New types of measurement in Internet-based research

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As examples for the many different new developments in the field of Internet-based research, we describe two types of measurement in self-administered questionnaires, visual analogue scales and dynamic lists. Whereas the former are well-known from paper-based questionnaires, the latter are a truly genuine Web methodology. What applies to both is that only with the transition to Web the surveying of large samples is feasible.

Type 1: visual analog scales – measurement on the level of an interval scale

Visual analog scales (VAS) are rating scales, used in self-administered questionnaires in paper and pencil studies as well as in computerized laboratory settings. Respondents can adjust the extent of the attitude, judgment, or impression being measured by clicking on the horizontal line between the verbal descriptors of the extremes. VAS are considered a reliable instrument for valid measurements. Automation in combination with a Web interface allows the fast and precise readout of data (see Figure 1). A free Web service (maintained by the authors) to create, test and download VAS for one's own studies is available at http://www.vasgenerator.net.

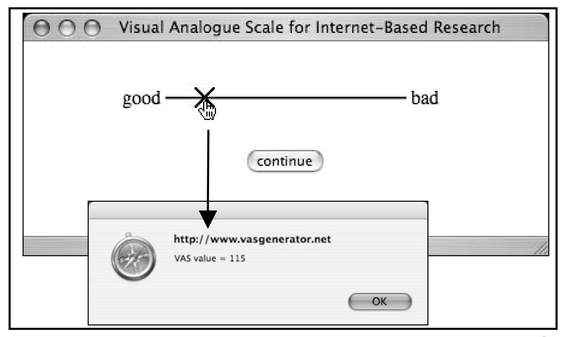

Figure 1. Automatic readout of VAS

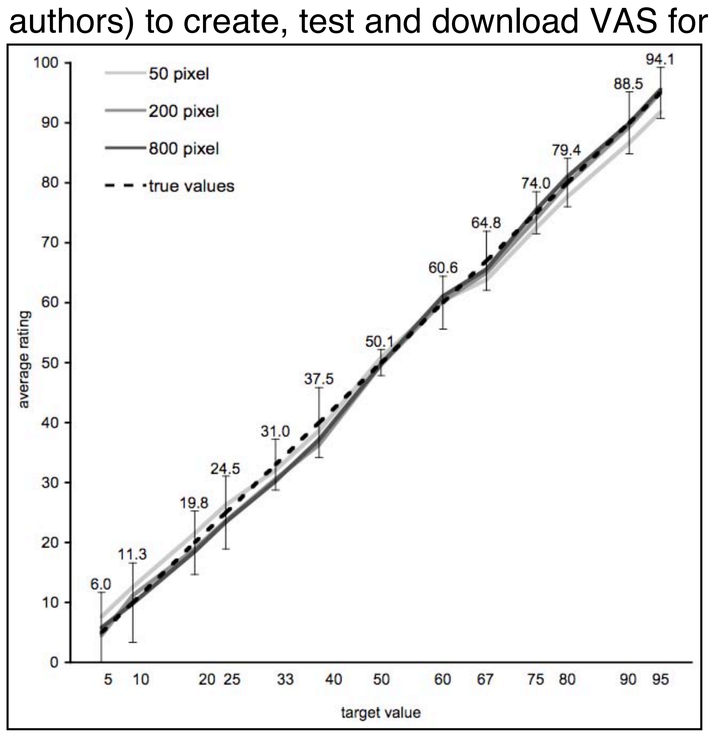

Figure 2. Equidistant data obtained with VAS

- 50 pixels -

200 pixels

800 pixels

Empirical test of interval level measurement

To test if respondents use the scale in the intended way, so that data are on the desired level of an interval scale, we conducted a Web experiment with an Internet sample of 255 students. There were three different length conditions, one regular (200 pixels) and two extreme (50 pixels and 800 pixels), see lines below. Participants were instructed to repeatedly identify 13 target values on a VAS. As crucial indicators for interval level we checked for difference from true value and for equidistance, i.e. even numerical difference between values correspond with even distances on the scale.

Findings

Figure 2 shows the relation between target values and average ratings. On average the difference to a linear relationship was at 3.2 percentage points, ranging from 2.8 for the medium VAS to 3.9 for the shortest VAS. Because equal numerical intervals corresponded to roughly equal segments on the VAS and only minor aberration from true values was found across the scale even for extremely short and extremely long VAS, there is strong evidence that data collected with VAS are equidistant and on the level of an interval scale. Therefore, a wide range of statistical procedures can safely be applied when analyzing data measured with VAS (see Reips & Funke, in press).

Type 2: dynamic lists – filtering closed-ended questions on the fly

Dynamic lists (Figure 3) assist respondents with finding the appropriate answer in closed-ended questions with many possible values. With dynamic elements, the respondent is guided through a hierarchical answering process, on a single Web page. The answering process is broken down into multiple steps. On load of the Web page only a very general choice is requested from the respondent. Immediately afterwards, further possible choices on the next, more specific level appear. Finally, after the second choice the final, very specific choices appear.

Web experiment

In an experimental design with three conditions we compared a dynamic list with conventional multi-page filtering (each level is presented on a separate Web page; Figure 4) and no filtering at all (i.e. all possible values were presented on a single page; Figure 5). In each condition respondents (n = 252) had to choose one from 48 possible values.

Findings

The most general finding is that dynamic lists work: we did not observe negative effects in the form of an increase of item nonresponse or dropout.

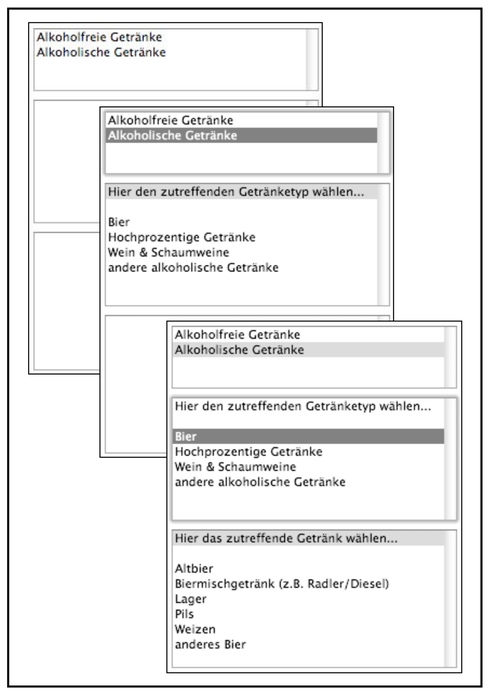

Figure 3. Condition 1: dynamic list on a single Web page

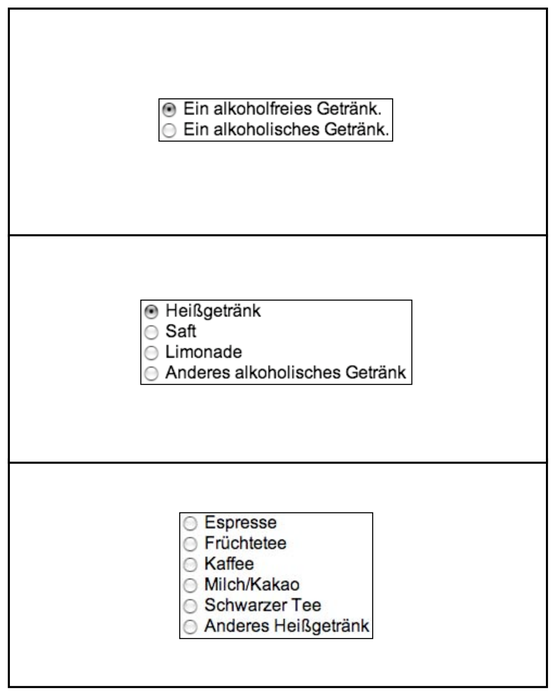

Figure 4. Condition 2: multipage filtering on 3 separate Web pages

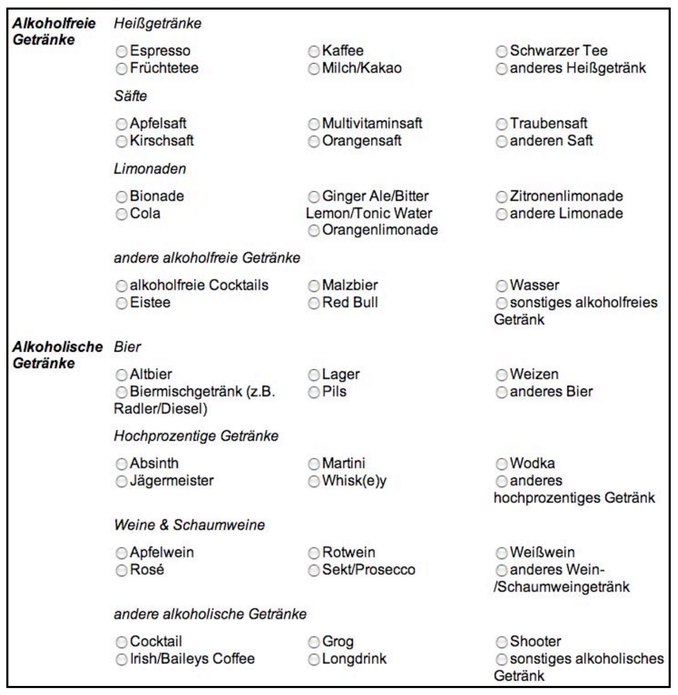

Figure 5. Condition 3: no filtering on a single Web page

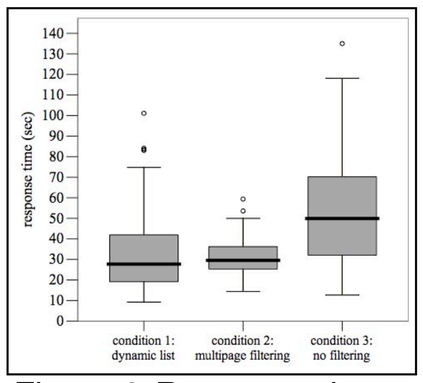

Figure 6. Response times

Furthermore, dynamic lists combine the advantages of knowing all choices with the speed of multipage filtering. Regarding response time (see Figure 6) we found the time needed to answer the question to be significantly higher than conditions 1 and 2 ($p < .001$) when all choices were presented on a single Web page (condition 3: $M = 52$ sec, $SD = 25$ sec). The variance was also larger, $W(1, 171) = 5.072$, $p < .05$, possibly indicating more difficulties with this format. The difference between dynamic list (condition 1: $M = 33$ sec, $SD = 20$ sec) and multipage filtering (condition 2: $M = 31$ sec, $SD = 9$ sec) was not statistically significant. Regarding the variety of answers we found that answers from the condition without filtering – where a deliberate choice could take place, as all possible answers were evident – resembled more the answers obtained with dynamic lists than with multipage filtering (see Funke & Reips, 2007). Thus, dynamic lists perform best regarding both, data quality and respondents burden (operationalized through response time).

Conclusion: Internet-based research expands methodological possibilities

As our examples show, new types of online measurement have the potential to improve data collection in speed, accuracy, data quality, and respondents burden. However, as previous research (e.g. Dillman, 2007) has shown, one has to be cautious when implementing new methods, as even minor changes can have a significant influence on data.

References

Dillman, D. A., & Smyth, J. D. (2007). Design effects in the transition to Web-based surveys. *American Journal of Preventive Medicine, 32,* 90-96.

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