Measurement Invariance of the MTS and the MTS-7

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Abstract

There is a growing body of research looking at cross-cultural and cross-national differences in maximizing tendency without first establishing measurement invariance. Using archival data, a confirmatory factor analysis (CFA) technique was used to assess full and partial measurement invariance across WEIRD and non-WEIRD groups on the Maximizing Tendency Scale (MTS; Diab, Gillespie, & Highhouse, 2008) and the MTS-7 (Dalal, Diab, Zhu, & Hwang, 2015). CFA results indicate that both measures are nonequivalent at the scalar level.

Introduction

Measurement of Maximizing
➢ What is maximizing?
  ➢ The tendency to consider all decision options available in order to select which will lead to an optimum outcome
  ➢ Herbert Simon suggested instead of maximizing, humans tend to satisfice, meaning they search through alternatives until a decision that will lead to an acceptable, but not always optimal, outcome is made.
➢ Ongoing debate about how best to measure maximizing
  ➢ Maximizing Scale: alternative search, decision difficulty, high standards
  ➢ Maximizing Tendency Scale: high standards
  ➢ Maximizing Tendency Scale – 7: high standards

Measurement Invariance
➢ Occurs when individuals with the same standing on a trait who are sampled from different groups have the same expected scores
➢ Implicit assumption made when utilizing a scale developed in one culture, country, and/or language in a different culture, country, and/or language is that the scale operates the same for both groups.
  ➢ If this assumption is not supported, observed group differences may be inferred to be meaningful when, in actuality, the differences may be an artifact of measurement non-equivalence.

Research Question
1) Are the MTS and the MTS-7 measurement invariant across WEIRD and NonWEIRD cultural groups?

Method

Item	Item Text
MTS	Whenever I'm faced with a choice, I try to imagine what all the other possibilities are, even ones that aren't present at the moment.
MTS (MTS-7)	No matter what I do, I have the highest standards for myself.
MTS (MTS-7)	I never settle for second best.
MTS (MTS-7)	No matter what it takes, I always try to choose the best thing.
MTS (MTS-7)	I don't like having to settle for "good enough."
MTS (MTS-7)	I am a maximizer.
MTS (MTS-7)	I will wait for the best option, no matter how long it takes.
MTS (MTS-7)	I never settle.
MTS	I am uncomfortable making decisions before I know all of my options.

➢ **Sampling procedure:**
  ➢ Archival data
    ➢ Literature search conducted on research databases to identify published studies wherein subjects completed the MTS or the MTS-7
    ➢ Researchers known to study maximizing tendency were contacted to share unpublished data
    ➢ Authors and researchers were contacted to request their item level data
➢ **Sample received**
  ➢ Five samples of students and Mturk participants:
    ➢ 2,734 WEIRD
    ➢ 508 NonWEIRD
      ➢ 88 Chile, 333 Singapore, 87 Turkey
➢ **WEIRD samples**
  ➢ There are concerns that researchers are making conclusions about human behavior or nature based on one cultural viewpoint, the WEIRD population
  ➢ Western, Educated, Industrialized, Rich, and Democratic
➢ **Mean and Covariance Structure Analysis**
  ➢ Confirmatory factor analysis framework
  ➢ $x_i = \tau_i + \lambda_i \xi + \delta_i$
    ➢ An observed response (x_i) is a linear combination of an item intercept (τ_i), a factor loading (λ_i), a latent variable (ξ), and item specific variance (δ_i).
  ➢ Sequentially fit a set of increasingly more restrictive CFA models to the data
    ➢ The model's absolute fit to the data and the difference in fit between models is examined

Level of Measurement Invariance	Description
Configural	Determine if the same factor structure holds for both groups, though the loadings are allowed to vary.
Metric	The same factor structure is specified and the factor loadings are constrained to be equal across both groups
Scalar	The same factor structure is specified and the factor loadings and regression intercepts are constrained to be equal across both groups.
Strict Factorial	The same factor structure is specified and the factor loadings, regression intercepts, and the item variances are constrained to be equal across both groups.

Results

MTS

Model	Invariance Test Sequence	χ^2	df	Compare	$\Delta\chi^2$	Δdf	TLI	CFI	ΔCFI	RMSEA	SRMSR
M0$_{WEIRD}$	-	308.923*	27	-	-	-	.925	.944		.064	.034
M0$_{NonWEIRD}$	-	95.276*	27	-	-	-	.898	.924		.072	.044
M1	Configural	404.200*	54	-	-	-	.921	.941		.065	.036
M2$_{\lambda \text{ equal}}$	Metric	439.715*	63	M1	35.516*	9	.927	.937	.004	.063	.042
M2$_{\lambda 2,3,4,5,6,7,9}$	Partial Metric	417.704*	61	M1	13.505	7	.929	.940	.001	062	.039
M3$_{\lambda 2,3,4,5,6,7,9, \tau \text{ equal}}$	Scalar	674.261*	69	M2$_{2,3,4,5,6,7,9}$	256.56*	8	.894	.898	.042	.076	.049

➢ **Measurement non-equivalence occurs at the scalar level**
  ➢ Items 1 and 8 factor loadings were allowed to vary freely to establish partial metric invariance
  ➢ Partial scalar invariance could not be established because more than 50% of the items' intercepts would need to be freed

MTS - 7

Model	Invariance Test Sequence	χ^2	df	Compare	$\Delta\chi^2$	Δdf	TLI	CFI	ΔCFI	RMSEA	SRMSR
M0$_{WEIRD}$	-	141.372*	14	-	-	-	.953	.968	-	.059	.026
M0$_{NonWEIRD}$	-	52.976*	14	-	-	-	.902	.935	-	.075	.040
M1	Configural	194.348*	28	-	-	-	.946	.964	-	.062	.028
M2$_{\lambda \text{ equal}}$	Metric	200.460*	34	M1	6.112	6	.956	.964	.000	.057	.030
M3$_{\lambda \tau \text{ equal}}$	Scalar	413.855*	34	M2$_{\lambda \text{equal}}$	230.220*	6	.899	.918	.046	.085	.045

➢ **Measurement non-equivalence occurs at the scalar level**
  ➢ Unlike the MTS, metric invariance was established without allowing any item factor loadings to vary freely
  ➢ Partial scalar invariance could not be established because more than 50% of the items' intercepts would need to be freed

Discussion and Future Directions

Discussion
➢ Configural invariance occurred for both scales, meaning that in general, the same factor structure exists between the groups, suggesting that the items elicit the same conceptualization in defining the construct for each group
➢ MTS- Items 1 and 8 factor loadings must vary freely to establish partial metric invariance
➢ MTS-7- Metric invariance occurred, meaning that the factor loadings are not significantly different from each other and the measure is calibrated to the construct the same way across groups, so difference scores can be meaningfully compared
➢ For both scales, measurement non-equivalence occurs at the scalar level, meaning that the regression intercepts are significantly different from each other. This suggests that mean comparisons should not be conducted across these groups because a systematic response bias is present.
  ➢ Could be a result of cultural specificity of the items or cultural/society specific features affecting the expression of maximizing tendency (e.g., people in WEIRD cultures may have more options when making choices as compared to people in nonWEIRD cultures.

Conclusions
➢ Both the MTS and the MTS-7 are measurement non-equivalent at the scalar level across WEIRD and NonWEIRD groups

Limitations and future research
➢ Smaller sample size in NonWEIRD group may have resulted in low power
➢ Test the MS for measurement invariance as it is widely used

Suggestions to Scale Users
➢ Analyze measurement invariance within individual cross-cultural maximizing studies to ensure equivalence before making group comparisons
➢ Use the MTS-7
  ➢ Because one of the problematic items from the MTS is removed, metric invariance for the MTS-7 holds without allowing any factor loadings to be freed