LBP-TBQ:
Supplementary digital content 7

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

Exercise Data

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

- 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= 144cases -12 outliers=132) or not (N=170 cases -17 outliers=153)

Model Fit Summary
CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	457.326	188	.000	2.433
Measurement weights	100	470.593	204	.000	2.307
Measurement intercepts	84	495.790	220	.000	2.254
Structural covariances	78	521.756	226	.000	2.309
Measurement residuals	58	617.076	246	.000	2.508
Saturated model	304	.000	0		
Independence model	64	4227.723	240	.000	17.616

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Unconstrained	.892	.862	.933	.914	.932
Measurement weights	.889	.869	.934	.921	.933
Measurement intercepts	.883	.872	.931	.925	.931
Structural covariances	.877	.869	.926	.921	.926

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Measurement residuals	.854	.858	.907	.909	.907
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.071	.063	.079	.000
Measurement weights	.068	.060	.076	.000
Measurement intercepts	.067	.059	.074	.000
Structural covariances	.068	.060	.076	.000
Measurement residuals	.073	.066	.080	.000
Independence model	.242	.236	.249	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	689.326	721.243		
Measurement weights	670.593	698.107		
Measurement intercepts	663.790	686.903		
Structural covariances	677.756	699.217		
Measurement residuals	733.076	749.035		
Saturated model	608.000	691.645		
Independence model	4355.723	4373.332		

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	13.267	.653	.003	.003	-.007	-.008
Measurement intercepts	32	38.465	.200	.009	.010	-.010	-.011
Structural covariances	38	64.430	.005	.015	.016	-.007	-.007
Measurement residuals	58	159.751	.000	.038	.040	.004	.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	25.198	.066	.006	.006	-.003	-.003
Structural covariances	22	51.163	.000	.012	.013	.000	.000
Measurement residuals	42	146.484	.000	.035	.036	.011	.012

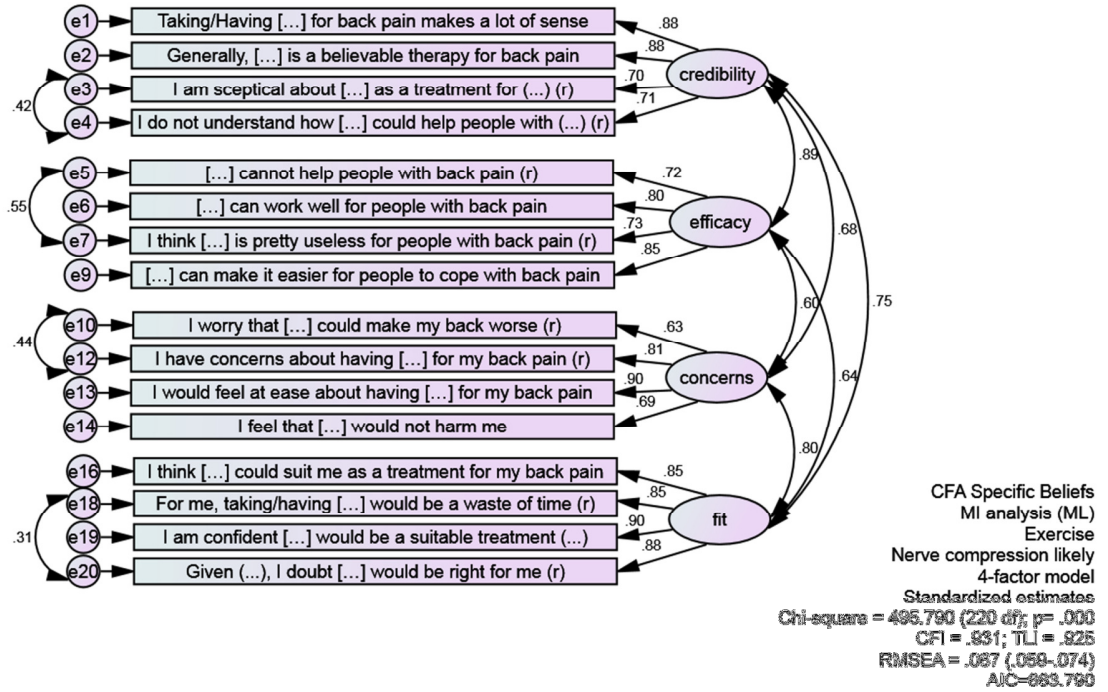
Assuming model Measurement intercepts to be correct:

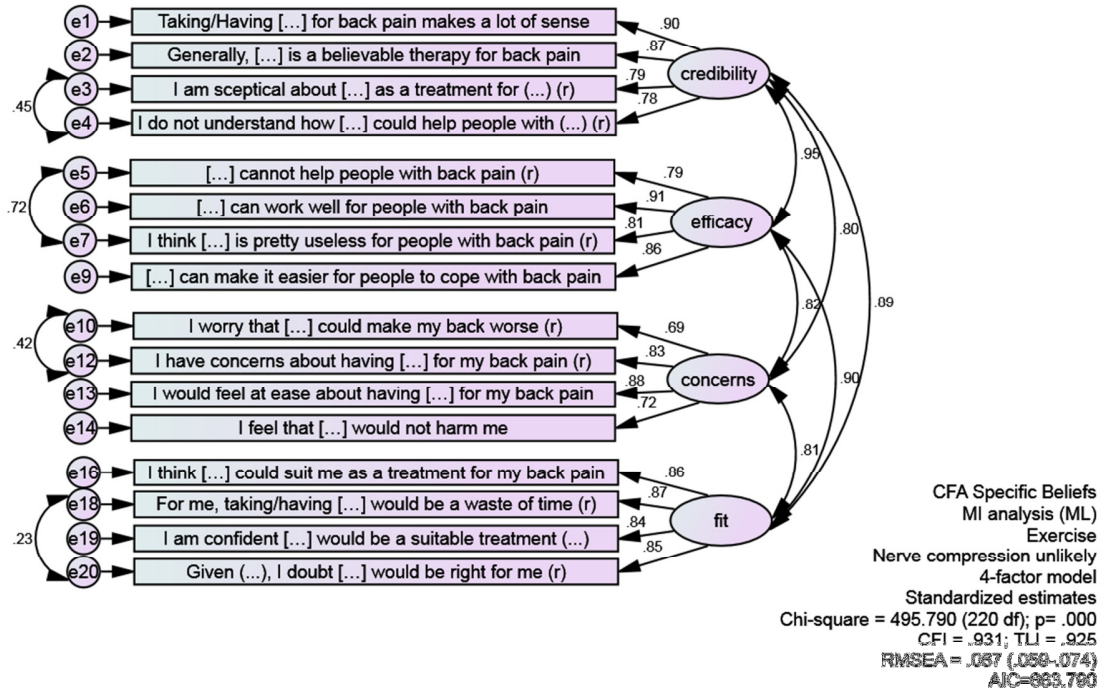
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	25.965	.000	.006	.006	.003	.003
Measurement residuals	26	121.286	.000	.029	.030	.014	.015

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	95.321	.000	.023	.024	.011	.012

Measurement intercepts models:





B. Sciatica diagnosis reported (N=192 cases -17outliers=175) or not (N=237 cases – 21 outliers=216)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	532.959	188	.000	2.835
Measurement weights	100	547.188	204	.000	2.682
Measurement intercepts	84	563.415	220	.000	2.561
Structural covariances	78	571.049	226	.000	2.527
Measurement residuals	58	612.165	246	.000	2.488
Saturated model	304	.000	0		
Independence model	64	5925.248	240	.000	24.689

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Unconstrained	.910	.885	.940	.923	.939
Measurement weights	.908	.891	.940	.929	.940
Measurement intercepts	.905	.896	.940	.934	.940
Structural covariances	.904	.898	.939	.936	.939
Measurement residuals	.897	.899	.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	.069	.062	.076	.000
Measurement weights	.066	.059	.072	.000
Measurement intercepts	.063	.057	.070	.000
Structural covariances	.063	.056	.069	.001
Measurement residuals	.062	.056	.068	.001
Independence model	.247	.241	.252	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	764.959	787.495		
Measurement weights	747.188	766.616		
Measurement intercepts	731.415	747.734		
Structural covariances	727.049	742.202		
Measurement residuals	728.165	739.433		
Saturated model	608.000	667.060		
Independence model	6053.248	6065.681		

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	14.230	.582	.002	.002	-.006	-.006
Measurement intercepts	32	30.456	.545	.005	.005	-.011	-.012
Structural covariances	38	38.090	.465	.006	.007	-.012	-.013
Measurement residuals	58	79.207	.034	.013	.014	-.014	-.015

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	16.227	.437	.003	.003	-.005	-.005
Structural covariances	22	23.861	.355	.004	.004	-.006	-.007
Measurement residuals	42	64.977	.013	.011	.011	-.008	-.008

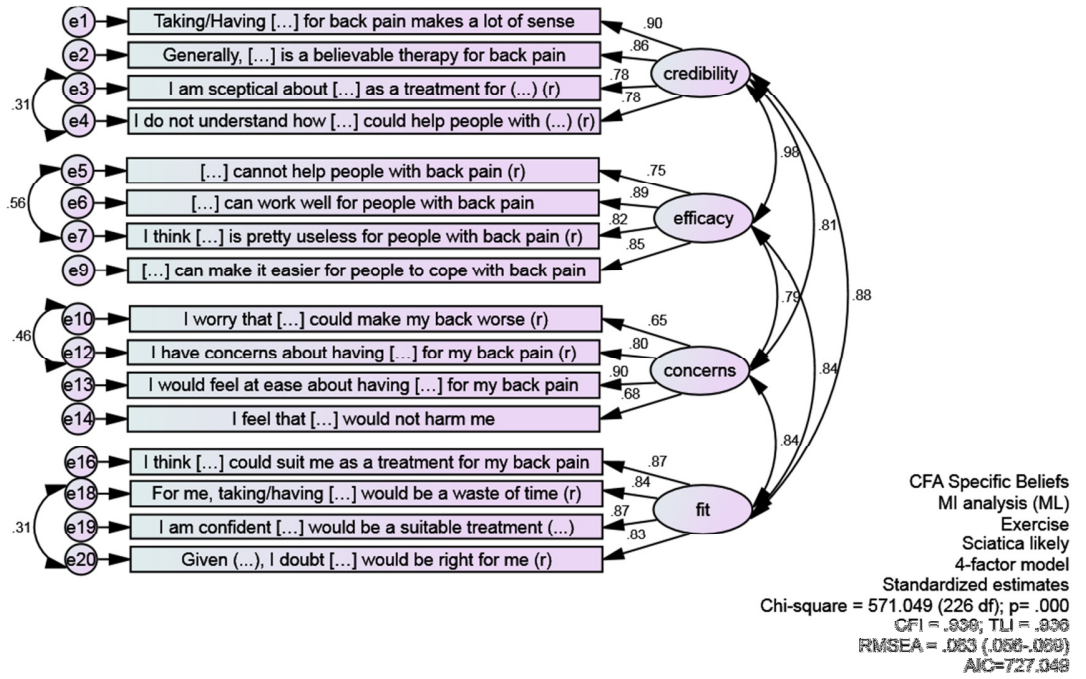
Assuming model Measurement intercepts to be correct:

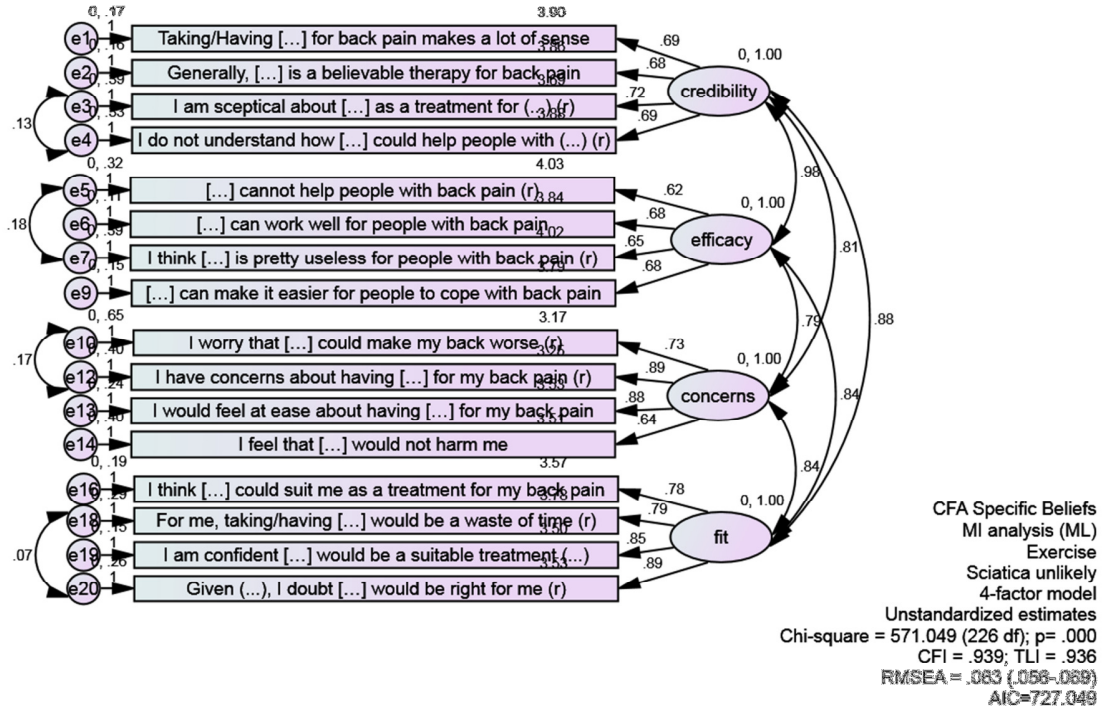
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	7.634	.266	.001	.001	-.001	-.001
Measurement residuals	26	48.751	.004	.008	.009	-.003	-.003

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	41.117	.004	.007	.007	-.002	-.002

Structural covariances models:





C. Pain duration less than 3 years (N = 151cases – 14outliers=137) vs more than 3 years (N = 278 cases - 28 outliers=250)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	467.121	188	.000	2.485
Measurement weights	100	481.901	204	.000	2.362
Measurement intercepts	84	487.346	220	.000	2.215
Structural covariances	78	505.824	226	.000	2.238
Measurement residuals	58	539.150	246	.000	2.192
Saturated model	304	.000	0		
Independence model	64	5874.857	240	.000	24.479

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Unconstrained	.920	.898	.951	.937	.950
Measurement weights	.918	.903	.951	.942	.951
Measurement intercepts	.917	.910	.953	.948	.953
Structural covariances	.914	.909	.950	.947	.950
Measurement residuals	.908	.910	.948	.949	.948
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.062	.055	.069	.003
Measurement weights	.059	.053	.066	.012
Measurement intercepts	.056	.049	.063	.064
Structural covariances	.057	.050	.063	.047
Measurement residuals	.056	.049	.062	.072
Independence model	.247	.241	.252	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	699.121	724.331		
Measurement weights	681.901	703.634		
Measurement intercepts	655.346	673.601		
Structural covariances	661.824	678.776		
Measurement residuals	655.150	667.755		
Saturated model	608.000	674.068		
Independence model	6002.857	6016.766		

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	14.780	.541	.003	.003	-.005	-.005
Measurement intercepts	32	20.224	.947	.003	.004	-.011	-.011
Structural covariances	38	38.703	.438	.007	.007	-.010	-.011
Measurement residuals	58	72.028	.102	.012	.013	-.012	-.012

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	5.444	.993	.001	.001	-.006	-.006
Structural covariances	22	23.923	.351	.004	.004	-.005	-.005
Measurement residuals	42	57.248	.059	.010	.010	-.007	-.007

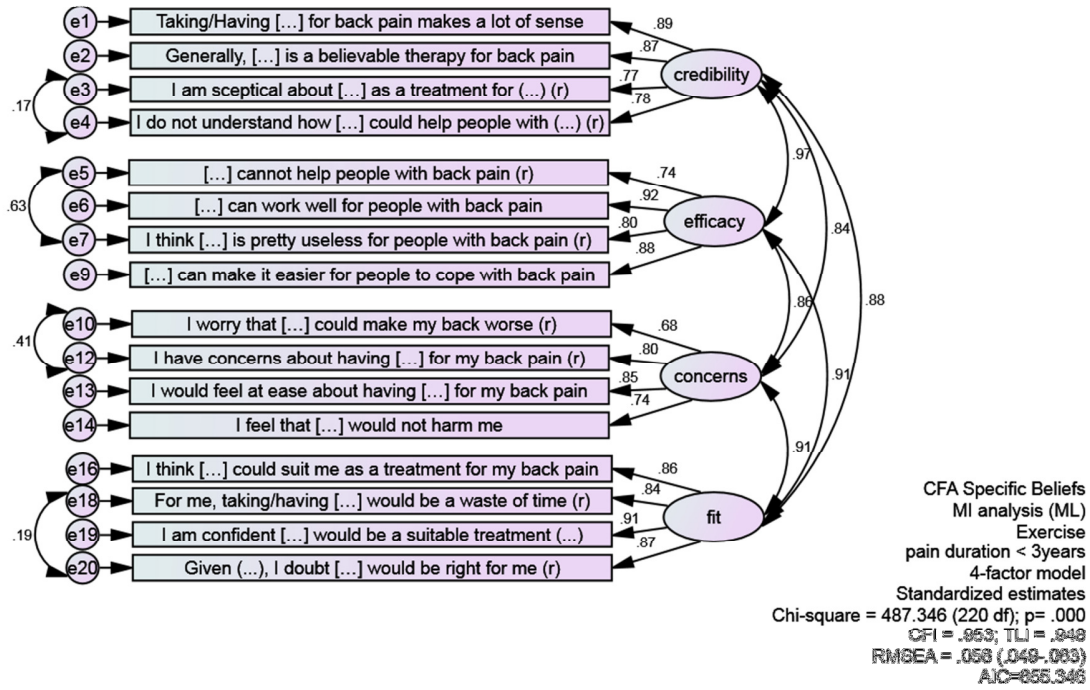
Assuming model Measurement intercepts to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	18.479	.005	.003	.003	.001	.001
Measurement residuals	26	51.804	.002	.009	.009	-.001	-.001

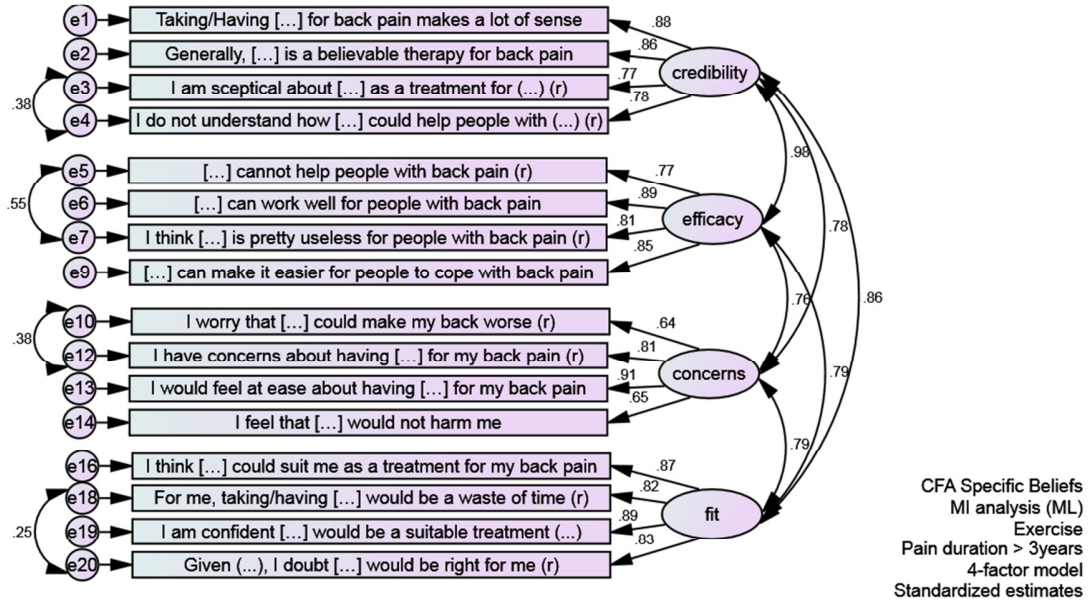
Assuming model Structural covariances to be correct:

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement residuals	20	33.326	.031	.006	.006	-.002	-.002

Measurement intercepts models:



CFA Specific Beliefs
MI analysis (ML)
Exercise
pain duration < 3years
4-factor model
Standardized estimates
Chi-square = 487.346 (220 df); p= .000
CFI = .953; TLI = .948
RMSEA = .056 (.049-.063)
AIC=655.346



CFA Specific Beliefs
MI analysis (ML)
Exercise
Pain duration > 3years
4-factor model
Standardized estimates
Chi-square = 487.346 (220 df); p= .000
CFI = .953; TLI = .948
RMSEA = .056 (.049-.063)
AIC=655.346

D. Treatment-experienced (N = 279– 24 outliers=255) or not (N = 149 – 13 outliers=136)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	570.982	188	.000	3.037
Measurement weights	100	590.415	204	.000	2.894
Measurement intercepts	84	633.388	220	.000	2.879
Structural covariances	78	645.078	226	.000	2.854
Measurement residuals	58	753.704	246	.000	3.064
Saturated model	304	.000	0		
Independence model	64	5706.809	240	.000	23.778

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Unconstrained	.900	.872	.931	.911	.930
Measurement weights	.897	.878	.930	.917	.929
Measurement intercepts	.889	.879	.925	.918	.924
Structural covariances	.887	.880	.924	.919	.923
Measurement residuals	.868	.871	.907	.909	.907
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	.066	.079	.000
Measurement weights	.070	.063	.076	.000
Measurement intercepts	.070	.063	.076	.000
Structural covariances	.069	.063	.075	.000
Measurement residuals	.073	.067	.079	.000
Independence model	.242	.237	.247	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	802.982	828.165		
Measurement weights	790.415	812.124		
Measurement intercepts	801.388	819.623		
Structural covariances	801.078	818.011		
Measurement residuals	869.704	882.295		
Saturated model	608.000	673.996		
Independence model	5834.809	5848.703		

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	19.433	.247	.003	.004	-.006	-.006
Measurement intercepts	32	62.405	.001	.011	.011	-.007	-.007
Structural covariances	38	74.095	.000	.013	.013	-.008	-.008
Measurement residuals	58	182.722	.000	.032	.033	.001	.001

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	42.973	.000	.008	.008	-.001	-.001
Structural covariances	22	54.663	.000	.010	.010	-.002	-.002
Measurement residuals	42	163.289	.000	.029	.030	.007	.007

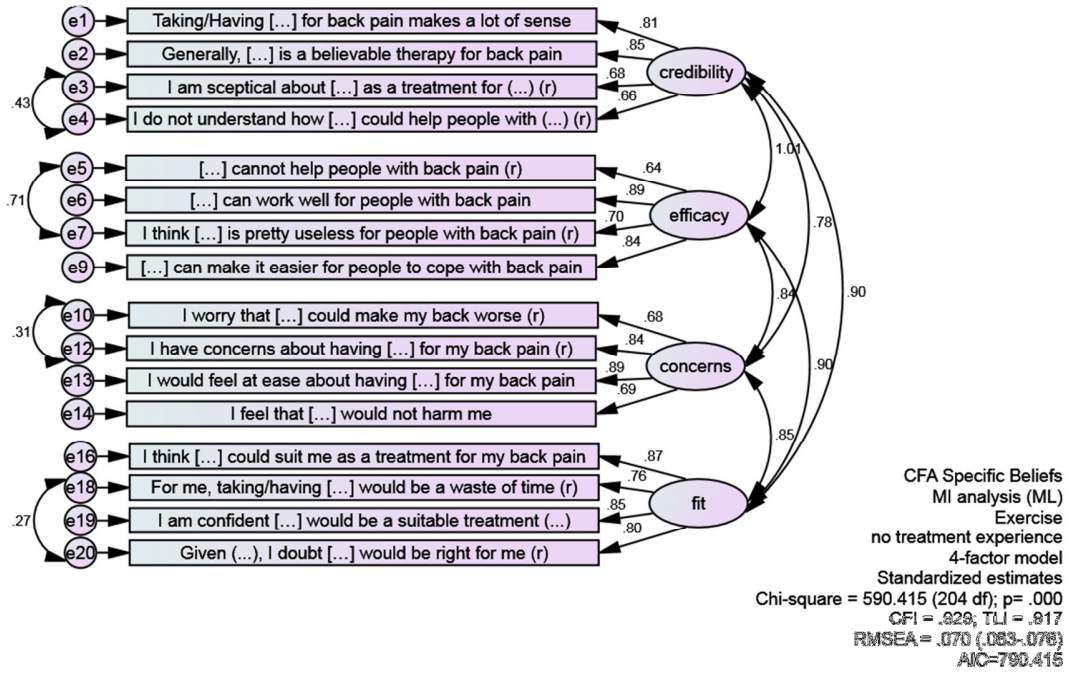
Assuming model Measurement intercepts to be correct:

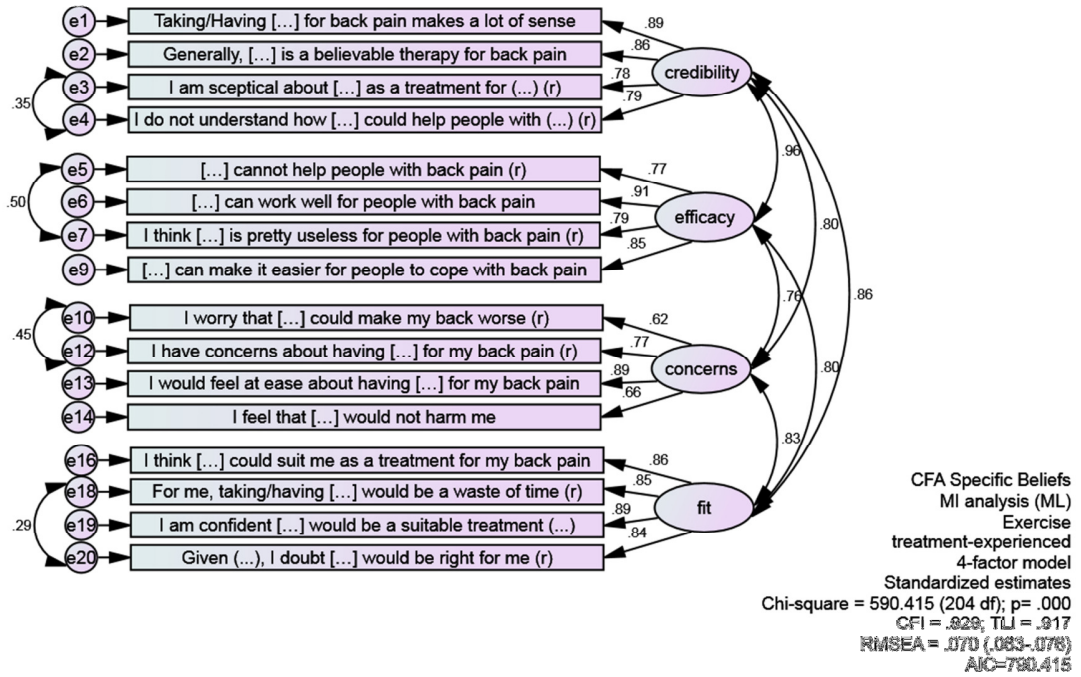
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	11.690	.069	.002	.002	-.001	-.001
Measurement residuals	26	120.316	.000	.021	.022	.008	.008

Assuming model Structural covariances to be correct:

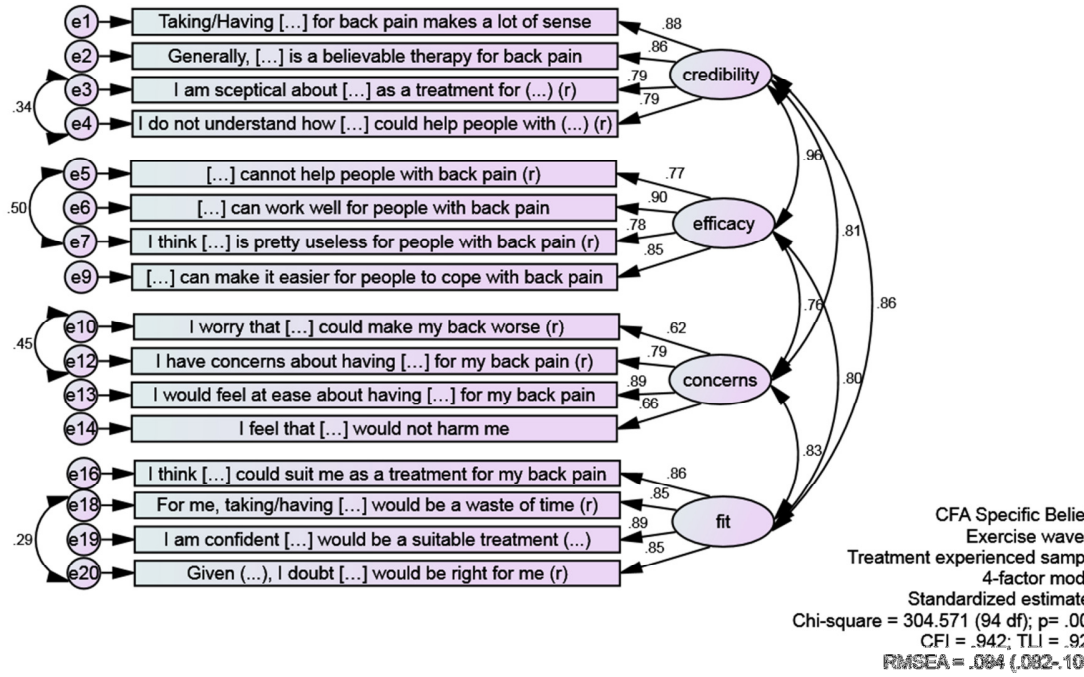
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Measurement residuals	20	108.626	.000	.019	.020	.009	.009

Measurement weights models:





Model run only for treatment experienced:



E. Measurement invariance across time: wave 1 (N= 429 cases -41 outliers=388) versus wave 2 (N=115cases -6 outliers=109)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Unconstrained	116	529.903	188	.000	2.819
Measurement weights	100	545.800	204	.000	2.675
Measurement intercepts	84	554.589	220	.000	2.521
Structural covariances	78	560.237	226	.000	2.479
Measurement residuals	58	625.544	246	.000	2.543
Saturated model	304	.000	0		
Independence model	64	7415.847	240	.000	30.899

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Unconstrained	.929	.909	.953	.939	.952
Measurement weights	.926	.913	.953	.944	.952
Measurement intercepts	.925	.918	.954	.949	.953
Structural covariances	.924	.920	.954	.951	.953
Measurement residuals	.916	.918	.947	.948	.947
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Unconstrained	.061	.055	.067	.002
Measurement weights	.058	.052	.064	.012
Measurement intercepts	.055	.050	.061	.059
Structural covariances	.055	.049	.060	.087
Measurement residuals	.056	.050	.061	.038
Independence model	.246	.241	.251	.000

AIC

Model	AIC	BCC	BIC	CAIC
Unconstrained	761.903	789.443		
Measurement weights	745.800	769.541		
Measurement intercepts	722.589	742.532		
Structural covariances	716.237	734.755		
Measurement residuals	741.544	755.314		
Saturated model	608.000	680.173		
Independence model	7543.847	7559.041		

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	15.897	.460	.002	.002	-.005	-.005
Measurement intercepts	32	24.686	.819	.003	.003	-.010	-.010
Structural covariances	38	30.333	.808	.004	.004	-.011	-.011

Measurement residuals	58	95.641	.001	.013	.013	-.009	-.009

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	8.789	.922	.001	.001	-.005	-.005
Structural covariances	22	14.437	.885	.002	.002	-.006	-.007
Measurement residuals	42	79.744	.000	.011	.011	-.004	-.004

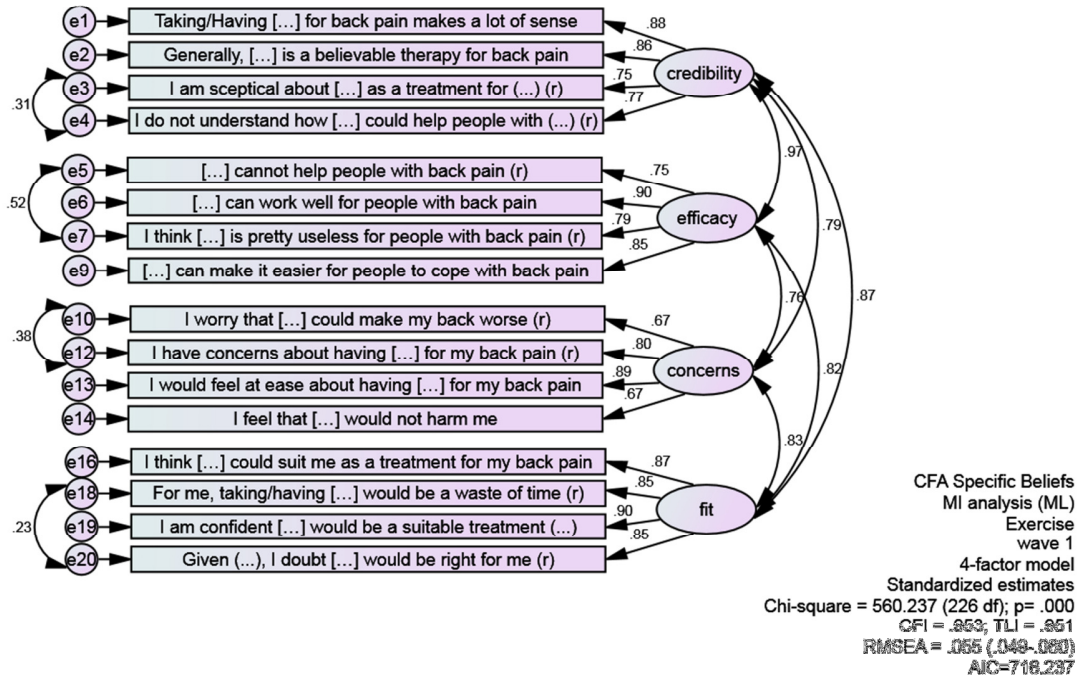
Assuming model Measurement intercepts to be correct:

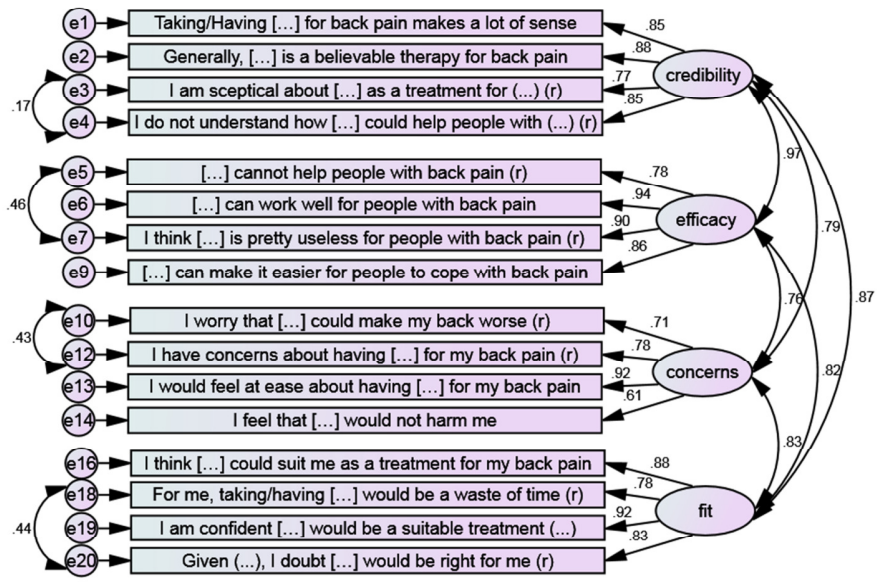
Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Structural covariances	6	5.648	.464	.001	.001	-.001	-.001
Measurement residuals	26	70.955	.000	.010	.010	.001	.001

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	65.307	.000	.009	.009	.002	.002

Structural covariances models

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Taking/Having […] for back pain makes a lot of sense
Generally, […] is a believable therapy for back pain
I am sceptical about […] as a treatment for (...) (r)
I do not understand how […] could help people with (...) (r)
[…] cannot help people with back pain (r)
[…] can work well for people with back pain
I think […] is pretty useless for people with back pain (r)
[…] can make it easier for people to cope with back pain
I worry that […] could make my back worse (r)
I have concerns about having […] for my back pain (r)
I would feel at ease about having […] for my back pain
I feel that […] would not harm me
I think […] could suit me as a treatment for my back pain
For me, taking/having […] would be a waste of time (r)
I am confident […] would be a suitable treatment (...)
Given (...), I doubt […] would be right for me (r)
credibility
efficacy
concerns
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.83
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.44
.97
.79
.87
.76
.82
.83
CFA Specific Beliefs
MI analysis (ML)
Exercise
wave 2
4-factor model
Standardized estimates
Chi-square = 560.237 (226 df); p= .000
CFI = .953; TLI = .951
RMSEA = .055 (.049-.060)
AIC=716.237