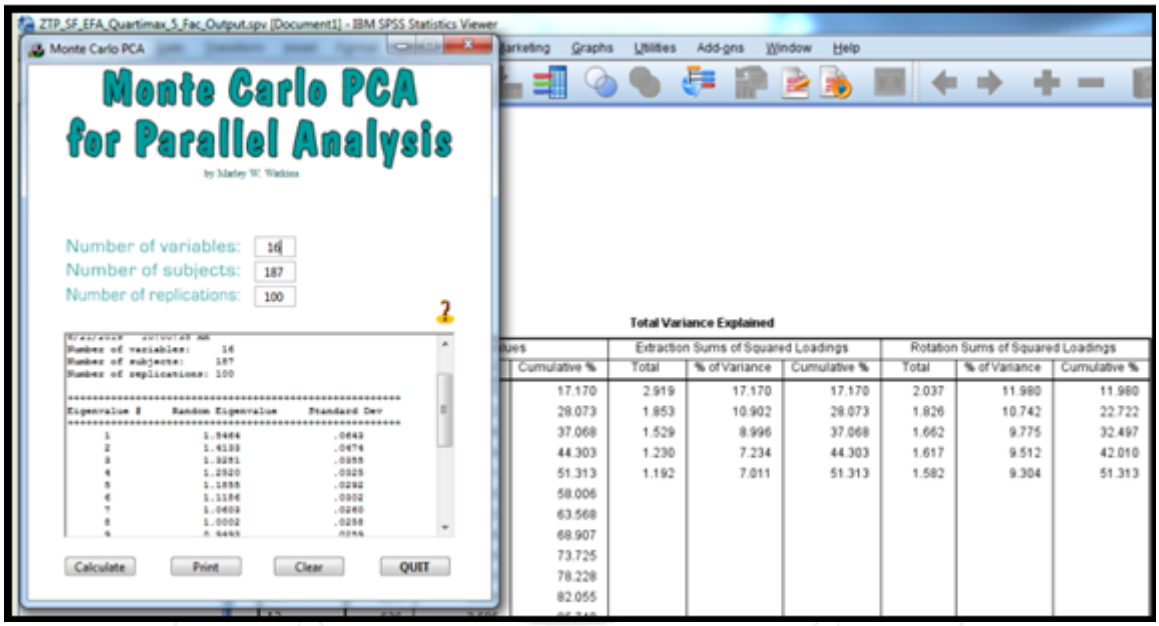
Table 2: Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
ZTP13	.763					
ZTP12	.724					
ZTP14	.580					
ZTP8	.498	.453				
ZTP11		.763				
ZTP10		.596				.396
ZTP6			.726			
ZTP5			.673			
ZTP7			.544		.410	
ZTP3				.763		
ZTP1				.583		
ZTP4				.561		
ZTP15					.694	
ZTP9		.333			.663	
ZTP2				.450	.648	
ZTP16						.789
ZTP17			.384			.522

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 10 iterations.

While most the items displayed reasonable clustering with their respective factors, item 11 displayed considerable split loading. It was discarded and the exploratory factor analysis was again conducted with Principal component analysis, but

with Quartimax rotation, to bring the number of factors from six to the theoretically indicated five factors. This method is the opposite of varimax rotation. In varimax rotation, the number of variables having very high factor loading on every factor is kept at low, allowing simple interpretation of factors. In Quartimax rotation, the number of factor necessary to explain the reflecting variables are kept low, which allows easy interpretation of manifest variables. The determinant was 0.077. The KMO sampling adequacy was 0.658. The Barlett's test of sphericity was significant. Five factors were extracted which explained 51.313 percent of the variance in the measured construct. The existence of five factors was confirmed by Hong's parallel analysis, as the obtained eigen values were greater than the critical eigen values.



Fa.No.	Critical Eigen Value	Obtained Eigen Value
1.	1.5464	2.037
2.	1.4133	1.826
3.	1.3281	1.662
4.	1.2520	1.617
5.	1.1855	1.582

Table 3: Reliability Statistics

Cronbach's Alpha	N of Items
.663	16

The internal consistency reliability, measured using Cronbach's alpha of the 16 retained items of the scale, was found to be 0.663. When the items per factor is less and number of factors are more in a scale, the value of Cronbach's alpha is low (Cortina, 1993).

Table 4: Tests of Normality:

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ZTP1	.205	187	.000	.903	187	.000
ZTP2	.236	187	.000	.895	187	.000
ZTP3	.207	187	.000	.905	187	.000
ZTP4	.163	187	.000	.915	187	.000
ZTP5	.226	187	.000	.885	187	.000
ZTP6	.237	187	.000	.880	187	.000
ZTP7	.205	187	.000	.890	187	.000
ZTP8	.284	187	.000	.836	187	.000
ZTP9	.226	187	.000	.890	187	.000
ZTP10	.214	187	.000	.855	187	.000
ZTP12	.182	187	.000	.909	187	.000
ZTP13	.240	187	.000	.893	187	.000
ZTP14	.252	187	.000	.881	187	.000
ZTP15	.156	187	.000	.899	187	.000
ZTP16	.220	187	.000	.902	187	.000
ZTP17	.195	187	.000	.905	187	.000
a. Lilliefors Significance Correction						

The Cronbach's alpha is the most famous estimate of reliability (Sijtsma, 2009). But, it suffers from limitations like violation of tau-equivalence condition (Cronbach, 1951) and non-normality of data (Green and Yang, 2009). When this assumption is violated, it leads to the underestimation of the true estimation of the reliability by 0.6 to 11 percent as per the seriousness of the violation (Raykov, 1997; Graham, 2006; Green and Yang, 2009). Since the factor loadings of the items are almost always never the same, the assumption of tau-equivalence is violated regularly. Also, researchers mostly deal with skewed data to varying extent. Under such realistic circumstances, the reliability is measured using the Greatest lower bound reliability (GLB) estimator (Woodhouse and Jackson, 1977). It is a confidence interval estimator instead of a point estimator of reliability like Cronbach's alpha.

From table 2, it is evident that the factor loadings of the 16 items on their respective dimensions are not the same. It implies that the assumption of tau equivalence is violated in this study. From table 3, the significant results of Kolmogorov Smirnov test and Shapiro Wilk's test establish that the data is skewed, as the null hypothesis associated with these tests is that the data is normal. Owing to the obtaining of these results, estimation of greatest lower bound reliability is required.

Estimation of Greatest Lower Bound Reliability

Using FACTOR software, the GLB of the present 16 items of ZTPI short form was found to be (0.822,1). It implies that while the true reliability of the scale would vary anywhere between 0.822 and 1, the scale for sure has the reliability of the former value. Comparing the two reliability estimates, it is apparent that there is an underestimation of at least 19 percent of the true reliability of the scale by Cronbach's alpha alone.

The factor loadings of the items associated with their respective factors are strong enough to indicate the intactness of the factor structure. To confirm the same, the confirmatory factor analysis test is conducted as a follow up.

Confirmatory Factor Analysis:

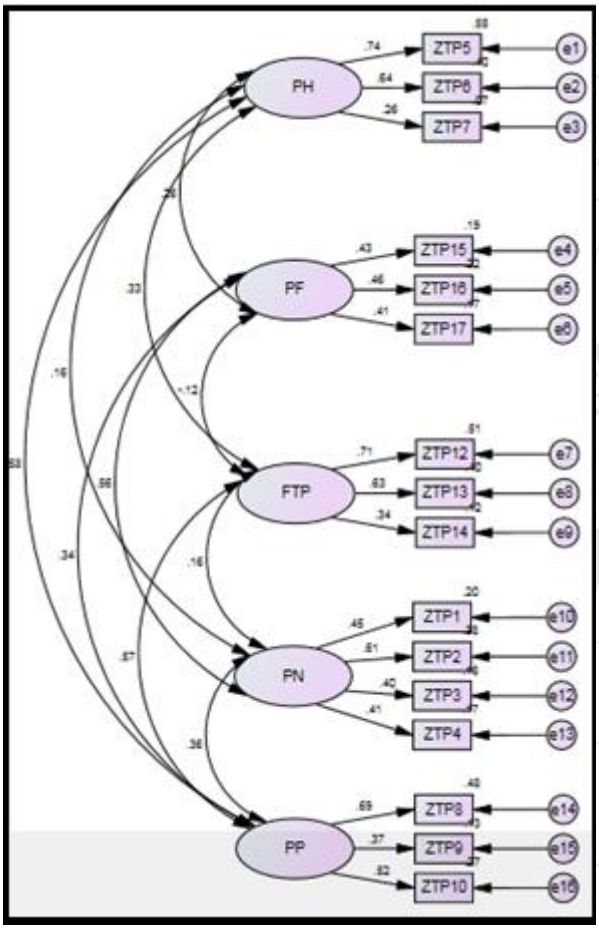


Figure 2: Factor Structure of ZTPI – SF in the Indian Context

From the path diagram shown above, it is evident that the retained factors and their respective items load well and meaningfully on each other.

Table 5: Goodness of Fit Estimates

Estimate	CMIN/DF	IFI	TLI	CFI	RMSEA
Benchmark	< 3.00	> 0.9	> 0.9	> 0.9	< 0.08
Result	1.360	0.899	0.86	0.891	0.044

The CMIN/DF is 1.360 which is way less than the benchmark value of 3.00. The incremental fit index (IFI) is 0.899 almost equal to the benchmark 0.9. Also, the Tucker-Lewis index and Comparative Fit Index estimates are 0.86 and 0.891, close to the benchmark 0.9. The root mean square error of approximation RMSEA estimate is 0.044, which is less than the cut off value of 0.08 (Hu and Bentler, 1999). In the light of the above obtained estimates, the scale has acceptable and decent goodness of fit.

Table 6: Status of the Items from ZTPI – SF (2017) Scale:

Item No.	Item Statement	Status
1	"I have taken my share of abuse and rejection in the past"	Retained
2	"I think about the bad things that happened to me in the past"	Retained
3	"The past has too many unpleasant memories that I prefer not to think about"	Retained
4	"It is hard for me to forget unpleasant images of my youth"	Retained
5	"I take risks to put excitement in my life".	Retained
6	"Taking risks keeps my life from becoming boring."	Retained
7	"I find myself getting swept up in the excitement of the moment."	Retained
8	"Happy memories of good times spring readily to mind.	Retained
9	"I get nostaligic about my childhood."	Retained
10	"I enjoy stories about how things used to be in the "good old times"."	Retained
11	"Meeting tomorrow's deadline and doing other necessary work come before tonight's play"	*Removed*
12	"I complete projects on time by making steady progress."	Retained

13	"I am able to resist temptation when I know that there is work to be done."	Retained
14	"I meet my obligations to friends and authorities on time."	Retained
15	"You can't really plan for the future because things change so much."	Retained
16	"My life path is controlled by forces I cannot influence."	Retained
17	"It does not make sense to worry about the future, since there is nothing that I can do about it anyway."	Retained

4. Discussion

The present study was conducted to validate the latest short version of Zimbardo time perspective inventory by Orosz et al. (2015) in the Indian context. The tool is the mostly widely used yet notorious for its volatile psychometric properties and factorial validity across cultures. Owing to its significance in time perspective research, its validation study was started in a culturally diverse nation India from the state of Punjab on Engineering students of computer science stream. In spite of split loading, the five factor structure of the tool could be retained through force loading item 15 and removing item 11 altogether. Cortina's (1993) observation regarding the relationship between Cronbach's alpha and number of items/factor was found to be pronounced in this study. The factor structure of the 17 items short form inventory originally conducted on the Hungarian subjects was found to be acceptable in the Indian context with the change that item 11 belonging to the future time perspective dimension of the scale is deleted.

The tool can be now tested on students from other states of India, belonging to varied academic streams. Apart from the fact that sample of the study was engineering students, a limitation of the study was out of 187 engineering students, 159 were boys and 28 were girls. Further studies should ensure gender parity. It remains to be observed whether the basic five factor structure of this scale, remains intact in other cultures or not.

5. Conclusion

The issues associated with the psychometric properties of Zimbardo time perspective inventory can be resolved only through the replication studies of the original and shorter versions of this scale in multiple context. Such studies can consequently provide sufficient data to compare and contrast the five factors structure of this big variable, eventually leading to a consensus through measurement invariance testing or equivalence testing (Sircova et al., 2014).

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