

Appendix C: R Studio and SAS Code

R 3.5.1 code

```
title: "MS thesis - BP data analysis"
output: html_notebook
---

##Libraries
``{r}
library(mclust)
library(skimr)
library(ggforce)
library(ggplot2)
library(Hmisc)
library(stats)
library(devtools)
library(moments)

install_github("vqv/ggbiplot")

library(ggbiplot)

##Check for colinearity
``{r}
dataQ7 <- data[,11:17]

Q7rr_corr <- rcorr(as.matrix(dataQ7), type="spearman")
Q7rr_corr
``

##Kruskal-Wallace - compare WOH and NWOH on 7 chars
``{r}
kruskal.test(Q7_port ~ Q4, data=data)
kruskal.test(Q7_ease ~ Q4, data=data)
kruskal.test(Q7_weight ~ Q4, data=data)
kruskal.test(Q7_fast ~ Q4, data=data)
kruskal.test(Q7_comfort ~ Q4, data=data)
kruskal.test(Q7_noise ~ Q4, data=data)
kruskal.test(Q7_discrete ~ Q4, data=data)
``
```

SAS 9.4 code

```
/* ENTIRE DATASET WITH 5 LEVELS FOR LIKERTS*/  
PROC LCA DATA=BPDATA.BPDATA;  
NCLASS 5;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 5 5 5 5 5 5;  
SEED 861551;  
RUN;
```

```
PROC LCA DATA=BPDATA.BPDATA;  
TITLE2 '2-class model';  
NCLASS 2;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 5 5 5 5 5 5;  
SEED 861551;  
RUN;
```

```
PROC LCA DATA=BPDATA.BPDATA;  
TITLE3 '3-class model';  
NCLASS 3;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 5 5 5 5 5 5;  
SEED 861551;  
RUN;
```

```
PROC LCA DATA=BPDATA.BPDATA;  
TITLE3 '2a-class model';  
NCLASS 2;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 5 5 5 5 5 5;  
SEED 861551;  
RHO PRIOR = 1;  
RUN;
```

```
PROC LCA DATA=BPDATA.BPDATA;  
TITLE3 '3a-class model';  
NCLASS 3;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 5 5 5 5 5 5;  
SEED 861551;  
RHO PRIOR = 1;  
RUN;
```

```
PROC LCA DATA=BPDATA.BPDATA;  
TITLE3 '2-class model - bifurcate';
```

```

NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
RUN;
*immediately above does not work - SAS detects that there are 5 levels for Q7_port
etc;

```

```

/*BIFURCATED DATA*/
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est1
OUTPARAM=par1;
TITLE3 '1-class model - bifurcated';
NCLASS 1;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
RUN;
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2;
TITLE3 '2-class model - bifurcated';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
RUN;

```

```

PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est3
OUTPARAM=par3;
TITLE3 '3-class model - bifurcated';
NCLASS 3;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
RUN;

```

```

PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est4
OUTPARAM=par4;
TITLE3 '4-class model - bifurcated';
NCLASS 4;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;

```

```
*RHO PRIOR = 1;
RUN;
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est5
OUTPARAM=par5;
TITLE3 '5-class model - bifurcated';
NCLASS 5;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
RUN;
```

```
%INCLUDE "C:\Users\BP Data\Documents\LcaBootstrap.sas";
```

```
%LcaBootstrap(null_outest=est1, alt_outest=est2, null_outparam=par1,
alt_outparam=par2, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=est2, alt_outest=est3, null_outparam=par2,
alt_outparam=par3, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=est3, alt_outest=est4, null_outparam=par3,
alt_outparam=par4, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=est4, alt_outest=est5, null_outparam=par4,
alt_outparam=par5, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
```

```
/*-----adding nstarts-----*/
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est1
OUTPARAM=par1 OUTSEEDS=seed1;
TITLE3 '1-class model - bifurcated';
NCLASS 1;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2;
TITLE3 '2-class model - bifurcated';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
```

```

*RHO PRIOR = 1;
NSTARTS 50;
RUN;
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est3
OUTPARAM=par3 OUTSEEDS=seed3;
TITLE3 '3-class model - bifurcated';
NCLASS 3;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;

```

```

PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est4
OUTPARAM=par4 OUTSEEDS=seed4;
TITLE3 '4-class model - bifurcated';
NCLASS 4;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;

```

```

PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est5
OUTPARAM=par5 OUTSEEDS=seed5;
TITLE3 '5-class model - bifurcated';
NCLASS 5;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;

```

```

%INCLUDE "C:\Users\BP Data\Documents\LcaGraphicsV2.sas";
%IdentificationPlot(SeedsDataset=seed1);
%IdentificationPlot(SeedsDataset=seed2);
%IdentificationPlot(SeedsDataset=seed3);
%IdentificationPlot(SeedsDataset=seed4);
%IdentificationPlot(SeedsDataset=seed5);

```

```

%ItemResponsePlot(ParamDataset=par1);
%ItemResponsePlot(ParamDataset=par2);
%ItemResponsePlot(ParamDataset=par3);
%ItemResponsePlot(ParamDataset=par4);

```

```
%ItemResponsePlot(ParamDataset=par5);
```

```
/*---COVARIATES---*/  
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2  
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;  
TITLE3 '2-class model - bifurcated - covariates, class 1 as ref';  
NCLASS 2;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 2 2 2 2 2 2 2;  
COVARIATES Q4_working Education Age_Bucket BP_Type;  
REFERENCE 1;  
SEED 861551;  
RHO PRIOR = 1;  
NSTARTS 50;  
RUN;  
%OddsRatioPlot(ParamDataset=par2, StdErrDataset=std2);
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est4  
OUTPARAM=par4 OUTSEEDS=seed4;  
TITLE3 '4-class model - bifurcated - covariate Q4, class 1 as ref';  
NCLASS 4;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 2 2 2 2 2 2 2;  
COVARIATES Q4_working;  
REFERENCE 1;  
SEED 861551;  
*RHO PRIOR = 1;  
NSTARTS 50;  
RUN;  
/*directly above doesn't run*/
```

```
/*---GROUPS---*/  
/*grouping with Q4*/  
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2  
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;  
TITLE3 '2-class model - bifurcated - Q4 as grouping variable, params estimated  
freely';  
NCLASS 2;  
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;  
CATEGORIES 2 2 2 2 2 2 2;  
GROUPS Q4_working;  
GROUPNAMES Yes No;  
*MEASUREMENT groups;  
SEED 861551;  
RHO PRIOR = 1;
```

```
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Q4 as grouping variable, meas invar imposed
across groups';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS Q4_working;
GROUPNAMES Yes No;
MEASUREMENT groups;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
/*grouping with Q4 + Age buckets*/
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Q4+Age as grouping variable, params estimated
freely';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS GROUP2;
GROUPNAMES YesOld YesYoung NoOld NoYoung;
*MEASUREMENT groups;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Q4+Age as grouping variable, meas invar
imposed across groups';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS GROUP2;
GROUPNAMES YesOld YesYoung NoOld NoYoung;
MEASUREMENT groups;
SEED 861551;
RHO PRIOR = 1;
```

```
NSTARTS 50;
RUN;
```

```
/*grouping with Education*/
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Edu as grouping variable, params estimated
freely';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS Education;
GROUPNAMES HSDiploma SomeCollege College GradSch;
*MEASUREMENT groups;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Edu as grouping variable, meas invar imposed
across groups';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS Education;
GROUPNAMES HSDiploma SomeCollege College GradSch;
MEASUREMENT groups;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
/*grouping with Age*/
PROC LCA DATA=RBTHESIS.JANBPDATABIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Age Bucket as grouping variable, params
estimated freely';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS Age_Bucket;
GROUPNAMES Old Young;
*MEASUREMENT groups;
SEED 861551;
```



```
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.JANBPDATA BIREV OUTEST=est2
OUTPARAM=par2 OUTSEEDS=seed2 OUTSTDERR=std2;
TITLE3 '2-class model - bifurcated - Age Bucket as grouping variable, meas invar
imposed across groups';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
GROUPS Age_Bucket;
GROUPNAMES Old Young;
MEASUREMENT groups;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
/*---SEPARATE DATASETS - WOH---*/
```

```
PROC LCA DATA=RBTHESIS.WOH OUTEST=west1 OUTPARAM=wpar1
OUTSEEDS=wseed1;
TITLE3 '1-class model - WOH';
NCLASS 1;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.WOH OUTEST=west2 OUTPARAM=wpar2
OUTSEEDS=wseed2;
TITLE3 '2-class model - WOH';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.WOH OUTEST=west3 OUTPARAM=wpar3
OUTSEEDS=wseed3;
TITLE3 '3-class model - WOH';
NCLASS 3;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
```

```
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.WOH OUTEST=west4 OUTPARAM=wpar4
OUTSEEDS=wseed4;
TITLE3 '4-class model - WOH';
NCLASS 4;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
PROC LCA DATA=RBTHESIS.WOH OUTEST=west5 OUTPARAM=wpar5
OUTSEEDS=wseed5;
TITLE3 '5-class model - WOH';
NCLASS 5;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;
```

```
%INCLUDE "C:\Users\BP Data\Documents\LcaGraphicsV2.sas";
%IdentificationPlot(SeedsDataset=wseed1);
%IdentificationPlot(SeedsDataset=wseed2);
%IdentificationPlot(SeedsDataset=wseed3);
%IdentificationPlot(SeedsDataset=wseed4);
%IdentificationPlot(SeedsDataset=wseed5);
```

```
%ItemResponsePlot(ParamDataset=wpar1);
%ItemResponsePlot(ParamDataset=wpar2);
%ItemResponsePlot(ParamDataset=wpar3);
%ItemResponsePlot(ParamDataset=wpar4);
%ItemResponsePlot(ParamDataset=wpar5);
```

```
%INCLUDE "C:\Users\BP Data\Documents\LcaBootstrap.sas";
```

```
%LcaBootstrap(null_outest=west1, alt_outest=west2, null_outparam=wpar1,
alt_outparam=wpar2, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
```

```

%LcaBootstrap(null_outest=west2, alt_outest=west3, null_outparam=wpar2,
alt_outparam=wpar3, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=west3, alt_outest=west4, null_outparam=wpar3,
alt_outparam=wpar4, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=west4, alt_outest=west5, null_outparam=wpar4,
alt_outparam=wpar5, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);

/*---Covariates---*/
PROC LCA DATA=RBTHESIS.WOH OUTEST=west2 OUTPARAM=wpar2
OUTSEEDS=wseed2 OUTSTDERR=wstd2;
TITLE3 '2-class model - WOH - covariates, class 1 as ref';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
COVARIATES Education Age_Bucket BP_Type;
REFERENCE 1;
SEED 861551;
RHO PRIOR = 1;
*BETA PRIOR = 1;
NSTARTS 50;
RUN;
%OddsRatioPlot(ParamDataset=wpar2, StdErrDataset=wstd2);

/*---SEPARATE DATASETS - NWOH---*/
PROC LCA DATA=RBTHESIS.NWOH OUTEST=nest1 OUTPARAM=npar1
OUTSEEDS=nseed1;
TITLE3 '1-class model - NWOH';
NCLASS 1;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
NSTARTS 50;
RUN;
PROC LCA DATA=RBTHESIS.NWOH OUTEST=nest2 OUTPARAM=npar2
OUTSEEDS=nseed2;
TITLE3 '2-class model - NWOH';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
*RHO PRIOR = 1;
NSTARTS 50;

```

```

RUN;
PROC LCA DATA=RBTHESIS.NWOH OUTEST=nest3 OUTPARAM=npar3
OUTSEEDS=nseed3;
TITLE3 '3-class model - NWOH';
NCLASS 3;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;

```

```

PROC LCA DATA=RBTHESIS.NWOH OUTEST=nest4 OUTPARAM=npar4
OUTSEEDS=nseed4;
TITLE3 '4-class model - NWOH';
NCLASS 4;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;

```

```

PROC LCA DATA=RBTHESIS.NWOH OUTEST=nest5 OUTPARAM=npar5
OUTSEEDS=nseed5;
TITLE3 '5-class model - NWOH';
NCLASS 5;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
SEED 861551;
RHO PRIOR = 1;
NSTARTS 50;
RUN;

```

```

%INCLUDE "C:\Users\BP Data\Documents\LcaGraphicsV2.sas";
%IdentificationPlot(SeedsDataset=nseed1);
%IdentificationPlot(SeedsDataset=nseed2);
%IdentificationPlot(SeedsDataset=nseed3);
%IdentificationPlot(SeedsDataset=nseed4);
%IdentificationPlot(SeedsDataset=nseed5);

```

```

%ItemResponsePlot(ParamDataset=npar1);
%ItemResponsePlot(ParamDataset=npar2);
%ItemResponsePlot(ParamDataset=npar3);
%ItemResponsePlot(ParamDataset=npar4);
%ItemResponsePlot(ParamDataset=npar5);

```

```

%INCLUDE "C:\Users\BP Data\Documents\LcaBootstrap.sas";

%LcaBootstrap(null_outest=nest1, alt_outest=nest2, null_outparam=npar1,
alt_outparam=npar2, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=nest2, alt_outest=nest3, null_outparam=npar2,
alt_outparam=npar3, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=nest3, alt_outest=nest4, null_outparam=npar3,
alt_outparam=npar4, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);
%LcaBootstrap(null_outest=nest4, alt_outest=nest5, null_outparam=npar4,
alt_outparam=npar5, n=2000, num_bootstrap=99, num_starts_for_null = 20,
num_starts_for_alt=20,cores=1);

/*---Covariates---*/
PROC LCA DATA=RBTHESIS.NWOH OUTEST=nest2 OUTPARAM=npar2
OUTSEEDS=nseed2 OUTSTDERR=nstd2;
TITLE3 '2-class model - NWOH - covariates, class 1 as ref';
NCLASS 2;
ITEMS Q7_port Q7_ease Q7_weight Q7_fast Q7_comfort Q7_noise Q7_discrete;
CATEGORIES 2 2 2 2 2 2 2;
COVARIATES Education Age_Bucket BP_Type;
REFERENCE 1;
SEED 861551;
RHO PRIOR = 1;
*BETA PRIOR = 1;
NSTARTS 50;
RUN;
%OddsRatioPlot(ParamDataset=npar2, StdErrDataset=nstd2);

```