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Effects of Survey Progress Bars on Data Quality and Enjoyment

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Evidence is presented for a positive effect of survey progress bars on survey enjoyment and focus. Focus mediated the relationship between progress bar inclusion and data quality. These findings provide a justification for progress bar inclusion despite previous research suggesting negative effects on survey completion.

Web-based surveys are often easier to administer and allow researchers to reach participants they might not otherwise have been able to, and as a result, in recent years the practice of administering surveys and questionnaires online has become increasingly popular. Another possible reason online surveys have become so prevalent is that their psychometric qualities don't appear to be significantly different from more traditional pen-and-paper surveys (Riva Teruzzi & Anolli, 2003).

Despite their popularity, there are some problems associated with administering surveys online as opposed to using more traditional pen-and-paper techniques. Dillman, Tortora, and Bowker (1999) first noted that in pre-tests of online surveys participants tended to drop out, sometimes with only a few questions left. Based on the fact that in traditional pen-and-paper surveys a participant can flip to the end and see how many questions remained, the authors suggested that the inclusion of some type of indicator for where a participant is in the survey would result in participants being more likely to see a survey to completion. Today vestiges of this suggestion remain in the form of survey progress bars, which are dynamic graphical representations of the portion of the survey a participant has completed and how much yet remains.

Somewhat surprisingly, the empirical research on survey progress bars seems to indicate that they have a zero or negative effect on participants' likelihood to complete an online survey (Crawford Couper & Lamias, 2001; Matzat Snijders & van der Horst, 2009). Though these studies would seem to indicate that the inclusion of progress bars is not in the best interests of researchers, they really only approach the question of the progress bar's utility from the direction of survey utility, leaving uninvestigated questions about their impact on data quality and the participants'

experience of the survey. The current study begins to investigate these questions.

Dillman and colleagues (1999) recommended the inclusion of a feature in online surveys to indicate progress to participants because it would allow participants a similar functionality to flipping through the rest of the pages to see how many questions they have left to finish. Presumably the ability to do this gives an individual a sense of comfort, perhaps stemming from a sense that their task is bounded, and not interminable. In the absence of such information it is reasonable to expect that as the survey goes on without any indication of how close to completion they are, participants will direct an increasingly large portion of their attention towards how much of the task remains, thus decreasing the cognitive resources available for answering survey questions. The inclusion of a progress bar should attenuate this problem and allow participants to focus more on the survey questions. Specifically, when a progress bar is included, we expect that participants would wait for a new survey page to load and then check their progress on the survey. Following this, they would then continue answering questions with a greater amount of focus, which would be missing if they had no cues as to how much of the survey remained.

Hypothesis 1: The presence of a progress bar will increase participants' focus on the survey.

Logically, it follows that, *ceteris paribus*, the more focused participants are when answering questions the higher the quality will be of the resultant data.

Hypothesis 2: Higher levels of focus will be related to higher data quality.

Hypothesis 3: Focus will mediate the relationship between the presence of the progress bar and data quality.

While the participants' enjoyment of the survey is not a primary goal of most research, it is reasonable to expect that if participants find the experience to be relatively enjoyable they might be more likely to participate in similar future research. If the progress bar truly does operate in the manner described above, we would expect that participants would enjoy surveys with progress bars more as they help relieve the uncomfortable uncertainty of not knowing how far they have left to go..

Hypothesis 4: The presence of a progress bar will increase participant's enjoyment of the survey.

Also of interest is the question of participants' explicit feelings regarding the use of progress bars in surveys. Because there are conflicting findings regarding the impact of progress bars on participants' experience, we ask the following research question:

Research Question 1: What will be participants' attitudes regarding the progress bar?

Method

Participants

Participants were 450 adults recruited through the Mechanical Turk (MTurk) system, a service provided by Amazon.com that allows requesters to post tasks (called Human Intelligence Tasks, or HITs) for workers in the system to complete. 57.4% of participants were from India, 30.9% were from the United States, and the remaining 11.7% were from 30 other countries. 59.4% identified themselves as Asian and/or Asian American; 26.5% identified themselves as Caucasian and/or European American; the remaining 14.1% reported other ethnicities. All participants reported fluency in English; 53.5% indicated English as their first language. 52.5% of the sample was male, and ages ranged from 18 years to 81 years with a mean of 30.13 years. Data were collected as part of an ongoing data collection effort for a separate purpose; careful completion of the entire study by

participants was remunerated by a $0.50 payment through the MTurk system.

Measures

Data Quality. Within the context of the ongoing data-collection process in which this study was contained, participants were asked to complete between four and seven attention-check items. These items were of a multiple-choice format and were scored as either correct or incorrect. We retained the percentage of these items that were answered correctly as an indicator of survey data quality.

Because extant scales regarding enjoyment associated with completing a survey and focus on the survey items are not available to our knowledge, we created two scales for use in this study. SMEs wrote 18 items to assess these constructs, and these items were administered to all participants, as described below. An exploratory factor analysis (EFA) using principal axis factoring and direct oblimin rotation was conducted using the data from only those participants with 100% data quality so as to ensure the best approximation of true factor structure. On examination of the scree plot and of interpretability of scales, the analysis was constrained to two factors. Assignment of items to scales was based on a criterion of a factor loading of .45 of that item on the target scale with no cross-loading at or above the value of .45. Fifteen of the original items were retained according to this criterion; two scales were extracted, as described below.

Survey Enjoyment. This construct was measured using a 12-item scale, developed as described above (Cronbach's coefficient alpha = .89). Participants indicated the extent to which they agreed with the statements on a five-point Likert-type scale with anchors at *Strongly Disagree* and *Strongly Agree*. See Table 1 for all items in this scale.

Survey Focus. This construct was measured using a 3-item scale, developed as described above (Cronbach's coefficient alpha = .70). Participants indicated the extent to which they agreed with the statements on a five-point Likert-type scale with anchors at *Strongly Disagree* and *Strongly Agree*. See Table 2 for all items in this scale.

Progress Bar Attitudes. Again, as a scale to assess perceptions of the presence of the progress bar itself in a survey does not exist to our knowledge, we created a five-item scale to measure this construct. Using the same factor-analytic method as described above, a single factor was extracted for all five of the items we had written. Participants indicated the extent to which they agreed with the statements on a five-point Likert-type scale with anchors at *Strongly Disagree* and *Strongly Agree*. See Table 3 for all items in this scale.

Progress Bar Detection. To determine whether participants noticed whether there was or there was not a progress bar in their survey, we asked "When completing this study, did you have a status bar at the top of your survey?" Participants selected either "yes" or "no" in response to this question.

Procedure

After providing informed consent, participants were randomly assigned and routed to one of two conditions. In the control condition, the survey they were presented (which was used to collect data for a separate study) did not contain any progress bar or indicator of the participant's progress through the survey. In the experimental condition, the survey they were presented contained at the top a graphical status bar that indicated the proportion of the survey that had been completed by becoming increasingly full from left to right with a dark color as the

participant progressed through pages of the survey.

Participants then proceeded through the data collection process for the separate study, which took approximately 45 minutes to complete. At the end of the survey, all participants were presented with the survey enjoyment and survey focus scales, as described above. Next, all participants were routed to a single common ending survey, in which regardless of condition no participant was exposed to a progress bar. Participants were then presented with the progress bar detection item. Those who indicated that they had completed the first survey in the presence of the progress bar were presented with the progress bar appreciation scale. Participants were then thanked for their participation, debriefed, and notified that they had reached the study's conclusion.

Results

Means, standard deviations, and correlations between all measured variables are displayed in Table 4. As a manipulation check, we conducted a Chi-Squared (X^2) test to determine whether detection of the progress bar varied by experimental condition. The proportion of participants that detected the progress bar did vary by condition (X^2 (1, N = 447) = 238.50, p < .001). The simple correlations provided support for hypothesis 2, in that a significant positive correlation between focus and data quality was observed.

To directly assess the impact of the progress bar on participants' experience, we conducted a series of independent-samples T tests comparing those participants who had been exposed to the status bar to those who had not. Results (which can be found in Table 5) indicated that the presence of the progress bar affected each of the four dependent variables significantly. This finding provides support for hypotheses 1 and 4, such that the presence of the progress bar resulted in higher levels of both focus and enjoyment related to the survey.

To test hypothesis 3, we conducted a mediation analysis following Baron and Kenny's (1986) procedure and confirmed these findings using a Sobel test (Sobel, 1982), the latter of which we conducted using Soper's Sobel Test Calculator (Soper, 2011). The steps conducted in this process are outlined in Table 6. We found that the influence of the presence of the progress bar was fully statistically mediated by survey focus, in support of hypothesis 3.

We answered research question 1 by examining the mean and standard deviation of participants' ratings of progress bar attitudes. As can be seen in Table 4, mean ratings of attitudes regarding the progress bar were near the 81st percentile, with a standard deviation of 14%. Thus, it appears that participants generally had positive attitudes about the progress bar. Because we administered the progress bar attitudes scale only to those participants who reported that they had been exposed to a progress bar during the first stage of the study, these estimates are based on only a portion of our overall sample. However, an unanticipated opportunity to investigate the impact of the presence progress bar on participant attitudes towards progress bars presented itself in the study. Because 31 participants inaccurately reported having been exposed to a progress bar in the first stage of the study, mean difference comparisons could be made with regard to this measure. Notably, a mean difference was observed when comparing the attitudes about status bars between those 31 participants who inaccurately reported having been exposed to the progress bar and those 206 who accurately reported having been so exposed (see Table 5). This finding indicated that exposure to a progress bar (and, importantly, not simply the perception that one had been exposed to a progress bar) significantly

increased attitudes regarding progress bars. We conducted follow-up analyses to further explore this pattern. When comparing those individuals who incorrectly and correctly indicated that the progress bar had been present (see Table 7), significant mean differences were observed for each of the remaining three dependent variables, such that those who had actually been exposed to the progress bar scored significantly higher on each of the three scales. This pattern partially held for those who incorrectly and correctly indicated that the progress bar had *not* been present (see Table 8), in that those who had actually been exposed to the progress bar scored higher on the survey enjoyment scale; the same was not the case for the survey focus scale or the data quality index. These lines of evidence corroborate the notion that it is exposure to the progress bar itself, and not memory of whether exposure to the progress bar had occurred.

Discussion

In conducting the present study we hoped to add to the existing body of literature on survey progress bars, and more specifically, why their use could be advisable if, as earlier research has suggested, they can have the effect of decreasing survey completion rates. To this end we posed four hypotheses to test our expectations of how progress bars might affect data quality through the mechanism of participant focus, how progress bars might affect participant's enjoyment of the survey. We also asked one research question related to participant's attitudes about the progress bar. We found support for all of our hypotheses which indicates that there could be reasons to include a survey progress bar; we will now summarize these results and interpret them in terms of their implications for survey administration and future research.

Since hypotheses 1-3 were supported it seems that the inclusion of a progress bar can increase the quality of survey data, and that this effect is mediated by an increase in focus experienced by participants as they complete the survey. Crawford, Couper, and Lamias (2001) suggested that the reason a progress bar might cause participants to abandon studies was that it caused participants to feel that the burden of time imposed on them by the study was more than they were willing to bear. It could be that the progress bar is made salient the notion that they had not made as much progress on the study as they believe they should have given their perception of the burden they agreed to take on in completing the survey, thus resulting in distraction or eventual abandonment by those who are not willing to accommodate this newly perceived burden. Those that continue the survey to completion thus represent the participants that find this burden acceptable, resulting in more focus and higher-quality data. If this interpretation is correct, when including a progress bar it is likely important that the reported progress be in reference to the amount of total time they have completed and have yet to complete rather than the number of questions.

Another effect of exposure to a progress bar was an increase in participant enjoyment of the survey experience. The need for further exploration of the ramifications of this finding is discussed below, but briefly put, this seems to be another compelling reason to utilize progress bars. One potential caveat on this recommendation arises when researchers are investigating normative information regarding delicate affective processes; where most questionnaire-based research is not expected to, in itself, affect participants' state affect, inclusion of a progress bar may do just this.

Our exploratory analyses regarding participants' attitudes towards the progress bar yielded both straightforward and

somewhat unanticipated findings. In the first category, it seems that, by and large, participants explicitly report positive attitudes regarding the progress bar and the advantages that it bestows on their survey experience (cf. Table 3). In the second and more ambiguous category, results indicated that those participants exposed to the progress bar experimentally expressed more positive attitudes than did those who were not so exposed. Note again that the participants who fell in the latter category were few, based on study design, and arose only after having mistakenly reported having been exposed to a progress bar. Whether we interpret this finding to indicate that there is no "placebo" effect for those who (incorrectly) *think* that they had received a progress bar *with regards to attitudes* or that the confused participants provided confused ratings of their attitudes is still an open question. Generally, however, none of the evidence of the present study indicates that there are either negative attitudes regarding or negative effects of exposure to a progress bar, and thus we recommend their implementation in surveys.

Limitations and Directions for Future Research

Due to the nature of this project only one survey was actually administered to participants. As the survey was rather lengthy, requiring approximately 45 minutes to complete, our data do not provide empirical evidence for the effects of a progress bar in briefer surveys. One possible avenue of future research could investigate whether survey length moderates the impact of the progress bar on data quality and the participant's enjoyment of the survey.

Another result of the design of the study is that we only considered data from those who actually completed the survey. While it appears that the inclusion of a progress bar increases data quality in participants who complete the study, it would be even more illustrative if a future study could show that the absence of a progress bar decrease the quality of data for participants before they abandon the study.

Participants who were in the progress bar condition reported higher levels of enjoyment. While having participants enjoy their experience more seems like an end in its own right there remains the empirical question whether their enjoyment is useful to researchers. Further research could investigate the effects of participant enjoyment on outcomes such as willingness to participate in additional research projects.

Additionally data on progress bar attitudes were not collected from everyone who completed the survey. Future research should assess all participants attitudes regarding the progress bar such that the effects of being exposed to the progress bar can be more thoroughly investigated.

A final limitation our study is that due to the fact that it was embedded within a larger data collection effort, we did not collect data with regard to burden to participants. An additional study that incorporates the concept of burden into our model could empirically corroborate some of the speculations we discussed earlier.

Conclusion

Despite previous research findings which indicate the inclusion of a progress bar could decrease survey completion rates, our data provide some justification for their continued use. Specifically we demonstrated that progress bars increase data quality, through the mechanism of user focus. Evidence was also found that participants enjoyed the survey more when a progress bar was present, and they had favorable attitudes towards the progress bar. Thus when constructing surveys the inclusion of a progress bar should be a matter of careful consideration of the tradeoffs between lower completion rates and better data quality. Future research should seek to empirically

assess this balance as well as possible moderation effects associated which characteristics of the survey such as length.

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Table 1
Survey Enjoyment Scale Items and Factor Loadings

Item wording	*Factor Loading*
This survey was engaging.	.89
This survey seemed to go by rather quickly.	.56
The content of this survey was interesting to me.	.81
Participating in this survey was satisfying.	.84
I was interested in this survey.	.86
I felt like I was making progress through this survey as I answered questions.	.54
I enjoyed this survey.	.85
*This survey was boring.	-.65
*This survey seemed to drag on forever.	-.53
*No matter how many questions I answered in this survey, it didn't seem like I was getting anywhere.	-.49
*I was annoyed with this survey.	-.48
*I disliked participating in this survey.	-.68

Note: Items preceded by an * are reverse-coded.

Table 2

Survey Focus Scale Items and Factor Loadings

Item wording	*Factor Loading*
I was able to concentrate throughout this entire survey.	.48
* I lost focus often during this survey.	-.75
* I was distracted while taking this survey.	-.82

Note: Items preceded by an * are reverse-coded.

Table 3
Progress Bar Attitudes Scale Items and Factor Loadings

Item wording	*Factor Loading*
It was helpful to know how much of the study I had left to complete.	.75
It made me feel good to see how I was progressing through the study.	.72
Knowing how much I had left to complete helped me to stay motivated to complete the study.	.96
When I know how far I have left to go I can stay focused easier.	.82
*I would rather not have the status bar at the top of the page.	-.48

Note: Items preceded by an * are reverse-coded.

Table 4

Means, Standard Deviations, and Simple Correlations of Study Variables

Variable	Mean	St. Dev	1	2	3
1 – Survey Enjoyment	3.51	.69	--		
2 – Survey Focus	3.85	.82	.43**	--	
3† – Progress Bar Attitudes	4.06	.70	.27**	.36**	--
4 – Data quality	81.77	22.66	.09	.38**	.35**

Note: † This scale was only presented to those participants who claimed to have been exposed to a progress bar (N = 237). All other values based on N = 445. ** indicates significance at the $p < .01$ level.

Table 5

Results of independent-samples t *tests of the effects of progress bar exposure*

Variable	No Progress Bar		Progress Bar		Mean Difference	Cohen's *d*	*t*	*df*	*p*
	Mean	St. Dev	Mean	St. Dev					
Survey Enjoyment	3.43	.70	3.59	.67	.16	.24	2.52	443	.01
Survey Focus	3.73	.82	3.96	.80	.23	.28	2.90	443	< .01
Progress Bar Attitudes	3.63	.39	4.12	.72	.49	.48	3.70	235	< .00
Data quality	79.54	22.57	83.75	22.60	4.21	.19	1.96	444	.05

Note: Progress Bar Attitudes scale was only given to those participants who reported having been exposed to a progress bar. 206 participants correctly reported having been exposed to a progress bar; 31 incorrectly reported having been so exposed

Table 6
Description of Mediation Analysis Procedures

Test:	
Baron & Kenny (1986)	Test value
Mediation Step 1: IV and Mediator related	
- Pearson's *r* between exposure to progress bar and focus	.14**
Mediation Step 2: Mediation and DV related	
- Pearson's *r* between focus and data quality	.38***
Mediation Step 3: IV and DV related without Mediator	
- Pearson's *r* between exposure to progress bar and data quality	.09*
Mediation Step 4: Relationship between IV and DV eliminated by presence of Mediator	
- Standardized Regression Coefficient of exposure to progress bar when data quality is regressed on both exposure to progress bar and focus	.04
Sobel (1982)	
Sobel Test Statistic	2.76**

Note: * indicates statistical significance at the $p < .05$ level. * indicates statistical significance at the $p < .01$ level. * indicates statistical significance at the $p < .001$ level.

Table 7

Results of independent-samples t *tests of the effects of progress bar exposure among those who reported having been exposed to the progress bar*

Variable	No Progress Bar		Progress Bar		Mean Difference	Cohen's *d*	*t*	*df*	*p*
	Mean	St. Dev	Mean	St. Dev					
Survey Enjoyment	3.33	.31	3.57	.67	.24	.74	3.34	*82.58	.01
Survey Focus	3.10	.69	3.94	.79	.84	.73	5.63	236	< .001
Data quality	59.91	21.18	84.39	22.05	24.48	.36	5.80	237	< .001

Note: * indicates that this test triggered Levene's Test for Equality of Variances, and thus equal variances were not assumed.

Table 8

Results of independent-samples t *tests of the effects of progress bar exposure among those who reported having not been exposed to the progress bar*

Variable	No Progress Bar		Progress Bar		Mean Difference	Cohen's *d*	*t*	*df*	*p*
	Mean	St. Dev	Mean	St. Dev					
Survey Enjoyment	3.44	.75	3.74	.59	.30	.28	2.01	205	.05
Survey Focus	3.85	.79	4.08	.86	.24	--	1.46	205	.15
Data quality	82.94	21.07	78.95	26.29	-3.99	--	-.90	205	.37