

MI RMarkdown

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Executive Summary

In an attempt to examine the presence of any group differences between Peruvian nationals and Venezuelan refugees with regards to Social Emotional Learning, we conduct measurement invariance on a range of different SEL measures for a sample of 823 Grade 3 students and 744 Grade 7 students and their caregivers. Using Confirmatory Factor Analysis, we conduct measurement invariance to ensure that any differences observed are a reflection of true differences between groups and are not a result of biased measurements, which would produce unreliable results. A measurement is invariant if the items measure the factor consistently across groups.

To confirm that a measurement is invariant we verify both threshold and loading invariances. We first test our measurement model separately on each of the groups 'Peruvian' and 'Venezuelan' to ensure that the model fits our data. We rely on the following indices to determine adequate fit ($p > 0.05$, CFI > 0.90 , RMSEA < 0.10 , SRMR < 0.08). If model fit is confirmed, then we proceed to test for invariance. To do so, we conduct a multi-group CFA firstly without any constraints to produce the configural model, then we impose an equality constraint on the thresholds in the two groups to generate the threshold model, then we constrain both thresholds and factor loadings to be equal across groups to obtain the loading model. Threshold invariance is established if the threshold model fits the data and the differences in fit indices between the configural and threshold models are non-significant. Similarly, loading invariance is satisfied if the loading model fits the data and the differences in fit indices between the threshold and loading models are non-significant. A change in model fit between the configural and threshold models is considered to be significant if $\Delta p < 0.05$, $\Delta CFI > 0.02$, $\Delta RMSEA = 0.03$, or $\Delta SRMP = 0.03$. When comparing the threshold and loading models, the change in fit is significant if $\Delta p < 0.05$, $\Delta CFI > 0.01$, $\Delta RMSEA = 0.01$, or $\Delta SRMP = 0.01$.

If both threshold and loading invariances are satisfied, we can safely compare the mean and variance of the two groups on the particular construct. If threshold or loading invariances cannot be confirmed, we proceed to investigate partial invariance and we provide a table identifying the restricted parameters with a significant modification index (> 4). To achieve partial invariance, we should consider freeing those constrained parameters.

Our findings suggest that for Grade 3, the only measure that was found to be invariant was Child Self Regulation. The Caregiver Relationship measure was found to be threshold non-invariant, while for the following measures - Child Self Regulated Learning, Child Internalizing-Caregiver Report, Child Emotional Processes, the fit of the measurement model did not fit either one or both groups. For the Caregiver Anxiety and Depression model the fit on the Venezuelan group was ambiguous. For Grade 7, all measures but one were found to be threshold non-invariant - Child Self Regulation, Child Self Regulated Learning, Child Internalizing-Child Report, Child Externalizing-Child Report, Caregiver Relationship and Caregiver Anxiety and Depression. The Child Emotional Processes model had an ambiguous fit on the Venezuelan group.

(Refer to the MI_Analysis.R script to access a more extensive analysis on each of the measures than what is provided below)

Grade 3

Child Self Regulation (csr)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	397	1	172.57	90	0.00	0.96	0.05	[0.04, 0.06]	0.05						
Venezuelan Only	316	1	156.60	90	0.00	0.97	0.05	[0.04, 0.06]	0.05						
Configural	713	2	329.14	180	0.00	0.97	0.05	[0.04, 0.06]	0.05						
Threshold	713	2	383.75	224	0.00	0.96	0.04	[0.04, 0.05]	0.05	56.909	44.000	0.092	-0.001	-0.001	0.000
Loading	713	2	371.85	239	0.00	0.97	0.04	[0.03, 0.05]	0.05	16.944	15.000	0.322	-0.004	0.006	0.004

Conclusions

Both Threshold and Loading invariances were satisfied, this measure is invariant for Venezuelan and Peruvian groups.

Standardized means and variances of groups

group	mean.est	mean.se	variance.est	variance.se
Peruvian	0	0	1.0000000	0.00000000
Venezuelan	0	0	1.096366	0.08507385

Child Self Regulated Learning (csrl)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	397	1	340.19	90	0.00	0.82	0.08	[0.07, 0.09]	0.08						
Venezuelan Only	312	1	226.86	90	0.00	0.87	0.07	[0.06, 0.08]	0.08						
Configural	709	2	568.31	180	0.00	0.84	0.08	[0.07, 0.09]	0.08						
Threshold	709	2	696.61	224	0.00	0.80	0.08	[0.07, 0.08]	0.08	118.683	44.000	0.000	-0.022	0.000	0.000
Loading	709	2	661.64	239	0.00	0.82	0.07	[0.06, 0.08]	0.08	21.093	15.000	0.134	-0.011	0.001	0.004

Conclusions

The csrl measure model fits poorly both the Peruvian and Venezuelan groups.

Child Internalizing - Caregiver Report (aint)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	464	1	332.88	77	0.00	0.87	0.08	[0.08, 0.09]	0.08						
Venezuelan Only	332	1	263.42	77	0.00	0.81	0.09	[0.07, 0.10]	0.10						
Configural	796	2	588.48	154	0.00	0.86	0.08	[0.08, 0.09]	0.08						
Threshold	796	2	690.61	195	0.00	0.84	0.08	[0.07, 0.09]	0.08	95.505	41.000	0.000	-0.014	-0.003	0.000
Loading	796	2	744.49	209	0.00	0.82	0.08	[0.07, 0.09]	0.09	53.312	14.000	0.000	-0.029	0.008	0.006

Conclusions

The model for the aint factor has a poor fit on both the Peruvian and Venezuelan groups.

Child Emotional Processes - Caregiver Report (aemo)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	473	1	167.98	35	0.00	0.95	0.09	[0.08, 0.10]	0.06						
Venezuelan Only	333	1	256.24	35	0.00	0.89	0.11	[0.12, 0.15]	0.09						
Configural	806	2	425.71	70	0.00	0.92	0.11	[0.10, 0.12]	0.07						
Threshold	806	2	533.34	99	0.00	0.90	0.10	[0.10, 0.11]	0.07	93.947	29.000	0.000	-0.008	-0.004	0.000
Loading	806	2	560.93	109	0.00	0.90	0.10	[0.09, 0.11]	0.08	49.581	10.000	0.000	-0.016	0.013	0.007

Conclusions

The model for the aemo measure fits the Venezuelan group poorly.

Caregiver Relationship - Caregiver Report (arel)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	473	1	45.56	20	0.00	0.97	0.05	[0.03, 0.07]	0.05						
Venezuelan Only	338	1	32.67	20	0.04	0.96	0.04	[0.01, 0.07]	0.06						
Configural	811	2	77.59	40	0.00	0.97	0.05	[0.03, 0.06]	0.05						
Threshold	811	2	159.62	63	0.00	0.92	0.06	[0.05, 0.07]	0.05	64.763	23.000	0.000	-0.029	0.016	0.000
Loading	811	2	147.27	71	0.00	0.93	0.05	[0.04, 0.06]	0.06	5.939	8.000	0.654	-0.001	-0.002	0.006

Conclusions

Threshold invariance can not be established.

Investigating threshold partial invariance

Consider freeing the equality constraint on the following thresholds to obtain Threshold Partial Invariance on the Grade 3 Caregiver Relationship Measure.

plabel	lhs	op	rhs	label	X2
.p10.	arel1		t2	arel1.thr2	11.175454
.p18.	arel4		t1	arel4.thr1	8.540644
.p30.	arel8		t1	arel8.thr1	6.385733
.p27.	arel7		t1	arel7.thr1	5.621943
.p13.	arel2		t2	arel2.thr2	5.513307
.p12.	arel2		t1	arel2.thr1	5.064609
.p26.	arel6		t3	arel6.thr3	4.208154

Caregiver Anxiety and Depression (a anxdep)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	476	1	15.87	5	0.01	0.99	0.07	[0.03, 0.11]	0.03						
Venezuelan Only	339	1	29.73	5	0.00	0.98	0.12	[0.08, 0.16]	0.05						
Configural	815	2	46.33	10	0.00	0.99	0.09	[0.07, 0.12]	0.04						
Threshold	815	2	86.16	24	0.00	0.97	0.08	[0.06, 0.10]	0.04	32.719	14.000	0.003	-0.004	-0.008	0.000
Loading	815	2	105.95	29	0.00	0.97	0.08	[0.06, 0.10]	0.05	18.406	5.000	0.002	-0.012	0.023	0.006

Conclusions

The fit of the model on the Venezuelan group is ambiguous.

However, if we choose to accept the fit of the model on the Venezuelan group, and proceed to determine and compare the goodness of fit of the Configural, Threshold and Loading models to test the measure's invariance, we conclude that the measure is threshold non-invariant.

Investigating threshold partial invariance

Consider freeing the equality constraint on the following thresholds to obtain Threshold Partial Invariance on the Grade 3 Caregiver Anxiety and Depression Measure.

plabel	lhs	op	rhs	label	X2
.p8.	a anxdep2		t3	a anxdep2.thr3	6.315158
.p7.	a anxdep2		t2	a anxdep2.thr2	5.363162

Grade 7

Child Self Regulation (csr)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	378	1	138.19	54	0.00	0.95	0.06	[0.05, 0.08]	0.06						
Venezuelan Only	259	1	118.82	54	0.00	0.91	0.07	[0.05, 0.08]	0.07						
Configural	637	2	254.96	108	0.00	0.94	0.07	[0.06, 0.08]	0.06						
Threshold	637	2	329.27	143	0.00	0.92	0.06	[0.05, 0.07]	0.06	68.856	35.000	0.001	-0.009	0.001	0.000
Loading	637	2	275.54	155	0.00	0.91	0.07	[0.06, 0.08]	0.07	34.812	12.000	0.001	-0.019	0.011	0.006

Conclusions

Threshold invariance is not satisfied.

Investigating threshold partial invariance

Consider freeing the equality constraint on the following thresholds to obtain Threshold Partial Invariance on the Grade 7 Child Self Regulation Measure.

plabel	lhs	op	rhs	label	X2
.p32.	csr13		t2	csr13.thr2	9.605377
.p24.	csr8		t3	csr8.thr3	7.978314
.p48.	csr19		t3	csr19.thr3	7.780825
.p20.	csr5		t2	csr5.thr2	6.567323
.p15.	csr1		t3	csr1.thr3	6.369234
.p35.	csr15		t2	csr15.thr2	5.121829
.p13.	csr1		t1	csr1.thr1	4.717451
.p39.	csr16		t3	csr16.thr3	4.128304

Child Self Regulated Learning (csrl)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	383	1	220.27	90	0.00	0.91	0.06	[0.05, 0.07]	0.07						
Venezuelan Only	254	1	177.47	90	0.00	0.90	0.06	[0.05, 0.08]	0.07						
Configural	637	2	395.97	180	0.00	0.91	0.06	[0.05, 0.07]	0.07						
Threshold	637	2	487.10	224	0.00	0.89	0.06	[0.05, 0.07]	0.07	86.194	44.000	0.000	-0.012	0.001	0.000
Loading	637	2	491.52	239	0.00	0.89	0.06	[0.05, 0.06]	0.08	26.269	15.000	0.035	-0.016	0.006	0.008

Conclusions

The fit of the threshold model is ambiguous. Therefore, we can not establish threshold invariance.

Investigating threshold partial invariance

Consider freeing the equality constraint on the following thresholds to obtain Threshold Partial Invariance on the Grade 7 Child Self Regulated Learning Measure.

plabel	lhs	op	rhs	label	X2
.p31.	csrl6r		t1	csrl6r.thr1	13.953220
.p32.	csrl6r		t2	csrl6r.thr2	11.190971
.p28.	csrl5r		t1	csrl5r.thr1	5.627817
.p46.	csrl11		t1	csrl11.thr1	5.794246
.p27.	csrl4		t3	csrl4.thr3	5.637164
.p54.	csrl13r		t3	csrl13r.thr3	5.550479
.p16.	csrl1		t1	csrl1.thr1	4.147530

Child Internalizing - Child Report (cyips)

Model fit for each model and model comparison statistics

Model	n	ngroups	x2	df	p	CFI	RMSEA	RMSEA.CI95	SRMR	diff.x2	diff.df	diff.p	diff.CFI	diff.RMSEA	diff.SRMR
Peruvian Only	386	1	62.43	35	0.00	0.98	0.05	[0.03, 0.06]	0.05						
Venezuelan Only	259	1	94.46	35	0.00	0.92	0.08	[0.06, 0.10]	0.07						
Configural	645	2	157.46	70	0.00	0.95	0.06	[0.05, 0.08]	0.06						