Logbook

Authors: Rens van de Schoot, Joris J. Broere, Koen H. Perryck, Mariëlle Zondervan-Zwijnenburg, Nancy E.E. van Loey

Contents

Data

The corresponding files are in the sub folder "Original data SPSS"

- File as received from Nancy van Loey: "beademing en PTSS v01.sav"
- Alterations are:
  - o Only individuals with three waves of data are included:
    - ▪ 13 missing values on variable svlm5
    - ▪ 23 missing values on variable svlm9
    - ▪ There are 24 respondents in total who did not participate at one or two time moments.
      - Original n = 102
      - Final n = 78
  - o Missing data recoded to -999 and save file as .dat
- Final data set, "beademing en PTSS v02.sav ". Mplus .dat file is "final.dat"
  -> this file was used for all the analysis
- However, Nancy v Loey agreed to put the data online, but only the variables we actually used for our paper. Therefore, I created a new SPSS file with only these variables: "beademing en PTSS v03.sav " and the Mplus .dat file is "final – online version.dat". I re-analyzed all models with this data except for the sensitivity analysis for Figure 4. The file 'final.dat' has been deleted from this subfolder and the re-analyze the data the following syntax should be replaced (in red) by the syntax in blue.

```
DATA: FILE IS final.dat;

VARIABLE: NAMES ARE x1-x5 x6 x7-x11 svlm2 svlm5 svlm9 x15;


DATA: FILE IS 'final - online version.dat' ;

VARIABLE: NAMES ARE ID x6 svlm2 svlm5 svlm9;
```

Empirical data analysis

SPSS analyses – repeated measure

See also the syntax file 'Syntax1.sps' in the subfolder 'Originele data SPSS':

```
DATASET ACTIVATE DataSet1.
GLM svlm2 svlm5 svlm9
  /WSFACTOR=svlm 3 Polynomial
  /METHOD=SSTYPE(3)
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=svlm
  /DESIGN=wel_niet_bead.
```

Figure 1 is the profile plot.

Mplus – replicating SPSS

Applying the steps described by Duncan and Duncan (p. 42)[1] you can replicate the SPSS analysis in Mplus. Also see the syntax file "Originele data SPSS/syntax1.sps".

Chapter 3: LGM, Repeated measures ANOVA, and the mixed linear model:
"SPSS MANOVA performs a polynomial transformation of the dependent variables in a repeated measures design. For comparison's sake, therefore, all analyses were conducted for a three-factor fully saturated growth model using an orthogonal polynomial transformation matrix to represent the regression coefficients relating the latent factors to the observed variables, …" (p. 42)

1. Means, SD, covariance matrix
```
DESCRIPTIVES VARIABLES=svlm2 svlm5 svlm9
  /STATISTICS=MEAN STDDEV MIN MAX.

CORRELATIONS
  /VARIABLES=svlm2 svlm5 svlm9
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

2. The above is the info you need to give in the syntax
```
MATRIX DATA VARIABLES=ROWTYPE_ x1 x2 x3.
BEGIN DATA
MEAN 39.411 29.792 24.483
STDDEV 10.816 18.449 22.317
N 78 78 78
COR 1.000
COR 0.233 1.000
COR 0.372 0.699 1.000
END DATA .
```

3. Repeated measures analysis in SPSS
```
MANOVA x1 x2 x3
/TRANSFORM(x1 x2 x3)=POLYNOMIAL
/RENAME=CNST LIN QUAD
/PRINT=CELLINFO(ALL) ERROR TRANSFORM PARAM(ALL) SIGNIF(MULTIV UNIV)
/MATRIX=IN(*)
/DESIGN.
```

---

[1] From: Duncan, T., Duncan, S., & Strycker, L. (2009). *An introduction to latent variable growth curve modeling; concepts, issues, and applications* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates,.

4. Retreive the transformation matrix from the output

```
Transformation Matrix (Transposed)

                    CNST            LIN            QUAD

x1                .57735         -.70711          .40825
x2                .57735          .00000         -.81650
x3                .57735          .70711          .40825
```

5. This info is then used in Mplus (but with 10 numbers after the decimal). See input file in sub folder "Results\Table 1 Coefficients Mplus ML & Bayes\ Coefficients replicating spss.inp":

```
MODEL:
i by svlm2@0.5773502692 svlm5@0.5773502692 svlm9@0.5773502692;
ls by svlm2@-0.7071067812 svlm5@0 svlm9@0.7071067812;
qs by svlm2@0.4082482905 svlm5@-0.8164965809 svlm9@0.4082482905;

[svlm2@0 svlm5@0 svlm9@0];
svlm2@0 svlm5@0 svlm9@0;
```

6. Results SPSS:

```
CONSTANT

 Parameter        Coeff.       Std. Err.      t-Value       Sig. t     Lower -95%    CL- Upper      ETA Sq.

     1     54.0896373193       2.77625       19.48299       .00000       48.56142      59.61785     .83502

SLOPE

 Parameter        Coeff.       Std. Err.      t-Value       Sig. t     Lower -95%    CL- Upper      ETA Sq.

     1    -10.5556900296       1.67073       -6.31802       .00000      -13.88253      -7.22885     .34736

QUADRATIC

 Parameter        Coeff.       Std. Err.      t-Value       Sig. t     Lower -95%    CL- Upper      ETA Sq.

     1      1.7595501319       1.32281        1.33016       .18739        -.87451       4.39361     .02305
```

7. Results Mplus:

See the file 'Coefficients replicating spss.inp'

```
MODEL RESULTS

                                              Two-Tailed
                  Estimate     S.E.  Est./S.E.   P-Value
Means
    I               54.090     2.759    19.607     0.000
    LS             -10.556     1.660    -6.359     0.000
    QS               1.759     1.314     1.339     0.181
```

<mark>Conclusion</mark>: We have replicated the repeated measures analysis in Mplus.

Mplus – met covariate – Table 1

As a next step we included a covariate for the slope: whether or not mechanical ventilation was needed. See: "Results\Table 1 Coefficients Mplus ML & Bayes\ ".

Syntax: `LS on mv;`

Analyses were done with ML estimation and Bayesian estimation (see the files 'Coefficients ML 1- met correlaties .inp' and 'Coefficients Bayes objective1- met correlaties.inp'). For the latter we used default priors, a fixed number of iterations (10,000), and bseed = 24.

Since the covariance was not significant and to simplify the model even further we re-analyzed the data with ML and Bayes without covariances. This is the model we used for our sensitivity analysis and our simulation study. See the files 'Coefficients ML 2 - zonder correlaties' and 'Coefficients Bayes objective2- zonder correlaties'.

Number of iterations needed

We also examined the number of iterations we truly need, see sub folder "Results\Determining amount of iterations". For more elaborate information see bachelor thesis by Koen and Joris. The accompanying table is:

Table 3: Determining the amount of iterations in Bayesian analyses

			$n = 8$			
Iterations	Pop	M	MSE	% Bias	95% cover	Power
1,000	10.0080	10.1911	100.8967	1.83%	.983	.066
5,000	10.0080	9.4550	101.2127	-5.525%	.990	.036
10,000	10.0080	9.9278	100.8716	-0.80%	.987	.049
30,000	10.0080	9.7202	100.9618	-2.88%	.988	.042
50,000	10.0080	9.9748	100.8663	-0.33%	.988	.048
100,000	10.0080	10.0602	100.8658	0.52%	.988	.048

Note: focused on β

Conclusion: 10,000 is enough.

Sensitivity analysis

Sensitivity Analysis 1 – Figure 3

The effect of different estimators (ML vs. Bayes) and different values for σ_0^2, but with a fixed μ_0.

See files in the sub folder "results\Figure 3 - Coefficients beta different priors "

Results are detailed in Figure 3 and Table S1.

The R script to generate Figure 3 can be found in sub folder "results/graphs/plot.r"

Sensitivity Analysis 2 – Figure 4

Influence of miss-specification of prior means of beta with different prior variances.

See files in sub folder "results\Figure 4 – Misspecification"

Results are detailed in Figure 4 and in Table S2.

The R script to generate Figure 4 can be found in sub folder "results/graphs/plot.r"

Simulation Study

ML-estimation – Table 2

Monte Carlo (MC) study with ML estimation

See files in sub folder "results\ Table 2 - MC ML n = 8"

Results are detailed in Table 2.

Bayesian results 1 – Table 3

MC study with Bayesian estimation

See files in sub folder "results\ Table 3- MC Bayes objective n = 8"

Results are detailed in Table 3.

Different Priors for IG - Figure 5

Different priors for $p(\theta_l) \sim \mathrm{IG}(\alpha_0, \nu_0)$

See files in sub folder "results\ Figure 5 - Different priors IG"

Results are detailed in Figure 5 and Table S3

Raw file for Figure 5 is linked in word document.

Figure 6-8

The syntax to obtain the traceplots can be found in the subfolder 'Figures 6-8 - trace plots'. Note that we used data set number 23 instead of 24 as is stated in the title of the files.

Bayesian results 2 – Table 4

MC study with Bayesian estimation with $p(\theta_l) \sim IG(.5,.5)$

See files in sub folder "results\ Table 4 - MC Bayes objective IG(.5, .5) n = 8"

Results are detailed in Table 4.

Bayesian results 3 – Figures 9-10

The results of the simulation study in terms of power and coverage.

See files in sub folder "results\ Figures 9 and 10 - MC Bayes subjective IG(.5, .5) **n = 8**" and "Figures 9 and 10 - MC Bayes subjective IG(.5, .5) **n = 14**" en "Figures 9 and 10 - MC Bayes subjective IG(.5, .5) **n = 22**"

Results are detailed in Figures 9-10. The R script to generate Figure 9-10 can be found in sub folder "results/graphs/plot.r"

N at power = .80

To determine the number of participants needed for obtaining a power of .80 with ML for beta we ran a separate simulation study. These files can be found in the subfolder 'n needed for power .80 with ML'. We increased the sample size until we found enough power.

Results Empirical Example

The files for the final analysis can be found in de sub folder "results empirical data".

Model:

```
MODEL:
  i by svlm2@0.5773502692 svlm5@0.5773502692 svlm9@0.5773502692;
  ls by svlm2@-0.7071067812 svlm5@0 svlm9@0.7071067812;
  qs by svlm2@0.4082482905 svlm5@-0.8164965809
svlm9@0.4082482905;

  [svlm2@0 svlm5@0 svlm9@0];
  svlm2@0 svlm5@0 svlm9@0;

  [I LS QS](p1-p3);
  I LS QS (p4-p6);


  LS on mv (p7);

     ls with i@0;
     qs with i@0;
     qs with ls @0 ;
```
Priors:

```
 MODEL PRIORS:
  p4-p6 ~IG(.5,.5);
  p7~N(0,50);
```

The prior distribution for β is: