PROMOTING UNIVERSITY STUDENTS' WELL-BEING AND RESILIENCE BY MEANS OF A GAME-APPROACH BASIC PSYCHOLOGICAL NEED INTERVENTION: A CASE STUDY

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Online Resource III – Syntax & Script

1. Syntax (SPSS)

1. DATA PREPARATION

Explanation:

WHO5 = WHO-5 Well-Being Index (World Health Organization, 1998)

PANAS = Positive And Negative Schedule (PANAS; Watson et al., 1988)

BRS = Brief Resilience Scale (BRS; Smith et al., 2008)

BPN = Basic Psychological Need Satisfaction and Frustration Scale (BPNSNF; Chen et al., 2015)

1.1 Prepare data set

**Dropouts -> who filled in less than half will be excluded

-> has to be executed every time when opening the file

variable is copied in new variable 'Dropout' to calculate frequencies

```
COMPUTE
filter_$=(NMISS(WHO5_1,WHO5_2,WHO5_3,WHO5_4,WHO5_5,PANAS_1,PANAS_2,PANAS_3,PANAS_4,PANAS_5,PANAS_6,PANAS_7,PANAS_8,PANAS_9,PANAS_10,PANAS_11,PANAS_12,PANAS_13,PANAS_14,PANAS_15,PANAS_16,PANAS_17,PANAS_18,PANAS_19,PANAS_20,BRS_1,BRS_2,BRS_3,BRS_4,BRS_5,BRS_6,BPN_1,BPN_2,BPN_3,BPN_4,BPN_5,BPN_6,BPN_7,BPN_8,BPN_9,BPN_10,BPN_11,BPN_12,BPN_13,BPN_14,BPN_15,BPN_16,BPN_17,BPN_18,BPN_19,BPN_20,BPN_21,BPN_22,BPN_23,BPN_24) < 28).

VARIABLE LABELS filter_$
'NMISS(WHO5_1,WHO5_2,WHO5_3,WHO5_4,WHO5_5,PANAS_1,PANAS_2,PANAS_3,PANAS_4,PANAS_5,'+'PANAS_6,PANAS_7,PANAS_8,PANAS_9,PANAS_10,PANAS_11,PANAS_12,PANAS_13,PANAS_14,PANAS_15,PANAS_16,PANAS_17,PANAS_18,PANAS_19,'+'PANAS_20,... (FILTER)'.
```

```
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.

FREQUENCIES VARIABLES=Dropout
  /ORDER=ANALYSIS.

CROSSTABS
  /TABLES=Time BY Group BY Dropout
  /FORMAT=AVALUE TABLES
  /CELLS=COUNT
  /COUNT ROUND CELL.

*if analysis should be run including dropouts:

FILTER OFF.
USE ALL.
EXECUTE.

**Flatlining for every variable
only participants flatlining at scales with more than 10 items will be excluded
SDs are calculated and recoded (SD = 0 -> 0, SD > 0 -> 1)
everyone with a 0 will be excluded
-> n(Flatliners) = 10; are excluded by hand

COMPUTE SD_WHO=SD(WHO5_1,WHO5_2,WHO5_3,WHO5_4,WHO5_5).
COMPUTE
SD_PANAS=SD(PANAS_1,PANAS_2,PANAS_3,PANAS_4,PANAS_5,PANAS_6,PANAS_7,PANAS_8,PANAS_
9,PANAS_10,PANAS_11,PANAS_12,PANAS_13,PANAS_14,PANAS_15,PANAS_16,PANAS_17,PANAS_18,
PANAS_19,PANAS_20).
COMPUTE SD_BRS=SD(BRS_1,BRS_2,BRS_3,BRS_4,BRS_5,BRS_6).
```

```
COMPUTE
SD_BPN=SD(BPN_1,BPN_2,BPN_3,BPN_4,BPN_5,BPN_6,BPN_7,BPN_8,BPN_9,BPN_10,BPN_11,BPN_12,BPN_13,BPN_14,BPN_15,BPN_16,BPN_17,BPN_18,BPN_19,BPN_20,BPN_21,BPN_22,BPN_23,BPN_24).
EXECUTE.

RECODE SD_WHO (MISSING=SYSMIS) (0=0) (ELSE=1).
RECODE SD_PANAS (MISSING=SYSMIS) (0=0) (ELSE=1).
RECODE SD_BRS (MISSING=SYSMIS) (0=0) (ELSE=1).
RECODE SD_BPN (MISSING=SYSMIS) (0=0) (ELSE=1).
EXECUTE.

FREQUENCIES VARIABLES=SD_WHO SD_PANAS SD_BRS SD_BPN
  /ORDER=ANALYSIS.
```

1.2. Calculating means

```
**WHO-5 calculating, descriptives

COMPUTE WHO5=SUM(WHO5_1,WHO5_2,WHO5_3,WHO5_4,WHO5_5)-5.
EXECUTE.

DESCRIPTIVES VARIABLES=WHO5
  /STATISTICS=MEAN STDDEV MIN MAX.

*Below 13 = poor well-being -> dichotomous WHO-5; recoding & descriptives

RECODE WHO5 (MISSING=SYSMIS) (0 thru 12=1) (13 thru 25=2) INTO WHO5_dich.
VARIABLE LABELS  WHO5_dich 'WHO5 dichotomous'.
EXECUTE.
```

```
FREQUENCIES VARIABLES=WHO5_dich
  /ORDER=ANALYSIS.

*distributed by group and time

 CTABLES
  /VLABELS VARIABLES=Group Time WHO5 DISPLAY=LABEL
  /TABLE Group [C] > Time [C] BY WHO5 [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
  /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
  /CRITERIA CILEVEL=95.

CROSSTABS
  /TABLES=Time BY Group BY WHO5_dich
  /FORMAT=AVALUE TABLES
  /CELLS=COUNT
  /COUNT ROUND CELL.

**PANAS
PA = positive affect; NA = negative affect
calculating, descriptives

COMPUTE
PA=SUM(PANAS_1,PANAS_2,PANAS_3,PANAS_4,PANAS_5,PANAS_6,PANAS_7,PANAS_8,PANAS_9,PA
NAS_10).
EXECUTE.

COMPUTE
NA=SUM(PANAS_11,PANAS_12,PANAS_13,PANAS_14,PANAS_15,PANAS_16,PANAS_17,PANAS_18,PA
NAS_19,PANAS_20).
EXECUTE.

DESCRIPTIVES VARIABLES=PA NA
```

/STATISTICS=MEAN STDDEV MIN MAX.

*distributed by group and time

CTABLES

/VLABELS VARIABLES=Group Time PA DISPLAY=LABEL

/TABLE Group [C] > Time [C] BY PA [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]

/CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE

/CRITERIA CILEVEL=95.

CTABLES

/VLABELS VARIABLES=Group Time NA DISPLAY=LABEL

/TABLE Group [C] > Time [C] BY NA [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]

/CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE

/CRITERIA CILEVEL=95.

**Resilience

calculatiing after recoding reveresed items, then descriptives

RECODE BRS_2 BRS_4 BRS_6 (MISSING=SYSMIS) (1=5) (3=3) (2=4) (4=2) (5=1) INTO BRS_2_rev BRS_4_rev BRS_6_rev.

VARIABLE LABELS BRS_2_rev 'I have a hard time making it through stressful events_reversed' /BRS_4_rev 'It is hard for me to snap back when something bad happens_reversed'

/BRS_6_rev 'I tend to take a long time to get over set-backs in my life_reversed'.

EXECUTE.

COMPUTE BRS=MEAN(BRS_1,BRS_2_rev,BRS_3,BRS_4_rev,BRS_5,BRS_6_rev).

EXECUTE.

DESCRIPTIVES VARIABLES=BRS

/STATISTICS=MEAN STDDEV MIN MAX.

*distributed by group and time

```
CTABLES
  /VLABELS VARIABLES=Group Time BRS DISPLAY=LABEL
  /TABLE Group [C] > Time [C] BY BRS [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
  /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
  /CRITERIA CILEVEL=95.
```

**BPN

Aut = Autonomy, Com = Competence, Rel = Relatedness; S = Satisfaction, F = Frustration

Calculating facets & descriptives

```
COMPUTE AutS=MEAN(BPN_1,BPN_7,BPN_13,BPN_19).
COMPUTE AutF=MEAN(BPN_2,BPN_8,BPN_14,BPN_20).
COMPUTE ComS=MEAN(BPN_5,BPN_11,BPN_17,BPN_23).
COMPUTE ComF=MEAN(BPN_6,BPN_12,BPN_18,BPN_24).
COMPUTE RelS=MEAN(BPN_3,BPN_9,BPN_15,BPN_21).
COMPUTE RelF=MEAN(BPN_4,BPN_10,BPN_16,BPN_22).
EXECUTE.

DESCRIPTIVES VARIABLES=AutS AutF ComS ComF RelS RelF
  /STATISTICS=MEAN STDDEV MIN MAX.
```

*distributed by group and time

```
CTABLES
  /VLABELS VARIABLES=Group Time AutS DISPLAY=LABEL
  /TABLE Group [C] > Time [C] BY AutS [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
  /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
  /CRITERIA CILEVEL=95.
```

```
CTABLES
 /VLABELS VARIABLES=Group Time AutF DISPLAY=LABEL
 /TABLE Group [C] > Time [C] BY AutF [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
 /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
 /CRITERIA CILEVEL=95.

CTABLES
 /VLABELS VARIABLES=Group Time ComS DISPLAY=LABEL
 /TABLE Group [C] > Time [C] BY ComS [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
 /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
 /CRITERIA CILEVEL=95.

CTABLES
 /VLABELS VARIABLES=Group Time ComF DISPLAY=LABEL
 /TABLE Group [C] > Time [C] BY ComF [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
 /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
 /CRITERIA CILEVEL=95.

CTABLES
 /VLABELS VARIABLES=Group Time RelS DISPLAY=LABEL
 /TABLE Group [C] > Time [C] BY RelS [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
 /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
 /CRITERIA CILEVEL=95.

CTABLES
 /VLABELS VARIABLES=Group Time RelF DISPLAY=LABEL
 /TABLE Group [C] > Time [C] BY RelF [S][MEAN, SEMEAN, MINIMUM, MAXIMUM]
 /CATEGORIES VARIABLES=Group Time ORDER=A KEY=VALUE EMPTY=INCLUDE
 /CRITERIA CILEVEL=95.
```

2. ANALYSIS HYPOTHESIS 3

3. HYPOTHESE 1

**identifying potential control variables (only for t1, because multiple regression is only for t1)

```
RECODE Q5 (1=1) (2=2) (ELSE=SYSMIS) INTO gender.
VARIABLE LABELS  gender 'gender, excluding other'.
EXECUTE.
```

```
sort cases by Time
split file by Time
split file off
```

*Pearson correlations with interval-scaled variables: PA & NA, WHO, need satisfaction & frustration, age (add gender & firstgen to pearson, as dichotomous)

with first checking for normal distribution

```
EXAMINE VARIABLES=WHO5 PA NA BRS AutS AutF ComS ComF RelS RelF age
  /PLOT BOXPLOT STEMLEAF NPPLOT
  /COMPARE GROUPS
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.
```

*Pearson correlation for normal distributed variables

```
CORRELATIONS
  /VARIABLES=WHO5 PA BRS AutS ComS RelS firstgen gender
  /PRINT=TWOTAIL NOSIG
  /STATISTICS DESCRIPTIVES
  /MISSING=PAIRWISE.
```

*Spearman correlations with ordinal-scaled variables: additional to the above: NA, need frustration, age

```
NONPAR CORR
/VARIABLES=WHO5 PA BRS AutS ComS RelS firstgen gender NA AutF ComF RelF age
/PRINT=SPEARMAN TWOTAIL NOSIG
```

*ANOVA nationality

```
GLM WHO5 PA NA AutS AutF ComS ComF RelS RelF BY nationality
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=nationality(LSD)
  /PRINT=DESCRIPTIVE ETASQ OPOWER HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN= nationality.
```

**Multiple Regressions

```
sort cases by Time
split file by Time
split file off
```

*WHO5

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
```

```
  /DEPENDENT WHO5
  /METHOD=ENTER age gender WithinEU OutsideEU
  /METHOD=ENTER age gender WithinEU OutsideEU AutS AutF ComS ComF RelS RelF
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(2)
  /SAVE PRED ZPRED ADJPRED MAHAL COOK LEVER ZRESID DRESID SDRESID SDBETA SDFIT COVRATIO.
```

*Positive Affect

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT PA
  /METHOD=ENTER age gender WithinEU OutsideEU
  /METHOD=ENTER age gender WithinEU OutsideEU AutS AutF ComS ComF RelS RelF
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(2)
  /SAVE PRED ZPRED ADJPRED MAHAL COOK LEVER ZRESID DRESID SDRESID SDBETA SDFIT COVRATIO.
```

*Negative Affect

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
```

```
  /NOORIGIN
  /DEPENDENT NA
  /METHOD=ENTER age gender WithinEU OutsideEU
  /METHOD=ENTER age gender WithinEU OutsideEU AutS AutF ComS ComF RelS RelF
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(2)
  /SAVE PRED ZPRED ADJPRED MAHAL COOK LEVER ZRESID DRESID SDRESID SDBETA SDFIT COVRATIO.

*Resilience

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT BRS
  /METHOD=ENTER age gender WithinEU OutsideEU
  /METHOD=ENTER age gender WithinEU OutsideEU AutS AutF ComS ComF RelS RelF
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(2)
  /SAVE PRED ZPRED ADJPRED MAHAL COOK LEVER ZRESID DRESID SDRESID SDBETA SDFIT COVRATIO.
```

2. Script (R Studio)

```
#impute data
tempData <- mice(Case_Study_matched_relevant,m=5,maxit=50,meth='pmm',seed=500)
summary(tempData)

tempData$imp$AutS_t1
```

```
tempData$imp$AutS_t2

tempData$imp$AutS_t3


View(tempData)


init=mice(Case_Study_matched_relevant,maxit=0)

meth=init$method

predM=init$predictorMatrix

meth[c("AutS_t1","AutS_t2","AutS_t3")]="norm"


set.seed(103)

imputed=mice(Case_Study_matched_relevant,method=meth,predictorMatrix=predM,m=5)


imputed <- complete(imputed)


View(imputed)


###finding: not enough data to impute for t3, so we continue with t1 and t2

###therefore six rmANOVAs for the six variables


dat_t2 <- Case_Study_matched_relevant_t1vst2


#preparing dataset

library(tidyverse)


dat_t2_long <- dat_t2 %>%

  gather(key="variable",value="value",-ResponseId) %>%

  separate(variable, into = c("measure","time"), sep = "_t") %>%

  mutate(time = as.numeric(time))
```

```
dat_t2_long_sorted <- dat_t2_long %>%
  arrange(ResponseId,measure)

##assumptions testing
#Test for normality
install.packages("mhde")
library(mhde)

AutS_data <- as.numeric(subset(dat_t2_long_sorted, measure == "AutS")$value)
AutF_data <- as.numeric(subset(dat_t2_long_sorted, measure == "AutF")$value)
ComS_data <- as.numeric(subset(dat_t2_long_sorted, measure == "ComS")$value)
ComF_data <- as.numeric(subset(dat_t2_long_sorted, measure == "ComF")$value)
RelS_data <- as.numeric(subset(dat_t2_long_sorted, measure == "RelS")$value)
RelF_data <- as.numeric(subset(dat_t2_long_sorted, measure == "RelF")$value)

hz.test <- function(x, y) {
  hist_x <- hist(x, plot = FALSE)
  hist_y <- hist(y, plot = FALSE)

  h_x <- hist_x$density
  h_y <- hist_y$density

  n <- length(x)
  m <- length(y)

  term1 <- (n / (n + m))^0.25 * sum(h_x^2)
  term2 <- (m / (n + m))^0.25 * sum(h_y^2)
  term3 <- (n / (n + m))^0.5 * sum(h_x * h_y)

  HZ_stat <- (term1 + term2 - 2 * term3) / sqrt(2 * (1 - term3))
```

```
  return(HZ_stat)
}



result_mvnorm_Aut <- hz.test(AutS_data, AutF_data)
result_mvnorm_Com <- hz.test(ComS_data, ComF_data)
result_mvnorm_Rel <- hz.test(RelS_data, RelF_data)

print(result_mvnorm_Aut)
print(result_mvnorm_Com)
print(result_mvnorm_Rel)



#Test for Sphericity: Mauchly's Test of Sphericity
library(car)
install.packages("MANOVA.RM")
library(MANOVA.RM)
install.packages("MASS")
library(MASS)
library(stats)
library(psych)
install.packages("multivariateTests")
library(multivariateTests)

###Mauchly's Test of Sphericity. Only reported for variables or effects with >2 levels because sphericity necessarily
###holds for effects with only 2 levels. The null hypothesis is that the variances of the group differences are equal.
###Thus, a significant p-value (p <= 0.05) indicates that the variances of group differences are not equal.
###https://www.datanovia.com/en/lessons/mauchlys-test-of-sphericity-in-r/
```

```
#rmANOVA


library(tidyverse)

library(ggpubr)

library(rstatix)


AutS_data <- subset(dat_t2_long_sorted, measure == "AutS", select = c("ResponseId", "time", "value"))

AutF_data <- subset(dat_t2_long_sorted, measure == "AutF", select = c("ResponseId", "time", "value"))

ComS_data <- subset(dat_t2_long_sorted, measure == "ComS", select = c("ResponseId", "time", "value"))

ComF_data <- subset(dat_t2_long_sorted, measure == "ComF", select = c("ResponseId", "time", "value"))

RelS_data <- subset(dat_t2_long_sorted, measure == "RelS", select = c("ResponseId", "time", "value"))

RelF_data <- subset(dat_t2_long_sorted, measure == "RelF", select = c("ResponseId", "time", "value"))

AutS_data <-as.data.frame(AutS_data)

AutF_data <-as.data.frame(AutF_data)

ComS_data <-as.data.frame(ComS_data)

ComF_data <-as.data.frame(ComF_data)

RelS_data <-as.data.frame(RelS_data)

RelF_data <-as.data.frame(RelF_data)


res_AutS <- anova_test(data = AutS_data, dv = value, wid = ResponseId, within = time)

res_AutF <- anova_test(data = AutF_data, dv = value, wid = ResponseId, within = time)

res_ComS <- anova_test(data = ComS_data, dv = value, wid = ResponseId, within = time)

res_ComF <- anova_test(data = ComF_data, dv = value, wid = ResponseId, within = time)

res_RelS <- anova_test(data = RelS_data, dv = value, wid = ResponseId, within = time)

res_RelF <- anova_test(data = RelF_data, dv = value, wid = ResponseId, within = time)

res_AutS
```

res_AutF

res_ComS

res_ComF

res_RelS

res_RelF