**Longitudinal Mixture IRT Models**

Understanding individuals’ propensity for response shift (RS), a type of longitudinal differential item functioning, can improve the measurement of patient-reported outcomes in diverse populations. This study aims to detect propensity for RS in Physical Functioning domain of the SF36 over time. Specifically, our objectives were to: a) distinguish latent classes of people who experienced RS in physical and mental health versus those who did not, and b) identify demographic and health-related characteristics that predict the latent classes. Using a sample data from a longitudinal assessment of SF36 Physical Functioning items over two measurement occasions, we used longitudinal mixture IRT model to examine the propensity for response shift.

**### MPLUS Codes ####**

**TITLE: 3-Class Longitudinal Mixture IRT model for the SF36 PF items ;**

y1 – y10 corresponds to the SF36 Physical functioning items at baseline

y11-y20 corresponds to data on the SF36 Physical functioning items at follow up occasion.

Data:

FILE is "CAMOS\_sf36\_long.csv";

 Variable:

 Names are y1-y20;

 !listwise = on;

 Usevariables y1-y20;

CATEGORICAL y1-y20 ;

!Change nuber of latent classes to 3. Add another section of latent classes

CLASSES = c(3);

 ANALYSIS: type = mixture;

 ALGORITHM = INTEGRATION;

 STARTS = 250 20;

 STITERATIONS = 500;

 !PROCESSORS = 12;

 MODEL:

 %OVERALL%

 !specify the proportion class1 proportion as 1/(1+exp(-L))

 !-here L = 0; proportion in C#1 is 50%

! %C#1%;

! [c#1@0];

!Factor Loadings at Time 1

f1 by y1\* y2-y10;

!Factor Loadings at Time 2

f2 by y11\* y12-y20;

 !Latent factor distribution at Time 1

 f1\*1;

 [f1\*0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

 !Latent factor distribution at Time 2

 f2\*1;

 [f2\*0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

!Correlation among factor loadings at both time points

f1 with f2;

!Latent Class #1

 %C#1%

!Factor Loadings at Time 1

f1 by y1\* y2-y10;

!Factor Loadings at Time 2

f2 by y11\* y12-y20;

 !Latent factor distribution at Time 1

 f1@1;

 [f1@0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

 !Latent factor distribution at Time 2

 f2@1;

 [f2@0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

!Correlation among factor loadings at both time points

f1 with f2;

!Latent Class #2

 %C#2%

!Factor Loadings at Time 1

f1 by y1\* y2-y10;

!Factor Loadings at Time 2

f2 by y11\* y12-y20;

 !Latent factor distribution at Time 1

 f1@1;

 [f1@0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

 !Latent factor distribution at Time 2

 f2@1;

 [f2@0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

!Correlation among factor loadings at both time points

f1 with f2;

!Latent Class #3

 %C#3%

!Factor Loadings at Time 1

f1 by y1\* y2-y10;

!Factor Loadings at Time 2

f2 by y11\* y12-y20;

 !Latent factor distribution at Time 1

 f1@1;

 [f1@0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

 !Latent factor distribution at Time 2

 f2@1;

 [f2@0];

 [y1$1 - y4$1];

 [y1$2 - y4$2];

 [y6$1 - y8$1];

 [y6$2 - y8$2];

 [y5$1];

 [y9$1];

 [y10$1];

!Correlation among factor loadings at both time points

f1 with f2;

savedata:

FILE is "sf36pf\_3class.dat";

save is fscores;

save is cprob;

 OUTPUT: STDYX; TECH1; TECH9;