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TwinLife Balloon Analogue Risk Task (BART)

v1.0.0

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Balloon Analogue Risk Task (BART)

The Balloon Analogue Risk Task (BART) is a computerized risk-taking game and scientific instrument to assess risk behavior (Lejuez et al., 2002). The assessment was part of the F2F 3 survey, integrated in the CASI questionnaire and carried out on a tablet at participants´ home. The participant was led by the programmed app through a sequence of instructions, a practice phase, and the test phase. The interviewer only intervened if problems arose. Participants were free to decline their participation in the game or stop playing at any time after starting it.

In our setup, after starting the game, the participant was asked to inflate a balloon with individual pump blasts by pressing a button. Five points were awarded for each blast, with a maximum of 128 pump blasts possible per balloon and 30 balloons in total. At all times there was a random chance that the balloon might burst (i.e., even during the first pump blast). In case a balloon burst, the points of that balloon were lost. Therefore, to prevent this loss, at any time, the participant had the opportunity to secure points for the current balloon in a total account. Once a balloon has burst or points have been secured, the game proceeded with the next balloon.

Computer animated test setup

Depending on the total score, participants took part in a lottery (30 times 50 Euro as monetary incentive) and obtained one or multiple draws (5 draws starting at 2500 points, 7 draws starting at 5000 points, and 10 draws starting at 7500 points).

Following variables were recorded during the game:

brt0001	Balloon game participation
brt**00	Game stopped in this round *
brt**01	Balloon burst in this round *
brt**02	Number of pumps in this round *
brt4000	Sum of all pump strokes obtained in the rounds in which the balloon did not burst
brt4001	Number of rounds played

** The number of the round is indicated by the two first digits, e.g. brt01** for round number one, brt30** for round number 30.*
As an example, the variables for round number twenty-two are coded as follows:
brt2200 – Game stopped in round twenty-two
brt2201 – Balloon burst in this round twenty-two
brt2202 – Number of pumps made in round twenty-two

To calculate the measure of taken risk, a score (brt5000) was created based on the average number of pumps on each balloon (brt**02) excluding balloons that have burst (brt**01).

$$\boldsymbol{mesure\ of\ risk\ taking} = \frac{\sum_{i=1}^{N} \boldsymbol{p_i}}{\boldsymbol{N_{nb}}}$$

$$p_i = number\ of\ pumps\ for\ balloon\ i;\ p_i = 0\ if\ balloon\ burst$$

$$N_{nb} = number\ of\ balloons\ that\ did\ not\ burst$$

The codebook for the dataset can be found on the documentation downloads page: https://www.twin-life.de/documentation/downloads
Codebook for the F2F3 survey:
https://www.twin-life.de/documentation/images/TwinLife/Downloads/ZA6701_cod_wid5_v7-1-0.pdf

In total, 7,072 participants agreed to play the game, while 864 declined and were coded as -99 in the brt5000 variable. Of these 7,072 participants, 332 participants stopped playing during the game. These cases were coded as -80 "game not completed" in brt5000. 3 participants had no rounds in which the balloon did not burst. These cases were coded with -81 "balloon

burst in every round". The mean risk-taking score for participants who completed the game was 30.44 (SD = 14.51) ranging from 1 to 116. The calculated score (brt5000) is included in the scientific use file (SUF) and the score distribution is shown in Figure 1.

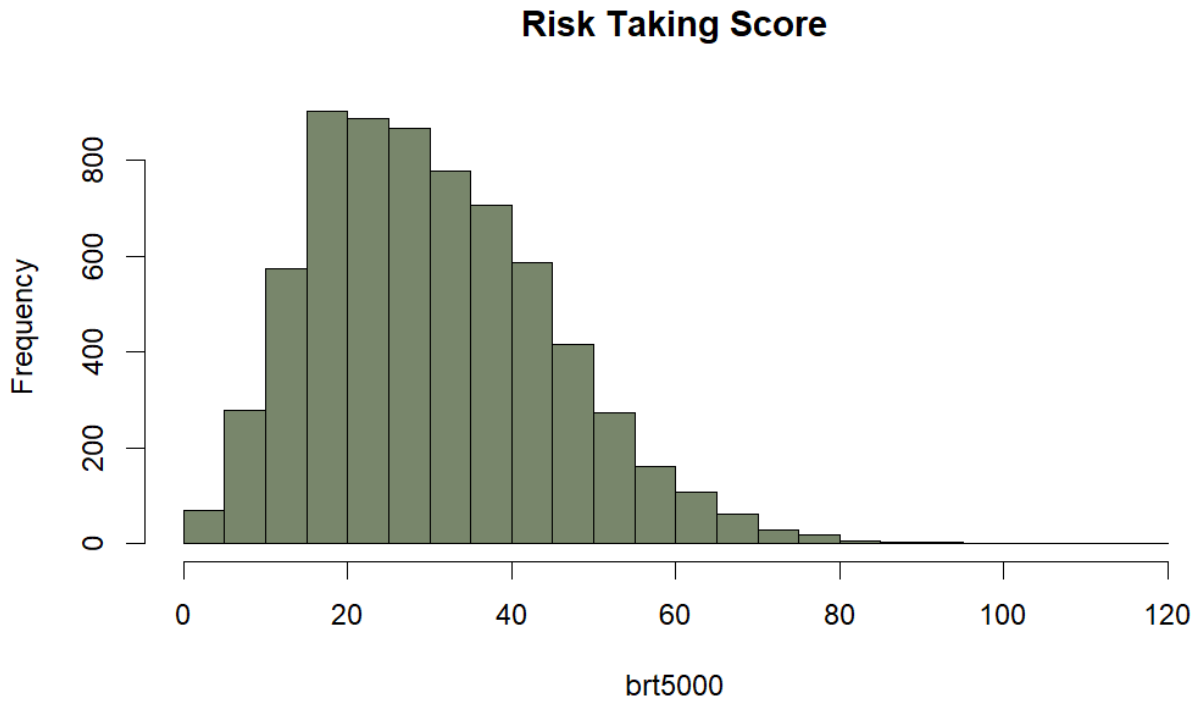

Figure 1. Distribution of the risk-taking score brt5000.

References:

Lejuez, C. W., Read, J. P., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., Strong, D. R., & Brown, R. A. (2002). Evaluation of a behavioral measure of risk taking: The Balloon Analogue Risk Task (BART). *Journal of Experimental Psychology: Applied*, *8*(2), 75–84. https://doi.org/10.1037/1076-898X.8.2.75

Appendix A

R markdown syntax for the calculation of the measure of risk-taking

This syntax refers to the data file ZA6701_person_wid5_v7-1-0 en). Each surveyed person has one data row containing the surveyed items.

To calculate the measure of taken risk, a score (brt5000) was created based on the average number of pumps on each balloon (brt**02) excluding balloons that have burst (brt**01).

per0200 Self-reported willingness to take risks
brt0001 Balloon game participation (0=not true; 1=true)
brt4000 Sum of all pump strokes obtained in the rounds in which the balloon did not burst
brt4001 Number of rounds played
brt**00 Game stopped in this round (0=not true; 1=true)
brt**01 Balloon burst in this round (0=not true; 1=true)
brt**02 Number of pumps in this round
calculated: brt5000 measure of taken risk

assigned missing values:
-80 not all 30 rounds have been played
-81 all 30 balloons have burst
-95 doesn't apply (screened out)
-99 not specified (refused to answer)

import data (wave 3: F2F)

```{r}
library(haven)
F2F3 <- read_sav("C:/Example_path.sav ")
```

filter data by columns

```{r}
BART <- F2F3[c("pid","per0200",
"brt0001","brt4000","brt4001",

"brt0100","brt0101","brt0102",
"brt0200","brt0201","brt0202",
"brt0300","brt0301","brt0302",
"brt0400","brt0401","brt0402",
"brt0500","brt0501","brt0502",

"brt0600","brt0601","brt0602",
"brt0700","brt0701","brt0702",
"brt0800","brt0801","brt0802",
"brt0900","brt0901","brt0902",
"brt1000","brt1001","brt1002",

"brt1100","brt1101","brt1102",
"brt1200","brt1201","brt1202",
"brt1300","brt1301","brt1302",
"brt1400","brt1401","brt1402",
```

```
            "brt1500","brt1501","brt1502",

            "brt1600","brt1601","brt1602",
            "brt1700","brt1701","brt1702",
            "brt1800","brt1801","brt1802",
            "brt1900","brt1901","brt1902",
            "brt2000","brt2001","brt2002",

            "brt2100","brt2101","brt2102",
            "brt2200","brt2201","brt2202",
            "brt2300","brt2301","brt2302",
            "brt2400","brt2401","brt2402",
            "brt2500","brt2501","brt2502",

            "brt2600","brt2601","brt2602",
            "brt2700","brt2701","brt2702",
            "brt2800","brt2801","brt2802",
            "brt2900","brt2901","brt2902",
            "brt3000","brt3001","brt3002")]
```

valid values for brt0001 (balloon game participation)

```{r}
BART$valid_participation <- ifelse(BART$brt0001==1 & !is.na(BART$brt0001), 1,-95)
BART$valid_participation <- ifelse(BART$brt0001==2 & !is.na(BART$brt0001), -99, BART$valid_participation )
```

cases where all not all 30 rounds have been played were set to missing (-80)

```{r}
BART$valid_participation[BART$brt4001 < 30] <- -80
```

sum columns (only rounds were balloon burst "brt**01")

```{r}
BART$rounds_burst <- rowSums(BART[, c("brt0101", "brt0201", "brt0301", "brt0401", "brt0501", "brt0601", "brt0701", "brt0801", "brt0901", "brt1001", "brt1101", "brt1201", "brt1301", "brt1401", "brt1501", "brt1601", "brt1701", "brt1801", "brt1901", "brt2001", "brt2101", "brt2201", "brt2301", "brt2401", "brt2501", "brt2601", "brt2701", "brt2801", "brt2901", "brt3001")])
```

sum rounds where balloon did not burst (30 minus number of rounds were balloon burst)

```{r}
BART$rounds_not_burst <- 30 - BART$rounds_burst
```

calculate risk-taking score "brt5000" (sum rounds where balloon did not burst "brt4000" divided by number of rounds where balloon did not burst "rounds_not_burst")

```{r}
BART$brt5000_risk_taking <- BART$brt4000 /  BART$rounds_not_burst
```

round to two digits after decimal point for risk-taking score "brt5000"
```{r}
BART$brt5000_risk_taking <- round(BART$brt5000_risk_taking, 2)
```

set missings according to participation variable; exclude cases where all 30 balloons have burst
```{r}
BART$brt5000 <- ifelse(BART$valid_participation ==1 , BART$brt5000_risk_taking, BART$valid_participation)
BART$brt5000[BART$pid %in% c(121541201, 146295001, 281083200, 490504001)] <- -81
```

Save the dataframe to Stata .dta format
```{r}
write_dta(BART[,c("pid","brt5000")], "C:/Users/karlg/Desktop/twinlife_bart_20250701.dta")
```

delete custom missings for descriptive statistics
```{r}
BART$brt5000_risk_taking <- BART$brt5000
BART$brt5000_risk_taking[BART$brt5000_risk_taking <0] <- NA
```

show min and max value for risk-taking score "brt5000"
```{r}
c(min(BART$brt5000_risk_taking, na.rm=TRUE), max(BART$brt5000_risk_taking, na.rm=TRUE))
```

calculate mean value of risk-taking score "brt5000", round to two digits
```{r}
round(mean(BART$brt5000_risk_taking, na.rm=TRUE), 2)
```

calculate SD for risk-taking score
```{r}
round(sd(BART$brt5000_risk_taking, na.rm=TRUE), 2)
```

create histogram
```{r}
hist(BART$brt5000_risk_taking, main = "Risk Taking Score", xlab = "brt5000", col = "#78866B", border = "black", breaks = 20,
xlim=c(0, 120))
```