Analysis of the Psychometric scales

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Why to use multi-item psychometric scales?

- Up to now most cross-cultural studies on child well-being have used single-item scales.
- It has been pointed-out that using only one single item scale for comparative purpose is a too weak solution.
- Multiple-item scales are much more robust measures.
- In this project we have used 4 multiple-item scales and one single item scale.

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Why to use Confirmatory Factor Analysis (CFA) with Structural Equation Modelling (SEM)?

- CFA is used to assess the construct validity of a measurement model (i.e.: a psychometric scale).
- SEM is a multivariate technique that seeks to explain the relationship between multiple variables (even unobservable or "latent"), including the measurement errors in the model. It takes advantage of psychometric and econometric knowledge, and its foundation lies in factor analysis and multiple regression analysis.

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Why to use Multi-group CFA?

- When using the same model with different groups (i.e.: samples from different countries) we need to examine the degree to which the models are equivalent across groups (i.e.: its comparability).
- In order to meaningfully compare statistics across groups (i.e.: the mean of a latent variable) **measurement invariance** is required. Three steps are required to check for measurement invariance: (a) *configural invariance* (unconstrained variables); (b) *metric invariance* (constrained factor loadings); (c) *scalar invariance* (constrained loadings and intercepts).
- Metric invariance allows meaningful **comparison of correlations and regressions**.
- Scalar invariance allows meaningful **comparison of the latent means**.

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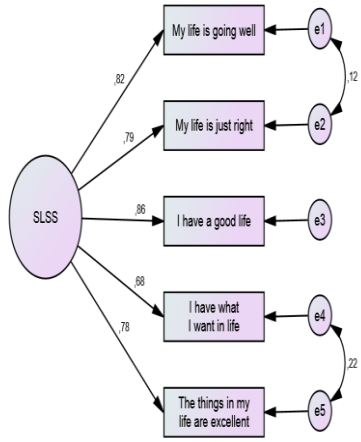
SLSS. 10-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	909.42	5	.000	.981	.103 (.097-.108)	.024
2	SLSS 2 error cov	1-2 4-5	3	.000	.998	.042 (.035-.049)	.007
3	SLSS multigroup 2errCov	284.47	45	.000	.996	.018 (.016-.020)	.013
4	SLSS multigroup 2errCov Constrained loadings	620.88	101	.000	.991	.017 (.016-.019)	.015
5	SLSS multigroup 2errCov Constr load. & intercepts	1571.99	157	.000	.975	.023 (.022-.024)	.016
6	SLSS multigroup 2errCov Semipartial constr interc: without item 2	1207.98	143	.000	.981	.021 (.020-.022)	.016



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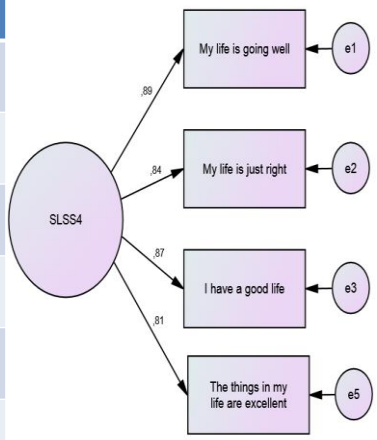
SLSS. 12-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	1086.79	5	.000	.982	.111 (.106-.117)	.023
2	SLSS4 Item 4 deleted	71.36	2	.000	.999	.045 (.036-.054)	.006
3	SLSS4 multigroup	278.69	30	.000	.995	.022 (.019-.024)	.012
4	SLSS4 multigroup Constrained loadings	622.23	72	.000	.990	.021 (.019-.022)	.021
5	SLSS4 multigroup Constr load. & intercepts	2151.03	114	.000	.962	.032 (.031-.033)	.022
6	SLSS4 multigroup Semipartial constr interc: only items 1 & 3 constr	872.30	86	.000	.986	.023 (.022-.024)	.022



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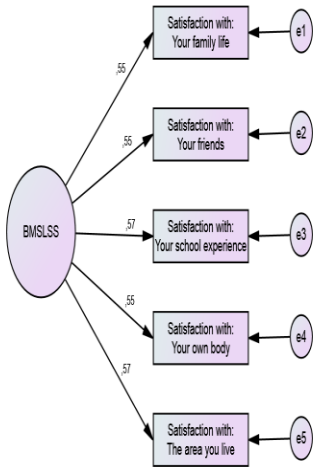
BMSLSS. 10-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	91.85	5	.000	.993	.032 (.026-.038)	.010
2	Multigroup	336.43	75	.000	.980	.014 (.013-.016)	.017
3	Multigroup Constrained loadings	716.41	131	.000	.955	.016 (.015-.017)	.053
4	Multigroup (1 err cov) EXCLUDING: Algeria, Colombia, Germany and Turkey. Uconstrained	251.53	55	.000	.982	0.021 (.018-.023)	.023
5	Multigroup (1 err cov) EXCLUDING: Algeria, Colombia, Germany and Turkey. Constr. loadings	395.65	95	.000	.972	.018 (.016-.019)	.032
6	Multigroup (1 err cov) EXCLUDING: Algeria, Colombia, Germany and Turkey. C load & interc	1218.84	135	.000	.898	.025 (.024-.026)	.030
7	Multigroup (1 err cov) EXCLUDING: Algeria, Colombia, Germany and Turkey. C load & partial constr interc: items 3, 4 & 5 excluded	494.99	105	.000	.963	.017 (.015-.018)	.032



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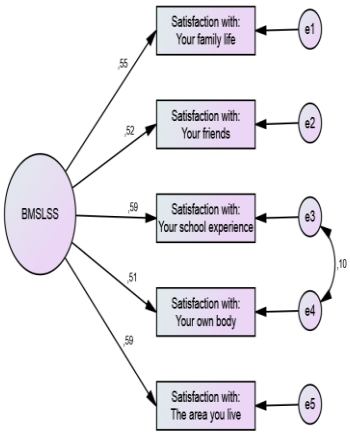
BMSLSS. 12-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	159.00	5	.000	.988	.042 (.037-.048)	.017
2	1 error covariance	77.39	4	.000	.994	.032 (.026-.039)	.012
3	Multigroup (1 err cov)	326.11	60	.000	.979	.016 (.014-.018)	.018
4	Multigroup (1 err cov) Constrained loadings	666.42	116	.000	.957	.016 (.015-.018)	.060
5	Multigroup (1 err cov) Constr. load. & interc	3472.57	172	.000	.739	.033 (.032-.034)	.064
6	Multigroup (1 err cov) EXCLUDING: Algeria, Ethiopia, Germany and . Romania. Uconstrained	285.55	44	.000	.977	0.021 (.018-.023)	.019
7	Multigroup (1 err cov) EXCLUDING: Algeria, Ethiopia, Germany and Romania. Constr. load.	428.32	84	.000	.967	.018 (.016-.019)	.044
8	Multigroup (1 err cov) EXCLUDING: Algeria, Ethiopia, Germany and Romania. C L & interc.	2230.00	124	.000	.796	.036 (.035-.38)	.053



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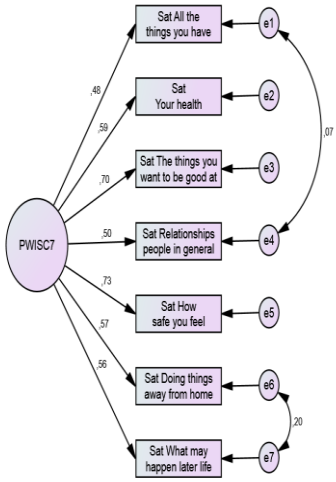
PWI-SC7. 10-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	731.72	14	.000	.974	.055 (.051-.058)	.025
2	2 error covariances	129.67	12	.000	.996	.024 (.020-.028)	.011
3	Multigroup (2 err cov)	692.39	180	.000	.985	.013 (.012-.014)	.032
4	Multigroup (2 err cov) Constrained loadings	1335.81	264	.000	.968	.015 (.015-.016)	.056
5	Multigroup (2 err cov) EXCLUDING: Colombia, Nepal, Poland and Romania. Unconstr.	550.32	132	.000	.984	.016 (.014-.017	.032
6	Multigroup (2 err cov) EXCLUDING: Colombia, Nepal, Poland and Romania. Constr.L.	861.46	192	.000	.975	.017 (.015-.018)	.055
7	Multigroup (2 err cov) EXCLUDING: Colombia, Nepal, Poland and Romania. C.L.&Int.	2602.99	252	.000	.912	.027 (.026-.028)	.054
8	Multigroup (2 err cov) EXCLUDING: Colombia, Nepal, Poland and Romania. Semipart. C.L.& Int.: Ítems 1, 3, 6 & 7 no constr interc	1021.59	212	.000	.970	.017 (.016-.018)	.052



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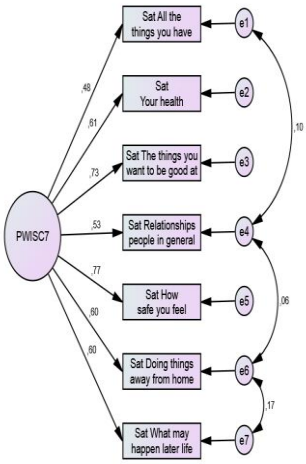
PWI-SC7. 12-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	737.37	14	.000	.978	.054 (.051-.058)	.024
2	3 error covariances	190.81	11	.000	.995	.031 (.027-.034)	.012
3	Multigroup (3 err cov)	803.86	165	.000	.984	.015 (.014-.016)	.014
4	Multigroup (3 err cov) Constrained loadings	1460.19	249	.000	.970	.017 (.016-.018)	.042
5	Multigroup (3 err cov) Constr. load. & interc	4639.36	333	.000	.893	.027 (.027-.028)	.046
6	Multigroup (3 err cov) EXCLUDING: Algeria, Colombia, Nepal and Romania Uconstrained	644.07	121	.000	.985	.018 (.017-.020)	.018
7	Multigroup (3 err cov) EXCLUDING: Algeria, Colombia, Nepal and Romania Constrained loadings	1060.47	181	.000	.975	.019 (.018-.021)	.030
8	Multigroup (3 err cov) EXCLUDING: Algeria, Colombia, Nepal and Romania Constr loadings & interc.	2799.89	241	.000	.926	.029 (.028-.030)	.031
9	Multigroup (3 err cov) EXCLUDING: Algeria, Colombia, Nepal and Romania Constr L & part constr interc: Items 1, 2, 3, 6 excluded	1299.36	201	.000	.968	.021 (.020-.022)	.030



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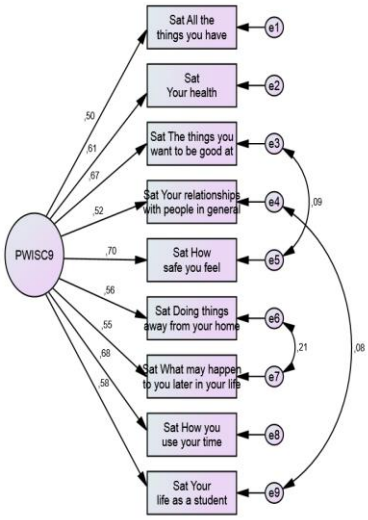
PWI-SC9. 10-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	1257.72	27	.000	.970	.052 (.049-.054)	.027
2	3 error covariances	411.45	24	.000	.991	.031 (.028-.033)	.015
3	Multigroup (3 err cov)	1663.73	360	.000	.973	.015 (.014-.015)	.032
4	Multigroup (3 err cov) Constrained loadings	2654.42	472	.000	.955	.016 (.016-.017)	.054
5	Multigroup (3 err cov) EXCLUDING: Colombia, Ethiopia, Germany, Poland, Romania & Turkey. Uconstr.	1068.75	216	.000	.974	.019 (.018 -.020)	.032
6	Multigroup (3 err cov) EXCLUDING: Colombia, Ethiopia, Germany, Poland, Romania & Turkey. Constrained loadings	1447.01	280	.000	.965	.020 (.019 -.021)	.053
7	Multigroup (3 err cov) EXCLUDING: Colombia, Ethiopia, Germany, Poland, Romania & Turkey. Constr loadings & interc.	3598.96	344	.000	.902	.030 (.029-.031)	.055
8	Multigroup (3 err cov) EXCLUDING: Colombia, Ethiopia, Germany, Poland, Romania & Turkey. Constr loadings & partial constr. int.: items 1, 3, 6, 7, 9 exc	1715.68	304	.000	.957	.021 (.020-.022)	.054



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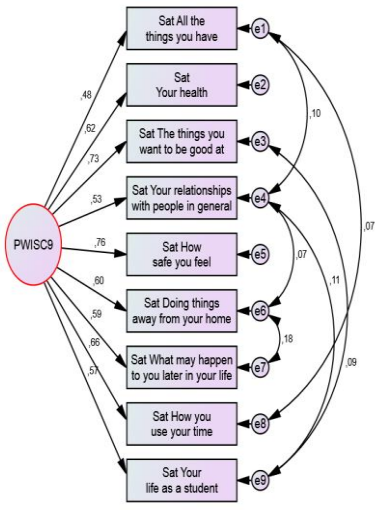
PWI-SC9. 12-year-olds 15 countries pooled sample

Model		χ^2	df	p-value	CFI	RMSEA (confidence interval)	SRMR
1	Initial model. Pooled data	1531.09	27	.000	.969	.056 (.054-.059)	.028
2	6 error covariances	546.92	21	.000	.989	.038 (.035-.041)	.016
3	Multigroup (6 err cov)	1525.71	315	.000	.978	.015 (.014-.016)	.024
4	Multigroup (6 err cov) Constrained loadings	2439.29	427	.000	.963	.016 (.016-.017)	.046
5	Multigroup (6 err cov) Constr. load. & interc	7140.63	539	.000	.880	.026 (.026-.027)	.047
6	Multigroup (6 err cov) EXCLUDING: Colombia, Nepal, Romania & Turkey Uconstrained	1155.88	231	.000	.980	.017 (.016 -.018)	.024
7	Multigroup (6 err cov) EXCLUDING: Colombia, Nepal, Romania & Turkey Constrained loadings	1714.39	311	.000	.970	.019 (.018-.019)	.048
8	Multigroup (6 err cov) EXCLUDING: Colombia, Nepal, Romania & Turkey Constr loadings & interc.	5227.12	391	.000	.895	.031 (.030-.031)	.050
9	Multigroup (6 err cov) EXCLUDING: Colombia, Nepal, Romania & Turkey C L & part constr interc.: items 1, 2, 3, 6, 9 excl	2132.74	341	.000	.961	.020 (.019-.021)	.049



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	SLSS	SLSS-4 (item 4 does not fit)
	10 year olds database	**12 year olds database**
Items included	My life is going well My life is just right I have a good life I have what I want in life The things in my life are excellent	My life is going well My life is just right I have a good life The things in my life are excellent
yes	Algeria Catalonia Colombia England Estonia Ethiopia Germany Israel Nepal Norway Poland Romania South Africa South Korea Turkey	Algeria Catalonia Colombia England Estonia Ethiopia Germany Israel Nepal Norway Poland Romania South Africa South Korea Turkey
no		
Results	• *Correlations and regressions comparable among all 15 countries* • *Means of items 1, 3, 4 and 5 are comparable among all countries, but item 2 is not*	• *Correlations and regressions comparable among all 15 countries* • *Means of items 1 and 3 are comparable among all countries, but items 2 and 5 are not*

	BMSLSS	BMSLSS
	10 year olds database	**12 year olds database**
Items included	Sat with people I live with Sat with my friends Sat with my school experience Sat with myself Sat the area I live in, in general	Sat with people I live with Sat with my friends Sat with my school experience Sat with myself Sat the area I live in, in general
yes	Catalonia England Estonia Ethiopia Israel Nepal Norway Poland Romania South Africa South Korea	Catalonia England Estonia Ethiopia Germany Israel Norway Poland South Africa South Korea Turkey
no	Algeria Colombia Germany Turkey	Algeria Colombia Nepal Romania
Results	• *Correlations and regressions are comparable among all countries excepting 4* • *Means of items 1 and 2 are comparable among 11 countries, but items 3, 4, 5 are not*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of the items are not comparable*

	PWI-SC7	PWI-SC7
	10 year olds database	12 year olds database
Items included	Sat all things you have Satisfaction with health Sat things want be good at Sat relationship people Sat how safe you feel Sat doing things away home Sat may happen later life	Sat all things you have Satisfaction with health Sat things want be good at Sat relationship people Sat how safe you feel Sat doing things away home Sat may happen later life
yes	Algeria Catalonia England Estonia Ethiopia Germany Israel Norway South Africa South Korea Turkey	Algeria Catalonia England Estonia Ethiopia Germany Israel Norway Poland South Africa South Korea
no	Colombia Nepal Poland Romania	Colombia Nepal Romania Turkey
Results	• *Correlations and regressions comparable among all countries excepting 4* • *Means of items 2, 4 and 5 are comparable among 11 countries, but items 1, 3, 6, 7 are not*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of items 4, 5 and 7 are comparable among 11 countries, but items 1, 2, 3 and 6 are not*

	PWI-SC9	PWI-SC9
	10 year olds database	12 year olds database
Items included	Sat all things you have Satisfaction with health Sat things want be good at Sat relationship people Sat how safe you feel Sat doing things away home Sat may happen later life Sat how you use your time Sat your life as student	Sat all things you have Satisfaction with health Sat things want be good at Sat relationship people Sat how safe you feel Sat doing things away home Sat may happen later life Sat how you use your time Sat your life as student
yes	Algeria Catalonia England Estonia Israel Nepal Norway South Africa South Korea	Catalonia Colombia England Estonia Israel Nepal Norway Poland South Africa South Korea Turkey
no	Colombia Ethiopia Germany Poland Romania Turkey	Algeria Ethiopia Germany Romania
Results	• *Correlations and regressions comparable among all countries excepting 6* • *Means of items 2, 4, 5 and 8 are comparable among 9 countries, but items 1, 3, 6, 7 and 9 are not*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of items 4, 5, 7 and 8 are comparable among 11 countries, but items 1, 2, 3, 6, 9 are not*

10	SLSS	BMSLSS-5	PWI-SC7	PWI-SC9
yes	Algeria Catalonia Colombia England Estonia Ethiopia Germany Israel Nepal Norway Poland Romania South Africa South Korea Turkey	Catalonia England Estonia Ethiopia Israel Nepal Norway Poland Romania South Africa South Korea	Algeria Catalonia England Estonia Ethiopia Germany Israel Norway South Africa South Korea Turkey	Algeria Catalonia England Estonia Israel Nepal Norway South Africa South Korea
no		Algeria Colombia Germany Turkey	Colombia Nepal Poland Romania	Colombia Ethiopia Germany Poland Romania Turkey
Results	• *Correlations and regressions comparable among all 15 countries* • *Means of items 1, 3, 4 and 5 are comparable among all countries, but item 2 is not*	• *Correlations and regressions are comparable among all countries excepting 4* • *Means of items 1 and 2 are comparable among 11 countries, but items 3, 4, 5 are not*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of items 2, 4 and 5 are comparable among 11 countries, but items 1, 3, 6, 7 are not*	• *Correlations and regressions comparable among all countries excepting 6* • *Means of items 2, 4, 5 and 8 are comparable among 9 countries, but items 1, 3, 6, 7 and 9 are not*

12	SLSS-4 (item 4 not fit)	BMSLSS-5	PWI-SC7	PWI-SC9
yes	Algeria Catalonia Colombia England Estonia Ethiopia Germany Israel Nepal Norway Poland Romania South Africa South Korea Turkey	Catalonia England Estonia Ethiopia Germany Israel Norway Poland South Africa South Korea Turkey	Algeria Catalonia England Estonia Ethiopia Germany Israel Norway Poland South Africa South Korea	Catalonia Colombia England Estonia Israel Nepal Norway Poland South Africa South Korea Turkey
no		Algeria Colombia Nepal Romania	Colombia Nepal Romania Turkey	Algeria Ethiopia Germany Romania
Results	• *Correlations and regressions comparable among all 15 countries* • *Means of items 1 and 3 are comparable among all countries, but items 2 and 5 are not*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of the items are not comparable*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of items 4, 5 and 7 are comparable among 11 countries, but items 1, 2, 3 and 6 are not*	• *Correlations and regressions comparable among all countries excepting 4* • *Means of items 4, 5, 7 and 8 are comparable among 11 countries, but items 1, 2, 3, 6, 9 are not*

Summary of the items comparability

	Comparable		Not comparable	
	10-y.o.	12-y.o.	10-y.o.	12-y.o.
SLSS (15 countries)	My life is going well I have a good life I have what I want in life The things in my life are excellent	My life is going well I have a good life	My life is just right	My life is just right I have what I want in life The things in my life are excellent
BMSLSS (11 countries)	Sat with people I live with Sat with my friends		Sat with my school experience Sat with myself Sat the area I live in, in gen.	Sat with people I live with Sat with my friends Sat with my school experience Sat with myself Sat the area I live in, in gen.
PWI-SC7 (11 countries)	Satisfaction with health Sat relationship people Sat how safe you feel	Sat relationship people Sat how safe you feel Sat may happen later life	Sat all things you have Sat things want be good at Sat doing things away home Sat may happen later life	Sat all things you have Satisfaction with health Sat things want be good at Sat doing things away home
PWI-SC9 (9 countries 10yo; 11 countries 12yo)	Satisfaction with health Sat relationship people Sat how safe you feel Sat how you use your time	Sat relationship people Sat how safe you feel Sat may happen later life Sat how you use your time	Sat all things you have Sat things want be good at Sat doing things away home Sat may happen later life Sat your life as student	Sat all things you have Satisfaction with health Sat things want be good at Sat doing things away home Sat your life as student

Summarised results (I)

- Data in our database display a very good quality.
- We have identified models using each of the 4 different psychometric scales which fit well with the pooled database from all countries.
- Therefore, the models here presented, in principle, can be used for in-country analysis and even cross-groups analysis in each country, although specific checking is advisable with each country data depending of the kind of analysis developed.
- Correlations and regressions are comparable among countries excepting for a few countries (the ones indicating by "no" for each scale and age group in the previous tables).
- SLSS displays promising results, because is the only scale which correlations and regressions are comparable among ALL countries in this sample. However, not all its items display comparable means.
- The non-comparability of data suggests different answering styles, probably due to linguistic and cultural factors.

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Summarised results (II)

- Means of the overall scale indexes are only comparable among countries in some cases, using partial intercepts constrains (not all items constrained).
- SLSS means are comparable: (a) for the 10-year-olds database, when item 2 is unconstrained, meaning that items 1, 3, 4 and 5 means are comparable; (b) for the 12-year-olds database, when item 4 is not included and items 2 and 5 are unconstrained, meaning that only items 1 and 3 means are strictly comparable.
- Means of 2 items of the BMSLSS are comparable among 11 countries, but only with the 10-y.o. database.
- Means of the PWI-SC7 are comparable among 11 countries: (a) using the 10-year-olds database, when items 1, 3, 6, 7 are unconstrained, meaning that only of items 2, 4 and 5 are strictly comparable; (b) using the 12-year-olds database, when items 1, 2, 3, 6 are unconstrained, meaning that only items 4, 5 and 7 are comparable.

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Summarised results (III)

- Means of the PWI-SC9 are comparable: (a) among 9 countries using the 10-year-olds database, when items 1, 3, 6, 7 are unconstrained, meaning that only items 2, 4, 5 and 8 are strictly comparable; (b) among 11 countries using the 12-year-olds database, when items 1, 2, 3, 6, 9 are unconstrained, meaning that only items 4, 5, 7 and 8 are comparable.
- Future challenge: more analysis must be done in order to identify which items should be modified – and how - in order to increase cross-country comparability of the scales.

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