

# Bivariate Latent Change Score Modeling of Pain and Physical Function in Knee Osteoarthritis

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## Background

Patient reported outcome measures are commonly used to evaluate knee osteoarthritis symptoms prior to surgery. The A.S.K. study assessed Pain and Physical Function using the KOOS-12 and PROMIS measures at baseline, 6-, and 12-months. KOOS-12 is a disease-specific measure of knee pain, function, and quality of life. PROMIS Pain Interference and Physical Function were chosen, but these are generic measures. We were interested in how covariates differentially affect disease-specific and generic measures over time.

## Participants

N=3530 (KOOS-12) or N=1726 (PROMIS) as PROMIS was added later in the study

- Had surgery: 47% and 51%, respectively
- Female: 64% and 65%
- Any obesity: 57% and 52%
- Pain in non-operative joints (47%) and/or lower back pain (26%) was common

## Methods

- Using a structural equation modeling framework, fit bivariate latent change score (BLCSM) representing pain and function over time.
- Sequentially add covariates in blocks representing sociodemographics, emotional health, and physical health (including surgery status)
- Examine standardized estimates across models to compare influence of covariates on disease-specific (KOOS) vs. generic (PROMIS) patient reported outcome measures

## Results

Participants who went to surgery generally had greater pain and poorer function at baseline, especially on PROMIS measures. Pain in other joints primarily affected KOOS scores, but lower back pain and obesity affected both PROMIS and KOOS. Being female had a greater effect on scores from PROMIS.

At 6 months, previous improvement, obesity, and treatment status affected KOOS scores, while age, ethnicity, and comorbidity additionally affected PROMIS scores.

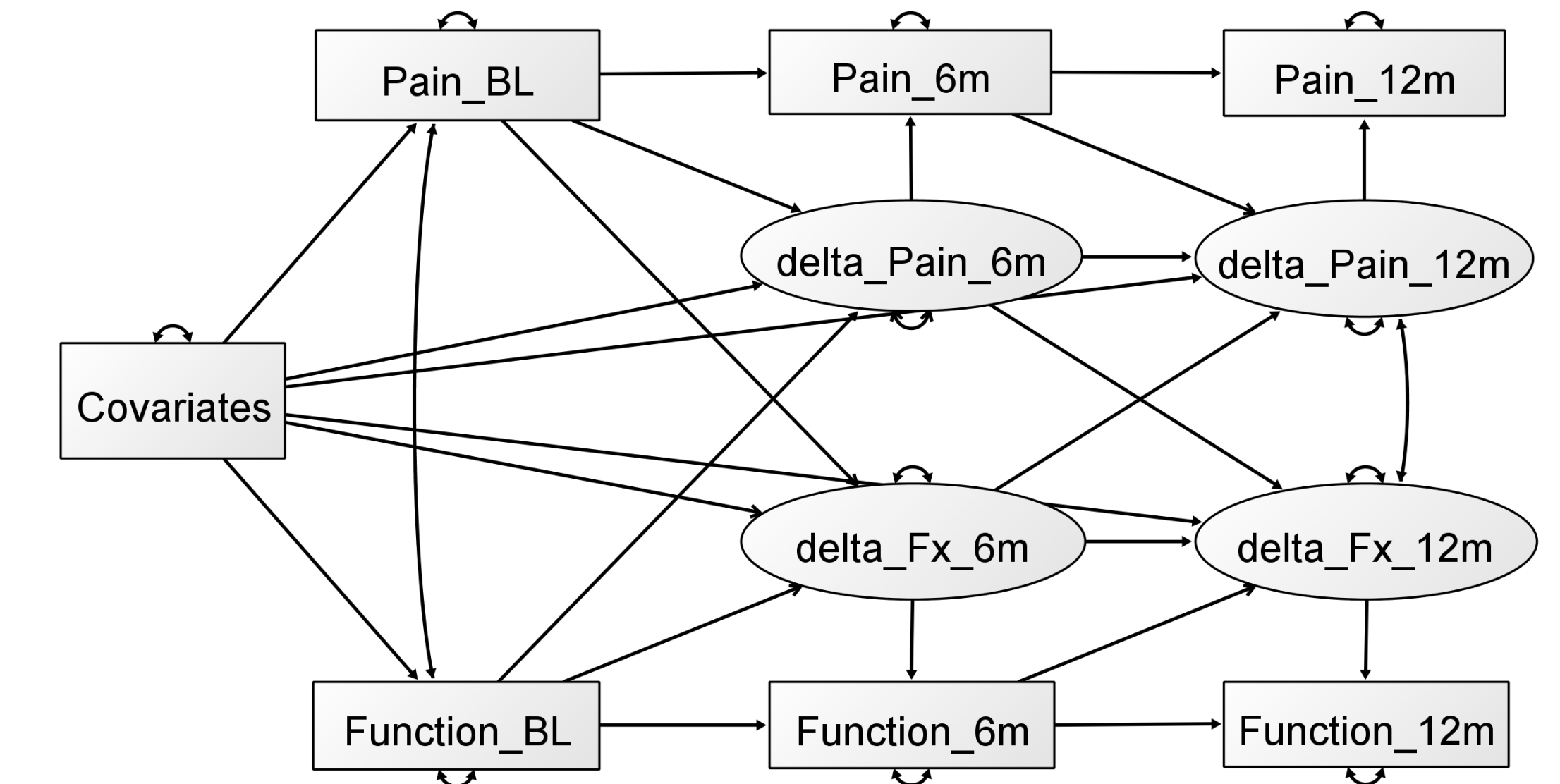
At 12 months, previous improvement and treatment status were associated with change for both measures, but lingering covariate effects remained for baseline mental health and obesity (for the function domain only).

## Key Parameter Comparisons

Effect	Timepoint	KOOS	PROMIS
Female on Function	Baseline	-0.02	-0.17
Pain in other joints on Pain	Baseline*	-0.15 to -0.16	0.05 to 0.09
Back pain on Pain	Baseline*	-0.09	0.14
Pain in other joints on Fx	Baseline	-0.15 to -0.17	-0.06 to 0.10
Back pain on Function	Baseline	-0.10	-0.14
Surgical status on Pain	Baseline*	-0.14	0.32
Surgical status on Function	Baseline	-0.13	-0.34
Previous Fx on Pain	6 & 12 m*	0.04 & 0.18	-0.20 & -0.23
Previous Fx on Function	6 & 12 m	-0.62 & -0.65	-0.46 & -0.58
Previous Pain on Pain	6 & 12 m	-0.54 & -0.61	-0.70 & -0.64
Previous Pain on Function	6 & 12 m*	0.05 & 0.18	0.01 & -0.18
Surgical status on Pain	6 month*	0.10	-0.07
Surgical status on Function	6 month	0.11	0.14
BMI > 40 on Function	12 month	-0.10	-0.15
Surgical status on Pain	12 month*	0.32	-0.21
Surgical status on Function	12 month	0.28	0.21

\* = PROMIS Pain Interference is scored in the opposite direction from KOOS Pain, these are in the expected direction. Also note that the full coefficients are available as a handout.

## Schematic of the Model



## Limitations

Not all participants took PROMIS measures, so direct comparisons are not possible.

Recruitment and retention of racial or ethnic minorities remains a challenge within osteoarthritis research

With only 3 time points, we are unable to determine when rates of improvement change.

## Conclusion

- KOOS-12 and PROMIS measures can both quantify changes in pain and function over time for patients with osteoarthritis.
- Different baseline characteristics affect the scores, such that clinicians need to be cognizant of different factors depending on measure choice.
- Most improvement is apparent by 6 months, with minimal change and minimal covariate effect at 12 months after the index visit.