**Mplus Syntax: AHA METRIC**

**Exploratory Factor Analysis (preliminary):**

Data:

File is developmentalfinal.dta.dat; # File name

Variable:

Names are

idauniq psceda pscedb pscedc pscedd pscede pscedf pscedg pscedh scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg06 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlme headlho headlmo scactarev scactbrev scactcrev

scactdrev limiting balance repcstest gaittest hehelfrev scfeelarev

scfeelbrev scfeelcrev oribi learning recall fluency maxgrip fibrinogen

highdensity triglyceride lowdensity CRP glycated random validation; # Variable names

usevariables are

psceda pscedb pscedc pscedd pscede pscedf pscedg pscedh scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg06 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlme headlho headlmo scactarev scactbrev scactcrev

scactdrev limiting balance repcstest gaittest hehelfrev scfeelarev

scfeelbrev scfeelcrev oribi learning recall fluency maxgrip fibrinogen

highdensity triglyceride lowdensity CRP glycated; # Subset of variables to use

categorical are

psceda pscedb pscedc pscedd pscede pscedf pscedg pscedh scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg06 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlme headlho headlmo scactarev scactbrev scactcrev

scactdrev limiting balance repcstest gaittest hehelfrev scfeelarev

scfeelbrev scfeelcrev oribi learning recall fluency maxgrip fibrinogen

highdensity triglyceride lowdensity CRP glycated; # Specifies which variables are categorical

IDvariable is idauniq; # Indicates name of participant ID variable

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Type = EFA 1 10; # Tells Mplus to carry out Exploratory Factor Analysis; the numbers specify the lower and upper limits on the number of factors to be extracted

Rotation = Geomin; # Specifies the Geomin oblique rotation for correlated factors

Estimator = WLSMV; # Implements the mean- and variance-adjusted weighted least squares estimator

Plot: type = plot2; # Requests graphical displays

**Exploratory Factor Analysis (final):**

Data:

File is developmentalfinal.dta.dat; # File name

Variable:

Names are

idauniq psceda pscedb pscedc pscedd pscede pscedf pscedg pscedh scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg06 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlme headlho headlmo scactarev scactbrev scactcrev

scactdrev limiting balance repcstest gaittest hehelfrev scfeelarev

scfeelbrev scfeelcrev oribi learning recall fluency maxgrip fibrinogen

highdensity triglyceride lowdensity CRP glycated random validation; # Variable names

usevariables are

psceda pscedc pscedd pscede pscedf pscedg scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlho scactarev scactbrev scactcrev

scactdrev limiting repcstest gaittest hehelfrev

oribi learning recall fluency maxgrip fibrinogen CRP; # Subset of variables to use

categorical are

psceda pscedc pscedd pscede pscedf pscedg scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlho scactarev scactbrev scactcrev

scactdrev limiting repcstest gaittest hehelfrev

oribi learning recall fluency maxgrip fibrinogen CRP; # Specifies which variables are categorical

IDvariable is idauniq; # Indicates name of participant ID variable

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Type = EFA 1 10; # Tells Mplus to carry out Exploratory Factor Analysis; the numbers specify the lower and upper limits on the number of factors to be extracted

Rotation = Geomin; # Specifies the Geomin oblique rotation for correlated factors

Estimator = WLSMV; # Implements the mean- and variance-adjusted weighted least squares estimator

Plot: type = plot2; # Requests graphical displays

**Second-order Confirmatory Factor Analysis:**

Data:

File is validationfinal.dta.dat; # File name

Variable:

Names are

idauniq psceda pscedb pscedc pscedd pscede pscedf pscedg pscedh scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg06 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlme headlho headlmo scactarev scactbrev scactcrev

scactdrev limiting balance repcstest guralnik hehelfrev scfeelarev

scfeelbrev scfeelcrev oribi learning recall fluency maxgrip fibrinogen

highdensity triglyceride lowdensity CRP glycated random validation; # Variable names

usevariables are

psceda pscedc pscedd pscede pscedf pscedg scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlho scactarev scactbrev scactcrev

scactdrev limiting repcstest guralnik hehelfrev

oribi learning recall fluency maxgrip fibrinogen CRP; # Subset of variables to use

categorical are

psceda pscedc pscedd pscede pscedf pscedg scpt04

scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg07 scorg08

hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlho scactarev scactbrev scactcrev

scactdrev limiting repcstest guralnik hehelfrev

oribi learning recall fluency maxgrip fibrinogen CRP; # Specifies which variables are categorical

IDvariable is idauniq; # Indicates name of participant ID variable

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Rotation = Geomin; # Specifies the Geomin oblique rotation for correlated factors

Estimator = WLSMV; # Implements the mean- and variance-adjusted weighted least squares estimator

Starts = 250; # Specifies the number of random sets of starting values

Model:

f1 BY psceda pscedc pscedd pscede pscedf pscedg; # f1-f4 specify the first-order factors; e.g., f1 is loaded on six indicators representing depressive symptoms, as appropriate after conducting an Exploratory Factor Analysis

f2 BY hemobwa hemobsi hemobch hemobcs hemobcl hemobst hemobre hemobpu hemobli

hemobpi headldr headlwa headlba headlea headlbe headlwc headlma headlpr

headlsh headlph headlho limiting repcstest guralnik hehelfrev

maxgrip fibrinogen CRP;

f3 BY scpt04 scpt05 scorg01 scorg02 scorg03 scorg04 scorg05 scorg07 scorg08

scactarev scactbrev scactcrev scactdrev;

f4 BY oribi learning recall fluency;

f5 BY f1-f4; # The first-order factors (f1-f4) are nested under a second-order structure (i.e., a general AHA factor)

Output:

SAMPSTAT MOD(0) STAND; # Requests descriptive statistics and standardised loadings

**Single-group latent growth curve model (linear):**

Data:

File is GMMcovbinarySESdu.dta.dat; # File name

Variable:

Names are

idauniq QoL2 AHA2 QoL3 AHA3 QoL4 AHA4 QoL5 AHA5 QoL6 AHA6 QoL7 AHA7

QoL8 AHA8 QoL9 AHA9 sexcons ethcons educons occcons wealthcons agewcons

QoL9binary mediumed highed mediumocc highocc quint2 quint3 quint4

quint5; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Type = missing H1; # Calls the full-information maximum likelihood algorithm

Model:

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; the syntax specifies the appropriate factor loadings corresponding to the equidistant time intervals (i.e., linear functional form)

i s | AHA2@0 AHA3@1 AHA4@2 AHA5@3 AHA6@4 AHA7@5 AHA8@6 AHA9@7;

Output:

sampstat standardized tech1; # Requests additional output

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;

**Single-group latent growth curve model (quadratic):**

Data:

File is GMMcovbinarySESdu0323.dta.dat; # File name

Variable:

Names are

idauniq QoL2 AHA2 QoL3 AHA3 QoL4 AHA4 QoL5 AHA5 QoL6 AHA6 QoL7 AHA7

QoL8 AHA8 QoL9 AHA9 sexcons ethcons educons occcons wealthcons agewcons

QoL9binary mediumed highed mediumocc highocc quint2 quint3 quint4

quint5; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Type = missing H1; # Calls the full-information maximum likelihood algorithm

Model:

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; a quadratic (q) growth factor has been added to this model

i s q | AHA2@0 AHA3@1 AHA4@2 AHA5@3 AHA6@4 AHA7@5 AHA8@6 AHA9@7;

Output:

sampstat standardized tech1; # Requests additional output

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;

**Single-group latent growth curve model (latent basis):**

Data:

File is GMMcovbinarySESdu0323.dta.dat; # File name

Variable:

Names are

idauniq QoL2 AHA2 QoL3 AHA3 QoL4 AHA4 QoL5 AHA5 QoL6 AHA6 QoL7 AHA7

QoL8 AHA8 QoL9 AHA9 sexcons ethcons educons occcons wealthcons agewcons

QoL9binary mediumed highed mediumocc highocc quint2 quint3 quint4

quint5; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Type = missing H1; # Calls the full-information maximum likelihood algorithm

Model:

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; @1 indicates the time score value has been fixed to one; "\*" defines a latent basis model, allowing the pattern of change to be driven by the data

i s | AHA2@0 AHA3\* AHA4\* AHA5\* AHA6\* AHA7\* AHA8\* AHA9@1;

Output:

sampstat standardized tech1; # Requests additional output

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;

**Unconditional Latent Class Growth Analysis (three classes):**

Data:

File is GMMcovbinarySESdu0323.dta.dat; # File name

Variable:

Names are

idauniq QoL2 AHA2 QoL3 AHA3 QoL4 AHA4 QoL5 AHA5 QoL6 AHA6 QoL7 AHA7

QoL8 AHA8 QoL9 AHA9 sexcons ethcons educons occcons wealthcons agewcons

QoL9binary mediumed highed mediumocc highocc quint2 quint3 quint4

quint5; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Classes = c(3); # Indicates the number of classes (i.e., 3-class model in this example)\*

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset Analysis:

Type = MIXTURE missing; # Calls the mixture model algorithm

Starts = 1000 250; # Specifies the number of random sets of starting values followed by the number of final optimisations

Stiterations = 20; # Specifies the maximum number of iterations allowed in the initial stage

Algorithm = integration EM; # Specifies the Expectation Maximization algorithm

Model:

%OVERALL%

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; @1 indicates the time score value has been fixed to one; "\*" defines a latent basis model, allowing the pattern of change to be driven by the data

i s | AHA2@0 AHA3\* AHA4\* AHA5\* AHA6\* AHA7\* AHA8\* AHA9@1;

i-s@0; # Fixes within-class variances of the intercept and growth factors to zero: specifies LCGA (which assumes homogeneity among the individual growth trajectories in each class) rather than GMM

Output:

TECH1 TECH11 TECH14 TECH4; # Requests additional output

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;

\* This model was also run with 2, 4, 5, and 6 classes.

**Unconditional Growth Mixture Model (three classes):**

Data:

File is GMMcovbinarySESdu0323.dta.dat; # File name

Variable:

Names are

idauniq QoL2 AHA2 QoL3 AHA3 QoL4 AHA4 QoL5 AHA5 QoL6 AHA6 QoL7 AHA7

QoL8 AHA8 QoL9 AHA9 sexcons ethcons educons occcons wealthcons agewcons

QoL9binary mediumed highed mediumocc highocc quint2 quint3 quint4

quint5; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Classes = c(3); # Indicates the number of classes (i.e., 3-class model in this example)\*

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

Analysis:

Type = MIXTURE missing; # Calls the mixture model algorithm

Starts = 1000 250; # Specifies the number of random sets of starting values followed by the number of final optimisations

Stiterations = 20; # Specifies the maximum number of iterations allowed in the initial stage

Algorithm = integration EM; # Specifies the Expectation Maximization algorithm

Model:

%OVERALL%

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; @1 indicates the time score value has been fixed to one; "\*" defines a latent basis model, allowing the pattern of change to be driven by the data

i s | AHA2@0 AHA3\* AHA4\* AHA5\* AHA6\* AHA7\* AHA8\* AHA9@1;

# The i–s@0 statement has been removed from the LCGA syntax to specify GMM

Output:

TECH1 TECH11 TECH4; # Requests additional output

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;

\* This model was also run with 2, 4, 5, and 6 classes, as well as with the two best log-likelihood values, by adding the following statement to the Analysis section of the syntax: OPTSEED = […].

[…] to be replaced with 407108 and 318177 in two separate models.

**Step 1 of the three-step manual Growth Mixture Model procedure (three classes):**

Data:

File is GMMcovbinarySESdu0323.dta.dat; # File name

Variable:

Names are

idauniq QoL2 AHA2 QoL3 AHA3 QoL4 AHA4 QoL5 AHA5 QoL6 AHA6 QoL7 AHA7

QoL8 AHA8 QoL9 AHA9 sexcons ethcons educons occcons wealthcons agewcons

QoL9binary mediumed highed mediumocc highocc quint2 quint3 quint4

quint5; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Classes = c(3); # Indicates the number of classes (i.e., 3-class model)

AUXILIARY = sexcons agewcons ethcons mediumed highed mediumocc highocc quint2 quint3

quint4 quint5 QoL9binary; # Auxiliary variables (i.e., includes covariates and distal outcome in the output file)

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

SAVEDATA: FILE IS manualstep1c3.dat; # Saves the posterior probabilities to a new file

save cprobabilities;

Analysis:

Type = MIXTURE missing; # Calls the mixture model algorithm

Starts = 1000 250; # Specifies the number of random sets of starting values followed by the number of final optimisations

Stiterations = 20; # Specifies the maximum number of iterations allowed in the initial stage

Algorithm = integration EM; # Specifies the Expectation Maximization algorithm

Model:

%OVERALL%

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; @1 indicates the time score value has been fixed to one; "\*" defines a latent basis model, allowing the pattern of change to be driven by the data

i s | AHA2@0 AHA3\* AHA4\* AHA5\* AHA6\* AHA7\* AHA8\* AHA9@1;

# The i–s@0 statement has been removed from the LCGA syntax to specify GMM

Output:

TECH1 TECH11 TECH4; # Requests additional output

CINTERVAL;

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;

**Step 3 of the three-step manual Growth Mixture Model procedure (three classes):**

Data:

File is step2c3manual0323.dat; # File name

Variable:

Names are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9 sexcons agewcons ethcons mediumed

highed mediumocc highocc quint2 quint3 quint4 quint5 QoL9binary w

x y z c1 c2 c3 n idauniq; # Variable names

usevariables are

AHA2 AHA3 AHA4 AHA5 AHA6 AHA7 AHA8 AHA9 sexcons agewcons ethcons mediumed

highed mediumocc highocc quint2 quint3 quint4 quint5 QoL9binary n; # Subset of variables to use

IDvariable is idauniq; # Indicates name of participant ID variable

Categorical = QoL9binary; # Specifies the distal outcome variable should be treated as categorical

Classes = c(3); # Indicates the number of classes (i.e., 3-class model)

Nominal = n; # Most likely latent class membership

Missing are all (-9999); # Indicates the value assigned to missing variables in the dataset

SAVEDATA: FILE IS manualstep3c3.dat; # Saves the posterior probabilities to a new file

save cprobabilities;

Analysis:

Type = MIXTURE missing; # Calls the mixture model algorithm

Starts = 1000 250; # Specifies the number of random sets of starting values followed by the number of final optimisations

Stiterations = 20; # Specifies the maximum number of iterations allowed in the initial stage

Algorithm = integration EM; # Specifies the Expectation Maximization algorithm

Model:

%OVERALL%

# The @0 time score for the slope (s) growth factor at the first timepoint defines the intercept (i) growth factor as an initial status factor; @1 indicates the time score value has been fixed to one; "\*" defines a latent basis model, allowing the pattern of change to be driven by the data

i s | AHA2@0 AHA3\* AHA4\* AHA5\* AHA6\* AHA7\* AHA8\* AHA9@1;

# Multinomial logistic regression of the latent class variable (c) on covariates

c on sexcons agewcons ethcons mediumed highed mediumocc highocc quint2 quint3

quint4 quint5;

# Regresses the intercept and slope growth factors onto the covariates

i s on sexcons agewcons ethcons mediumed highed mediumocc highocc quint2 quint3

quint4 quint5;

# The i–s@0 statement has been removed from the LCGA syntax to specify GMM

# Uncertainty rates prefixed at probabilities obtained in step 2

%c#1%

[n#1@2.871]

[n#2@-0.247]

%c#2%

[n#1@-0.771]

[n#2@4.409]

%c#3%

[n#1@-2.401]

[n#2@-1.110]

Output:

TECH1 TECH11 TECH4; # Requests additional output

CINTERVAL;

Plot:

Series = AHA2-AHA9 (s); # Requests graphical displays

Type = plot3;