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to Increase Data Quality and  
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# Using Personalized Feedback to Increase Data Quality and Respondents' Motivation in Web Surveys?

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## Abstract

Web surveys technically allow providing feedback to respondents based on their previous responses. This personalized feedback may not only be used to target follow-up questions, it also allows test results to be returned immediately to respondents. This paper argues that the possibility of learning something about themselves increases respondents' motivation and possibly the accuracy of responses. While past studies mainly concentrate on the effects of providing study results on future response rates, thus far survey research lacks of theoretical and empirical contributions on the effects of personalized, immediate, feedback on response behavior. To test this, we implemented a randomized trial in the context of the Berlin Aging Study II (BASE-II) in 2014, providing feedback regarding the respondents' personality tests (Big-Five personality inventory) to a subgroup of the sample. Results show moderate differences in response behavior between experimental and control group (item nonresponse, response styles, internal consistency, socially desirable responding, corrective answers, and response times). In addition, we find that respondents of the experimental group report higher levels of satisfaction with the survey.

## Keywords

Personalized Feedback, Web Surveys, Online Surveys, Incentives, Respondent Motivation, Measurement Error, Survey Satisfaction, Big Five Personality Traits

## Introduction

Web surveys are increasingly replacing the traditional modes of data collection via mail and telephone surveys. This holds true for Germany, the context under investigation, as well as in many other Western societies (e.g., ADM 2016). Although web-based surveys still face serious methodological difficulties, for instance with regard to selection bias (e.g. Schonlau et al. 2009), they also offer important advantages. On the one hand, online surveys are usually less costly than either in-person interviews or mail surveys (Couper and Miller 2008). On the other hand, web surveys offer researchers a straightforward way to integrate highly complex and technically demanding survey instruments. For example, survey researchers have integrated video footage (Fuchs and Funke 2007) and interactive response options (e.g. sliders, see Couper et al. 2006, and dependent interviewing applications, see Hoogendoorn 2004) in their online surveys. Another possible technical application in online surveys is to provide immediate and personalized feedback to respondents. For instance, after collecting information about the respondent's body weight and height, the web-survey system can calculate and display the respondent's Body Mass Index (BMI).

Technological advancement has not only changed the ways in which we conduct survey research in the social and life sciences, but it has also paved new ways for citizens to study

themselves. Movements such as the so-called “quantified self” highlight the growing wish of many to learn something about themselves by self-monitoring personalized information (e.g., Swan 2013). This paper suggests that survey research should harness this intrinsic motivation of individuals to increase their self-knowledge by enhancing procedures to provide feedback from the collected personal survey data to the respondent. We argue that this personalized feedback may motivate respondents to respond more accurately in surveys. Moreover, the personalized feedback may also increase respondent’s motivation; thereby potentially increasing (future) survey participation in online surveys. Despite these possible benefits, very few studies have actually provided this type of feedback in their web-survey applications. Moreover, there is almost no empirical research on the potential benefits and costs of providing this type of feedback.

We seek to address this gap in the literature by investigating the potential advantages and disadvantages of providing personalized feedback within an online survey. Using a randomized trial, we assess (1) whether the feedback decreases undesired response behavior, such as item nonresponse, response styles, low reliability, socially desirable responding, or corrective answers; and (2) whether the feedback affects respondent satisfaction with the survey.

## Background and State of Research

### *Feedback in Surveys*

Providing feedback to respondents and study participants is common practice in various research disciplines, including medicine, psychology, sociology, and survey research. The literature highlights four main dimensions of feedback that can be separated: scope, purpose, timing, and form.

*Scope:* The scope of the feedback relates to the level of aggregation of information provided. While many studies report sample-based findings to respondents (i.e., overall study results), other studies provide individual feedback to respondents; for instance, on participants’ health status. We define personalized feedback as the provision of information (the feedback) to respondents based on their individual responses during the interview. In the case of personalized feedback, researchers may also offer additional information, such as population averages, allowing for respondents to compare their individual measures with benchmarks.

*Purpose:* The reasons for researchers to offer feedback are quite divergent. First, feedback has been used to reduce (future) deviant behavior by respondents. This type of feedback is usually found in health-related studies. For instance, Larimer et al. (2007) test whether personal feedback based on responses about individual drinking behavior affects future drinking behavior. Other examples are found in studies on smoking behavior (Curry et al. 1995), marijuana use (Lee et al. 2010), and nutrition (Oenema et al. 2001)<sup>1</sup>. Second, feedback has been provided for research-ethical considerations. For instance, in the context of health-related studies including medical checks, researchers are ethically, if not legally, obligated to provide individual feedback to participants if, for instance, they have information on serious health issues. Third, feedback has been used to influence respondent’s survey participation and engagement behavior. Especially in the context of longitudinal and panel surveys, such as the Socio-Economic Panel Study (SOEP, see Wagner et al. 2007), study results and selected publications are regularly provided to respondents. In this context, feedback is used to increase the respondent’s engagement with the study and to maintain the respondent’s willingness to participate in (future) surveys and waves. Fourth, especially in the context of web surveys, feedback may be used as a type of technical assistance in order to increase the quality of responses. For instance, researchers may display previous

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<sup>1</sup>See DiClemente et al. (2001) for an overview on research regarding feedback on health-related behavior.

answers in targeted follow-up questions (a type of “dependent interviewing”, e.g., Jäckle and Lynn 2007), include consistency checks, or provide interactive, real-time feedback on responses (e.g., Conrad et al. 2005) in order to reduce the cognitive burden of answering to highly demanding survey questions.<sup>2</sup> Finally, however only rarely applied, feedback may be used to increase the respondents motivation to provide accurate and thoughtful answers during a single web survey (e.g., Göritz and Luthe 2013).

*Timing:* Third, feedback varies with respect to the timing when it is provided to respondents. In the case of general feedback based on overall, sample-based, study results, the feedback is often sent to respondents via mail or e-mail weeks after the interview has been completed. In the case of web surveys and other forms of computer-assisted interviewing, feedback may be provided at the end of, or even during, the interview.

*Form:* The information constituting the feedback may be presented in different ways such as text, tables, and graphs.

### *Effects of Personalized Feedback on Respondent Behavior in Web Surveys*

Even though providing general feedback on study results and findings to respondents is common practice in many ongoing interviewer-administered (e.g., in the SOEP and the UK Understanding Society<sup>3</sup>) as well as web-based panel surveys (LISS: Scherpenzeel and Toepoel 2014, GIP: Blom et al. 2016 (Upcoming)), very few studies have experimentally tested the effects of either personalized or general feedback on participation rates and response behavior. This seems especially surprising in the context of web surveys, since the implementation of personalized feedback is a simple matter from a technical point of view.<sup>4</sup>

Two studies focus on the effects of personalized feedback on participation in repeat interviews. Marcus et al. (2007) find that for individuals who are not especially interested in the survey topic, e.g. the study topic salience is low, personalized feedback provided after an initial web survey increases response rates in follow-up online surveys. This is in line with Bälter et al. (2011), who observed higher response rates in follow-up surveys for respondents provided with personalized feedback regarding the respondents’ energy expenditure, physical activity, and nutrition during the first interview. As to the effects of general feedback on sample results, Göritz and Luthe (2013) found no effect of providing general study results after wave 1 on response rates in follow-up surveys. Similarly, Scherpenzeel and Toepoel (2014) find no effects on future participation when online panel respondents were provided with real-time answer distributions at the end of a web questionnaire.

To our knowledge, only one study examines the effects of general, sample-based, feedback on response behaviors and data quality: Göritz and Luthe (2013) studies the effect on item non-response and did not find evidence of a positive effect of offering general study results in one interview on completion rates in the following waves of an online panel. Moreover, the authors find no significant difference in responses when analyzing the non-differentiation of answers (so-called straightlining behavior) between respondents who were advised that they would receive feedback within the survey and those who were not.

Hence, no known study looks at the effects of personalized feedback on response behavior during an interview. We try to fill this gap by systematically investigating effects of immediate (within-survey), personalized, feedback on response behavior and data quality in web surveys. We also augment the list of indicators of response behaviors with response times,

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<sup>2</sup>For example, Conrad et al. (2005) provided interactive feedback about a sum of multiple numerical answers and found more answers that were equal to the targeted fixed sum of 100 compared to a control group that did not receive the feedback.

<sup>3</sup>See [doc.ukdataservice.ac.uk/doc/7083/mrdoc/pdf/7083\\_ip\\_wave\\_5\\_info\\_leaflets.pdf](http://doc.ukdataservice.ac.uk/doc/7083/mrdoc/pdf/7083_ip_wave_5_info_leaflets.pdf)

<sup>4</sup>Many of the current professional web survey software instruments allow researchers to perform the necessary calculations and then provide the feedback directly within the survey system. If that is not possible, researchers may use the possibilities offered by Internet browsers, for instance, by including external applications (e.g., based on Java).

internal consistency of answers, socially desirable responding, and corrective answers. Moreover, we directly ask respondents to report their satisfaction with the survey, allowing us to evaluate the effect of personalized feedback on respondents' satisfaction with the survey.

### *Theoretical Background and Hypotheses*

One crucial aspect when conducting surveys is to motivate respondents to give accurate and thoughtful answers to survey questions in order to maximize reliability, validity, and completeness of answers. It is well documented, however, that response behaviors do not always live up to this ideal and that errors occur throughout the response process, starting from the understanding of a survey question and ending with selecting an answer (Tourangeau et al. 2000).

In particular, *satisficing*, also known as “short-cutting” or just providing a satisfactory rather than an optimal answer, is associated with a set of response behaviors that are said to be closely linked to the motivation of respondents. According to Krosnick (1991) satisficing occurs in situations when the burden and complexity of survey questions exceeds the cognitive effort and motivation of respondents (see Krosnick 1991, p. 214).<sup>5</sup> Satisficing may take effect through different response strategies (see Krosnick 1991, p. 214): Respondents may simply choose the first answer option offered in a question (acquiescence).<sup>6</sup> Some respondents may choose to refuse an answer or respond with “don’t know” rather than giving a substantial answer (item non-response). When answering multiple items they may choose the same answer over and over again (straightlining). In addition, respondents may speed through the questionnaire rather than carefully reading and thinking about questions and answer options (response time). Finally, satisficing may also result in haphazard misreporting and, therefore, lower reliability of answers (internal consistency).

*Hypothesis 1:* Respondents interested in informative, personalized, feedback also need to provide accurate answers. As personalized feedback of test results may increase the motivation of respondents, we expect that it also reduces item non-response, straightlining, speedy answering, and increases internal consistency of answers.

*Socially desirable responding* is one of the most prominent factors threatening the validity of survey responses. Socially desirable responding refers to the tendency of respondents to adjust their true answers toward social norms in order to give positive self-descriptions and appear in a good light (see Krumpal (2013) for a recent overview). Social desirability bias may not only occur in the presence of a third person (e.g., an interviewer), but also in self-administered surveys, such as web surveys (Kreuter et al. 2008). Following Paulhus (1991), socially desirable responding comprises two components (factors): A self-deceptive component and an other-deceptive component also referred to as “impression management.” In the case of web surveys, social desirability bias is likely to be due to the self-deceptive component. In this regard, some respondents may tend to adjust their answers into a more positive and desirable direction in order to feel better about themselves.

So far, there are no theoretical or empirical contributions on whether personalized feedback decreases or increases socially desirable responding and, thus, validity of answers, in web surveys. In principle, both mechanisms seem plausible. On the one hand, the advance notification of the feedback is expected to increase the respondent’s motivation to answer accurately in order to receive meaningful feedback. On the other hand, the anticipation of the personalized feedback may also provoke self-deception tendencies in some respondents since

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<sup>5</sup>Krosnick (1991) distinguishes between two overall forms of satisficing: “(1) incomplete or biased information retrieval and/or information integration, and (2) no information retrieval or integration at all”.

<sup>6</sup>Since our targeted questions for the feedback did not include questions with answer options presented in lists but grid-questions only, we did not investigate acquiescence answering behavior.

s/he is facing an imminent situation (the upcoming feedback), either making her/him feel good and satisfied or bad and unpleasant. Negative feedback may even result in respondents re-accessing and manipulating their initial responses to obtain the desired self-description.

*Hypothesis 2:* Due to the self-deceptive component of socially desirable responding, personalized feedback is expected to increase social desirability bias as well as subsequent manipulations of answers after the feedback is displayed.

Above and beyond response behavior, personalized feedback may contribute to the satisfaction of respondents with the survey. As personalized feedback is likely to be perceived as interesting and novel, respondents may experience the questionnaire more positively.

*Hypothesis 3:* We expect that the personalized feedback increases respondents' positive evaluation of the survey experience.

## Data and Methods

### *The Berlin Aging Study II*

We test the effects of personalized feedback on response behavior in a randomized trial implemented in a web-based survey of the Berlin Aging Study II (BASE II) (Bertram et al. 2014, Boeckenhoff et al. 2013). BASE II is a longitudinal study that was launched in 2008 that covers 1,600 elderly respondents (most between the ages of 60 and 80) and a reference group of 600 young respondents (most between 20 and 35). The BASE-II study focuses on healthy aging, with respondents participating in regular medical check-ups as well as mental and motoric testing at centralized test sites. In 2008, 2009, 2012, and 2014, participants and their household members received an additional 45-minute individual questionnaire containing questions on their economic situation, social relations, and biographical information. The experiment on personalized feedback was implemented in the 2014 wave.<sup>7</sup> Table 1 displays basic socio-demographic characteristics of our sample in 2014.

### *Experimental Setup and Feedback on Personality*

We implemented personalized feedback using personality tests. More specifically, respondent answers on the well-established Big-Five Personality Inventory (Gerlitz and Schupp 2005; McCrae and Costa Jr. 1987) were used to calculate personality profiles that we provided to respondents once they finished the personality testing. We expect that the information on personality traits is intriguing for many respondents: While this information is most likely to be perceived as interesting, respondents usually have only very limited information on their performance and individual scores in standardized, scientific personality tests.

All respondents were randomly allocated to a treatment group (*feedback*,  $n = 439$ ) or a control group (*no feedback*,  $n = 404$ ). The treatment group received advanced notice informing them that they would receive personalized feedback regarding their personality and

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<sup>7</sup>Since participants from the greater Berlin metropolitan area were recruited from different sources by the collaborating research groups (e.g., the geriatrics research group at Charit Universitätsmedizin Berlin, and the Max Planck Institute for Human Development) instead of a single sampling frame, we used external survey and register data on the target population to compensate for potential processes of selectivity in BASE-II. First, we compared the data with a large, representative reference study, the German Socio-Economic Panel (SOEP), thereby facilitating analysis of differences in participant characteristics between BASE-II and SOEP. Based on this selectivity analysis, we then generated propensity score weights that adjust for the selectivity in the BASE-II survey. In addition, we adjusted the weights of the BASE-II sample to statistical information from the Federal Statistical Office so that the BASE-II study has the same totals as the official statistics. These procedures ensure the generalizability of our findings based on the representativeness of the BASE-II sample to the German population regarding common socio-demographic characteristics as well as BASE-II-specific variables such as health-related factors, personality traits, attitudes, and neighborhood characteristics.

Table 1: Characteristics of the BASE II Web-survey Participants

	n	%
Gender		
female	407	48
male	436	52
Age		
29-35	260	31
36-59	66	8
60-85	515	61
<i>Mean/Median</i>	<i>56</i>	<i>67</i>
Education		
Secondary and Tertiary	486	58
Primary, None	357	42
Total	843	100

would be able to compare their own personality profile against German population averages (see Figure 1 in the Appendix). After answering the questions (Figure 2 in the Appendix), respondents were informed that they had just completed a well-established scientific survey instrument (Figure 3 in the Appendix). The personalized feedback was displayed immediately after this additional information page. We made use of visual representations for each of the five personality dimensions (see Figure 4 in the Appendix). More specifically, we used scales with verbal labels at both ends of the scale. Individual scores were displayed by using red dots placed on the respective scales. In addition, a population average derived from the Socio-Economic Panel Study (SOEP, Wagner et al. 2007) was displayed by using blue dots on the scales.

Table 2: Experimental Setup: Big-Five Personality Inventory

Experimental Group	Advance Notice Feedback	Big Five Inventory	Personalized Feedback	Evaluation Questions	Paradata
Treatment (n=439)	✓	✓	✓	✓	✓
Control (n=404)	✗	✓	✗	✓	✓

### Data Analysis

In order to investigate whether personalized feedback affects response behavior as well as satisfaction with the survey, we made use of  $t$ -tests on differences between both experimental groups. More specifically, we compared a) item nonresponse, b) straightlining,<sup>8</sup> c) response time, and d) internal consistency<sup>9</sup> as indicators of satisficing. As indicators of social desirability bias, we compare the means of answers on the items of the personality test in light of previous research on the susceptibility of these items toward this type of bias. A second

<sup>8</sup>Straightlining was not defined in the strict sense (the same answer for all items) but rather based on the intra-individual as well as overall variation in responses.

<sup>9</sup>The internal consistency of answers is determined for all five subscales of the Personality Inventory between both groups by using Cronbach's Alpha based on a bootstrapping approach.



indicator is the tendencies of subsequent adjustments of answers measured by paradata. Finally, we test the effect of personalized feedback on respondents' evaluation of the survey by performing  $t$ -tests on each of four evaluation items. Finally, multivariate linear regression models establish the robustness of results and document group-specific effects.

## Results

### *Effects of the Advance Notice of Feedback on Response Behavior*

We performed various comparisons of the measures of response behavior between both experimental groups in order to assess the effects of the advance notice of personalized feedback on response behavior. First, item nonresponse rates were comparatively low in both groups. Only seven individuals in the feedback group (1.6%) and eight individuals in the control group (2.0%) were associated with a missing value in at least one of the 15 Big Five inventory items ( $t=-0.42$ ,  $p=0.67$ ). Second, both experimental groups did not differ with respect to their tendency to apply straightlining response behavior (feedback: 15.3%, SE=.02, no feedback: 14.4%, SE=0.2;  $t=0.35$ ,  $p=0.72$ ). Third, no differences were observed with respect to average response times (feedback: 87.1 sec, SE=1.61, no feedback: 87.8, SE=1.77;  $t=0.31$ ,  $p=0.76$ ).<sup>10</sup> Fourth, we compared levels of internal consistency of responses between both experimental groups. Do respondents provide more consistent answers (higher reliability) if informed that they will receive personalized feedback on their responses? Table 3 displays Cronbach's Alpha for each of the Big-Five dimensions across experimental groups. No significant differences were observed for any of the five dimensions.

Table 3: Internal Consistency of Responses

Big-Five Scale	Cronbach's Alpha		$\Delta^*$
	Adv. Notice	No Adv. Notice	
Extraversion	.66	.70	-0.05 (ns)
Agreeableness	.40	.39	0.01 (ns)
Conscientiousness	.58	.63	-0.05 (ns)
Neuroticism	.67	.68	-0.01 (ns)
Openness	.64	.69	-0.05 (ns)

\* 95%-CI-Overlap, Bootstrapping, 1000 replications

Testing whether the advance notice of personalized feedback increases socially desirable responding, Table 4 reports mean scores across the five dimensions of the Big-Five-Inventory. These personality traits are known to be susceptible to social desirability bias to somewhat different degrees. More specifically, Paulhus (2002) reports that low levels of neuroticism, on the one hand, and high levels of extraversion, openness, and, in particular, agreeableness, on the other hand, correlate positively with measures of socially desirable responding. Indeed, we find differences across the experimental groups in the case of agreeableness ( $p < .05$ ), the personality measure usually most affected by social desirability bias. However, in contrast to our expectation, respondents receiving notice of the upcoming feedback report lower levels of agreeableness. This finding tentatively suggests more honest answers in the feedback group.

<sup>10</sup>We excluded extreme values (top 2%) from this analysis.

Table 4: Effects of Advance Notice on Substantial Responses in Big Five Inventory

Big-Five Scale	Mean Scale Score		<i>t</i> -Test <i>FB</i> – <i>noFB</i>
	Notice $\bar{x}$ (SE)	No Notice $\bar{x}$ (SE)	
Extraversion	4.84 (.06)	4.77 (.06)	0.94
Agreeableness	5.11 (.05)	5.24 (.05)	-2.02**
Conscientiousness	5.51 (.05)	5.53 (.05)	-0.27
Neuroticism	3.64 (.06)	3.50 (.06)	1.58
Openness	5.08 (.06)	5.07 (.06)	0.10

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Paradata on computer mouse clicks (responses and buttons) allowed us to investigate whether respondents – after receiving their personalized feedback – tried to use the web survey system back buttons to re-access the questions and adjust their initial responses. Only 2 individuals (0.005%) made use of the back-buttons to re-access the personality questions. One of these two individuals modified two out of the 15 items. Thus, the provision of feedback did not cause respondents to alter their initial answers.

#### *Personalized Feedback and Survey Evaluation*

We included a set four survey evaluation questions at the end of the questionnaire in order to test whether the feedback affected the respondents' satisfaction with the survey (see Figure 5 in the Appendix).<sup>11</sup> Table 3 displays mean values for these items across both experimental groups along with results of the corresponding *t*-tests.

Table 5: Satisfaction with the Survey

Item	Feedback $\bar{x}$ (SE)	No Feedback $\bar{x}$ (SE)	<i>t</i> -Test <i>FB</i> - <i>noFB</i>
Survey was fun	5.19 (.07)	5.00 (.07)	1.88*
Learned sth. (about me)	4.14 (.09)	3.60 (.09)	4.30***
Topics/contents boring (-)	2.67 (.07)	2.85 (.08)	-1.70*
Contribution to science	5.27 (.07)	5.30 (.08)	-0.24

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

With respect to satisfaction with the survey, we observe a significant difference between both groups for three out of the four items. Respondents who received personalized feedback

<sup>11</sup> Another four questions related to the perceived burden with answering to the questionnaire as well as overall evaluation of the study. We replicated our analysis for those questions as well, however – and this seems plausible – did not find evidence for an effect of providing feedback.

evaluated the survey as more fun ( $t = 1.88, p < .10$ ), less boring ( $t = -1.70, p < .10$ ), and were more likely to report that they learned something about themselves ( $t = 4.30, p < .01$ ). No significant effects was observed – as one may expect – for the subjective contribution to science.

### *Individual Characteristics of the Feedback and Survey Evaluation*

The effect of personalized feedback on satisfaction with the survey may vary with respect to both respondent’s innate characteristics as well as characteristics of the individual feedback presented to respondents. In this regard, it seems plausible that respondents who perceive their individual feedback as flattering or pleasant may evaluate the survey as more enjoyable. Since each individual feedback on personality scores was supplemented with a population average, respondents were able to compare their own scores with a benchmark. Moreover, the Big Five scales reflect a more or less (socially) desirable and undesirable range (Paulhus 2002). Thus, we tested whether differences between individuals’ scale scores compared to (1) the population averages displayed, and (2) the most desirable end (maximum/minimum) of the scale affected survey evaluation in the group of respondents receiving personalized feedback.

Table 6: Individual Feedback Characteristics and Survey Evaluation<sup>a</sup>

Model	Variable	Evaluation Items			
		1 Fun	2 Learned	3 Boring	4 Science
1	Mean Diff. to Pop. Average	-0.19 (.20)	-0.13 (.26)	-0.70*** (.21)	-0.18 (.23)
	N	431	430	429	429
2	Mean Diff. to Desirable Scale Ends	-0.22 (.29)	-0.17 (.38)	-1.02*** (.31)	-0.20 (.33)
	N	431	430	429	429

<sup>a</sup> Multivariate linear regression. Coefficients  $b$  (SE); Controls: Gender, Age, Education, and Personality

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Table 6 displays the results of multiple multivariate linear regressions of the four evaluation items on the mean difference to the population average (Model 1) as well as the mean difference to the more desirable scale ends (Model 2). As the respondent’s personality itself may affect the evaluation of the survey, we included the Big Five personality scores in the models. Moreover, we control for the respondents’ gender, age and education (coefficients not displayed). In both sets of models, we observe a highly significant effect for one out of the four evaluation items. Respondents who experienced – on average – larger differences between their individual scores and (1) the population averages; and (2) the most desirable end of the scale were less likely to report that the survey was boring.

## **Summary and Discussion**

In this paper, we investigate whether personalized feedback on personality traits affects response behavior and respondents’ satisfaction with a web survey. Based on a randomized trial in the context of the Berlin Aging Study II, potential effects were examined using a variety of indicators of response behaviors and different domains of satisfaction.

We found minor effects of the advance notification of feedback for responses to the Big

Five personality inventory. Thus, contrary to what was expected, the results do not point to a general increase in data quality through the announcement of upcoming feedback. However, our results tentatively indicate a positive effect of the personalized feedback on reducing social desirability bias and we observe a positive effect of feedback on respondent satisfaction with the survey. Respondents who received personalized feedback were more likely to rate the survey as interesting and fun, less boring, and reported more frequently that they had learned something about themselves.

Even though we implemented a randomized trial, our study faces some limitations concerning the generalizability of the results. First, the survey population consists of a self-recruited sample of residents of the larger metropolitan area of Berlin and all respondents had already participated in two earlier waves that included both medical checks and personal interviews. Thus, it seems plausible that our web survey respondents were generally highly motivated to take part in the survey. As a consequence, personalized feedback may have had only a little effect on responses since the motivation to answer accurately and thoughtfully may have been already comparatively high. Second, we only implemented feedback for personality traits. Even though we think that feedback on personality traits is likely to be perceived as novel and important to many, other topics may reveal stronger effects of feedback on data quality and survey evaluation.

Interesting fields for further research exist, especially within the context of panel studies. On the one hand, personalized feedback may not only increase satisfaction with the current interview, but also increase participation rates in follow-up waves. At the same time, though, personalized feedback in one wave may introduce forms of reactivity and panel conditioning in later waves of a longitudinal survey.

### Declaration of Conflicting Interests

The authors declare that there are no conflicts of interest.

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## Appendix


### Your Personality

The following questions are relating to different personality traits a person may have.

After answering the questions, you will be able to compare your **individual personality profile** with the average of the general population in Germany.

Figure 1: Advance Notification of Personalized Feedback

People can have many different qualities—some are listed below. You will probably find that some of these descriptions fit you completely and that some do not fit you at all. Others may fit to a certain extent.

 Please answer on a scale from 1 to 7, where 1 means "does not describe me at all", and 7 meaning "describes me perfectly".

I am:	Does not describe me at all							Describes me perfectly
	1	2	3	4	5	6	7	
– a thorough worker .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– communicative, talkative .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– sometimes a bit rude to others .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– original, someone who comes up with new ideas .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– a worrier .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– forgiving .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– somewhat lazy .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– outgoing, sociable .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– someone who values artistic, aesthetic experiences .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– nervous .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– effective and efficient in completing tasks .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– reserved .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– considerate and kind to others .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– imaginative .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– relaxed, able to deal with stress .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 2: Big Five Inventory, English Version

**Thank you for answering the questions on your personality!**

By the way, you have just answered the short version of the **Five-Factor-Personality Test** (“Big Five Test”). The test is designed to cover the five most basic personality traits and has been used for scientific purposes, by the economy, and within medical research for many years.

On the next page you’ll find your **individual personality profile** based on your previous answers.

Figure 3: Information Page prior to the Personalized Feedback

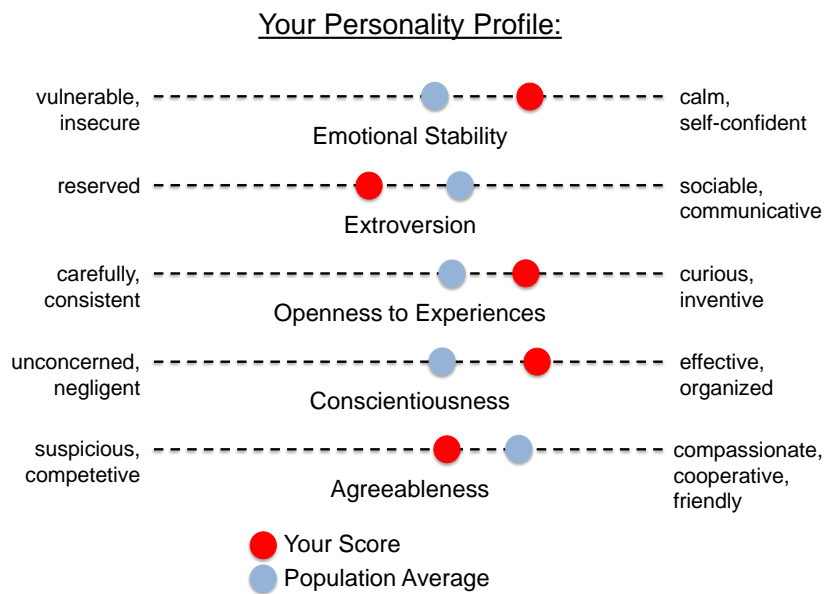


Figure 4: Example of Personalized Feedback

We would like to know, how you evaluate this survey. Please rate the survey by considering the following statements:

→ Please mark the appropriate box. The value 1 means „does not apply at all“ and the value 7 means „applies fully“. You may grade your answer with the values inbetween.

	Does not apply at all						Applies fully
	1	2	3	4	5	6	7
1. It was fun to answer the questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I've learned something (about myself).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I feel like I have contributed to science and research.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. The topics and contents of the survey were boring.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. It was generally easy to understand the questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Some of the terms were unclear to me or were not adequately explained.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Even though I knew an answer, sometimes it was difficult to choose an appropriate answer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Overall, how would you rate this survey?

bad	1	2	3	4	5	6	7	excellent
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Figure 5: Survey Evaluation Questions at the End of the Survey