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Visual Analogue Scales versus Categorical Scales: Respondent Burden, Cognitive Depth, and Data Quality

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- respondent burden
 - actual response time
 - perceived response time

- cognitive processes
 - perception of scale: anchor order effect
 - flow experience

- data quality
 - equivalence of measurement
 - non-observation error:
item nonresponse & breakoffs
 - test-retest reliability

Limitations

- samples:
 - self-selected
 - highly motivated
 - educated
- n (per study) ~ 200
- but:
 - experimental design
 - same size on screen
 - quite low-tech

Visual Analogue Scales

Visual Analogue Scales (VAS)

- advantages:
 - fine graduation possible
 - no problems with odd/even categories
 - data on the level of an interval scale (Reips & Funke, in press)

Visual Analogue Scales (VAS)

- known problems (e.g. Couper, Tourangeau, Conrad, & Singer, 2006):
 - more dropout
 - higher rates of item nonresponse
 - longer response time

Equivalence Of Measurement



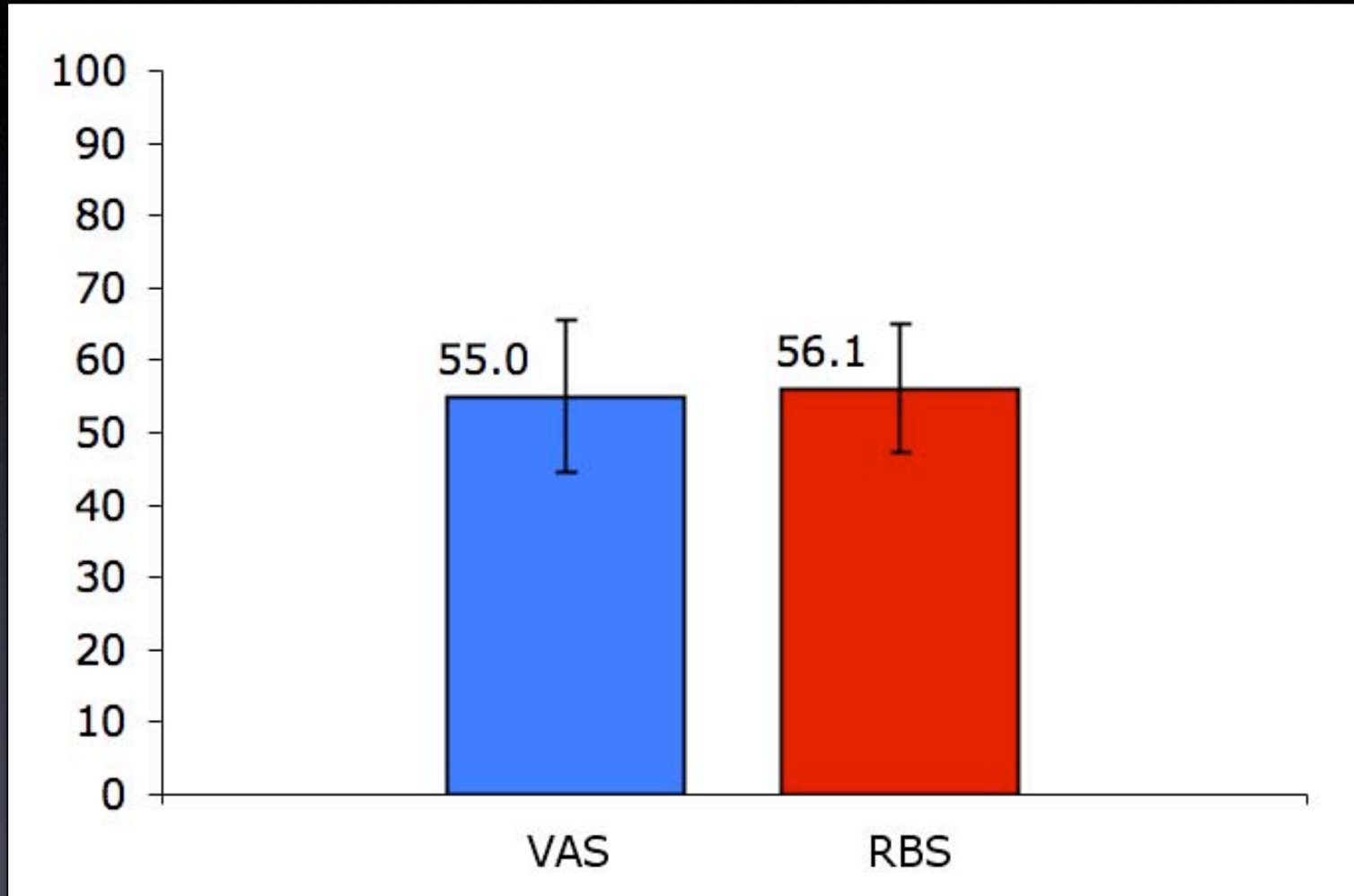
Equivalence of Measurement

- inventory on social desirability (Musch, Brockhaus, & Bröder, 2002), sub scale self-deception (10 items)
- scale should have no influence on perceived social desirability when answering a questionnaire

- scales



Equivalence of Measurement



- no difference in means



Test-Retest Reliability

Test-Retest Reliability

- is measurement error different for VAS than for categorical scales?
- do ratings with VAS produce more random measurement error?
- do VAS' fine distinctions overtax respondents, resulting in greater variance of data?

Test-Retest Reliability

- 40 item inventory on personality (IPIP40)
- 250 pixels VAS
- 5 radio buttons

inappropriate _____ appropriate

I do not want to answer this question.

inappropriate appropriate

I do not want to answer this question.

Test-Retest Reliability

- test-retest reliability (mean for all 40 items):



Alpha = .88



Alpha = .83

- difference is statistically significant ($p < .001$)

Test-Retest Reliability

- VAS are used in a consistent way
- measurement with VAS is more reliable

Break Offs & Missing Data

Break Offs and Missing Data

- 40 item inventory on personality (IPIP40)
- 2 experimental conditions:

1: inappropriate _____ appropriate

I do not want to answer this question.

2: inappropriate appropriate

I do not want to answer this question.

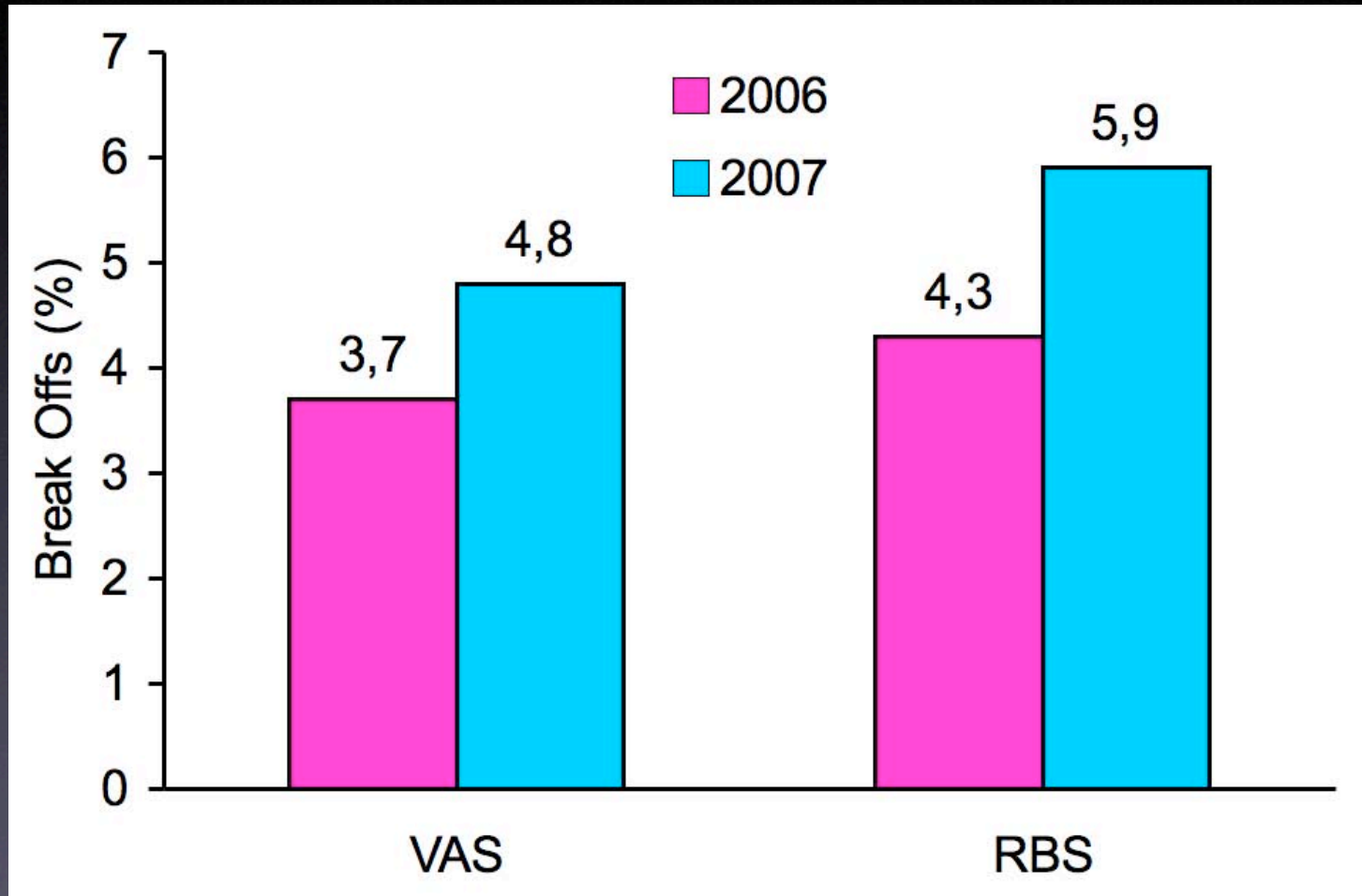
- study 1: IPIP40 (2006)
- study 2: IPIP40 (2007)

Break Offs and Missing Data

- break offs
- prediction:
more break offs with VAS (Couper, Tourangeau,
Conrad, & Singer, 2006)

Break Offs and Missing Data

- break offs

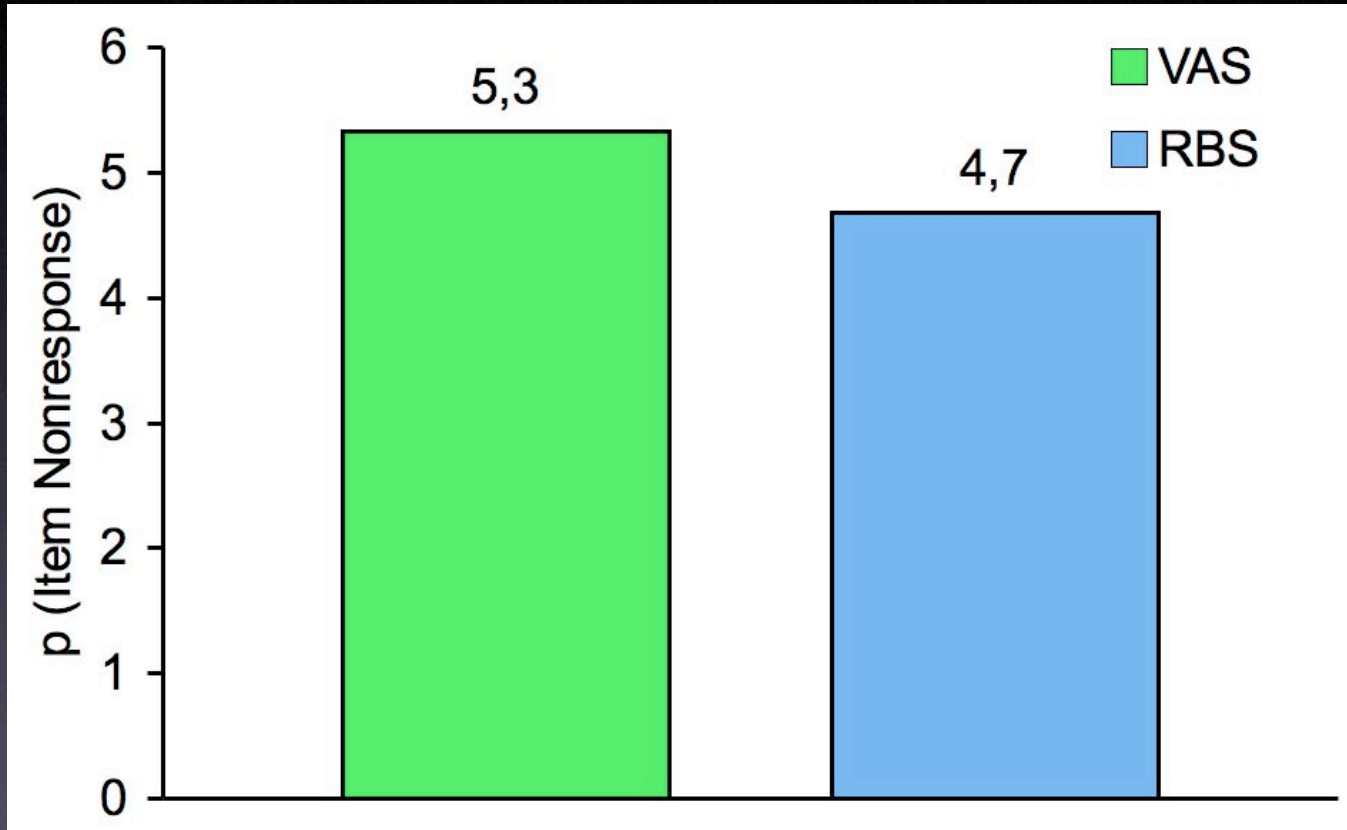


Break Offs and Missing Data

- item nonresponse
- prediction:
more item nonresponse with VAS (Couper,
Tourangeau, Conrad, & Singer, 2006)

Break Offs and Missing Data

- probability of missing value per item



higher rate of item nonresponse with VAS

Break Offs and Missing Data

less break offs
but
more missing data
with VAS

Response Times

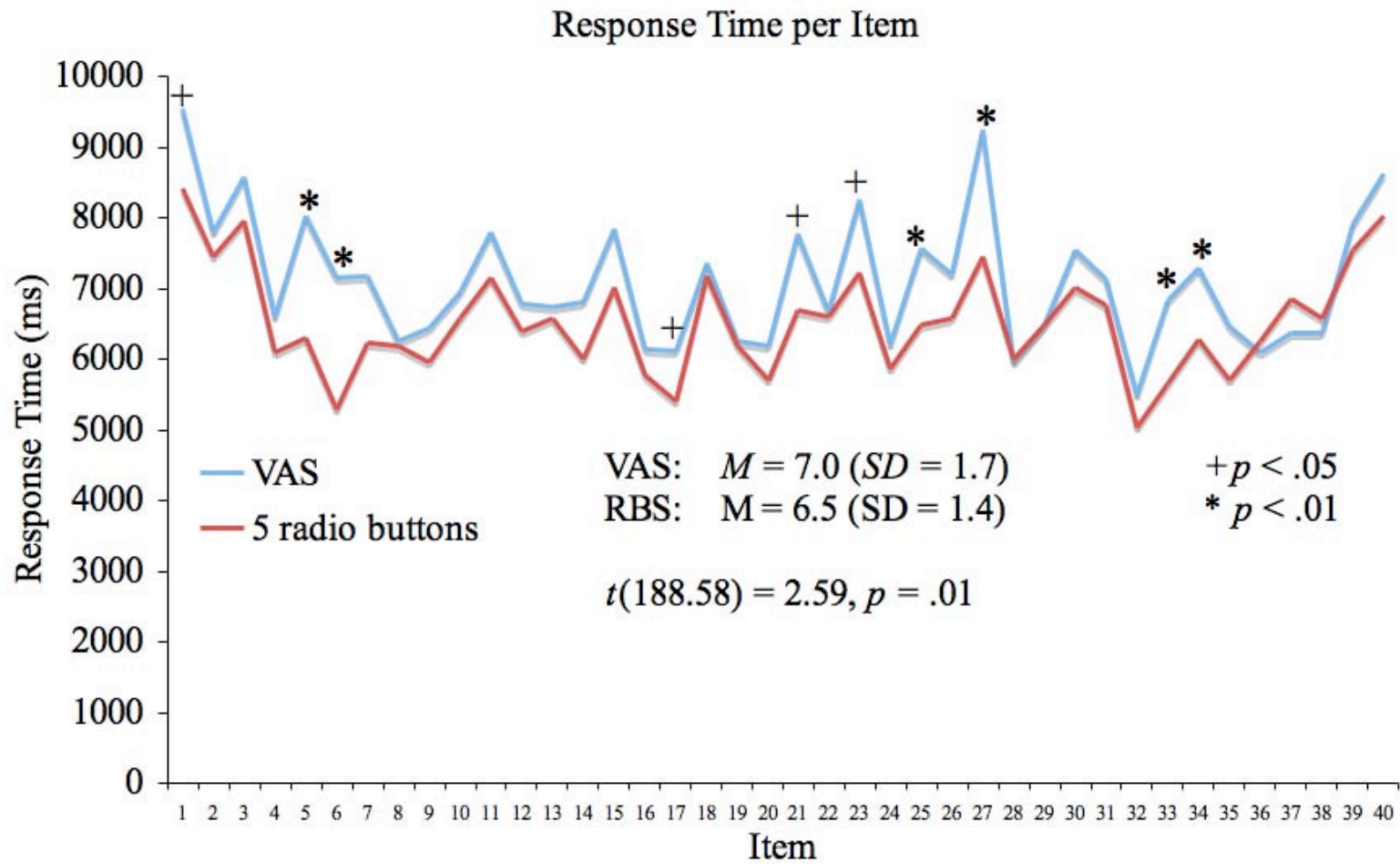
Response Times

- study 1: IPIP40 (2006)
- study 2: questionnaire on relationship and sexuality
- prediction:
higher response times with VAS (Couper,
Tourangeau, Conrad, & Singer, 2006)

Response Times

study I

Response Times – Study I

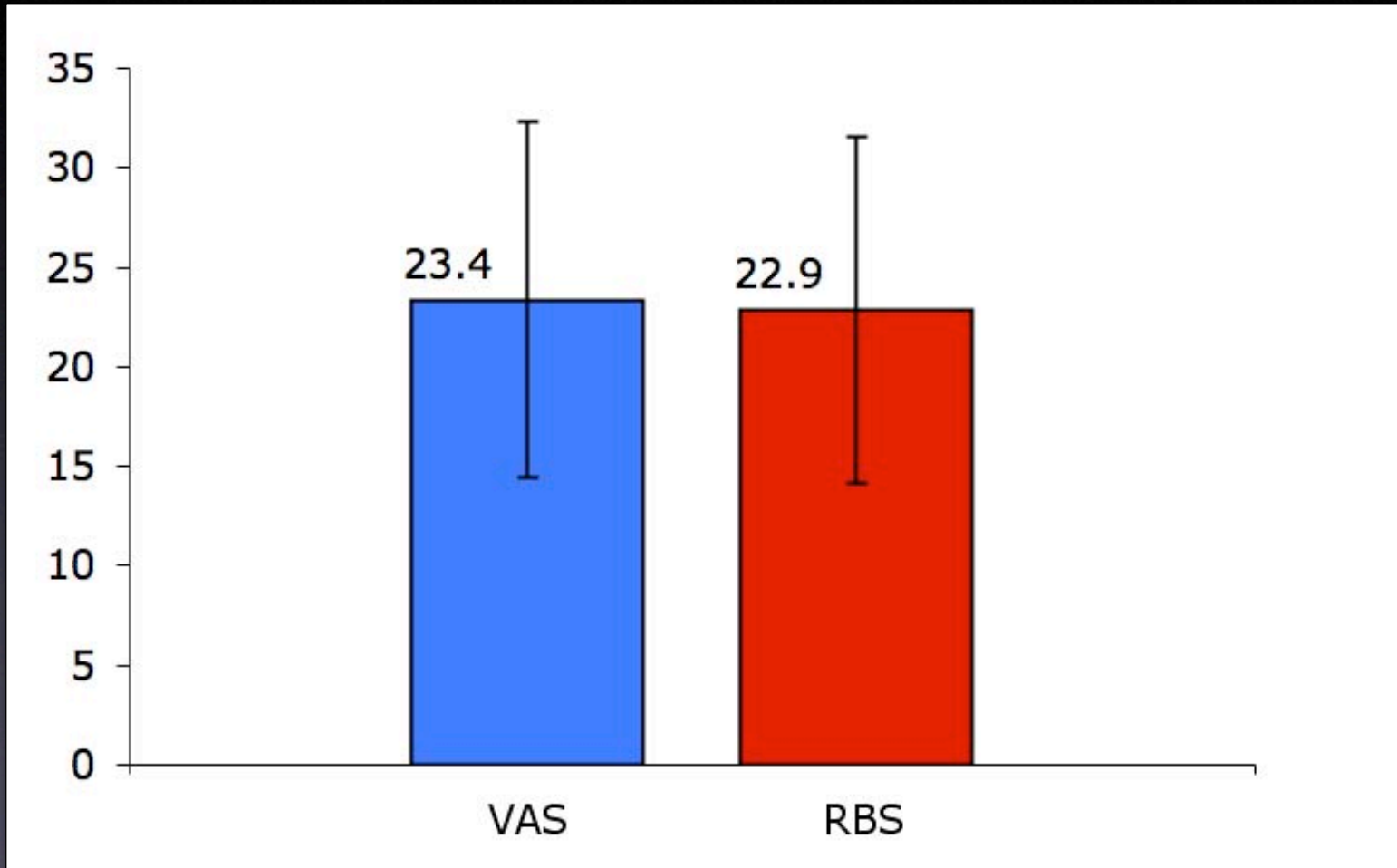


Response Times

study 2

Response Times – Study 2

- overall response times (minutes)

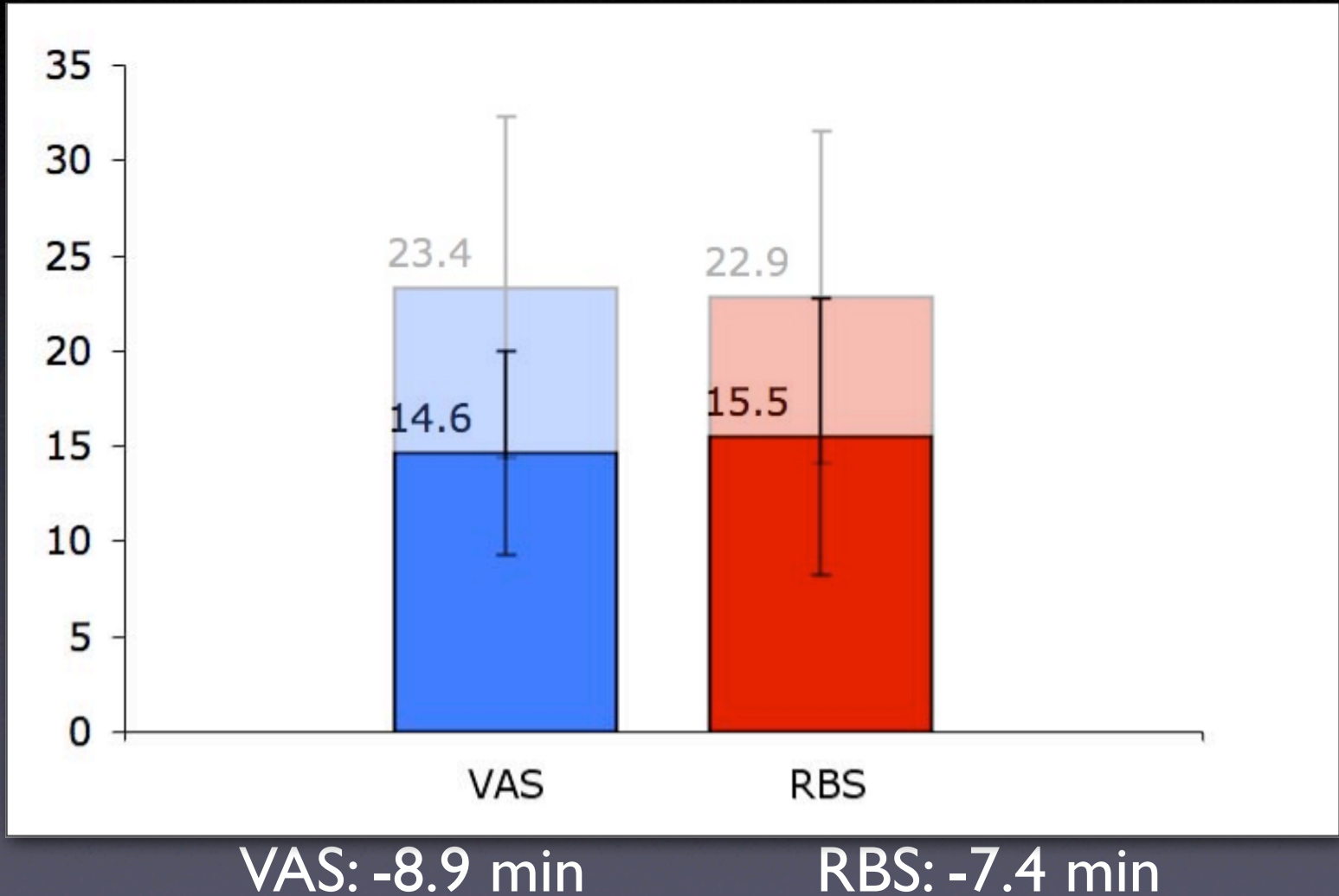


higher response times
with VAS

higher response times
=
higher burden
?

Response Times – Study 2

- response time underestimated in both conditions



Response Times

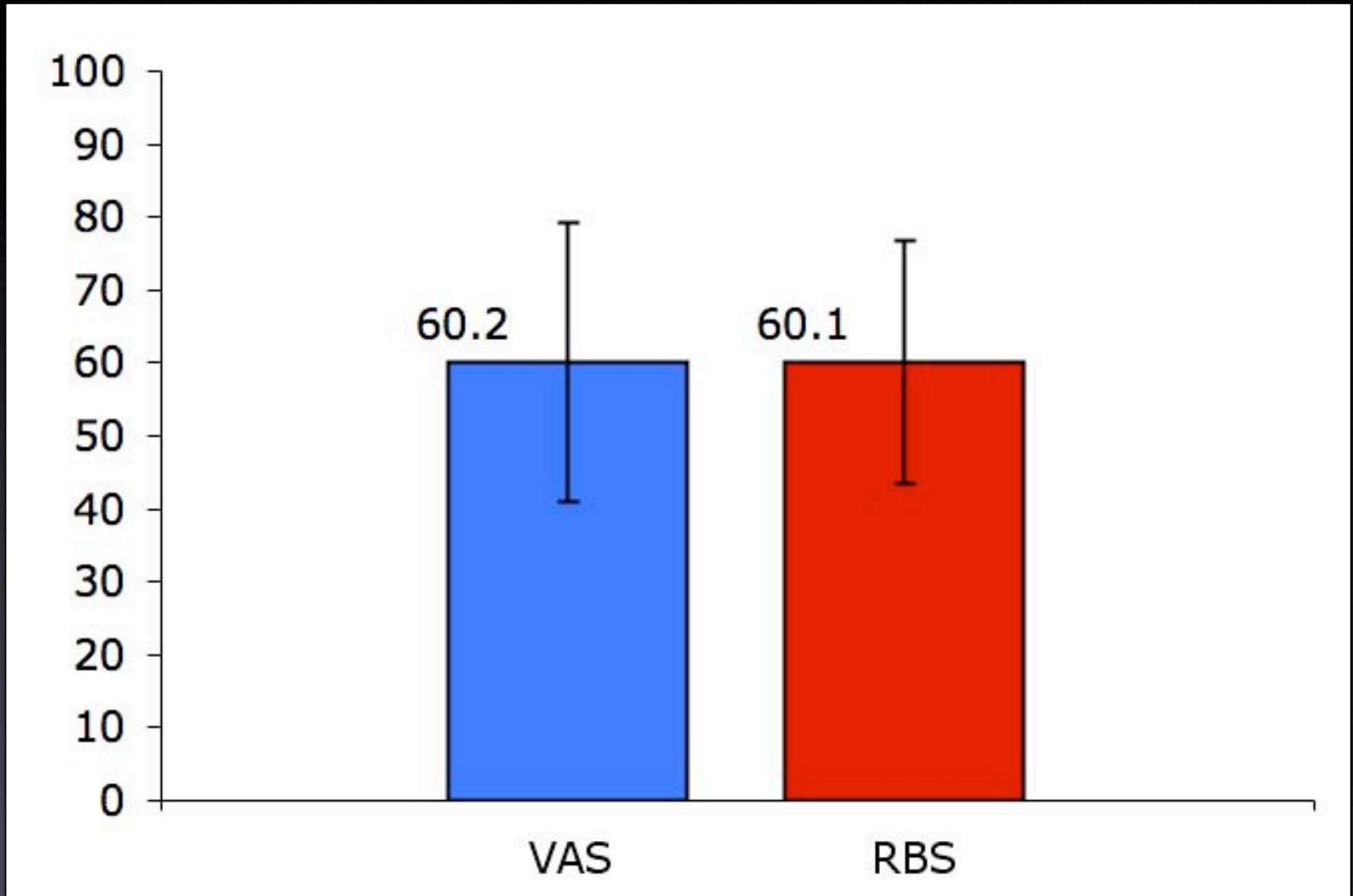
- replicated:
response times are higher with VAS
- but:
response time is more underestimated with VAS
- inconclusive:
do higher response times reflect problems with making a judgement or deeper processing?

Flow Experience

Flow Experience

- shorter subjective response time may be due to greater extent of flow experience when answering a questionnaire
- 6 items on flow experience (Czikszentmihalyi, 1988)

Flow Experience



- no difference in reported flow experience

higher response time is not synonymous
with higher respondent burden

flow experience does not serve as an
explanation

Anchor Order Effect

Anchor Order Effect

- are VAS and RBS equally prone to order effects of anchors?
- I I statements on relationships
- order 1: positively skewed

appropriate ———— X ———— inappropriate

appropriate ○ ○ ○ ○ ○ ○ ○ inappropriate

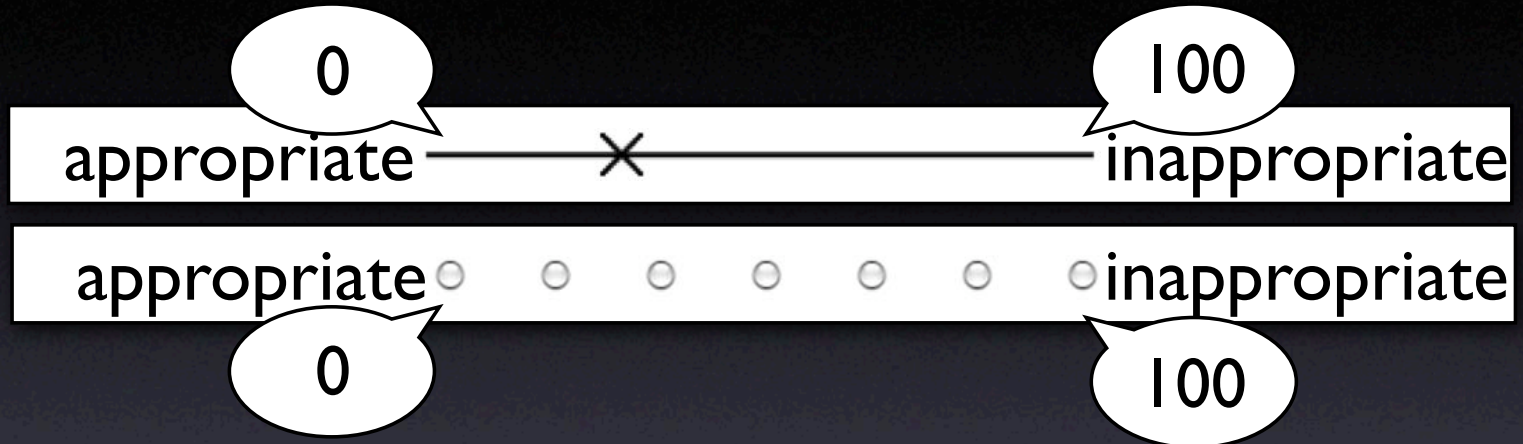
- order 2: negatively skewed

inappropriate ———— X ———— appropriate

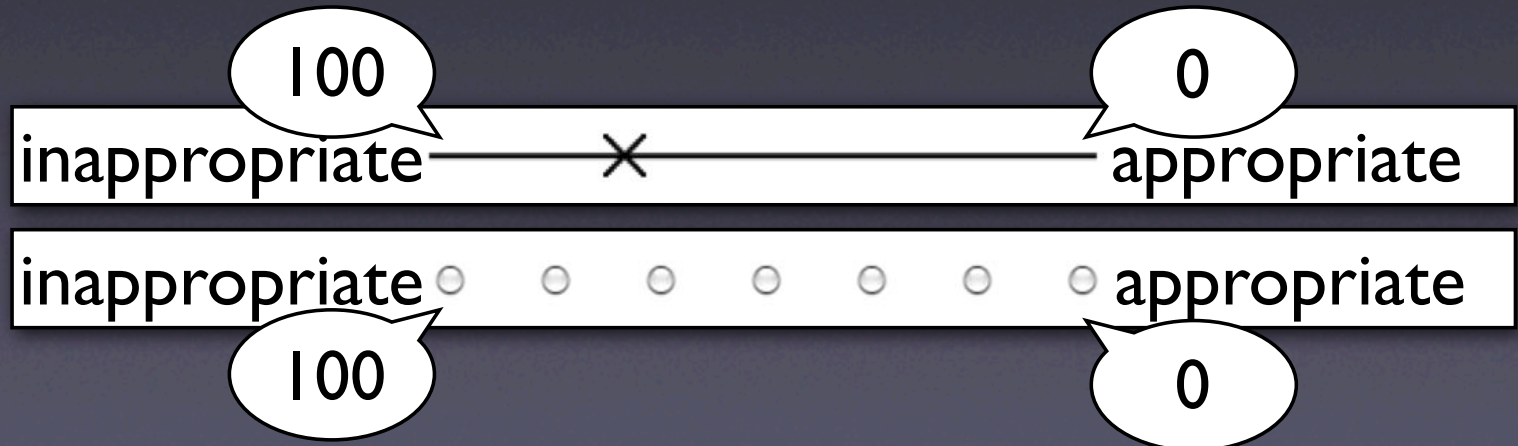
inappropriate ○ ○ ○ ○ ○ ○ ○ appropriate

Anchor Order Effect

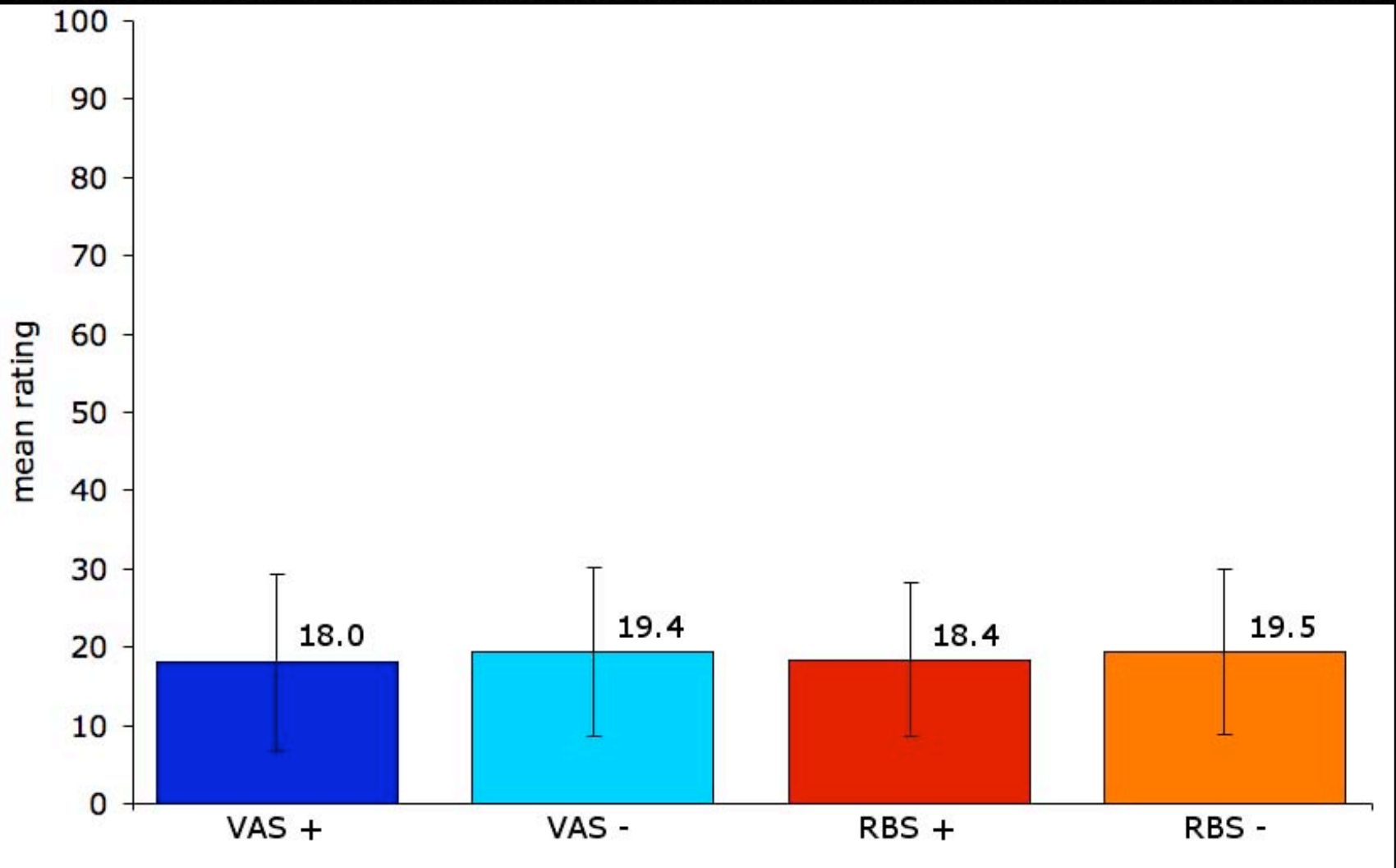
- order 1: positively skewed



- order 2: negatively skewed



Anchor Order Effect



Anchor Order Effect

VAS and RBS
are read
from left to right

CONCLUSION

Respondent Burden

lower burden with VAS

- no higher perceived response time
 - less dropout

Cognitive Depth

both scales are read the same way

- equivalence of measurement
- no/same anchor order effect

- inconclusive: higher response times indicator for deeper processing?

Data Quality

higher data quality with VAS

- more reliable
- less dropout
- approximate interval scale level

Data Quality

inconclusive

- more item nonresponse desired or undesired?

Visual Analogue Scales

used in a consistent way

high data quality

no reasons against use
(see limitations)

VAS Generator

- free Web service: <http://www.vasgenerator.net>



The screenshot shows a web browser window titled "VAS Generator" with the URL "http://www.vasgenerator.net". The page has a green background and features the following elements:

- Header:** "VAS Generator" in large black font, followed by the subtitle "A tool to create Visual Analogue Scales (VAS) for online studies".
- Navigation:** Two buttons labeled "BASIC MODE" and "ADVANCED MODE".
- Instructions:** A paragraph explaining that advanced mode allows for additional parameter modifications and includes a "CONTACT FORM" link.
- Step 1:** "Set the parameters stated below and click 'generate/modify VAS'. Default values are pre-selected." This section includes:
 - Length: pixel
 - Divisions: (i.e. number of [discrete] intervals)
 - Width: light medium bold
 - Left Anchor:
 - Right Anchor:
 - Color: black white
 - Marker: cross (X) arrow (▼) point (•) line (|)
 - A button labeled "generate/modify VAS".
- Step 2:** "Mark the scale and click 'read out VAS value' to see the value that will be transmitted. Modify the VAS according to your needs and apply changes by clicking 'generate/modify VAS'." Below this is a button labeled "Click 'generate/modify VAS' for a preview."
- Step 3:** "If the VAS satisfies your needs:" followed by a button labeled "download basic files (VAS_survey.zip)". Below this is the instruction: "and unzip the archive (for example with the freeware 7-ZIP [Windows] or UNTAR [Mac]) on your local drive."
- Step 4:** "Click 'go to VAS and download' below and save the following page as 'your_VAS.html' (change the file extension from '.php' to '.html') into the folder 'VAS_survey' you have downloaded. Read *instructions.txt* (included in VAS_survey.zip) to adjust some parameters." Below this is a button labeled "go to VAS and download".
- Footer:** "2005-2007 by FREDERIK FUNKE & ULF-DIETRICH REIPS (University of Zurich, CH)"

Thank you!

