*aMNLFA* Updates & Summary of Resolved Errors

last updated 8/19/21 by IS

See [Tweet announcement](https://twitter.com/VeronicaTCole/status/1419730781446950936) and [website](https://nishagottfredson.web.unc.edu/amnlfa/) updates from the aMNLFA developers

**Summary of functions with bugs that we have identified and fixed**

*aMNLFA\_sample*

* *Write.inp.file* function worked only for short lists of indicator names (<90) (this function is used by others in future)

*aMNLFA\_initial*

* Did not create correct *varimpactscript.inp* or item input syntax when the user chooses not to estimate variance impact
* Strings after a certain length were not confined to 90 characters to comply with MPlus input rules

*aMNLFA\_simultaneous*

* not all significant lambda DIF was being pulled in from the item-level *.out* files into round2calibration for later pruning
* Was not able to accommodate cases of no variance impact
* Did not capture all intercept DIF from the items when there were more covariates than indicators
* Likely still not capturing all DIF when THRESHOLDS=TRUE
* Still does not automatically include main effect DIF when any significant interaction DIF is present

*aMNLFA\_prune*

* did not create the correct variable names for variance impact

*aMNLFA\_final*

* example instructed users to set *method=”bh”* when the code is set up to read capitalized labels (“*BH*”) and defaults to another correction method if the label is not recognized.
* *the.prune* data structure was not referenced correctly throughout (wrong column names, etc.)
* still will not work when THRESHOLDS=TRUE
* intercept DIF was incorrectly assigned to data frame for lambda DIF
* mean impact was incorrectly assigned to a data frame for variance impact
* Still does not automatically include main effect DIF when any significant interaction DIF is present
* Was bringing forward all mean and variance impact regardless of statistical significance
* erroneously added “V1” to the CONSTRAINT section of round3calibration (likely because of issue in *aMNLFA\_prune*)

NOTE: make sure you are calling the new *aMNLFA\_prune* (code embedded in aMNLFA\_final) until CRAN is updated

*aMNLFA\_scores*

* was not correctly reading in and assigning intercept DIF for *scoring.inp*
* scrambled covariates assignments to lambda DIF in constraints section
* was not correctly creating predictor numbers when there were double-digit lambda labels
* did not run if there were no constraints (i.e., no variance impact or lambda DIF) in final model
* Still does not automatically include main effect DIF when any significant interaction DIF is present

**Update from the aMNLFA developers –this is not meant to be automated**

*“Please note that the aMNLFA package is provided as a convenient way to generate templates for pieces of code which should be edited, run, and interpreted manually in Mplus. While you can use this package to facilitate the process, all model output must be inspected manually. There are a number of vital pieces of information which must be gleaned from actually looking at the output. For instance, the aMNLFA package does not read in warnings from Mplus about negative standard errors, untrustworthy parameter estimates, and the like. \*\*The user must inspect their Mplus inputs and outputs themselves and alter them according to empirical judgment and substantive theory.\*\* While we put this package into the scientific community with the aim of making it easier and more convenient for people to do high-quality measurement work, the reality is that the code it generates is not likely to be perfect. Each and every Mplus input file is meant to be checked, and potentially altered, by the user.”*

**Steps you should take to (re-)run your aMNLFA projects**

*NOTES*

The present version of the package can only accommodate THRESHOLDS=FALSE and indicator lists of 270 characters or fewer (most projects will not need more than that) or else there will be error messages. The code also requires some manual steps if you are testing for any DIF by covariate interactions (e.g., Age\_sex)–at this point, only include covariate interactions if you are comfortable navigating and manipulating MPlus code (via the steps below).

*PREPARATION*

1. Eventually (once CRAN has been updated –date TBA): re-install and load the aMNLFA package in RStudio –this will load the most updated version of the package that will have all of these bug fixes.
2. Delete the contents of your working MNLFA project folder.
3. The new corrected functions are in *New corrected* *MNLFA package 8.19.21*. Copy and paste the contents of this folder into your working MNFLA project folder.
4. Look at *Sample.Rmd* to for a sample of how to set up your directories and workflow.
   1. Make sure you set “homedir” as your working directory with no “/” at the end.
5. Make sure to set THRESHOLDS=FALSE in your *ob*. This setting will still estimate intercept DIF but will not test to see if it differs by the level of any ordinal variables. Re-create your *ob* object.
   1. NOTE: the code is currently not set up to accommodate THRESHOLDS=TRUE but will be in the future. You would only need this if you have specific reason to believe the DIF would vary by threshold level.

*RE-RUNNING*

At each step be sure to inspect all your *.out* files to look for any MPlus errors or estimation problems.

1. In your R script, make sure that when you call the aMNFLA functions that you are calling them from your MNLFA folder (and not from the base MNLFA package you have installed).
   1. look at the *Sample.Rmd* file that shows how to use the provided code to override the base code from the package

(i.e., *source(paste(homedir, 'aMNLFA\_initial.R', sep ='/')*)

1. Re-run *aMNLFA\_sample* using the new code we provide.
2. Re-run *aMNLFA\_initial* using the new code we provide and then run all of the resulting *.inp* files.
   1. Make sure you’ve deleted all the previous item, varimpactscript, and meanimpactscript .inp and .out files from your folder
3. Re-run *aMNLFA\_simultaneous* using the new code we provide and run the resulting *round2calibration.inp* file.
   1. This function has a newly added parameter *keepmean* that can be set to TRUE or FALSE to specify if you’d like to retain any significant mean impact for covariates that has significant DIF in the final model (recommended).
   2. If you have covariates with interactions, open *round2calibration.inp* before running it.
      1. If there is any intercept DIF by covariate interactions being estimated (e.g., ITEM ON AGE\_SEX), make sure the lower order main effects are also being estimated (e.g., ITEM ON AGE; ITEM ON SEX). If not, add them manually before running *round2calibration.inp*.
      2. If there is any lambda DIF by covariate interactions being estimated (check the lambda label that corresponds to the interaction term), make sure the lower order main effects are also being estimated (find the lambda labels that correspond to the lower order main effects). If not, add them manually before running *round2calibration.inp*.
4. Optional: You can experiment with the new *aMNLFA\_prune* and *aMNLFA\_DIFplot* functions, using the code we provide, to examine any intercept and lambda DIF as a function of various corrections for multiple comparisons.
5. Run *aMNLFA\_final* using the new code we provide --make sure the “BH” is capitalized in your R code!!!! (This is different from the updated instructions you may have previously received in an email blast). Run the resulting *round3calibration.inp* file.
   1. This function has a newly added parameter *keepmean* that can be set to TRUE or FALSE to specify if you’d like to retain any significant mean impact for covariates that has significant DIF in the final model (recommended).
6. This now outputs 2 .csv files into your home directory that will be used for manual checking in Step 8.
   * 1. *intercept\_dif\_from\_aMNLFA\_final.csv* where 1s correspond to the intercept DIF estimated in round3calibration.inp
     2. *lambda\_dif\_from\_aMNLFA\_final.csv* where 1s correspond to the lambda DIF estimated in round3calibration.inp
7. If you have covariates with interactions, open *round3calibration.inp* before running it.
   * 1. If there is any intercept DIF by covariate interactions being estimated (e.g., ITEM ON AGE\_SEX), make sure the lower order main effects are also being estimated (e.g., ITEM ON AGE; ITEM ON SEX). If not, add them manually before running *round3calibration.inp*.
     2. If there is any lambda DIF by covariate interactions being estimated (check the lambda label that corresponds to the interaction term), make sure the lower order main effects are also being estimated (find the lambda labels that correspond to the lower order main effects). If not, add them manually before running *round3calibration.inp*.
8. Run *aMNLFA\_scores* from the new code we provide. Run the resulting *scoring.inp* file.
   1. If you have covariates with interactions, open *scoring.inp* before running it.
      1. If there is any intercept DIF by covariate interactions being estimated (e.g., ITEM ON AGE\_SEX), make sure the lower order main effects are also being estimated (e.g., ITEM ON AGE; ITEM ON SEX). If not, add them manually before running *scoring.inp*.
      2. If there is any lambda DIF by covariate interactions being estimated (check the lambda label that corresponds to the interaction term), make sure the lower order main effects are also being estimated (find the lambda labels that correspond to the lower order main effects). If not, add them manually before running *scoring.inp*.

*MANUAL CHECKING*

1. Conduct the new [manual checking steps in Excel](https://docs.google.com/spreadsheets/d/1EeNNpgyUhIHC87SzVP6UkIEH-O_pJ1I3jrvmX2t-Sos/edit?usp=sharing) with the accompanying [instructional video](https://drive.google.com/file/d/1fKFkut7cRqyyd8X1npcSIaLKEtQNmq54/view?usp=sharing) to make sure the code is doing what it should be doing with your data
2. Re-name a “PROJECT X” tab at the bottom of the Excel sheet linked above with your name/project to claim a checking template
3. Watch the 18-minute video guide for completing this checking worksheet and reference the EXAMPLE tab in the Excel sheet
4. Complete all 3 steps of checking to verify your project before using the factor scores in any way
5. NOTE: the checking sheet focuses on DIF but you are also welcome to check mean/variance impact
6. Plot the distribution of the factor scores in R to check for outliers and distributional assumptions relating to your substantive models.
   1. You will find factor scores for your entire sample as “ETA” in *scores.dat* (with column headers at the bottom of *scoring.out)*

*FINAL OUTPUTS & REPORTING*

1. You will find factor scores for your entire sample as “ETA” in *scores.dat* (with column headers at the bottom of *scoring.out)* for use in your substantive models
2. Be sure to control for any mean impact covariates in your substantive models
3. NOTE: there is no standard error for eta with continuous data (only if you have some ordinal data)
4. *Round3calibration.out* will tell you what significant lambda and/or intercept DIF was ultimately present in your final scoring model (under MODEL RESULTS)
5. If you run *round3calibration.inp* in MPlus Diagrammer, you will get an image of a path diagram of your final scoring model