



2007-06-26



University of Zurich

Improving Data Quality in Web Surveys with Visual Analogue Scales

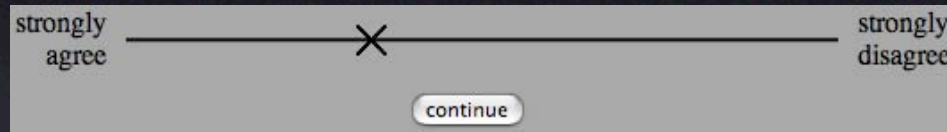
Frederik Funke & Ulf-Dietrich Reips (University of Zurich, Switzerland)

Visual Analogue Scales

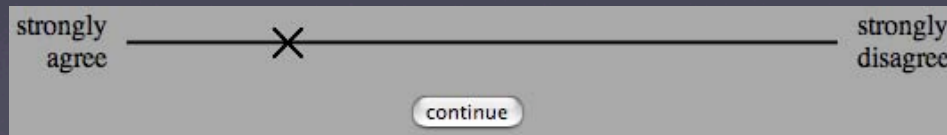
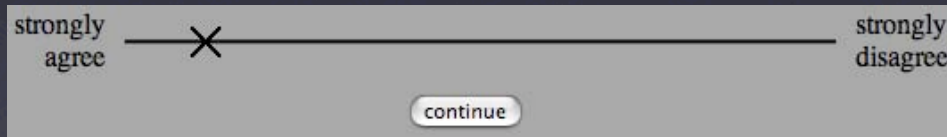
- on load:



- indicator appears after first click:



- can be changed:



Overview

- Web experiment 1:
data quality obtained with VAS
- Web experiment 2:
re-test reliability
- Web experiment 3:
how to compare VAS to categorical scales

Experiment I: Test for Equidistance

- How can data from VAS be interpreted?
- Do VAS produce data on interval level?
- What statistical procedures can be applied to data collected with VAS?

- interval level: difference between data points are meaningful; they do not only give information about a hierarchical order, but about the intensity of a difference; equal changes in intensity correspond to equal changes in data

Experiment I: Test for Equidistance

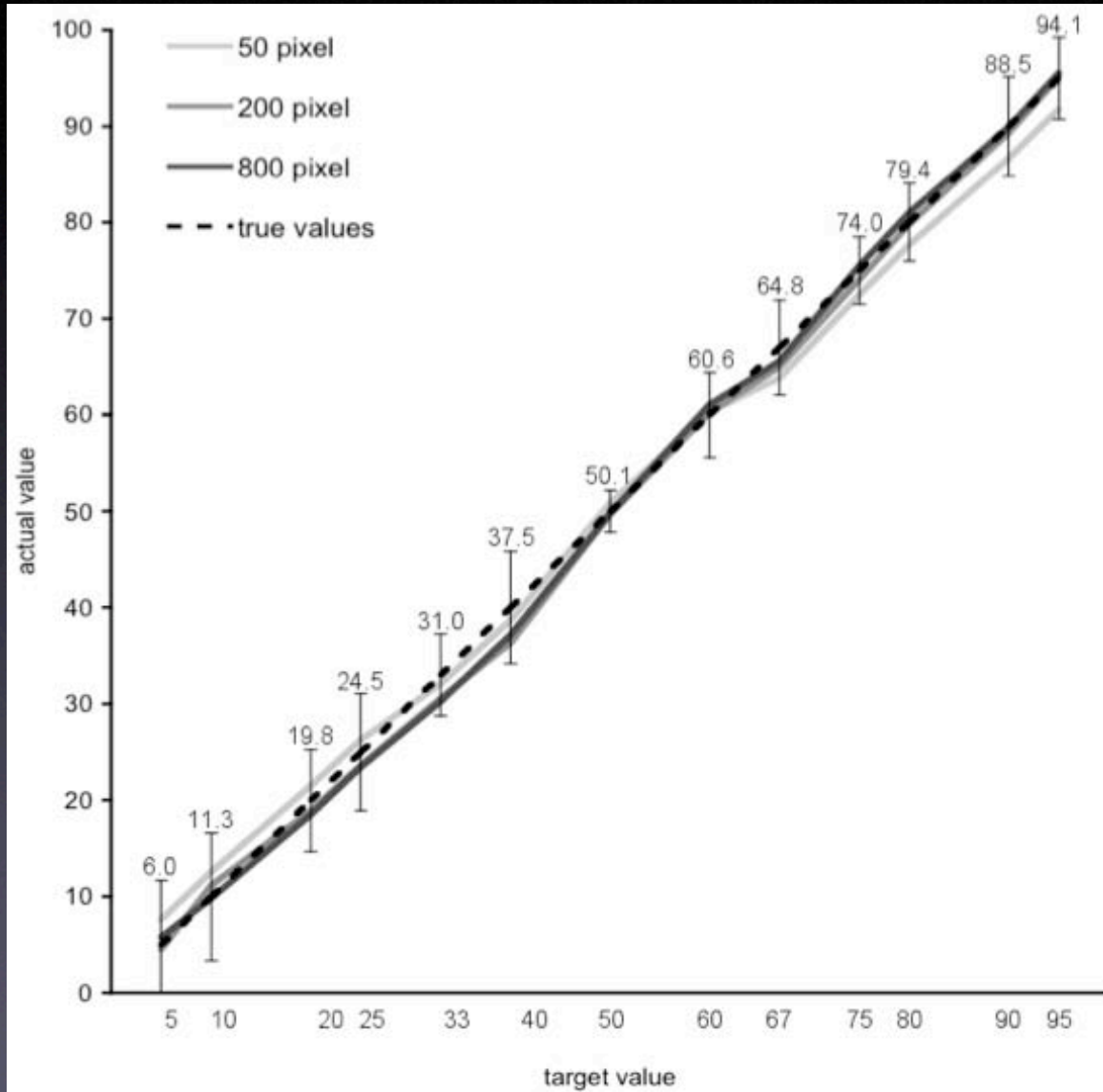
- self-selected student sample
between-subjects design
 $n = 355$
- 13 different target values (presented twice in reverse orders) had to be located on the VAS:
50%, 75%, 10%, 33%, 80%, 95%, 25%, 67%, 40%, 5%, 60%, 90%, 20%
- 3 VAS lengths: 50 pixel, 200 pixel & 800 pixel

0% ——— 100%

0% ————— 100%

0% ————— 100%

Experiment I: Test for Equidistance



Experiment 1: Test for Equidistance

- test for equidistance
 - to be equidistant: difference between 2 target values should correspond to difference between 2 actual values, regardless of position

interval	width		
	equidistant	realized	Δ
5% - 10%	5.0	$M=5.0$ ($SD=8.3$)	0.0
20% - 25%	5.0	$M=4.4$ ($SD=5.5$)	-0.6
75% - 80%	5.0	$M=5.3$ ($SD=5.1$)	0.3
90% - 95%	5.0	$M=5.2$ ($SD=7.5$)	0.2


Experiment I: Test for Equidistance

- conclusions
 - equal numerical intervals approximate equal segments on the VAS
 - strong evidence that data collected with VAS are equidistant, on the level of an interval scale
 - statistical procedures that require data on interval level can safely be applied
 - as length has no great effect, VAS should be robust to difference in appearance due to different screen sizes

Experiment 2: Re-Test 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?

Experiment 2: Re-Test Reliability

- 40 item inventory on personality
- student sample; $n = 60$
- The diagram consists of two white rectangular boxes. The left box contains five small circles in a horizontal row; the second circle from the left is filled with blue, while the others are empty. The right box contains a horizontal line with an 'x' mark in the center.
- difference between $t(1)$ and $t(2)$ to determine re-test reliability

Experiment 2: Re-Test Reliability

- with both scales, data running from 0 to 100
- mean difference between 2 measurements

 $M = -0.8$ ($SD = 3.5$)

 $M = -0.9$ ($SD = 2.9$)

$F(1, 59), ns$

- re-test reliability (mean for all 40 items)

 Alpha = .80

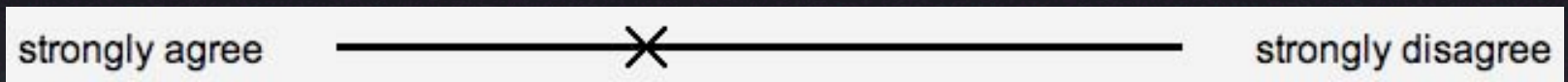
 Alpha = .85

Experiment 2: Re-Test Reliability

- conclusion
 - re-test reliability is slightly higher with VAS
 - variance with VAS is lower than with 5-point-categorical scale
 - VAS is used in a consistent way
 - respondents are not overtaxed with making a judgement on the VAS


Experiment 3: Comparing VAS to Categorical Scales

- How can data from VAS be compared to existing data from categorical scales?
- What is the appropriate categorization?



Experiment 3: Comparing VAS to Categorical Scales

- sample: 576 participants of the 33rd congress of the German Sociological Association

- 5-pt  strongly agree strongly disagree

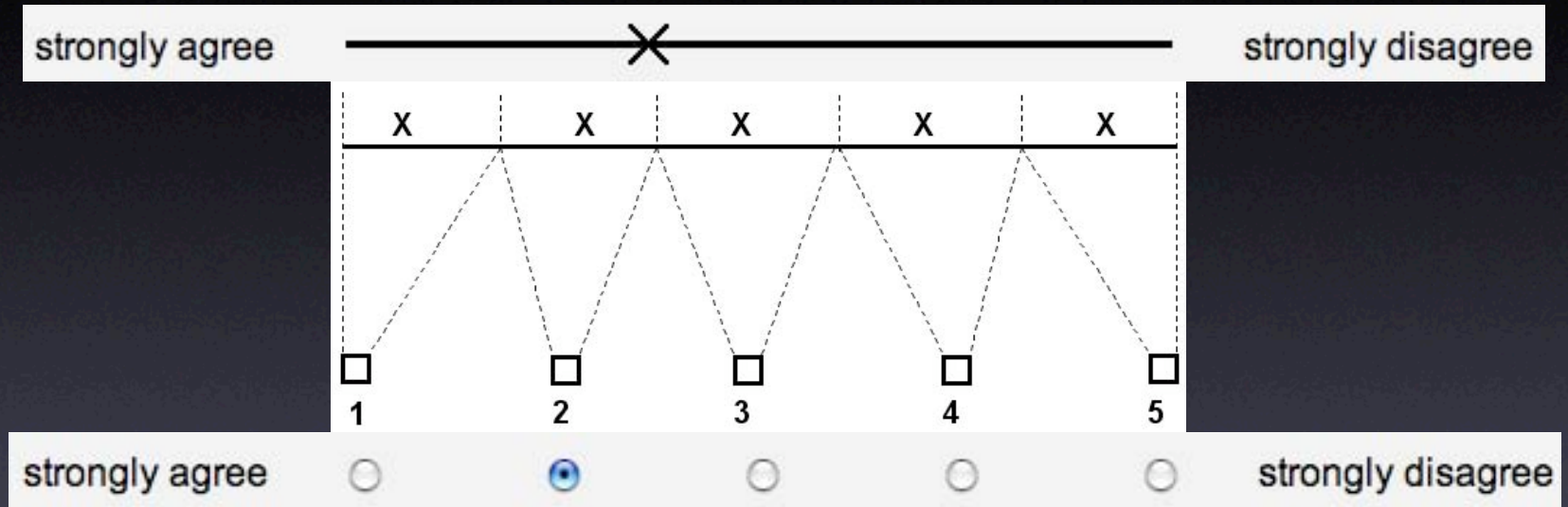
- 7-pt  strongly agree strongly disagree

- 9-pt  strongly agree strongly disagree

- VAS  strongly agree ————— X ————— strongly disagree

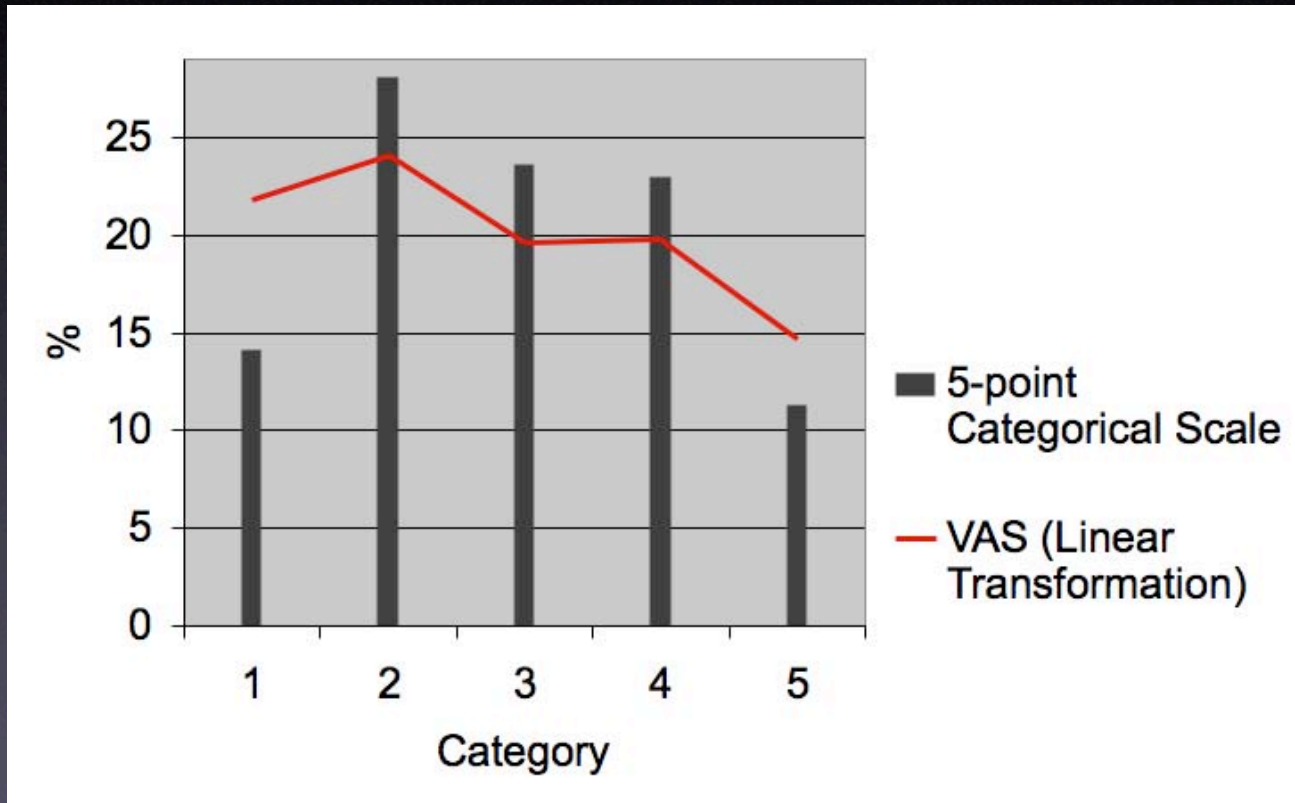
Experiment 3: Comparing VAS to Categorical Scales

- linear categorization of VAS



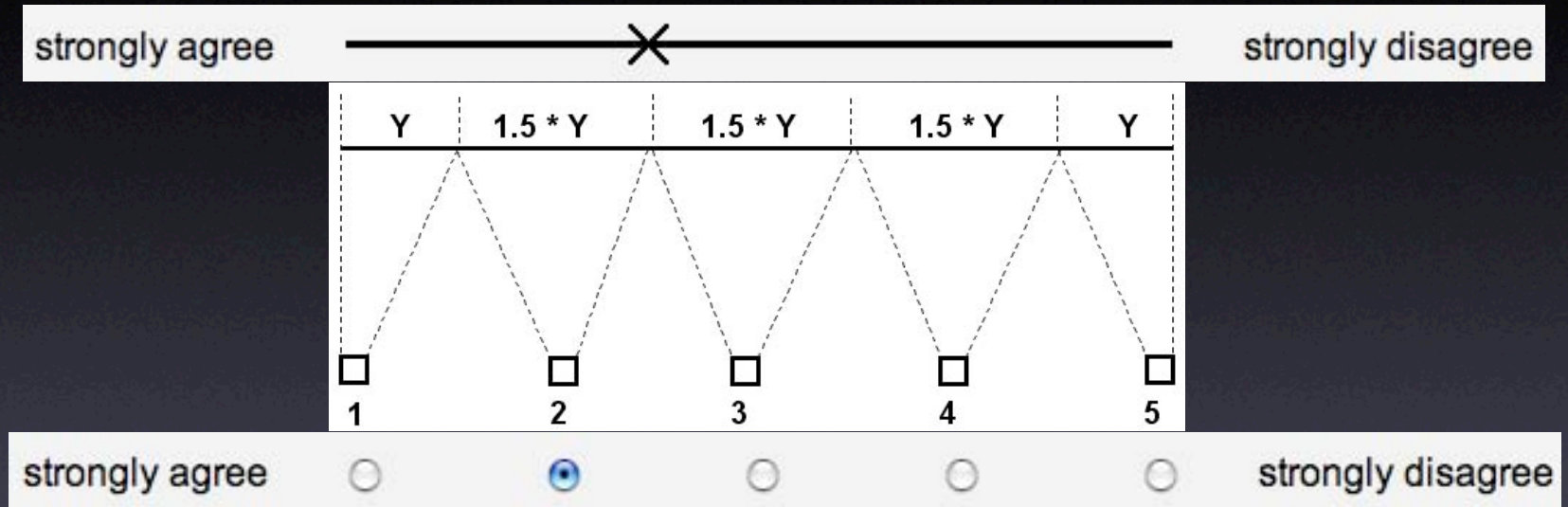
Experiment 3: Comparing VAS to Categorical Scales

- linear categorization of VAS



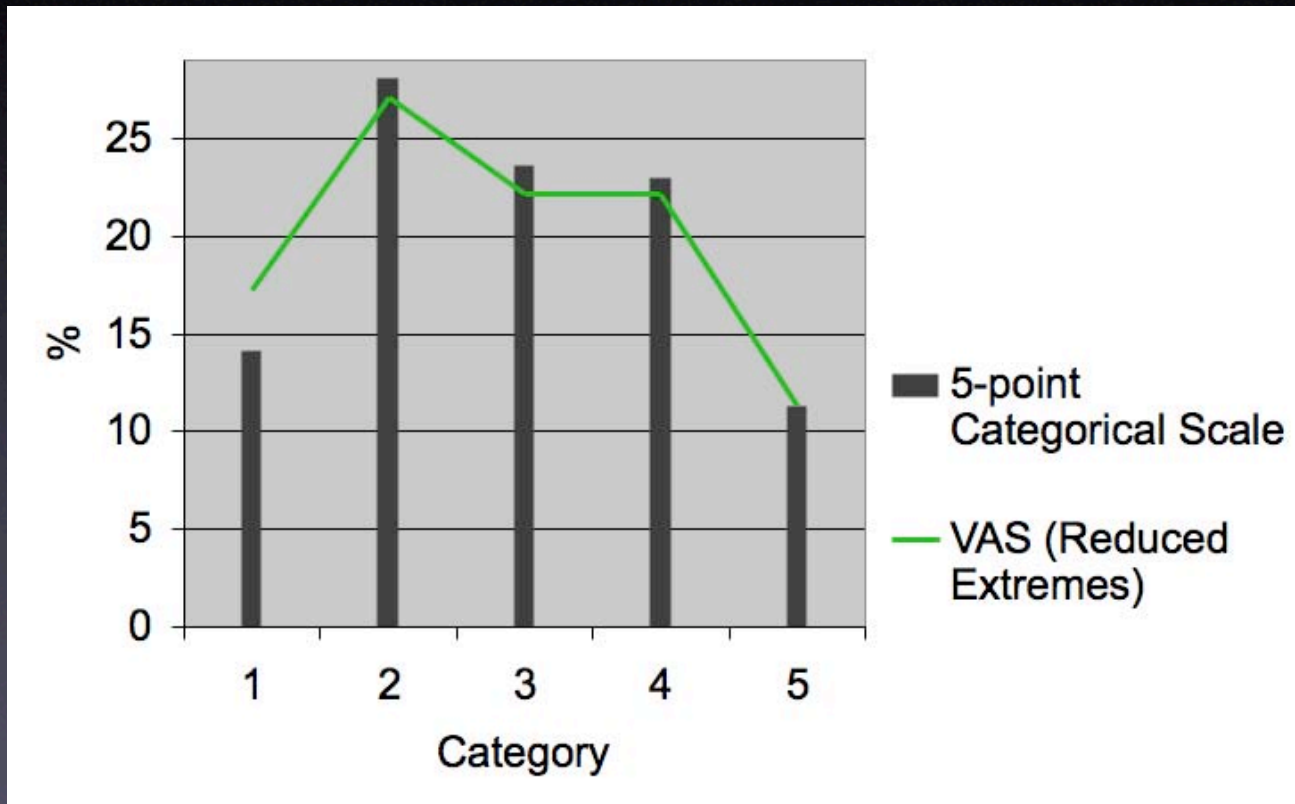
Experiment 3: Comparing VAS to Categorical Scales

- categorization of VAS with reduced extremes



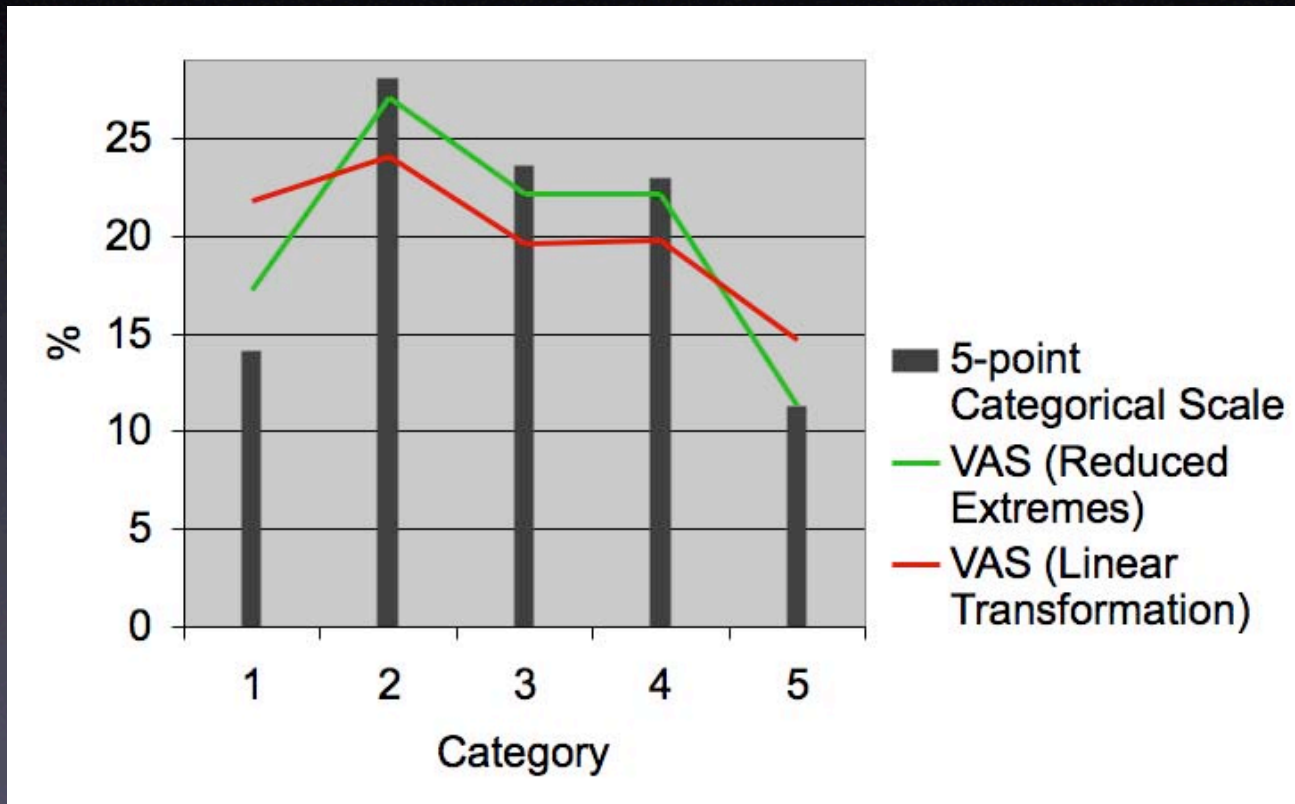
Experiment 3: Comparing VAS to Categorical Scales

- categorization of VAS with reduced extremes



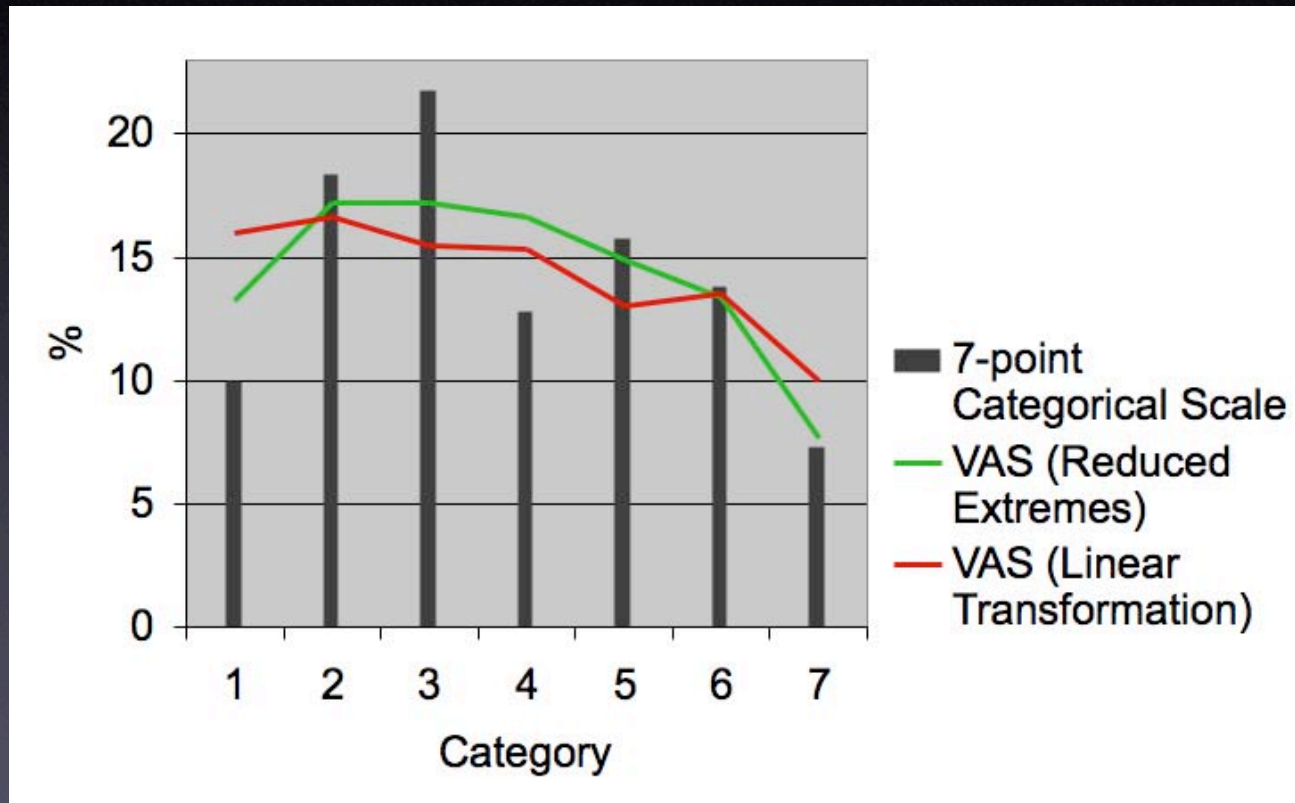
Experiment 3: Comparing VAS to Categorical Scales

- comparison of categorizations into 5 categories



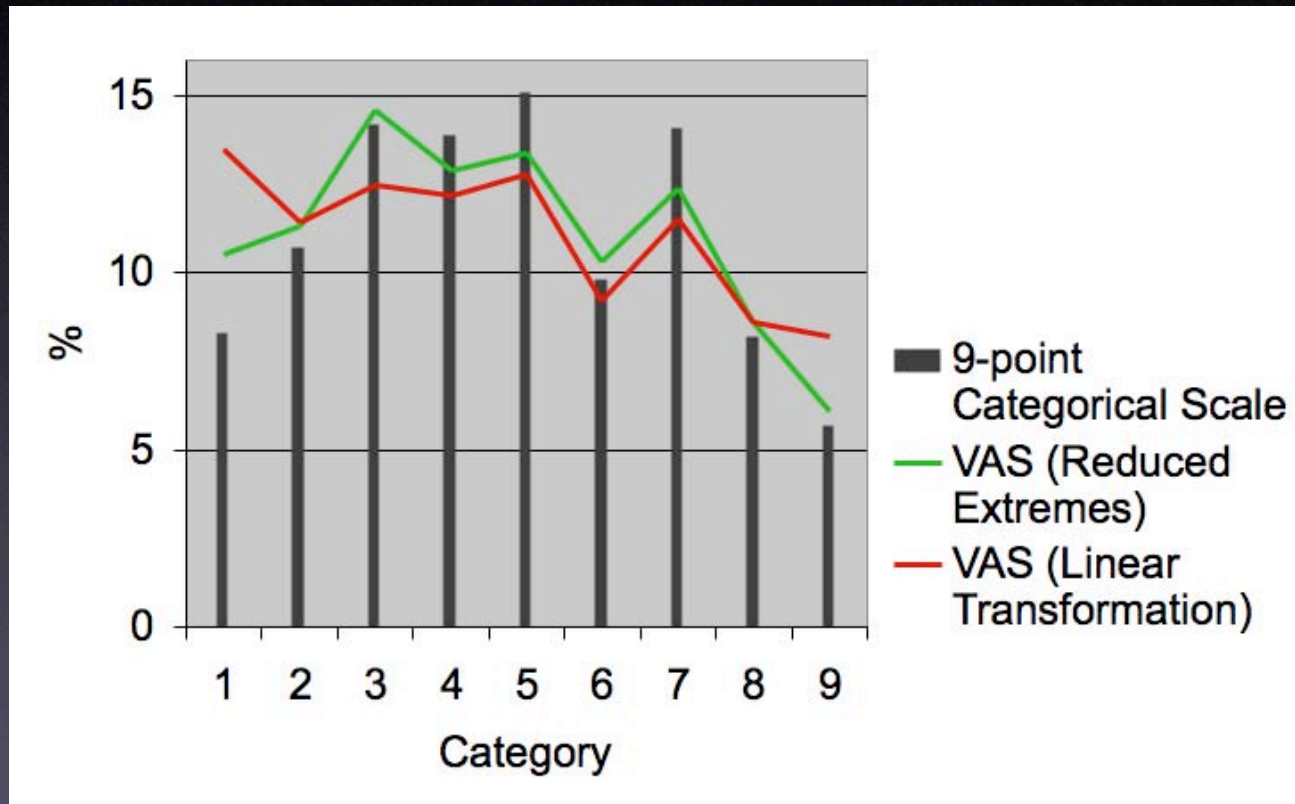
Experiment 3: Comparing VAS to Categorical Scales

- comparison of categorizations into 7 categories



Experiment 3: Comparing VAS to Categorical Scales

- comparison of categorizations into 9 categories



Experiment 3: Comparing VAS to Categorical Scales

- findings experiment 3
 - transformation with reduced extremes leads to greater accordance between VAS and categorical scales than linear transformation
 - difference between measurement with VAS and categorical scales is systematic

Combination of Experiment 1 & 3

- with data from VAS reaching interval level, they can be used as a benchmark to describe the width of categorical scales' categories
- width of categories can be better described with VAS after categorization with reduced extremes
- as respondents avoid picking extreme categories with categorical scales, extreme categories are systematically underrepresented
- strong evidence that categorical scales produce ordinal data only

Conclusion

- data from VAS approximate an interval scale level
- rating with VAS is reliable
- measurement with categorical scales systematically differs from measurement with VAS
- when frequencies from VAS are to be compared to frequencies from categorical scales, transformation with reduced extremes is appropriate
- VAS should be applied for measurement of continuous variables

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". A mouse cursor is pointing at the "ADVANCED MODE" button.
- Text:** A paragraph explaining that in advanced mode, additional parameters can be modified, with a warning about the number of divisions and a reference to a contact form.
- Form Fields:**
 - Length:** A text input field containing "200" followed by the label "pixel".
 - Divisions:** A text input field containing "200" followed by the label "(i.e. number of [discrete] intervals)".
 - Width:** Radio buttons for "light", "medium" (selected), and "bold".
 - Left Anchor:** A long, empty text input field.
 - Right Anchor:** A long, empty text input field.
 - Color:** Radio buttons for "black" (selected) and "white".
 - Marker:** Radio buttons for "cross (X)" (selected), "arrow (↖)", "point (•)", and "line (|)".
- Buttons:** A button labeled "generate/modify VAS".
- Instructions:**
 - Step 1:** "Set the parameters stated below and click 'generate/modify VAS'. Default values are pre-selected."
 - 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 text "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)"