**09.17.16 DIF analysis using three methods under 2PL and dichotomous GGUM**

1. I decided to look at only the extraversion and neuroticism facets, out of the 5 facets used to collect data, because they are the only two facets with clear unidimensionality, which is the pre-condition for running IRT analyses.
2. EFA to obtain scree plot for prove of unidimensionality
3. CFA (one-factor) to obtain the factor loadings. The results can be used for deciding which items to reverse, and also for detecting potential intermediate items (items that actually functioned as intermediate items)
4. Dichotomize all original responses, obtain GGUM item parameters, and do MODFIT under GGUM (no need for reverse coding; responses need to be coded into 0-3, with missing = 9 for MODFIT)
5. Look at GGUM MODFIT fit plots: any items with very flat plots are non-discriminating, and therefore should be excluded before any further analyses. (E: no such items; all 20 should be kept)
6. Look at GGUM MODFIT plots, 1-factor loadings, as well as the item content to decide which items should be reversed before running the dominance model analyses. Here, if an item has loadings larger than 0.3 across two groups, then it’s not intermediate, and should be reversed, if the loading indicates so. If an item has a loading smaller than 0.3 in one group, but not the other, refer to the plots, probably bell-shaped (intermediate), and therefore should be kept unreversed.
   1. **E: I1, 5, 8, 12-14, 16, 18, and 20 should be reversed based on the principles above.**
7. **MODFIT results: GGUM fits better than DOM; however, when doing constrained baseline model for GGUM, 15 out of 20 items had singularity problem – have to discard this facet… Sigh**
8. Switched to Neuroticism:
   1. MODFIT results good; GGUM improved a lot, and surpasses the dominance model under dichotomous GGUM, with non-discriminating items removed (I6, and I20).
   2. When running the constrained baseline model under GGUM, I had 5 singularity items, and even if they were removed for GGUM, the MODFIT results for the remaining 13 items will still be better than then 18 items under the dominance model.
   3. With the remaining 13 items, the free baseline model encountered again, the singularity problem – option: stick with only the constrained baseline model for DIF analysis (could be more conservative than the real situation; but definitely not more risky)
   4. After keeping Item 17 for the polytomous dominance model MODFIT analysis, the chi^2/df increased for both the US and CHN groups; now slightly higher than GGUM.
9. A few notes to myself:
   1. If you didn’t reverse code the item that is supposed to be reversed (based on GGUM MODFIT plots and FL), it will greatly boost chi^2/df.
   2. If there is an item that is super intermediate (functioned as an intermediate item, based on plot), it usually has low alpha parameter under the dominance mode, and if included in the dominance model MODFIT analysis, the model fit will be bad; if it’s removed due to being non-discriminating, the model fit will improve greatly, and therefore won’t appear much worse than GGUM MODFIT.
   3. There are probably different degrees of “intermediate”: some items have very very bell-shaped curve, while some have somewhat bell-shaped curves, and the more intermediate an item is, the more it will contribute to the fit of GGUM and misfit of the dominance model.
   4. When computing item parameters in MLG for dominance model MODFIT, NC is important. If NC = 25, the parameter estimates will be slightly different from when NC = 200 (the common setting of us), and increasing from 25 to 200 will probably improve dominance model fit. Something that you don’t want to happen when you expect dominance model fit to be bad, or worse than GGUM.