FFA-Normierung

ses

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1 Summary

- Berechnung der Normwerte für die beiden FFA-Faktoren *Acceptance13* und *Presence*
- Die Normwerte wurden empirisch ohne Verteilungsannahme berechnet
- Es werden auch Normwerte für folgende Subgruppen ausgegeben
    - Geschlecht (männlich, weiblich)
    - regelmäßige Praxis (ja, nein)
- Für die Summenscores der Gesamtgruppe zeigte sich, dass die Normalverteilung eine gute Näherung an die empirischen Quantile zulässt. Daher können die typischen p-Quantile der Normalverteilung herangezogen werden, um die Normwerte anzuzeigen (z.B. MW+1SD -> 84% etc.)

2 Setup

2.1 R-Packages

```
library(easystats)
library(here)
library(tidyverse)
library(gt)
library(knitr)
```

2.2 General setup

```
theme_set(theme_minimal())
```

2.3 Raw data

```
d_filename <- "Achtsamkeit_Daten_FFAEichung_rekodiert_2.sav"
d <- data_read(here("raw-data", d_filename))
```

3 Data preparation

```
d2 <-
  d %>%
  rename(FFA_13r = FFA_13_rek)
```

3.1 Get items

FFA Items:

14 Items

```
ffa_items <-
  d2 %>%
  select(starts_with("FFA_"))
```

```
ffa_items_names <-
  ffa_items %>%
  names()

ffa_items_names
```

```
##  [1] "FFA_1"   "FFA_2"   "FFA_3"   "FFA_4"   "FFA_5"   "FFA_6"   "FFA_7"
##  [8] "FFA_8"   "FFA_9"   "FFA_10"  "FFA_11"  "FFA_12"  "FFA_13r" "FFA_14"
```

Recoding:

```
ffa_items2 <-
  ffa_items %>%
  mutate(across(.cols = everything(),
                .fns = ~ case_when(. == "fast nie" ~ 0,
                                   . == "eher selten" ~ 1,
                                   . == "relativ oft" ~ 2,
                                   . == "fast immer" ~ 3)))
```

3.2 Item distribution

```
ffa_items2 %>%
  describe_distribution() %>%
  gt()
```

Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
FFA_1	1.910079	0.8478851	1	0	3	-0.520610258	-0.2433517	1012	0
FFA_2	1.511858	0.8889128	1	0	3	-0.006236037	-0.7335490	1012	0
FFA_3	1.417984	0.8602628	1	0	3	0.026307560	-0.6588279	1012	0
FFA_4	1.892292	0.8551120	2	0	3	-0.400798396	-0.4808879	1012	0
FFA_5	1.841897	0.8348869	1	0	3	-0.432153070	-0.2909060	1012	0
FFA_6	1.803360	0.8188365	1	0	3	-0.284162125	-0.4273440	1012	0
FFA_7	1.781621	0.8443319	1	0	3	-0.389036781	-0.3657126	1012	0
FFA_8	1.842885	0.7729469	1	0	3	-0.288387236	-0.2701975	1012	0
FFA_9	1.710474	0.8369372	1	0	3	-0.265991803	-0.4628476	1012	0
FFA_10	1.720356	0.8519836	1	0	3	-0.296809090	-0.4872828	1012	0
FFA_11	1.744071	0.8396189	1	0	3	-0.282678732	-0.4667145	1012	0
FFA_12	1.539526	0.8644072	1	0	3	-0.066960142	-0.6509747	1012	0
FFA_13r	1.666996	0.9032186	1	0	3	-0.150194365	-0.7677760	1012	0
FFA_14	1.604743	0.8367766	1	0	3	-0.135499836	-0.5428998	1012	0

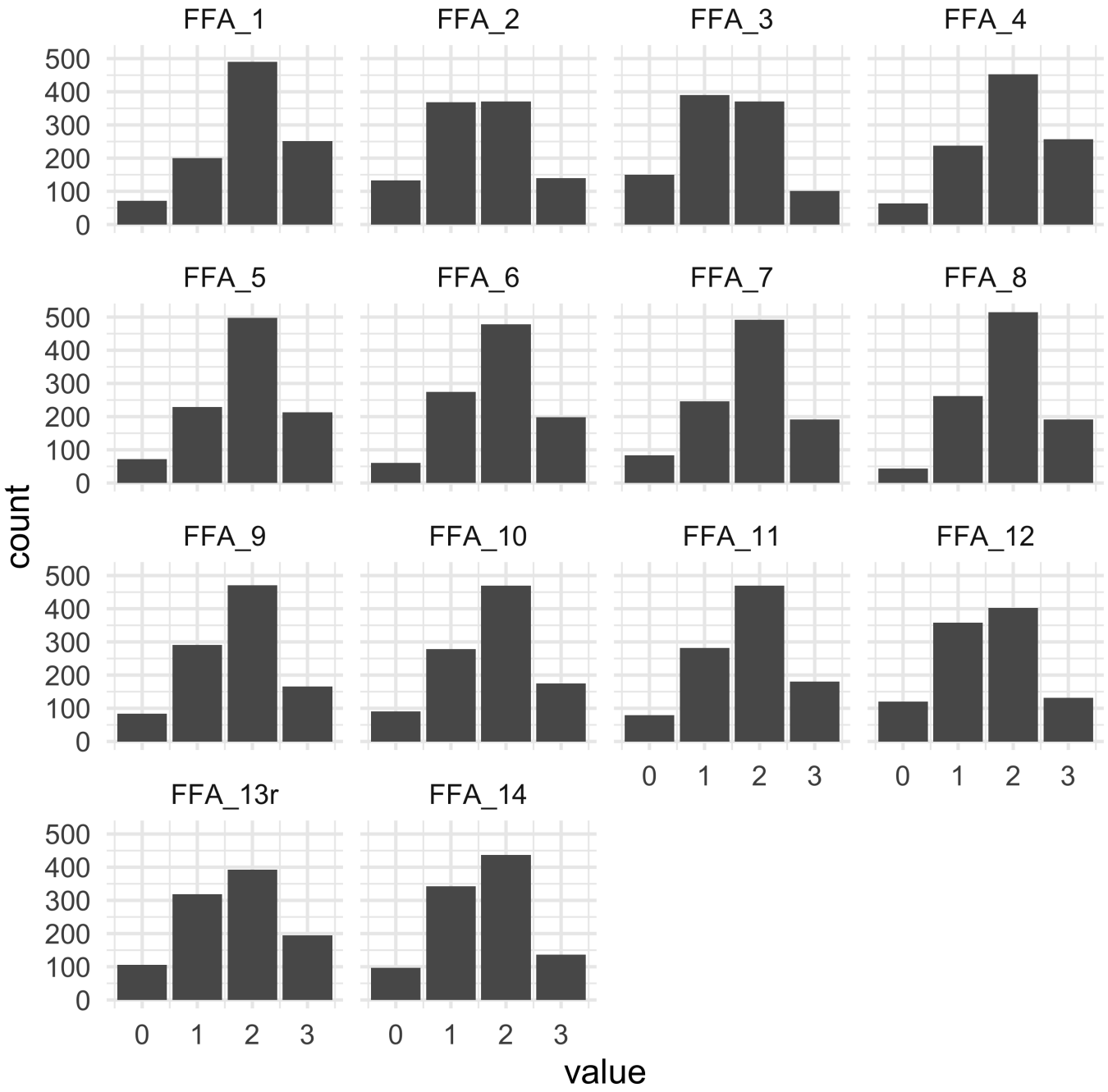
3.3 Visualization of item distribution

```
items_names <-
  ffa_items %>%
  names() %>%
  set_names()

map(items_names,
    ~ ggplot(data = ffa_items2) + geom_bar(aes(x = .data[[.x]])) + labs(y = .x))
```

```
ffa_items2 %>%
  pivot_longer(everything(), names_to = "item") %>%
  group_by(item) %>%
  group_split() %>%
  map(~ ggplot(., aes(x = value)) + geom_bar())
```

```
ffa_items2 %>%
  pivot_longer(everything(), names_to = "item") %>%
  mutate(item = factor(item, levels = ffa_items_names)) %>%
  ggplot(aes(x = value)) +
  geom_bar() +
  facet_wrap(~ item)
```

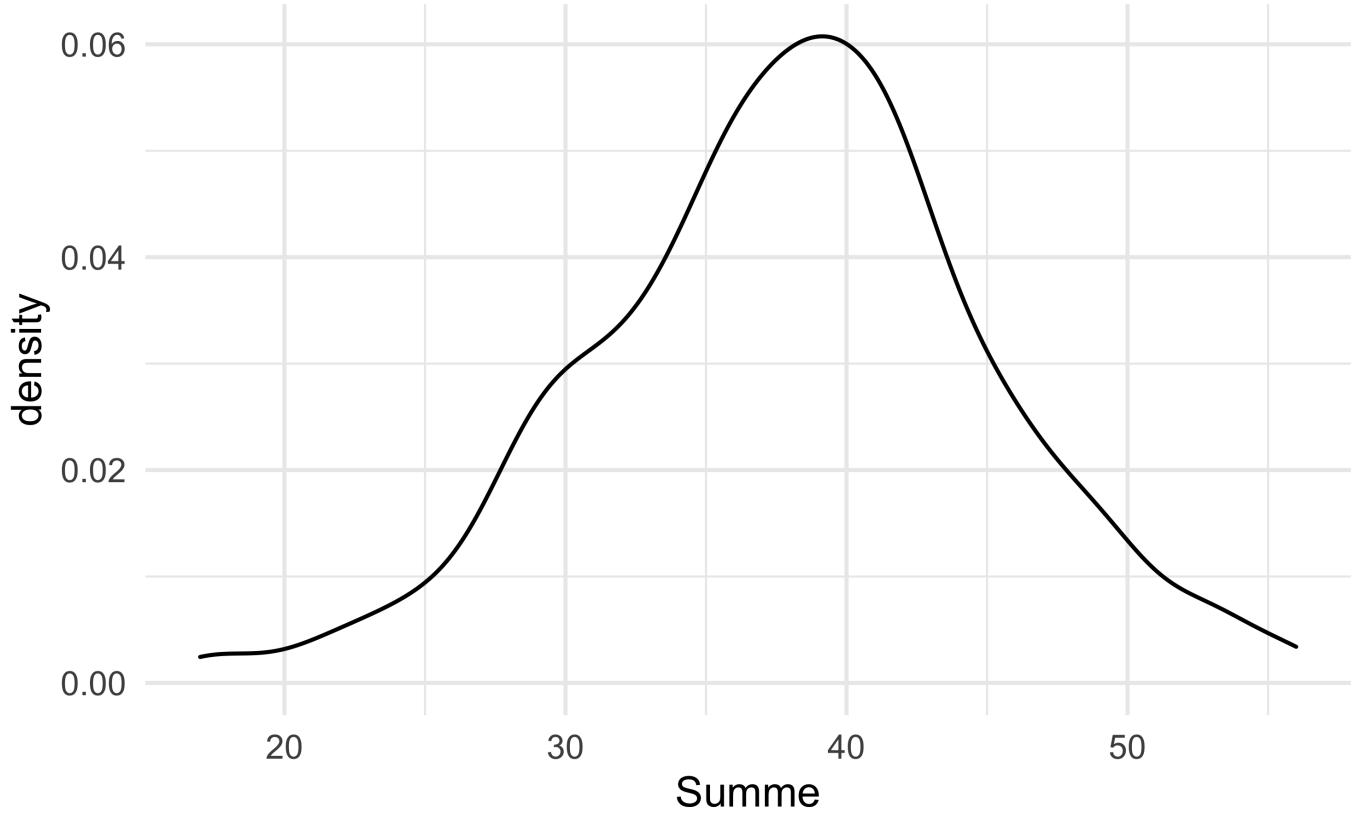


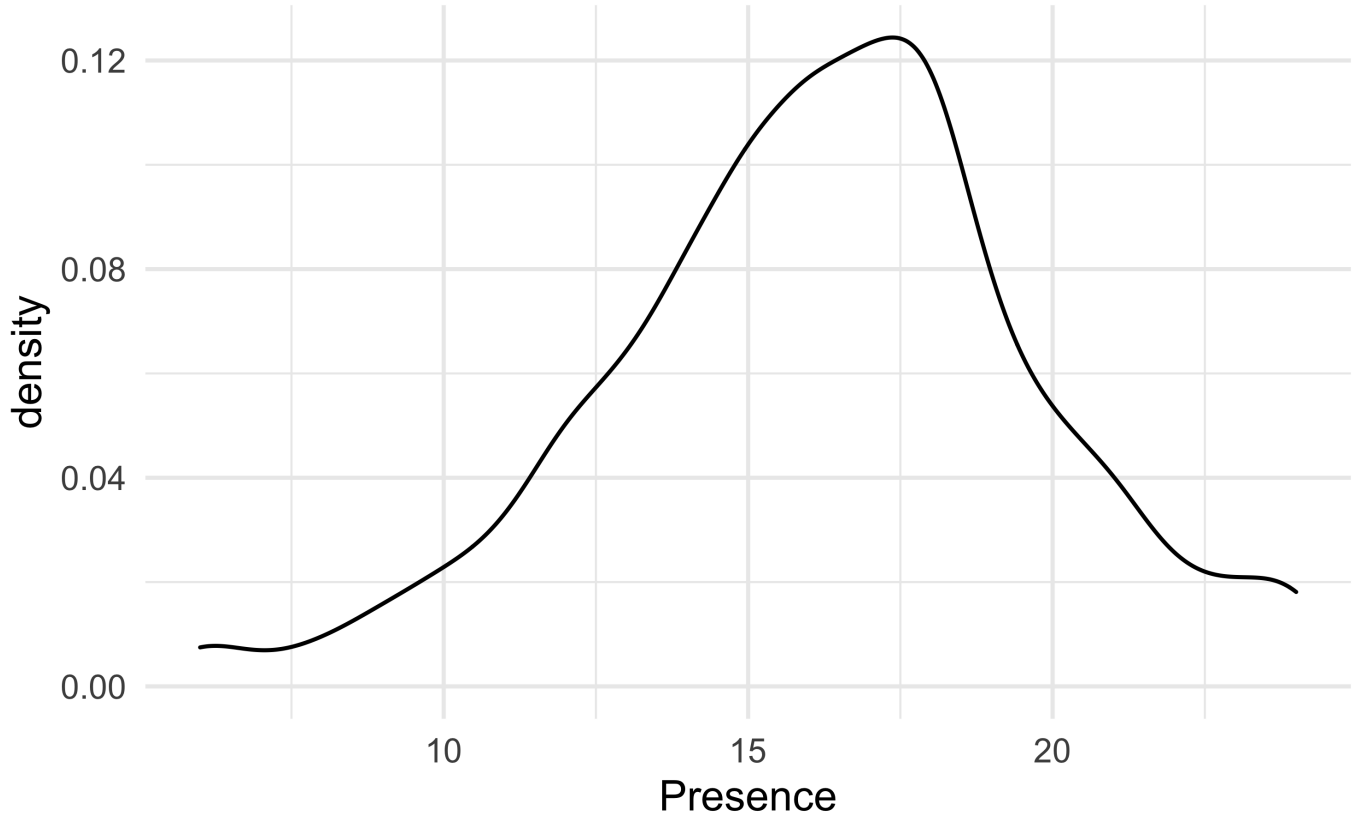
3.4 FFA13

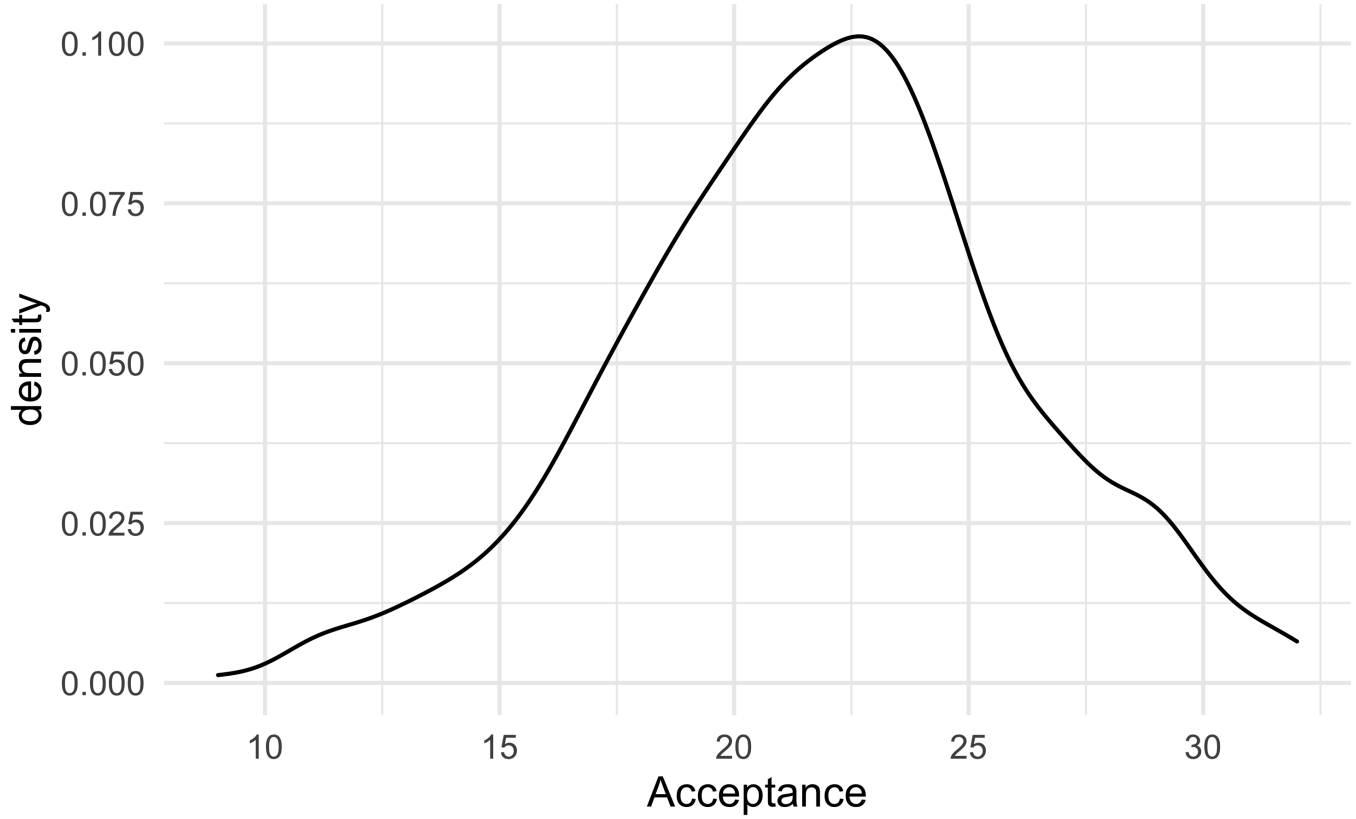
```
ffa13_items <-
  ffa_items2 %>%
  select(-FFA_13r)
```

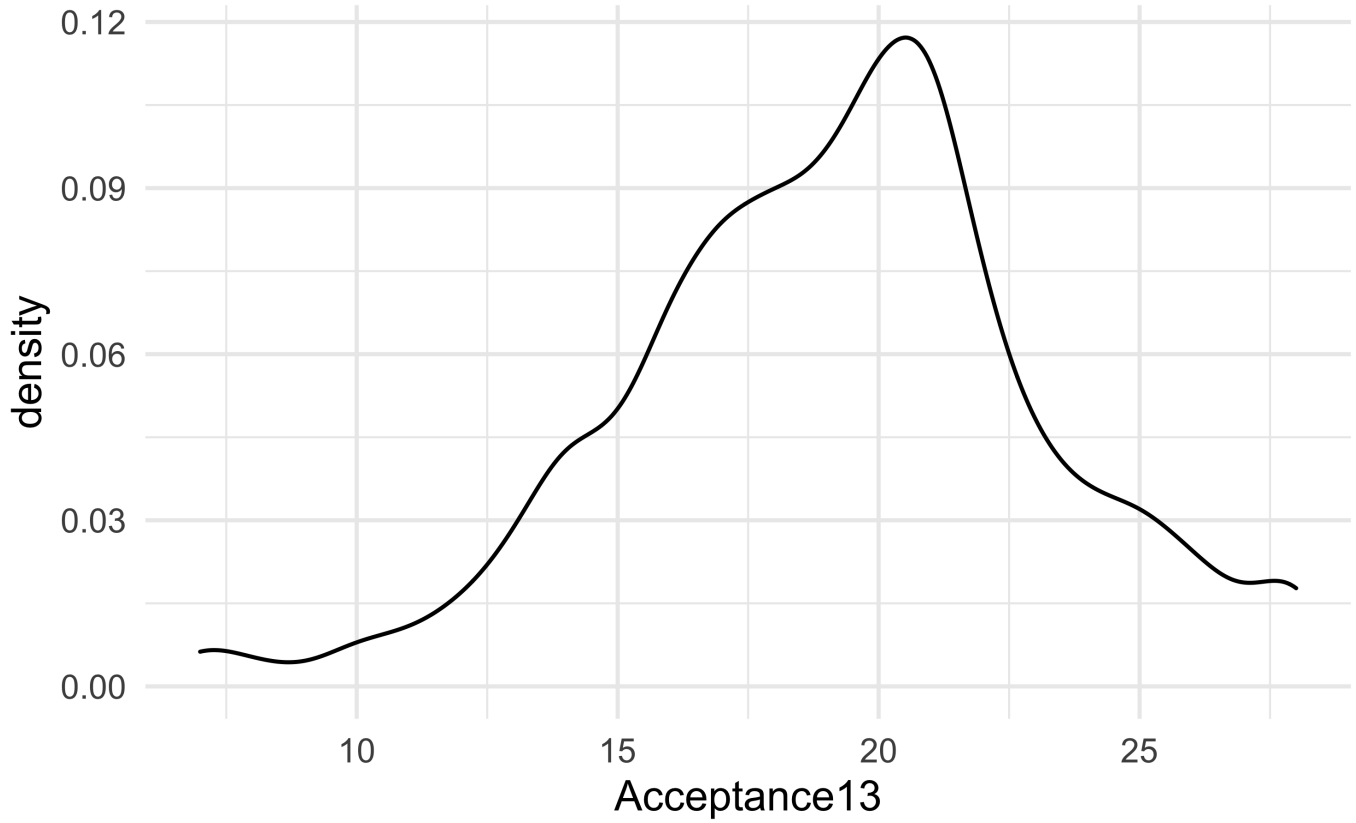
4 Scale distribution

```
ggplot(d, aes(x = Summe)) + geom_density()
ggplot(d, aes(x = Presence)) + geom_density()
ggplot(d, aes(x = Acceptance)) + geom_density()
ggplot(d, aes(x = Acceptance13)) + geom_density()
```


0.06
0.04
0.02
0.00
density
20
30
40
50
Summe


0.12
0.08
0.04
0.00
density
10
15
20
Presence






```
d %>%
  select(Summe, SummeFFA13, Presence, Acceptance, Acceptance13) %>%
  describe_distribution() %>%
  kable(digits = 2)
```

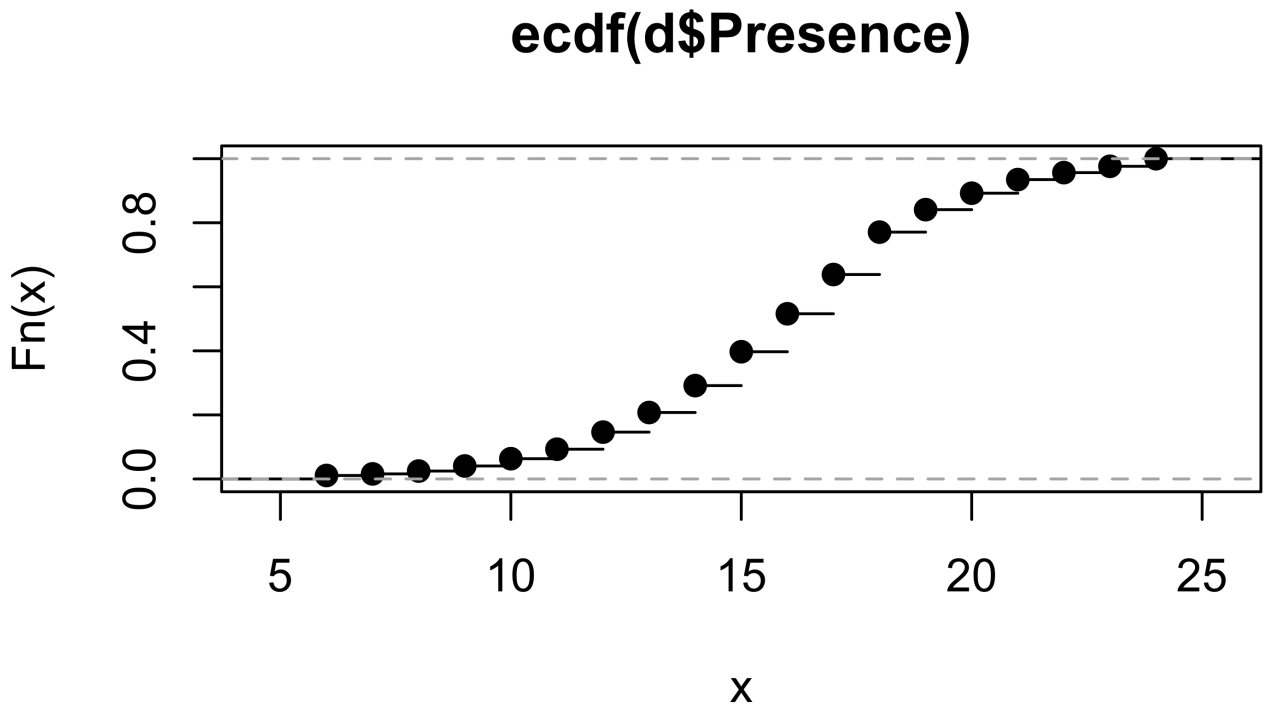
Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
Summe	37.99	7.13	9	17	56	-0.15	0.16	1012	0

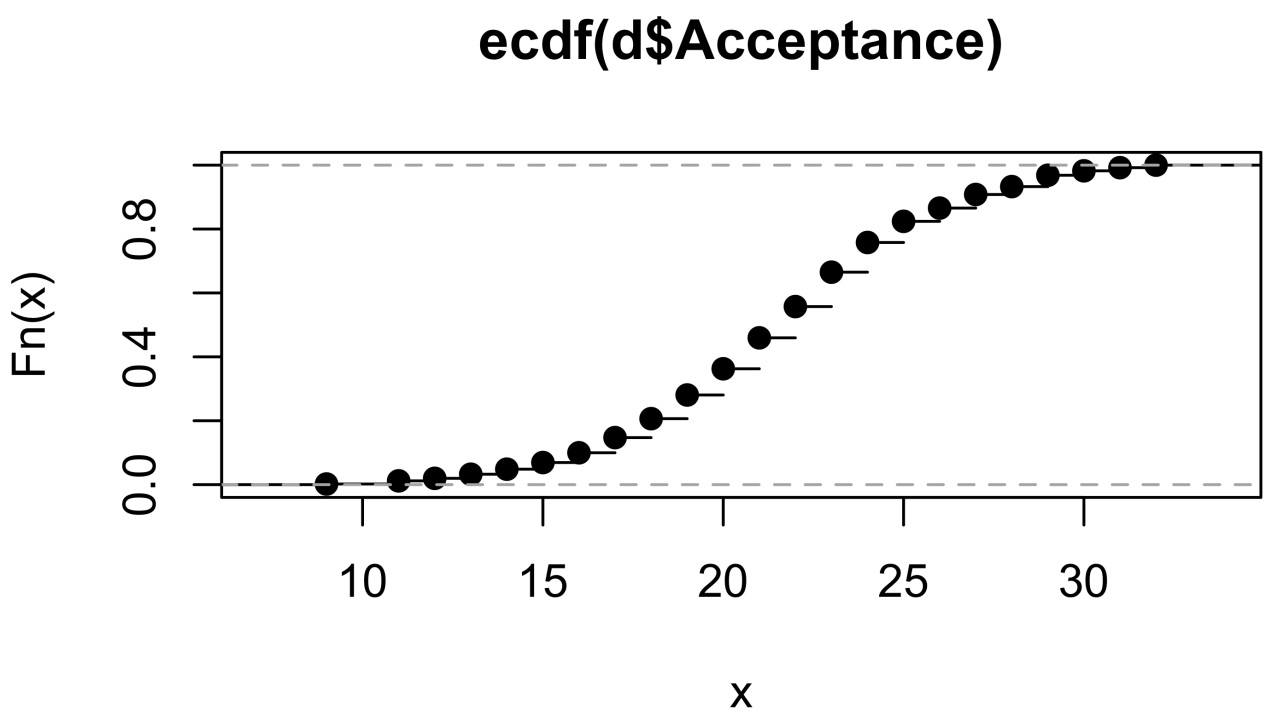
Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
SummeFFA13	35.32	7.08	9	13	52	-0.21	0.39	1012	0
Presence	16.18	3.56	4	6	24	-0.24	0.19	1012	0
Acceptance	21.80	4.20	5	9	32	-0.11	-0.01	1012	0
Acceptance13	19.14	4.05	4	7	28	-0.22	0.27	1012	0

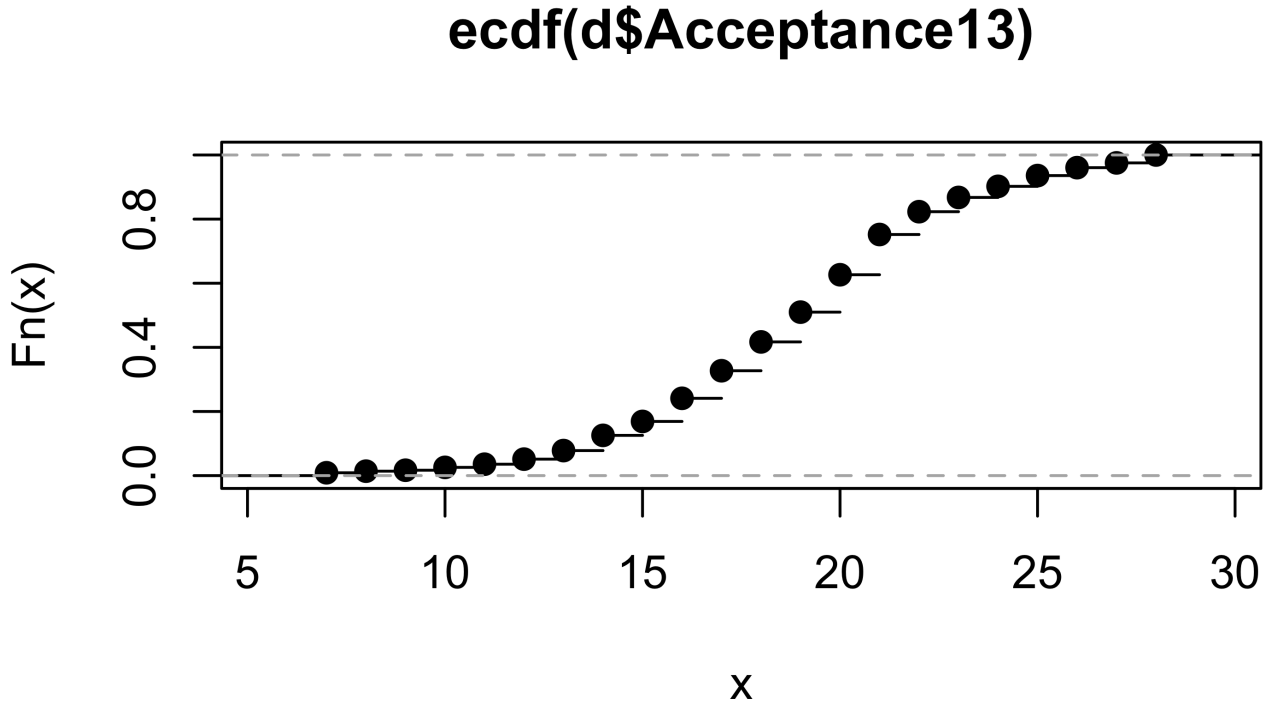
5 Quantiles

5.1 Factors

```
plot(ecdf(d$Presence))
plot(ecdf(d$Acceptance))
plot(ecdf(d$Acceptance13))
```







5.2 Quantiles per item

5.2.1 Presence

```
pres_q <- ecdf(d$Presence)
pres_q(6:24)
```

```
##  [1] 0.01086957 0.01581028 0.02470356 0.04051383 0.06324111 0.09288538
##  [7] 0.14624506 0.20750988 0.29150198 0.39723320 0.51581028 0.63833992
## [13] 0.77075099 0.84090909 0.89229249 0.93478261 0.95652174 0.97628458
## [19] 1.00000000
```

```
d2 %>%
  select(Presence) %>%
  describe_distribution() %>%
  kable(digits = 2)
```

Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
Presence	16.18	3.56	4	6	24	-0.24	0.19	1012	0

```
norms_presence <-
  tibble(
    presence_score = 6:24,
    presence_percentile = pres_q(presence_score)
  )

norms_presence %>%
  kable(digits = 2)
```

presence_score	presence_percentile
6	0.01
7	0.02
8	0.02
9	0.04
10	0.06
11	0.09
12	0.15
13	0.21
14	0.29
15	0.40
16	0.52
17	0.64
18	0.77
19	0.84
20	0.89
21	0.93
22	0.96

presence_score	presence_percentile
23	0.98
24	1.00

5.2.2 Acceptance

```
d2 %>%
  select(Acceptance) %>%
  describe_distribution() %>%
  kable(digits = 2)
```

Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
Acceptance	21.8	4.2	5	9	32	-0.11	-0.01	1012	0

```
acc_q <- ecdf(d2$Acceptance)

norms_acceptance <-
  tibble(
    acc_score = 9:32,
    acc_percentile = acc_q(acc_score)
  )

norms_acceptance %>%
  kable(digits = 2)
```

acc_score	acc_percentile
9	0.00
10	0.00
11	0.01
12	0.02
13	0.03
14	0.05
15	0.07
16	0.10
17	0.15
18	0.21
19	0.28
20	0.36
21	0.46
22	0.56

acc_score	acc_percentile
23	0.67
24	0.76
25	0.82
26	0.87
27	0.91
28	0.93
29	0.97
30	0.98
31	0.99
32	1.00

5.2.3 Acceptance13

```
d2 %>%
  select(Acceptance13) %>%
  describe_distribution() %>%
  kable(digits = 2)
```

Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
Acceptance13	19.14	4.05	4	7	28	-0.22	0.27	1012	0

```
acc13_q <- ecdf(d2$Acceptance13)

norms_acceptance13 <-
  tibble(
    acc13_score = 7:28,
    acc13_percentile = acc13_q(acc13_score)
  )

norms_acceptance13 %>%
  kable(digits = 2)
```

acc13_score	acc13_percentile
7	0.01
8	0.01
9	0.02
10	0.03
11	0.04
12	0.05

acc13_score	acc13_percentile
13	0.08
14	0.13
15	0.17
16	0.24
17	0.33
18	0.42
19	0.51
20	0.63
21	0.75
22	0.82
23	0.87
24	0.90
25	0.94
26	0.96
27	0.98
28	1.00

6 Quantiles for subgroups

6.1 Acceptance 13

6.1.1 Sex

```
d2 %>%
  select(Geschlecht, Acceptance) %>%
  group_by(Geschlecht) %>%
  describe_distribution(Acceptance) %>%
  kable(digits = 2)
```

Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing	.group
Acceptance	21.94	4.21	5	9	32	-0.13	0.24	495	0	Geschlecht=männlich
Acceptance	21.68	4.19	5	9	32	-0.10	-0.25	515	0	Geschlecht=weiblich
Acceptance	21.00	2.83	4	19	23	0.00	-2.00	2	0	Geschlecht=divers

Better not this way:

```
percentiles_female <-
  d2 %>%
  mutate(Geschlecht = as.character(Geschlecht)) %>%
  filter(Geschlecht == "weiblich") %>%
  mutate(acc_percentile_person = cume_dist(Acceptance)) %>%
  summarise(acc_percentile = unique(acc_percentile_person) %>% sort(),
            score = sort(unique(Acceptance)))

percentiles_female
```

Better this way:

6.1.1.1 Female

```
acc13_female_q <- ecdf(d2$Acceptance13[d$Geschlecht == "weiblich"])

norms_acceptance13_female <-
  tibble(
    acc13_score = sort(unique(d2$Acceptance13)),
    acc13_percentile = acc13_female_q(acc13_score)
  )

norms_acceptance13_female %>%
  kable(digits = 2)
```

acc13_score	acc13_percentile
7	0.00
8	0.00
9	0.01
10	0.02
11	0.03
12	0.05
13	0.09
14	0.14
15	0.18
16	0.26
17	0.34
18	0.42
19	0.51
20	0.63
21	0.75
22	0.83
23	0.87

acc13_score	acc13_percentile
24	0.90
25	0.93
26	0.97
27	0.98
28	1.00

6.1.1.2 Male

```
acc13_male_q <- ecdf(d2$Acceptance13[d$Geschlecht == "männlich"])

norms_acceptance13_male <-
  tibble(
    acc13_score = sort(unique(d2$Acceptance13)),
    acc13_percentile = acc13_female_q(acc13_score)
  )

norms_acceptance13_male %>%
  kable(digits = 2)
```

acc13_score	acc13_percentile
7	0.00
8	0.00
9	0.01
10	0.02
11	0.03
12	0.05
13	0.09
14	0.14
15	0.18
16	0.26
17	0.34
18	0.42
19	0.51
20	0.63
21	0.75
22	0.83
23	0.87
24	0.90

acc13_score	acc13_percentile
25	0.93
26	0.97
27	0.98
28	1.00

6.2 Presence

6.2.1 Sex

6.2.1.1 Female

```
acc13_female_q <- ecdf(d2$Presence[d$Geschlecht == "weiblich"])

norms_presence_female <-
  tibble(
    presence_score = sort(unique(d2$Presence)),
    presence_percentile = acc13_female_q(presence_score)
  )

norms_presence_female %>%
  kable(digits = 2)
```

presence_score	presence_percentile
6	0.00
7	0.01
8	0.01
9	0.03
10	0.06
11	0.09
12	0.14
13	0.20
14	0.29
15	0.39
16	0.50
17	0.63
18	0.76
19	0.82
20	0.88
21	0.93

presence_score	presence_percentile
22	0.95
23	0.98
24	1.00

6.2.1.2 Male

```
acc13_male_q <- ecdf(d2$Presence[d$Geschlecht == "männlich"])

norms_presence_male <-
  tibble(
    presence_score = sort(unique(d2$Presence)),
    presence_percentile = acc13_female_q(presence_score)
  )

norms_presence_male %>%
  kable(digits = 2)
```

presence_score	presence_percentile
6	0.00
7	0.01
8	0.01
9	0.03
10	0.06
11	0.09
12	0.14
13	0.20
14	0.29
15	0.39
16	0.50
17	0.63
18	0.76
19	0.82
20	0.88
21	0.93
22	0.95
23	0.98
24	1.00

6.3 Continuous training

6.3.1 Acceptance 13

6.3.1.1 Yes

```
acc13_train_q <- ecdf(d2$Acceptance13[d$Achts_regel == "ja"])

norms_acceptance13_training <-
  tibble(
    acc13_score = sort(unique(d2$Acceptance13)),
    acc13_percentile = acc13_female_q(acc13_score)
  )

norms_acceptance13_training %>%
  kable(digits = 2)
```

acc13_score	acc13_percentile
7	0.01
8	0.01
9	0.03
10	0.06
11	0.09
12	0.14
13	0.20
14	0.29
15	0.39
16	0.50
17	0.63
18	0.76
19	0.82
20	0.88
21	0.93
22	0.95
23	0.98
24	1.00
25	1.00
26	1.00
27	1.00

acc13_score	acc13_percentile
28	1.00

6.3.1.2 No

```
acc13_no_train_q <- ecdf(d2$Acceptance13[d$Achts_regel == "nicht"])

norms_acceptance13_no_training <-
  tibble(
    acc13_score = sort(unique(d2$Acceptance13)),
    acc13_percentile = acc13_female_q(acc13_score)
  )

norms_acceptance13_no_training %>%
  kable(digits = 2)
```

acc13_score	acc13_percentile
7	0.01
8	0.01
9	0.03
10	0.06
11	0.09
12	0.14
13	0.20
14	0.29
15	0.39
16	0.50
17	0.63
18	0.76
19	0.82
20	0.88
21	0.93
22	0.95
23	0.98
24	1.00
25	1.00
26	1.00
27	1.00
28	1.00

6.4 Quantiles based on normal distribution

Typical z-value cumulate probability:

```
qs <- c(-2, -1, 0, 1, 2)
ps <- pnorm(q = qs)
ps
```

```
## [1] 0.02275013 0.15865525 0.50000000 0.84134475 0.97724987
```

6.4.1 Acceptance 13

6.4.1.1 Empirical quantiles

```
quantile(d2$Acceptance13, probs = ps)
```

```
## 2.275013% 15.86553%       50% 84.13447% 97.72499%
##        10         15         19         23         28
```

6.4.2 Comparison with normal distribution

```
acc13_sd <- sd(d2$Acceptance13)
acc13_mean <- mean(d2$Acceptance13)

qnorm(p = ps, mean = acc13_mean, sd = acc13_sd)
```

```
## [1] 11.03077 15.08406 19.13735 23.19065 27.24394
```

Quite similar! It seems that using the normal distribution as a estimator for the score of this scale is sufficient. Empirical quantiles are not needed.

6.4.3 Presenece

6.4.3.1 Empirical quantiles

```
quantile(d2$Presence, probs = ps)
```

```
## 2.275013% 15.86553%       50% 84.13447% 97.72499%
##   8.00000  13.00000  16.00000  19.59954  23.99962
```

6.4.4 Comparison with normal distribution

```
qnorm(p = ps, mean = mean(d2$Presence), sd =  sd(d2$Presence))
```

```
## [1]  9.069686 12.626740 16.183794 19.740849 23.297903
```

Quite similar! It seems that using the normal distribution as a estimator for the score of this scale is sufficient. Empirical quantiles are not needed.