Common and Unique Latent Transition Analysis (CULTA) as a Way to Examine the Trait-State Dynamics of Alcohol Intoxication

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Mplus Input File for the Empirical Data Analysis

Final Model

```
TITLE:
  2-Profile CULTA with Covariate (Final);


DATA:
  FILE = __DATA__;


VARIABLE:
  NAMES =
    id x
    y1t0 y2t0 y3t0 y4t0 y1t1 y2t1 y3t1 y4t1
    y1t2 y2t2 y3t2 y4t2 y1t3 y2t3 y3t3 y4t3
    y1t4 y2t4 y3t4 y4t4 y1t5 y2t5 y3t5 y4t5
  ;
  USEVARIABLES =
    x
    y1t0 y2t0 y3t0 y4t0 y1t1 y2t1 y3t1 y4t1
    y1t2 y2t2 y3t2 y4t2 y1t3 y2t3 y3t3 y4t3
    y1t4 y2t4 y3t4 y4t4 y1t5 y2t5 y3t5 y4t5
  ;
  IDVARIABLE = id;
  CLASSES = c0(2) c1(2) c2(2) c3(2) c4(2) c5(2);
  MISSING = .;


DEFINE:
  STANDARDIZE
    y1t0 y2t0 y3t0 y4t0 y1t1 y2t1 y3t1 y4t1
    y1t2 y2t2 y3t2 y4t2 y1t3 y2t3 y3t3 y4t3
    y1t4 y2t4 y3t4 y4t4 y1t5 y2t5 y3t5 y4t5
```

```
  ;

ANALYSIS:
  TYPE = MIXTURE;
  STARTS = 200 100;
  STSCALE = 2;
  STITERATIONS = 200;
  PROCESS = __CORES__;
  MODEL = NOCOV;

MODEL:
  %OVERALL%
    ! unique traits -----------------------------------------------------

    !! factor loadings
    !!! k = 3
    u3 BY y3t0@1;
    u3 BY y3t1@1;
    u3 BY y3t2@1;
    u3 BY y3t3@1;
    u3 BY y3t4@1;
    u3 BY y3t5@1;
    !!! k = 4
    u4 BY y4t0@1;
    u4 BY y4t1@1;
    u4 BY y4t2@1;
    u4 BY y4t3@1;
    u4 BY y4t4@1;
    u4 BY y4t5@1;

    !! latent means
    [ u3@0 ];
    [ u4@0 ];
```

```
!! latent variances
u3 (psip3);
u4 (psip4);

! common states ----------------------------------------------------

!! factor loadings
!!! t = 0
s0 BY y1t0@1;
s0 BY y2t0 (lambdas2);
s0 BY y3t0 (lambdas3);
s0 BY y4t0 (lambdas4);
!!! t = 1
s1 BY y1t1@1;
s1 BY y2t1 (lambdas2);
s1 BY y3t1 (lambdas3);
s1 BY y4t1 (lambdas4);
!!! t = 2
s2 BY y1t2@1;
s2 BY y2t2 (lambdas2);
s2 BY y3t2 (lambdas3);
s2 BY y4t2 (lambdas4);
!!! t = 3
s3 BY y1t3@1;
s3 BY y2t3 (lambdas2);
s3 BY y3t3 (lambdas3);
s3 BY y4t3 (lambdas4);
!!! t = 4
s4 BY y1t4@1;
s4 BY y2t4 (lambdas2);
s4 BY y3t4 (lambdas3);
s4 BY y4t4 (lambdas4);
```

```
!!! t = 5
s5 BY y1t5@1;
s5 BY y2t5 (lambdas2);
s5 BY y3t5 (lambdas3);
s5 BY y4t5 (lambdas4);

!! latent means
[ s0@0 ];
[ s1@0 ];
[ s2@0 ];
[ s3@0 ];
[ s4@0 ];
[ s5@0 ];

!! latent variance of s0
s0 (psis0);

!! variance of the process noise
s1 (psis);
s2 (psis);
s3 (psis);
s4 (psis);
s5 (psis);

! unique states -----------------------------------------------------

!! variances
!!! t = 0
y1t0 (theta11);
y2t0 (theta22);
y3t0 (theta33);
y4t0 (theta44);
```

```
!!! t = 1
y1t1 (theta11);
y2t1 (theta22);
y3t1 (theta33);
y4t1 (theta44);
!!! t = 2
y1t2 (theta11);
y2t2 (theta22);
y3t2 (theta33);
y4t2 (theta44);
!!! t = 3
y1t3 (theta11);
y2t3 (theta22);
y3t3 (theta33);
y4t3 (theta44);
!!! t = 4
y1t4 (theta11);
y2t4 (theta22);
y3t4 (theta33);
y4t4 (theta44);
!!! t = 5
y1t5 (theta11);
y2t5 (theta22);
y3t5 (theta33);
y4t5 (theta44);

! constrained intercepts -------------------------------------------

!! t = 0
[ y1t0@0 ];
[ y2t0@0 ];
[ y3t0@0 ];
```

```
[ y4t0@0 ];
!! t = 1
[ y1t1@0 ];
[ y2t1@0 ];
[ y3t1@0 ];
[ y4t1@0 ];
!! t = 2
[ y1t2@0 ];
[ y2t2@0 ];
[ y3t2@0 ];
[ y4t2@0 ];
!! t = 3
[ y1t3@0 ];
[ y2t3@0 ];
[ y3t3@0 ];
[ y4t3@0 ];
!! t = 4
[ y1t4@0 ];
[ y2t4@0 ];
[ y3t4@0 ];
[ y4t4@0 ];
!! t = 5
[ y1t5@0 ];
[ y2t5@0 ];
[ y3t5@0 ];
[ y4t5@0 ];

! lta ---------------------------------------------------------------

!! initial profile membership
[ c0#1 ] (nu0);
c0#1 ON x (kappa0);
```

```
    !! profile transitions
    [ c1#1 ] (alpha0);
    [ c2#1 ] (alpha0);
    [ c3#1 ] (alpha0);
    [ c4#1 ] (alpha0);
    [ c5#1 ] (alpha0);
    c1#1 ON c0#1 (beta00);
    c2#1 ON c1#1 (beta00);
    c3#1 ON c2#1 (beta00);
    c4#1 ON c3#1 (beta00);
    c5#1 ON c4#1 (beta00);

MODEL c0:
  %c0#1%
    ! profile specific means
    [ y1t0 ] (mu10);
    [ y2t0 ] (mu20);
    [ y3t0 ] (mu30);
    [ y4t0 ] (mu40);

    ! covariate
    c1 ON x (gamma00);

  %c0#2%
    ! profile specific means
    [ y1t0 ] (mu11);
    [ y2t0 ] (mu21);
    [ y3t0 ] (mu31);
    [ y4t0 ] (mu41);

    ! covariate
    c1 ON x (gamma10);
```

```
MODEL c1:
  %c1#1%
    ! profile specific means
    [ y1t1 ] (mu10);
    [ y2t1 ] (mu20);
    [ y3t1 ] (mu30);
    [ y4t1 ] (mu40);

    ! covariate
    c2 ON x (gamma00);

    ! inertia
    s1 ON s0@0 (phi0);

  %c1#2%
    ! profile specific means
    [ y1t1 ] (mu11);
    [ y2t1 ] (mu21);
    [ y3t1 ] (mu31);
    [ y4t1 ] (mu41);

    ! covariate
    c2 ON x (gamma10);

    ! inertia
    s1 ON s0 (phi1);

MODEL c2:
  %c2#1%
    ! profile specific means
    [ y1t2 ] (mu10);
    [ y2t2 ] (mu20);
```

```
    [ y3t2 ] (mu30);
    [ y4t2 ] (mu40);

    ! covariate
    c3 ON x (gamma00);

    ! inertia
    s2 ON s1@0 (phi0);

  %c2#2%
    ! profile specific means
    [ y1t2 ] (mu11);
    [ y2t2 ] (mu21);
    [ y3t2 ] (mu31);
    [ y4t2 ] (mu41);

    ! covariate
    c3 ON x (gamma10);

    ! inertia
    s2 ON s1 (phi1);

MODEL c3:
  %c3#1%
    ! profile specific means
    [ y1t3 ] (mu10);
    [ y2t3 ] (mu20);
    [ y3t3 ] (mu30);
    [ y4t3 ] (mu40);

    ! covariate
    c4 ON x (gamma00);
```

```
    ! inertia
    s3 ON s2@0 (phi0);

  %c3#2%
    ! profile specific means
    [ y1t3 ] (mu11);
    [ y2t3 ] (mu21);
    [ y3t3 ] (mu31);
    [ y4t3 ] (mu41);

    ! covariate
    c4 ON x (gamma10);

    ! inertia
    s3 ON s2 (phi1);

MODEL c4:
  %c4#1%
    ! profile specific means
    [ y1t4 ] (mu10);
    [ y2t4 ] (mu20);
    [ y3t4 ] (mu30);
    [ y4t4 ] (mu40);

    ! covariate
    c5 ON x (gamma00);

    ! inertia
    s4 ON s3@0 (phi0);

  %c4#2%
    ! profile specific means
```

```
    [ y1t4 ] (mu11);
    [ y2t4 ] (mu21);
    [ y3t4 ] (mu31);
    [ y4t4 ] (mu41);

    ! covariate
    c5 ON x (gamma10);

    ! inertia
    s4 ON s3 (phi1);

MODEL c5:
  %c5#1%
    ! profile specific means
    [ y1t5 ] (mu10);
    [ y2t5 ] (mu20);
    [ y3t5 ] (mu30);
    [ y4t5 ] (mu40);

    ! inertia
    s5 ON s4@0 (phi0);

  %c5#2%
    ! profile specific means
    [ y1t5 ] (mu11);
    [ y2t5 ] (mu21);
    [ y3t5 ] (mu31);
    [ y4t5 ] (mu41);

    ! inertia
    s5 ON s4 (phi1);
```

```
MODEL CONSTRAINT:
  ! means for the first profile are higher than the second
  mu10 > mu11;
  mu20 > mu21;
  mu30 > mu31;
  mu40 > mu41;

  ! make sure variances are greater than zero
  psip3 > 0;
  psip4 > 0;
  psis0 > 0;
  psis > 0;
  theta11 > 0;
  theta22 > 0;
  theta33 > 0;
  theta44 > 0;

OUTPUT:
  TECH1 TECH3 TECH4 TECH7 TECH8 TECH12 TECH15 ENTROPY;

SAVEDATA:
  ESTIMATES = __ESTIMATES__;
  RESULTS = __RESULTS__;
  TECH3 = __TECH3__;
  TECH4 = __TECH4__;
  FILE = __CPROB__;
  SAVE = CPROBABILITIES;
```

Links

Research Compendium

The data and materials for this study are available on OSF (https://osf.io/gtdmr) and GitHub (https://github.com/jeksterslab/manCULTA, https://jeksterslab.github.io/manCULTA/index.html).

Data Simulation and Model Fitting

https://jeksterslab.github.io/manCULTA/articles/sim-culta-2-profiles.html

Comparison of Misspecified and Correctly Specified Models

- One-Profile CULTA vs. Two-Profile CULTA:

  https://jeksterslab.github.io/manCULTA/articles/sim-culta-1-profile.html

- Two-Profile LTA vs. Two-Profile CULTA:

  https://jeksterslab.github.io/manCULTA/articles/sim-lta-2-profiles.html

- Two-Profile RI-LTA vs. Two-Profile CULTA:

  https://jeksterslab.github.io/manCULTA/articles/sim-ri-lta-2-profiles.html

Generating Mplus Input Files

https://jeksterslab.github.io/manCULTA/articles/sim-input.html

Containers for Reproducibility

https://jeksterslab.github.io/manCULTA/articles/containers.html