

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

Transformation from raw data to the input files - second half

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1 Introduction

In this document, we transform a raw data file into an input data file. Because of privacy reasons we did not release for public access the non-anonymized raw data file.

Due to time constraints, the data transformed and analyzed in these files is only based on the first data collected between the 19th and 22nd of June. We are still aiming for 120 participants per questionnaire part for future work.

There are two documents to be transformed. They are divided like the questionnaire - split in two. Two groups answered either questionnaire. In the second group, which this document is about, human-ASA interaction evaluation data of the last 46 items were collected from 82 bilingual participants with German as their primary language (not necessarily first language), and English as their fluent language. The amount was reduced artificially to 72 participants to be able to merge this data with the first half (which only had 72 participants). Bilingual participants rated human-ASA interaction on 46 English items and corresponding German translations. In addition, they answered 14 attention control questions.

We transformed the raw data file into an input data file for further analysis, which we describe in ‘GermanSummative’.

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(rtticles)   # Use CTeX documents template
library(pander)     # For pandering tables
panderOptions("table.alignment.default", "left")
```

2 Data file Final__ASA__German__Summative__Second__Half__v1__2023__

We read the raw data file consisting of the last 46 English ASA item scores and corresponding German translation scores. The raw scores are from a 7-point scale, ranging from -3 (disagree), 0 (neither agree nor disagree) to 3 (agree). Due to time constraints, transformed data evaluation can only work when the first and second half are of equal size. Therefore, we reduced the amount of rows in this set to 72. The reduction was made in a separate file ‘data_equalization.Rmd’. To assure the code is reproducible, the indices of removed rows are listed in that file. Here, we access the already reduced data.

```
# Read the file
df <- read_sav("Final_ASA_German_Summative_Second_Half_v1_2023_06_22_anonym_reduced.sav")
```

Because of various combinations of participants in the 14 human-ASA interaction videos, there are multiple versions of the same questionnaire adjusted for gender, amount of participants (2 English versions, 6 German versions). While all versions of the questionnaire were present in one survey, their columns are currently not merged. Different variants of the same column are suffixed (e.g. ‘Q_DE_UAI4’, ‘Q_DE_UAI4.1’, ‘Q_DE_UAI4.2’, etc). The code below allows to merge two separate versions of a questionnaire.

```
merge_data <- function(data, multiplier=0){
  start <- 1 #this is the column of the first English item (the attention check)
  end <- start + 52 #this is the last column of the English item
  #create a new list (this will be the new columns with combined data)
  new_columns <- list()

  # Go over all columns
  for (i in seq(start, end)) {
```

```

# Get the column name without suffix
col1 <- colnames(data)[i]
# Get column index for next suffixed column of same name
col2_index <- i + 53
# Get its name
col2 <- colnames(data)[col2_index]

# Use the name of the unsuffixed column
new_col <- colnames(data)[i]

# Create a new column by merging the values of col1 and col2 by checking if they are NA
# The name of col1, the unsuffixed column, will be the name of the merged column
new_columns[[new_col]] <- ifelse(data[[col1]]=="", data[[col2]], data[[col1]])

}

# Make list of columns into a data frame
merged_data <- data.frame(new_columns)
# Remove the columns that were merged, and replace them with combined columns
# Keep any remaining columns (appended), to repeat this operation
combined_data <- cbind(merged_data, data[-1:-106])

return(combined_data)
}

```

Merge the two versions of the English questionnaire into one.

```

#Select only questions, attention checks
df_E <- data.frame(select(df, AttentionCheck_E_1:"Q_E_UAI4.1"))
df_E <- subset(df_E, select = -c(Num_Rewatch, Previous_Interaction, Previous_Passive, Use_Data))

#Select only English questions, attention checks
df_E <- select(df_E, AttentionCheck_E_1:Q_E_UAI4, AttentionCheck_E_1.1:Q_E_UAI4.1)

#Merge suffixed columns into one
df_E <- merge_data(df_E)

```

Merge the five versions of the German questionnaire into one.

```

#select only questions, attention checks
df_DE <- data.frame(select(df, AttentionCheck_E_1:"Q_DE_UAI4.4"))
df_DE <- subset(df_DE, select = -c(Num_Rewatch, Previous_Interaction, Previous_Passive, Use_Data))

#select only German questions, attention checks
df_DE <- select(df, AttentionCheck_DE_1:Q_DE_UAI4,
               AttentionCheck_DE_1.1:Q_DE_UAI4.1,
               AttentionCheck_DE_1.2:Q_DE_UAI4.2,
               AttentionCheck_DE_1.3:Q_DE_UAI4.3,
               AttentionCheck_DE_1.4:Q_DE_UAI4.4,
               AttentionCheck_DE_1.5:Q_DE_UAI4.5)

# Merge all variants of German (suffixed) columns into one
df0 <- merge_data(df_DE)

df1 <- merge_data(df0)

df2 <- merge_data(df1)

df3 <- merge_data(df2)

df4 <- merge_data(df3)

# Rename for better legibility
df_DE <- df4

```

Combine the unified English and German items.

```

# Combine English and German questions + attention checks
d_ASA_1 <- cbind(df_E, df_DE)
# Make entries numeric
d_ASA_1 <- d_ASA_1 %>% mutate_if(is.character, as.numeric)

```

3 Transformation results as input data file for further analysis

3.1 File summative_second_half_transformed.sav

We removed scores of attention control questions and other irrelevant data (e.g. ‘Finished’ and ‘rand_id’), retaining ratings of English items and corresponding German translations. The code

excluding people failing attention checks (from the Chinese translation codebase) is still in place. However, for the current study we already excluded participants failing the checks on Qualtrics. **Please note: Since these participants are not paid for their submission, we cannot use or publish their data in any way.**

```
# Select only question items from data frame (incl. attention checks)
# all participants
dd1 <- data.frame(select(d_ASA_1, AttentionCheck_E_1:Q_DE_UAI4), select(df, agentName))

# Filter out participant entries based on failed attention checks
attention_check_filtering <- function(data){
  # Select attention check questions
  # Note: for German translation rounds,
  # no single row should be removed based
  # on failed attention checks. This is already done in Qualtrics.
  # Note: This code chunk remains for 1) the final evaluation 2) legacy compatibility
  i <- grep("AttentionCheck",colnames(data))

  # Select desired answers for attention check questions
  Atten <- c(-3,3,3,-3,0,3,-3,0,-3,3,2,3,-3,1)

  # The following code and comments still remain from the Chinese translation code
  # with minor adjustments:

  x <- NULL # Row number of participant who failed the attention check
  for (j in (1:nrow(data))){
    # Find participants who failed attention check in 'dd1'
    count <- 0
    # The number of incorrectly answered attention control questions of each participant
    for (k in 1:14){

      if (as.numeric(data[[i[k]]][j])!=Atten[k]) # Check whether each participant's

      # attention control question answers are consistent with the correct answers
      count <- count+1

    }

    if (count>2)
      # Row number of the participant who failed more than two
```

```

    # attention control questions were added to 'x'
    x <- append(x,j)
    # Participants who failed more than two attention control questions
}
m <- length(x) # The number of participants who failed attention check
if (m!=0)
  data <- data[-x,] # Participants who failed attention check were excluded

# Print whether any participants failed attention checks
cat("Amount of participants who failed attention checks: ", m,
    "\nAmount of participants left after filtering based on attention checks: "
    , nrow(data), "\n")
return(data)
}

#Perform filtering on "all" and "recommended" dataframes
dd1 <- attention_check_filtering(dd1)

```

```

## Amount of participants who failed attention checks:  0
## Amount of participants left after filtering based on attention checks:  72

```

All participants' evaluation data were included as none of the participants failed any of the attention control questions (logically). We added prefix R to questions which have the sign [R] in the ASA questionnaire. Then, scores of these questions were inverted. Thus, we obtained the output data `summative_second_half_transformed.sav` for further evaluation.

```

# Add R prefix to inverted score items
colnames(dd1)[colnames(dd1) == "Q_E_AC1"] = "Q_E_R_AC1"
colnames(dd1)[colnames(dd1) == "Q_E_AC2"] = "Q_E_R_AC2"
colnames(dd1)[colnames(dd1) == "Q_E_AC3"] = "Q_E_R_AC3"
colnames(dd1)[colnames(dd1) == "Q_E_AC4"] = "Q_E_R_AC4"
colnames(dd1)[colnames(dd1) == "Q_E_AI3"] = "Q_E_R_AI3"
colnames(dd1)[colnames(dd1) == "Q_E_AT3"] = "Q_E_R_AT3"
colnames(dd1)[colnames(dd1) == "Q_E_AEI3"] = "Q_E_R_AEI3"
colnames(dd1)[colnames(dd1) == "Q_E_AEI5"] = "Q_E_R_AEI5"

colnames(dd1)[colnames(dd1) == "Q_DE_AC1"] = "Q_DE_R_AC1"
colnames(dd1)[colnames(dd1) == "Q_DE_AC2"] = "Q_DE_R_AC2"
colnames(dd1)[colnames(dd1) == "Q_DE_AC3"] = "Q_DE_R_AC3"
colnames(dd1)[colnames(dd1) == "Q_DE_AC4"] = "Q_DE_R_AC4"

```

```

colnames(dd1)[colnames(dd1) == "Q_DE_AI3"] = "Q_DE_R_AI3"
colnames(dd1)[colnames(dd1) == "Q_DE_AT3"] = "Q_DE_R_AT3"
colnames(dd1)[colnames(dd1) == "Q_DE_AEI3"] = "Q_DE_R_AEI3"
colnames(dd1)[colnames(dd1) == "Q_DE_AEI5"] = "Q_DE_R_AEI5"

for (i in grep("R", colnames(dd1))){
  # Find column number of reversing-scoring items and translations
  dd1[[i]][] <- dd1[[i]][]*(-1)
  # Reverse scores of reverse-scoring items and translations
}

# Add the 'agentName' column data
dd1$AgentID <- 0 # Add a column 'AgentID' to facilitate analysis for comparison
# between different cultural backgrounds in the main markdown file
# No specific meaning for 14 numbers, just a code for each agent
dd1$AgentID[dd1$agentName=='iCAT']<-1
dd1$AgentID[dd1$agentName=='DEEPBLUE']<-2
dd1$AgentID[dd1$agentName=='AMY']<-3
dd1$AgentID[dd1$agentName=='FURBY']<-4
dd1$AgentID[dd1$agentName=='POPPIE']<-5
dd1$AgentID[dd1$agentName=='SIRI']<-6
dd1$AgentID[dd1$agentName=='HAL 9000']<-7
dd1$AgentID[dd1$agentName=='SIM SENSEI']<-8
dd1$AgentID[dd1$agentName=='CHAPPIE']<-9
dd1$AgentID[dd1$agentName=='AIBO']<-10
dd1$AgentID[dd1$agentName=='SARAH']<-11
dd1$AgentID[dd1$agentName=='NAO']<-12
dd1$AgentID[dd1$agentName=='MARCUS']<-13
dd1$AgentID[dd1$agentName=='DOG']<-14
# Label AgentID for 14 ASAs
attr(dd1$agentName, "label")<-c("iCAT, DEEPBLUE, AMY, FURBY, POPPIE, SIRI,
HAL 9000, SIM SENSEI, CHAPPIE, AIBO, SARAH, NAO, MARCUS, DOG")
# Add label to 'AgentID'
attr(dd1$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'

```