

LBP-TBQ: Supplementary digital content 9

Multi-group analyses for measurement invariance – parameter estimates and model fit (ML)

Acupuncture data

Multi-group CFA analyses were performed with the 16-item LBP-TBQ to examine measurement invariance (MI) for acupuncture data between:

- Participants with nerve compression likely or not
- Participants with sciatica diagnosis reported or not
- Participants with pain duration less than 3 years versus more than 3 years
- Treatment-experienced versus treatment-naïve participants
- Across time (wave 1 versus wave 2)

Results are presented below and include model fit summaries, nested models comparisons, and graphical representation of the most appropriate models. For these analyses, multivariate outliers were first excluded from the sample to exclude this source of model misspecification; sensitivity analyses were performed selectively with the total samples, with similar results. Models reported here were estimated using maximum likelihood (ML).

A. Nerve compression likely ($N=144$ cases -20 outliers=124) or not ($N=170$ cases -23 outliers=147)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	418.984	188	.000	2.229
Measurement weights	100	440.899	204	.000	2.161
Measurement intercepts	84	455.682	220	.000	2.071
Structural covariances	78	499.057	226	.000	2.208
Measurement residuals	58	538.262	246	.000	2.188
Saturated model	304	.000	0		
Independence model	64	4298.500	240	.000	17.910

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Unconstrained	.903	.876	.944	.927	.943
Measurement weights	.897	.879	.942	.931	.942
Measurement intercepts	.894	.884	.942	.937	.942
Structural covariances	.884	.877	.933	.929	.933

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Measurement residuals	.875	.878	.928	.930	.928
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.068	.059	.076	.001
Measurement weights	.066	.057	.074	.001
Measurement intercepts	.063	.055	.071	.005
Structural covariances	.067	.059	.075	.000
Measurement residuals	.066	.059	.074	.000
Independence model	.251	.244	.257	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	650.984	684.891		
Measurement weights	640.899	670.129		
Measurement intercepts	623.682	648.236		
Structural covariances	655.057	677.856		
Measurement residuals	654.262	671.215		
Saturated model	608.000	696.860		
Independence model	4426.500	4445.207		

Nested Model Comparisons

Assuming model Unconstrained to be correct:

Model	DF	CMIN	P	NFI	IFI	RFI	TLI
				Delta-1	Delta-2	rho-1	rho2
Measurement weights	16	21.915	.146	.005	.005	-.004	-.004
Measurement intercepts	32	36.699	.260	.009	.009	-.009	-.009
Structural covariances	38	80.073	.000	.019	.019	-.001	-.001
Measurement residuals	58	119.278	.000	.028	.029	-.002	-.002

Assuming model Measurement weights to be correct:

Model	DF	CMIN	P	NFI	IFI	RFI	TLI
				Delta-1	Delta-2	rho-1	rho2
Measurement intercepts	16	14.784	.541	.003	.004	-.005	-.005
Structural covariances	22	58.158	.000	.014	.014	.003	.003
Measurement residuals	42	97.363	.000	.023	.024	.001	.002

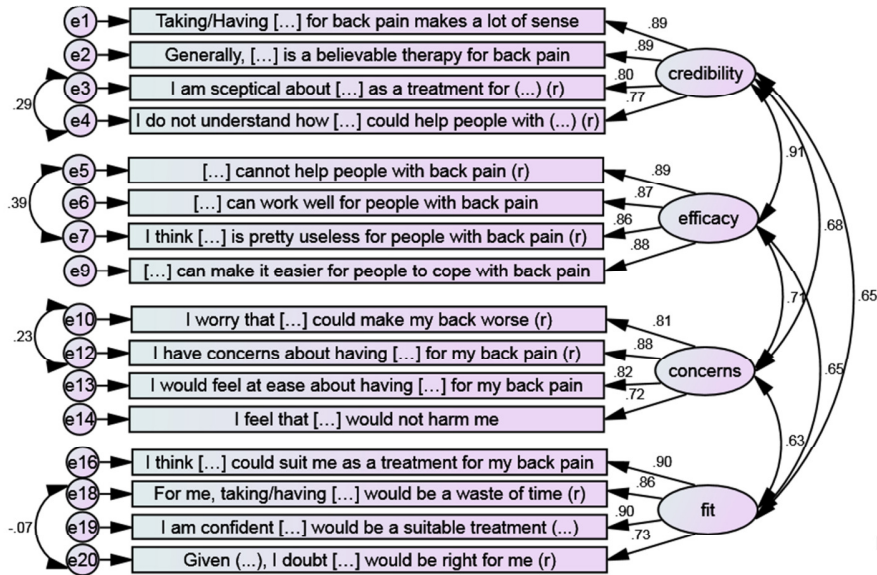
Assuming model Measurement intercepts to be correct:

Model	DF	CMIN	P	NFI	IFI	RFI	TLI
				Delta-1	Delta-2	rho-1	rho2
Structural covariances	6	43.374	.000	.010	.011	.008	.008
Measurement residuals	26	82.579	.000	.019	.020	.007	.007

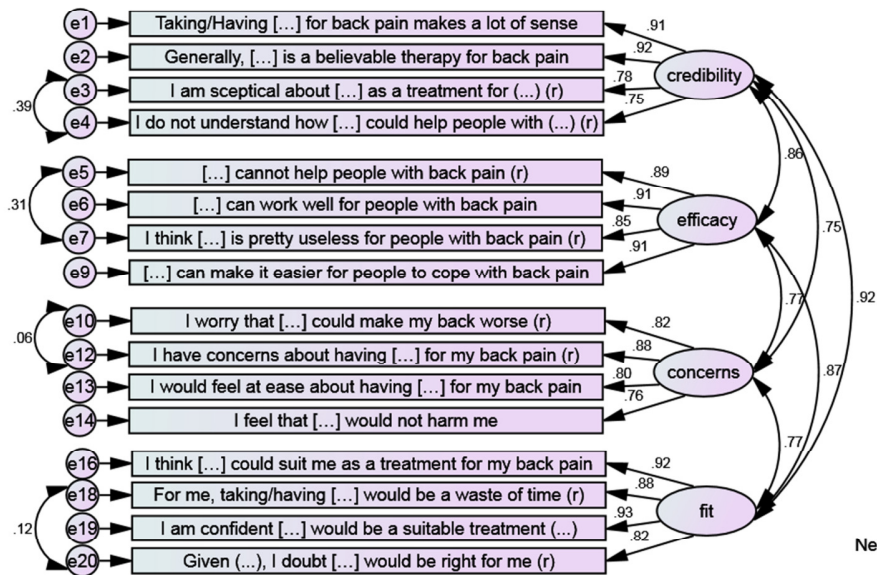
Assuming model Structural covariances to be correct:

Model	DF	CMIN	P	NFI	IFI	RFI	TLI
				Delta-1	Delta-2	rho-1	rho2
Measurement residuals	20	39.205	.006	.009	.010	-.001	-.001

Measurement intercepts models:



CFA Specific Beliefs
 MI analysis (ML)
 Acupuncture
 Nerve compression likely
 4-factor model
 Standardized estimates
 Chi-square = 455.682 (220 df); p = .000
 CFI = .942; TLI = .937
 RMSEA = .063 (.055-.071)
 AIC=623.682



CFA Specific Beliefs
 MI analysis (ML)
 Acupuncture
 Nerve compression unlikely
 4-factor model
 Standardized estimates
 Chi-square = 455.682 (220 df); p = .000
 CFI = .942; TLI = .937
 RMSEA = .063 (.055-.071)
 AIC=623.682

B. *Sciatica* diagnosis reported (N=192 cases -27outliers=165) or not (N=237 cases – 35 outliers=202)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	470.561	188	.000	2.503
Measurement weights	100	501.716	204	.000	2.459
Measurement intercepts	84	516.228	220	.000	2.346
Structural covariances	78	544.306	226	.000	2.408
Measurement residuals	58	598.457	246	.000	2.433
Saturated model	304	.000	0		
Independence model	64	5711.178	240	.000	23.797

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Unconstrained	.918	.895	.949	.934	.948
Measurement weights	.912	.897	.946	.936	.946
Measurement intercepts	.910	.901	.946	.941	.946
Structural covariances	.905	.899	.942	.938	.942
Measurement residuals	.895	.898	.936	.937	.936
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.064	.057	.071	.001
Measurement weights	.063	.056	.070	.001
Measurement intercepts	.061	.054	.068	.005
Structural covariances	.062	.055	.069	.002
Measurement residuals	.063	.056	.069	.001
Independence model	.250	.244	.256	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	702.561	726.710		
Measurement weights	701.716	722.533		
Measurement intercepts	684.228	701.715		
Structural covariances	700.306	716.544		
Measurement residuals	714.457	726.531		
Saturated model	608.000	671.285		
Independence model	5839.178	5852.501		

Nested Model Comparisons

Assuming model Unconstrained to be correct:

Model	DF	CMIN	P	NFI	IFI	RFI	TLI
				Delta-1	Delta-2	rho-1	rho2
Measurement weights	16	31.155	.013	.005	.006	-.002	-.002
Measurement intercepts	32	45.667	.056	.008	.008	-.007	-.007
Structural covariances	38	73.745	.000	.013	.013	-.004	-.004
Measurement residuals	58	127.896	.000	.022	.023	-.003	-.003

Assuming model Measurement weights to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement intercepts	16	14.512	.561	.003	.003	-.005	-.005
Structural covariances	22	42.590	.005	.007	.008	-.002	-.002
Measurement residuals	42	96.741	.000	.017	.018	-.001	-.001

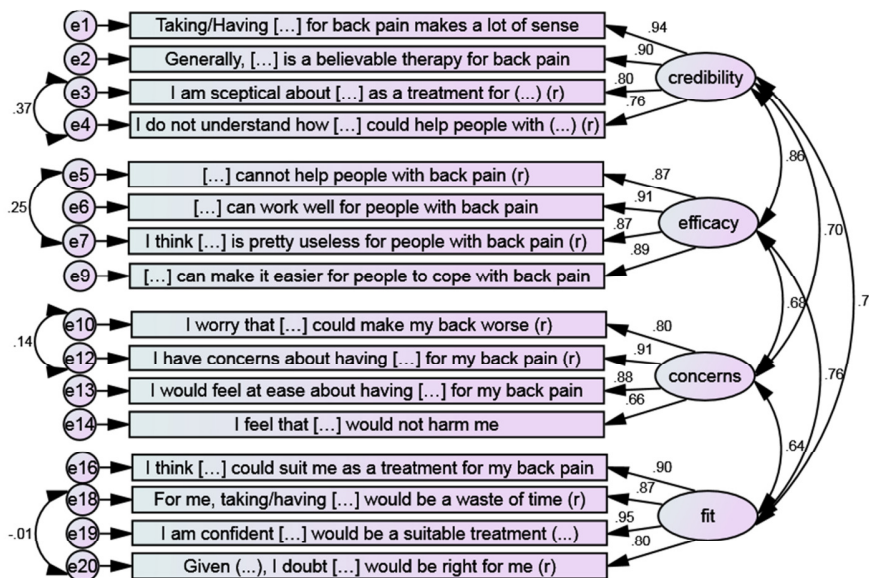
Assuming model Measurement intercepts to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	28.078	.000	.005	.005	.003	.003
Measurement residuals	26	82.229	.000	.014	.015	.004	.004

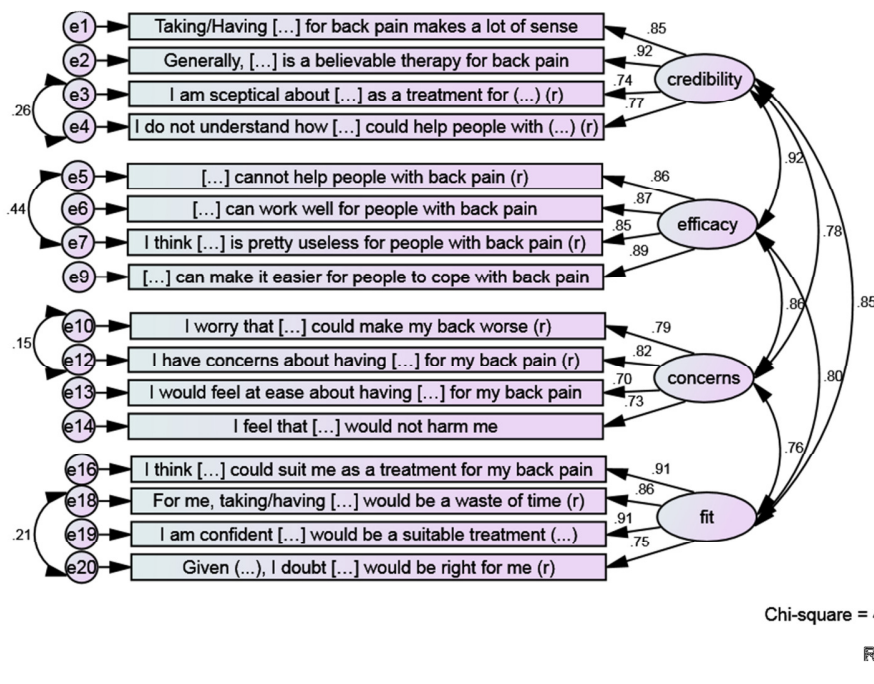
Assuming model Structural covariances to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement residuals	20	54.151	.000	.009	.010	.001	.001

Unconstrained models:



CFA Specific Beliefs
 ML analysis (ML)
 Acupuncture
 Sciatica likely
 4-factor model
 Standardized estimates
 Chi-square = 470.561 (188 df); p = .000
 CFI = .948; TLI = .934
 RMSEA = .084 (.057-.071)
 AIC=702.581



C. Pain duration less than 3 years (N = 151cases – 24 outliers=127) vs more than 3 years (N = 278 cases - 35 outliers=243)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	545.937	188	.000	2.904
Measurement weights	100	559.623	204	.000	2.743
Measurement intercepts	84	580.450	220	.000	2.638
Structural covariances	78	600.129	226	.000	2.655
Measurement residuals	58	686.426	246	.000	2.790
Saturated model	304	.000	0		
Independence model	64	5707.979	240	.000	23.783

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Unconstrained	.904	.878	.935	.916	.935
Measurement weights	.902	.885	.935	.923	.935
Measurement intercepts	.898	.889	.934	.928	.934
Structural covariances	.895	.888	.932	.927	.932
Measurement residuals	.880	.883	.919	.921	.919
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.072	.065	.079	.000
Measurement weights	.069	.062	.076	.000
Measurement intercepts	.067	.060	.073	.000
Structural covariances	.067	.061	.074	.000
Measurement residuals	.070	.064	.076	.000
Independence model	.249	.243	.254	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	777.937	804.966		
Measurement weights	759.623	782.923		
Measurement intercepts	748.450	768.022		
Structural covariances	756.129	774.303		
Measurement residuals	802.426	815.940		
Saturated model	608.000	678.833		
Independence model	5835.979	5850.891		

Nested Model Comparisons

Assuming model Unconstrained to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement weights	16	13.685	.622	.002	.002	-.007	-.007
Measurement intercepts	32	34.513	.349	.006	.006	-.011	-.012
Structural covariances	38	54.192	.043	.009	.010	-.010	-.011
Measurement residuals	58	140.489	.000	.025	.025	-.005	-.005

Assuming model Measurement weights to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement intercepts	16	20.827	.185	.004	.004	-.004	-.005
Structural covariances	22	40.506	.009	.007	.007	-.004	-.004
Measurement residuals	42	126.803	.000	.022	.023	.002	.002

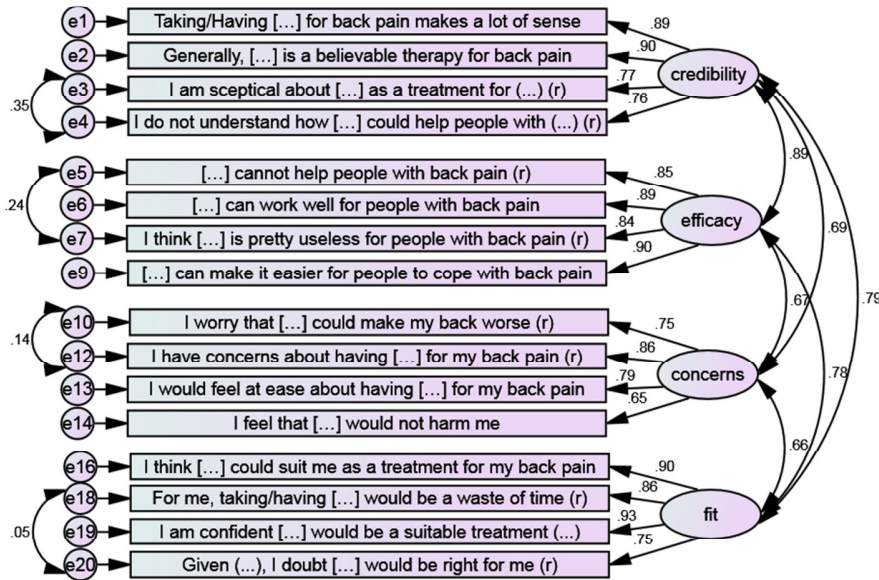
Assuming model Measurement intercepts to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	19.679	.003	.003	.004	.001	.001
Measurement residuals	26	105.976	.000	.019	.019	.006	.007

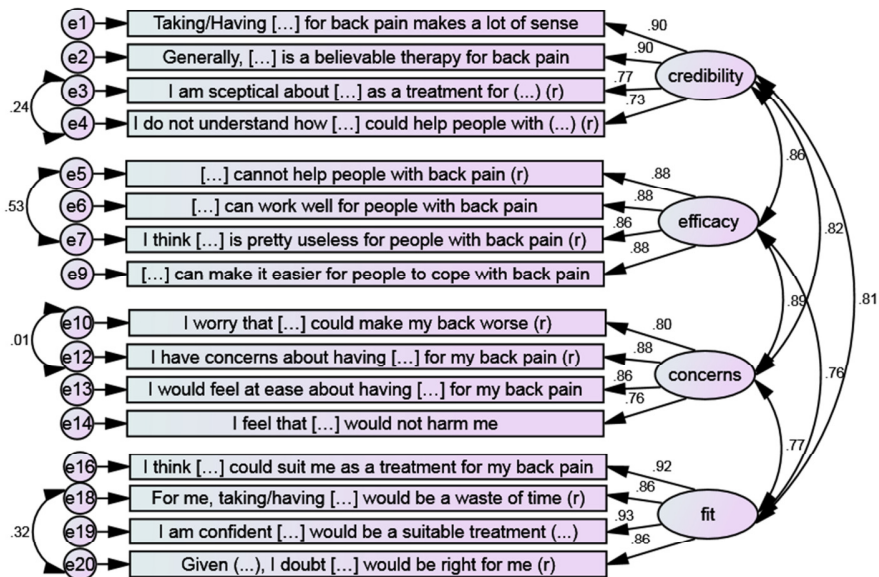
Assuming model Structural covariances to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement residuals	20	86.297	.000	.015	.016	.006	.006

Measurement intercepts models:



CFA Specific Beliefs
MI analysis (ML)
Acupuncture
Pain duration > 3years
4-factor model
Standardized estimates
Chi-square = 580.450 (220 df); p= .000
CFI = .934; TLI = .928
RMSEA = .067 (.060-.073)
AIC=748.450



CFA Specific Beliefs
MI analysis (ML)
Acupuncture
pain duration < 3years
4-factor model
Standardized estimates
Chi-square = 580.450 (220 df); p= .000
CFI = .934; TLI = .928
RMSEA = .067 (.060-.073)
AIC=748.450

D. Treatment-experienced (N = 151– 13 outliers=138) or not (N = 277 – 46outliers=231)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	491.399	188	.000	2.614
Measurement weights	100	549.802	204	.000	2.695
Measurement intercepts	84	669.557	220	.000	3.043
Structural covariances	78	693.520	226	.000	3.069
Measurement residuals	58	831.912	246	.000	3.382
Saturated model	304	.000	0		
Independence model	64	4913.347	240	.000	20.472

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Unconstrained	.900	.872	.936	.917	.935
Measurement weights	.888	.868	.927	.913	.926
Measurement intercepts	.864	.851	.904	.895	.904
Structural covariances	.859	.850	.900	.894	.900
Measurement residuals	.831	.835	.874	.878	.875
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.066	.059	.074	.000
Measurement weights	.068	.061	.075	.000
Measurement intercepts	.075	.068	.081	.000
Structural covariances	.075	.069	.081	.000
Measurement residuals	.081	.075	.087	.000
Independence model	.230	.225	.236	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	723.399	749.197		
Measurement weights	749.802	772.042		
Measurement intercepts	837.557	856.238		
Structural covariances	849.520	866.867		
Measurement residuals	947.912	960.810		
Saturated model	608.000	675.608		
Independence model	5041.347	5055.580		

Nested Model Comparisons

Assuming model Unconstrained to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement weights	16	58.403	.000	.012	.012	.004	.004
Measurement intercepts	32	178.158	.000	.036	.038	.021	.022
Structural covariances	38	202.122	.000	.041	.043	.022	.023
Measurement residuals	58	340.513	.000	.069	.072	.038	.039

Assuming model Measurement weights to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement intercepts	16	119.754	.000	.024	.025	.017	.018
Structural covariances	22	143.718	.000	.029	.031	.018	.019
Measurement residuals	42	282.109	.000	.057	.060	.034	.035

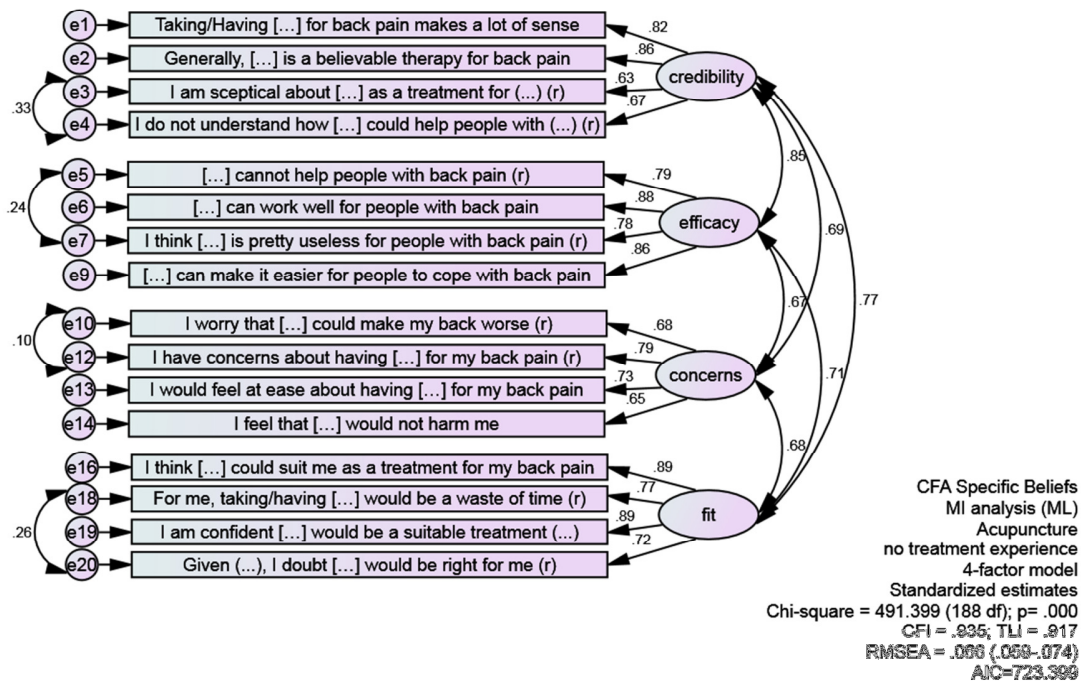
Assuming model Measurement intercepts to be correct:

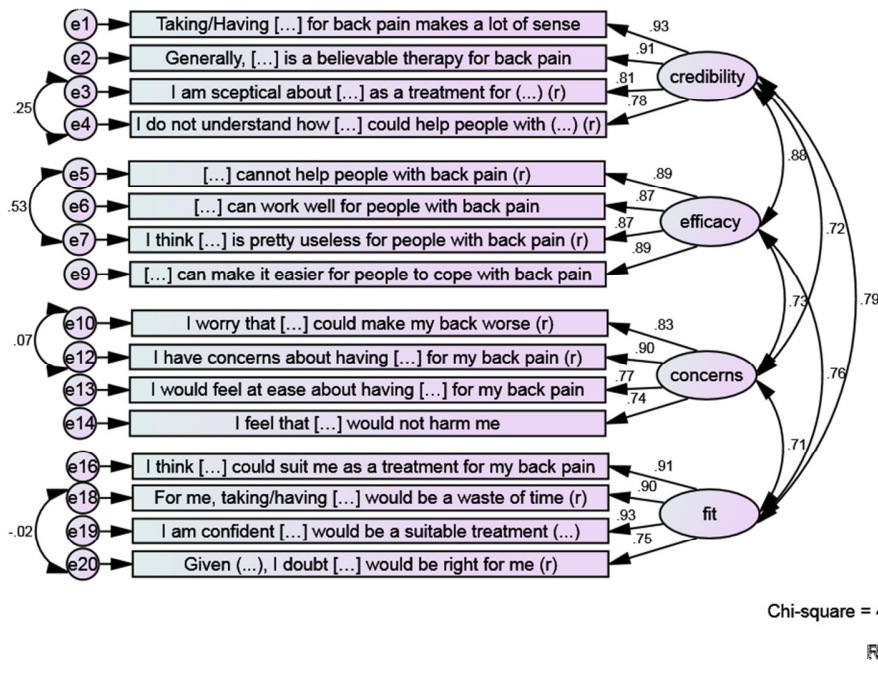
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	23.964	.001	.005	.005	.001	.001
Measurement residuals	26	162.355	.000	.033	.035	.017	.017

Assuming model Structural covariances to be correct:

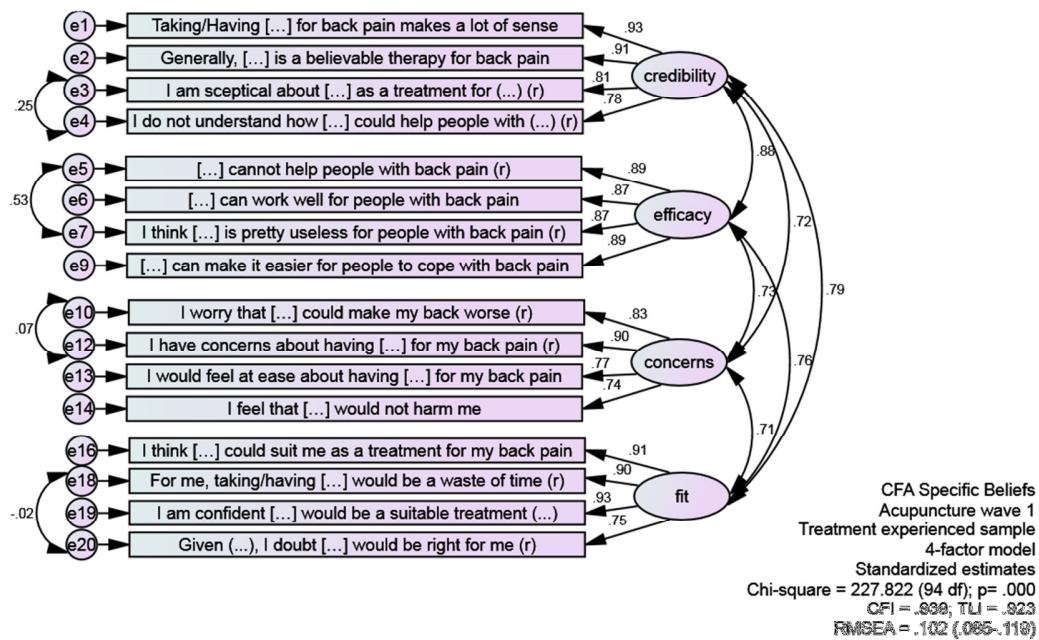
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement residuals	20	138.391	.000	.028	.030	.015	.016

Unconstrained models:





Model run only for treatment experienced:



E. Measurement invariance across time: : wave 1 (N= 429 cases - 60 outliers=369) versus wave 2 (N=115 cases -13 outliers=102)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	536.878	188	.000	2.856
Measurement weights	100	553.536	204	.000	2.713
Measurement intercepts	84	568.408	220	.000	2.584
Structural covariances	78	587.880	226	.000	2.601
Measurement residuals	58	613.242	246	.000	2.493
Saturated model	304	.000	0		
Independence model	64	7526.510	240	.000	31.360

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Unconstrained	.929	.909	.952	.939	.952
Measurement weights	.926	.913	.952	.944	.952
Measurement intercepts	.924	.918	.952	.948	.952
Structural covariances	.922	.917	.950	.947	.950
Measurement residuals	.919	.921	.950	.951	.950
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.063	.057	.069	.000
Measurement weights	.060	.054	.067	.002
Measurement intercepts	.058	.052	.064	.012
Structural covariances	.058	.053	.064	.009
Measurement residuals	.056	.051	.062	.030
Independence model	.254	.249	.259	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	768.878	798.568		
Measurement weights	753.536	779.130		
Measurement intercepts	736.408	757.907		
Structural covariances	743.880	763.844		
Measurement residuals	729.242	744.087		
Saturated model	608.000	685.808		
Independence model	7654.510	7670.891		

Nested Model Comparisons

Assuming model Unconstrained to be correct:

Model	DF	CMIN	P	NFI	IFI	RFI	TLI
				Delta-1	Delta-2	rho-1	rho2
Measurement weights	16	16.658	.408	.002	.002	-.005	-.005
Measurement intercepts	32	31.530	.490	.004	.004	-.009	-.009
Structural covariances	38	51.002	.077	.007	.007	-.008	-.008

Measurement residuals	58	76.364	.053	.010	.010	-.012	-.012
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Assuming model Measurement weights to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement intercepts	16	14.872	.534	.002	.002	-.004	-.004
Structural covariances	22	34.344	.045	.005	.005	-.004	-.004
Measurement residuals	42	59.707	.037	.008	.008	-.007	-.007

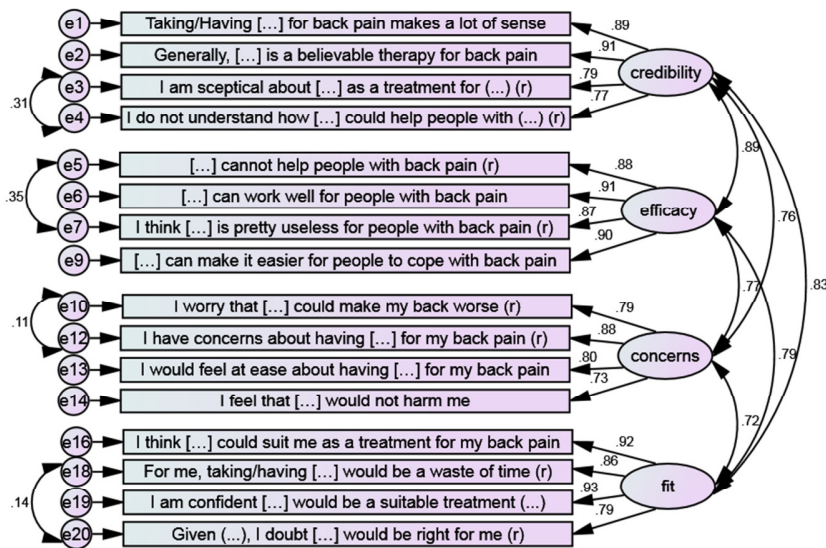
Assuming model Measurement intercepts to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	19.472	.003	.003	.003	.001	.001
Measurement residuals	26	44.835	.012	.006	.006	-.003	-.003

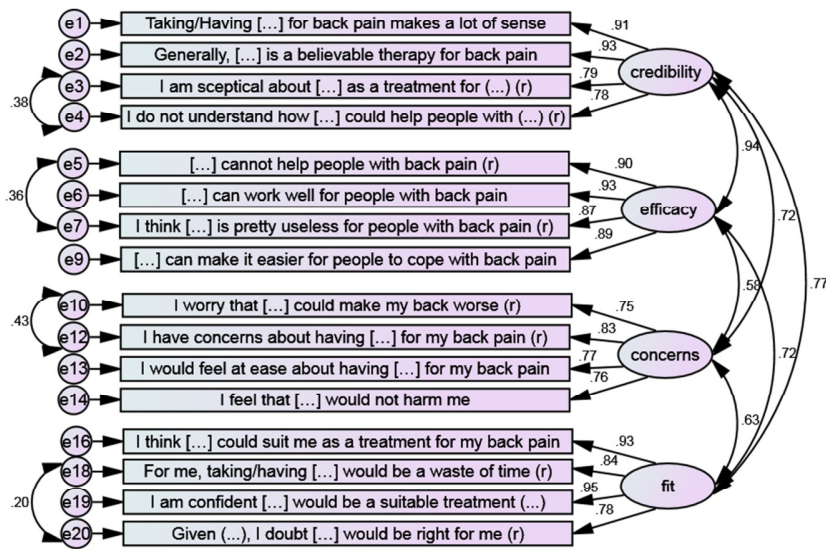
Assuming model Structural covariances to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement residuals	20	25.363	.188	.003	.003	-.003	-.004

Measurement intercepts models:



CFA Specific Beliefs
 MI analysis (ML)
 Acupuncture
 wave 1
 4-factor model
 Standardized estimates
 Chi-square = 568.408 (220 df); p= .000
 CFI = .952; TLI = .948
 RMSEA = .058 (.052-.064)
 AIC=738.408



CFA Specific Beliefs
 ML analysis (ML)
 Acupuncture
 wave 2
 4-factor model
 Standardized estimates
 Chi-square = 568.408 (220 df); p= .000
 CFI = .952; TLI = .948
 RMSEA = .058 (.052-.064)
 AIC=736.408