

German translation of the Artificial-Social-Agent questionnaire instrument for evaluating human-agent interaction

Creation of culture file

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In this file, we create the culture data based on our transformed data, and the mixed-English data from the previous study (Chinese translation).

We transformed the data into an input data file for further analysis, which we describe in ‘German-Summative’.

We use the following packages:

```
library(haven)      # Use read_sav function
library(dplyr)      # Use select function
library(knitr)       # Get markdown file
library(tinytex)     # Use TeX environment
library(rarticles)   # Use CTeX documents template
library(pander)      # For pandering tables
library(reshape2)   # Use melt function
panderOptions("table.alignment.default", "left")
```

1 File data__culture__EN__DE.sav

To formulate the input data file for the subsection ‘Comparison of Human-ASA Interaction between Different Cultural Backgrounds’ in the paper, we transformed the three data files into the file ‘data_culture.sav’. As this was only a comparison on construct/dimension level based on data collected with the English version of the questionnaire items, we first calculated scores for each English

construct/dimension per participant, by averaging the items' scores. And we add a new column 'ConstructID' to represent each construct/dimension, facilitating further analysis of the comparison between different cultural backgrounds when using English version of ASAQ. This we did both for data frame 'dd1' and 'dd2'.

```
d1_bilingual <- read_sav("summative_first_half_transformed.sav")

#remove Q_E_ prefix from English items
for ( col in 8:51){
  colnames(d1_bilingual)[col] <- sub("Q_E_", "", colnames(d1_bilingual)[col])
}

HLA_EN<-data.frame(select(d1_bilingual,HLA1:HLA4))
# Select English item scores of HLA1, HLA2, HLA3 and HLA4 for Dimension 'HLA'
HLB_EN<-data.frame(select(d1_bilingual,HLB1:HLB5))
NA_EN<-data.frame(select(d1_bilingual,NA1:NA5))
NB_EN<-data.frame(select(d1_bilingual,NB1:NB3))
AAS_EN<-data.frame(select(d1_bilingual,AAS1:AAS3))
AU_EN<-data.frame(select(d1_bilingual,AU1:AU2,AU3))
PF_EN<-data.frame(select(d1_bilingual,PF1:PF3))
AL_EN<-data.frame(select(d1_bilingual,AL1:AL5))
AS_EN<-data.frame(select(d1_bilingual,AS1:AS3))
APP_EN<-data.frame(select(d1_bilingual,APP1:APP3))
UAA_EN<-data.frame(select(d1_bilingual,UAA1:R_UAA3))
AE_EN<-data.frame(select(d1_bilingual,R_AE1:R_AE4))
# Select English item scores of each construct/dimension for Construct 1-8
d1_bilingual$HLA_EN<-rowMeans(HLA_EN)
# Calculate English item score mean of HLA1, HLA2, HLA3 and HLA4 as construct score
d1_bilingual$HLB_EN<-rowMeans(HLB_EN)
d1_bilingual$NA_EN<-rowMeans(NA_EN)
d1_bilingual$NB_EN<-rowMeans(NB_EN)
d1_bilingual$AAS_EN<-rowMeans(AAS_EN)
d1_bilingual$AU_EN<-rowMeans(AU_EN)
d1_bilingual$PF_EN<-rowMeans(PF_EN)
d1_bilingual$AL_EN<-rowMeans(AL_EN)
d1_bilingual$AS_EN<-rowMeans(AS_EN)
d1_bilingual$APP_EN<-rowMeans(APP_EN)
d1_bilingual$UAA_EN<-rowMeans(UAA_EN)
d1_bilingual$AE_EN<-rowMeans(AE_EN)
# Calculate English mean of each construct/dimension per participant
```

```

bilingualdata1<-melt(select(d1_bilingual,agentName:AE_EN),id.vars=c("agentName","AgentID"),
                    variable.name="Construct",value.name="Rating")
# Transform data into the long format
bilingualdata1$Culture <- 0
# Add a column 'Culture', '0' is participant group with bilingual cultural background
bilingualdata1$ConstructID[bilingualdata1$Construct=="HLA_EN"]<-1
bilingualdata1$ConstructID[bilingualdata1$Construct=="HLB_EN"]<-2
bilingualdata1$ConstructID[bilingualdata1$Construct=="NA_EN"]<-3
bilingualdata1$ConstructID[bilingualdata1$Construct=="NB_EN"]<-4
bilingualdata1$ConstructID[bilingualdata1$Construct=="AAS_EN"]<-5
bilingualdata1$ConstructID[bilingualdata1$Construct=="AU_EN"]<-6
bilingualdata1$ConstructID[bilingualdata1$Construct=="PF_EN"]<-7
bilingualdata1$ConstructID[bilingualdata1$Construct=="AL_EN"]<-8
bilingualdata1$ConstructID[bilingualdata1$Construct=="AS_EN"]<-9
bilingualdata1$ConstructID[bilingualdata1$Construct=="APP_EN"]<-10
bilingualdata1$ConstructID[bilingualdata1$Construct=="UAA_EN"]<-11
bilingualdata1$ConstructID[bilingualdata1$Construct=="AE_EN"]<-12
# Label ConstructID for English constructs/dimensions

```

Then we did the same manipulation to the second half.

```

d2_bilingual<-read_sav("summative_second_half_transformed.sav")

#remove Q_E_ prefix from English items
for ( col in 8:53){
  colnames(d2_bilingual)[col] <- sub("Q_E_", "", colnames(d2_bilingual)[col])
}

UE_EN<-data.frame(select(d2_bilingual,UE1:UE3))
# Select English item scores of UE1, UE2 and UE3 for Construct 'UE'
UT_EN<-data.frame(select(d2_bilingual,UT1:UT3))
UAL_EN<-data.frame(select(d2_bilingual,UAL1:UAL6))
AA_EN<-data.frame(select(d2_bilingual,AA1:AA3))
AC_EN<-data.frame(select(d2_bilingual,R_AC1:R_AC4))
AI_EN<-data.frame(select(d2_bilingual,AI1:AI4))
AT_EN<-data.frame(select(d2_bilingual,AT1:R_AT3))
SP_EN<-data.frame(select(d2_bilingual,SP1:SP3))
IIS_EN<-data.frame(select(d2_bilingual,IIS1:IIS4))
AEI_EN<-data.frame(select(d2_bilingual,AEI1:R_AEI5))
UEP_EN<-data.frame(select(d2_bilingual,UEP1:UEP4))

```

```

UAI_EN<-data.frame(select(d2_bilingual,UAI1:UAI4))
# Select English scores of the remaining 12 constructs/dimensions
d2_bilingual$UE_EN<-rowMeans(UE_EN)
# Calculate English item score mean of UE1, UE2 and UE3 as construct score
d2_bilingual$UT_EN<-rowMeans(UT_EN)
d2_bilingual$UAL_EN<-rowMeans(UAL_EN)
d2_bilingual$AA_EN<-rowMeans(AA_EN)
d2_bilingual$AC_EN<-rowMeans(AC_EN)
d2_bilingual$AI_EN<-rowMeans(AI_EN)
d2_bilingual$AT_EN<-rowMeans(AT_EN)
d2_bilingual$SP_EN<-rowMeans(SP_EN)
d2_bilingual$IIS_EN<-rowMeans(IIS_EN)
d2_bilingual$AEI_EN<-rowMeans(AEI_EN)
d2_bilingual$UEP_EN<-rowMeans(UEP_EN)
d2_bilingual$UAI_EN<-rowMeans(UAI_EN)
# Calculate English mean of each construct/dimension per participant
bilingualdata2<-melt(select(d2_bilingual,agentName:UAI_EN),id.vars=c("agentName","AgentID"),
                     variable.name="Construct",value.name="Rating")
# Transform data into the long format
bilingualdata2$Culture <- 0
# Add a column 'Culture', '0' is participant group with bilingual cultural background
bilingualdata2$ConstructID[bilingualdata2$Construct=="UE_EN"]<-13
bilingualdata2$ConstructID[bilingualdata2$Construct=="UT_EN"]<-14
bilingualdata2$ConstructID[bilingualdata2$Construct=="UAL_EN"]<-15
bilingualdata2$ConstructID[bilingualdata2$Construct=="AA_EN"]<-16
bilingualdata2$ConstructID[bilingualdata2$Construct=="AC_EN"]<-17
bilingualdata2$ConstructID[bilingualdata2$Construct=="AI_EN"]<-18
bilingualdata2$ConstructID[bilingualdata2$Construct=="AT_EN"]<-19
bilingualdata2$ConstructID[bilingualdata2$Construct=="SP_EN"]<-20
bilingualdata2$ConstructID[bilingualdata2$Construct=="IIS_EN"]<-21
bilingualdata2$ConstructID[bilingualdata2$Construct=="AEI_EN"]<-22
bilingualdata2$ConstructID[bilingualdata2$Construct=="UEP_EN"]<-23
bilingualdata2$ConstructID[bilingualdata2$Construct=="UAI_EN"]<-24
# Label ConstructID for English constructs/dimensions

```

We combine the mixed-English result from the previous translation paper (Chinese translation) with our current data

```

# Import culture data from Chinese translation paper
data_culture_mixed <- read_sav("data_culture.sav")
# Only use mixed-English data (culture = 1)
data_culture_mixed <- data_culture_mixed[data_culture_mixed$Culture == '1',]

#remove construct column from German-English data
bilingualdata1 <- select(bilingualdata1, -Construct)
bilingualdata2 <- select(bilingualdata2, -Construct)

# Combine German-English and mixed-English data
data_culture_EN_DE <- rbind(bilingualdata1, bilingualdata2, data_culture_mixed)

attr(data_culture_EN_DE$AgentName,"label")<-c("iCAT, DEEPBLUE, AMY, FURBY, POPPIE, SIRI,
HAL 9000, SIM SENSEI, CHAPPIE, AIBO, SARAH, NAO, MARCUS, DOG")
# Add label to 'AgentID'
attr(data_culture_EN_DE$AgentID,"label")<-c("1=iCAT, 2=DEEPBLUE, 3=AMY, 4=FURBY, 5=POPPIE,
6=SIRI, 7=HAL 9000, 8=SIM SENSEI, 9=CHAPPIE, 10=AIBO, 11=SARAH, 12=NAO, 13=MARCUS, 14=DOG")
# Add label to 'AgentID'
attr(data_culture_EN_DE$Rating,"label")<-c("Rating scores of 24 constructs/dimensions by
242 bilingual participants and 532 mixed international English-speaking participants")
attr(data_culture_EN_DE$Culture,"label")<-c("0=bilingual cultural background,
1=mixed international English-speaking cultural backgroup")
# Add label to 'Culture'
attr(data_culture_EN_DE$ConstructID,"label")<-c("1=HLA, 2=HLB, 3=NA, 4=NB, 5=AAS, 6=AU,
7=PF, 8=AL, 9=AS, 10=APP, 11=UAA, 12=AE, 13=UE, 14=UT, 15=UAL, 16=AA, 17=AC, 18=AI,
19=AT, 20=SP, 21=IIS, 22=AEI, 23=UEP, 24=UAI")
# Add label to 'ConstructID'

```