

ABSTRACT

YENTES, RICHARD DEAN. Attention and Data Quality in Online Surveys: The Role of Survey Length, Progress Bars, and Time Disclosure. (Under the direction of Dr. Lori L. Foster).

This paper examines the effects of survey length, survey time disclosure, and the presence of a survey progress bar on attention and consequent data quality. Two studies were conducted. In Study 1, respondents ($n=751$) completed an online survey in which the survey's length and the presence of a survey progress bar were experimentally manipulated. In Study 2, respondents ($n=1078$) completed the long version of the online survey from Study 1, and survey length disclosure and the presence of a survey progress bar were experimentally manipulated. Across both studies self-reported attention was significantly related to data quality. Survey length significantly reduced respondents' attention to the survey, and as a consequence, data quality. As interventions, neither survey progress bars nor survey time disclosure were effective in facilitating attention and subsequent data quality. Practical implications are discussed.

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Attention and Data Quality in Online Surveys: The Role of Survey Length, Progress Bars,
and Time Disclosure

by
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DEDICATION

This thesis is dedicated first, and foremost, to my family, whose support was strong and steadfast; to everyone who helped me along the way; and to my friends, who appreciate the irony of struggling to find the motivation to finish a thesis on the topic of motivation.

BIOGRAPHY

Richard Yentes completed his undergraduate studies at Virginia Polytechnic Institute and State University (Virginia Tech) in Blacksburg, Va. In 2010 he graduated with a Bachelor of Science in Psychology with High Honors. After graduating, he moved to Raleigh, North Carolina in order to begin graduate studies at North Carolina State University, where he is working to complete a Ph.D in Industrial and Organizational Psychology.

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Attention and Data Quality in Online Surveys: The Role of Survey Length, Progress Bars, and Time Disclosure

Online surveys are used by organizational researchers for a variety of purposes. Although researchers differ in their reasons for conducting them, they commonly use data obtained from online surveys to make important theoretical and practical decisions. Decisions made in this manner can only be as good as data on which they are based, making considerations of data quality in online surveys important to all researchers who use them. Of specific importance is the investigation of factors that lead to obtaining low-quality data from online surveys, and how these factors can be mitigated or avoided. For example, research has documented that participants completing surveys sometimes respond without regard for the content of survey items. (Berry et al., 1992; Meade & Craig, 2012). This phenomenon, referred to here as careless responding, has also been studied under names like random responding, and protocol invalidity (Meade & Craig, 2012). Several researchers have suggested that careless responding is likely related to waning attention on the part of survey respondents (Berry et al., 1992; Johnson, 2005; Meade & Craig, 2012), though very little work has been conducted to test this assumption directly. In view of the importance of data quality, this area of inquiry merits further investigation. The purpose of this paper is to empirically examine the relationship between attention and data quality, as well as the factors that may facilitate the collection of high-quality data by encouraging attention. Toward that goal two studies were conducted. In the first study, the effects of survey length and the presence of a survey progress bar were examined. Building off of the findings from the first study, study 2 re-tested the effects of a survey progress bar and examined those of survey

time disclosure. Figure 1 contains a conceptual model of the hypothesized relationships between data quality, attention, and their antecedents, across two studies, described next.

Study 1

Introduction

Careless responding. Researchers using online surveys to collect data are often concerned with the quality of the data they receive. Data quality refers to the parity between the characteristics of specific data and a set of ideal attributes. Of particular concern is a scenario in which responses to an online survey fail to accurately reflect the respondents' level of the constructs being measured, as is believed to occur when participants engage in careless responding (Meade & Craig, 2012). Use of such low-quality data for decision making purposes represents a serious threat to the validity of inferences. Methods for identifying and screening out data points that result from careless responding do exist; however, it would be preferable to prevent careless responding in the first place, and a greater understanding of the phenomenon may yield savings for researchers in both time and money. One clue to understanding careless responding lies in the idea that responding to questionnaires, including online surveys, requires motivation (Jenkins & Dillman, 1997). Therefore, careless responding is likely related to motivation, and research on motivation can provide a framework for understanding, and hopefully reducing, careless responding.

Goal setting theory is a well-researched and broadly accepted theory of motivation (Latham & Locke, 2007; Locke, 1997; Locke & Latham, 1990; Meyer, Becker, & Vandenberghe, 2004). The central tenet of goal setting theory is that the adoption of goals is positively related to performance (Locke & Latham, 1990). When respondents make the decision to take an online survey, presumably they adopt the goal of completing the survey.

In order to accomplish this goal, survey respondents engage in the task of answering survey items. Researchers generally rely upon the assumption that survey respondents are carefully considering each item, and providing a thoughtful response that reflects their level of whatever construct the item is attempting to measure (Meade & Craig, 2012; Tourangeau, Rips & Rasinski, 2000). This assumption may be ill founded, as some researchers have pointed out that the task accepted by survey respondents is not always precisely the same as the task researchers desire them to perform (Jenkins & Dillman, 1997). Rather than accepting the goal of providing high-quality data, respondents may instead adopt a goal to complete the survey. At the most literal level, completing an online survey frequently only requires respondents to select a radio button for each item. Providing high-quality data, while in the spirit of the task, is not explicitly required for its completion, even if it is explicitly requested. Goal setting theory has been expanded to accommodate such a circumstance, by distinguishing between discretionary and non-discretionary performance (Meyer, Becker, & Vandenberghe, 2004).

Non-discretionary performance is performing those behaviors that are explicitly required, at the time of commitment, in order to carry out a task (Meyer, Becker & Vandenberghe, 2004). Discretionary performance refers to optional behaviors that are aligned with the spirit of a task or otherwise benefit the target of a commitment (Meyer & Herscovitch, 2001). In the context of an online survey, simply providing responses to survey items is the core of non-discretionary task performance. Broadening the scope of completing a survey to include providing thoughtful responses may be considered a form of discretionary performance. Therefore, careless responding is when a survey respondent fails to engage in the discretionary aspects of performance, such as paying careful attention to survey items.

Data are an outcome of respondents' performance, and the quality of data is threatened when they fail to engage in discretionary performance. In order to reduce the incidence of careless responding it is necessary to understand the psychological mechanisms that relate to it.

Researchers investigating careless responding frequently allude to a relationship between careless responding and attention (Berry et al., 1992; Johnson, 2005; Meade & Craig, 2012). More specifically, waning attention on a survey is thought to directly contribute to careless responding. Though attention is often focused using automatic cognitive processes, sustaining attention on a task requires an expenditure of effort (i.e., engaging self-regulation). This may be especially true when distractions are present, or for tasks that are long and tedious. Some minimum level of attention must be directed at survey items in order for respondents to answer them. However, much more attention is required in order to engage with each item's content, and respond carefully. Therefore, expanding the scope of completing a survey to include allocating attention to the content of survey items is arguably a discretionary behavior. When survey respondents choose to allocate high levels of attention to the task at hand, active negligence and mistakes should be less likely. Active negligence occurs, for example, when respondents intentionally click on a response option without reading the associated item stem or response scale. Mistakes can take the form of misreading an item stem or response scale or accidentally clicking on a response other than the intended option. Increasing levels of attention should reduce the likelihood of such problems, resulting in better data.

Hypothesis 1. Respondents who focus more attention on the survey will produce higher quality data.

Survey length. Assuming focused attention on a survey is associated with increased data quality, it is important to identify the characteristics of a survey that can facilitate or hinder this process. Previous studies investigating careless responding often used surveys that are, by many standards, rather long (Baer, Ballenger, Berry, & Wetter, 1997; Berry et al., 1992; Johnson 2005; Meade & Craig, 2012). Some evidence indicates that careless responding mostly occurs later in such surveys (Berry et. al., 1992). Recent research on motivation and willpower helps to explain why survey length may adversely affect attention and data quality.

As mentioned previously, respondents must spend effort in order to persistently focus enough attention on a survey to carefully answer survey items. In goal setting theory, persistent effort is considered a goal mechanism, and is expected to have a stronger relationship with discretionary performance than non-discretionary performance (Meyer, Becker, & Vandenberghe, 2004). Thus, respondents who are willing to put more effort into completing a survey would be expected to focus more attention on it. The relationship between effort and attention is so strong that Kahenman (1973) went so far as to state that, for his purposes, attention and effort could be used interchangeably. Despite this comparison, effort is conceptually distinct from attention. Within the broader motivation literature, effort much more strongly resembles the concept of willpower from ego depletion theory.

The central idea of ego depletion theory is that people are limited in their capacity for self-regulation (Baumeister, Bratlavsky, Muravan, & Tice, 1998; Inzlicht & Gutsell, 2007; Galliot et al., 2007; Muraven, Tice, & Baumeister, 1998). The term willpower is often used to refer to the resource consumed by self-regulation. Ego depletion is the state in which a person's capacity for self-regulation is temporarily reduced, as a result of previous or

prolonged self-regulation (Baumeister, Bratlavsky, Muraven, & Tice, 1998). Here effort and willpower are considered interchangeable. Thus, when exerting effort in order to screen out distractions and keep attention focused on the survey, respondents are depleting their reserves of willpower. Surveys that take longer to complete should therefore require greater expenditures of willpower, leading to an increased likelihood that respondents will reach an ego depleted state. Further, research indicates people sometimes act to conserve willpower unless their motivation for completing a task is particularly high (Muraven & Slessareva, 2003). Thus, respondents may not persist with their full effort for the duration of longer surveys, even if they do not achieve a state of complete ego depletion. As a result, respondents completing a long survey will focus less attention on the task, and lower attention should mediate the relationship between survey length and data quality.

Hypothesis 2. Surveys of greater length will cause respondents to focus less attention on the survey.

Hypothesis 3. Attention will mediate the effects of survey length on data quality.

The role of feedback and survey progress bars. Another possible cause of declining attention to survey items could be that respondents begin to question how their effort relates to their goal of completing the survey. Research indicates that individuals seek to amass reserves of resources, in this case willpower, and avoid wasting them (Hobfoll, 1989; Muraven & Slessareva, 2003). Thus, respondents are likely to begin conserving willpower unless it is clear that their effort is being efficiently translated into progress toward their goal. As such considerations begin to intrude on respondents' awareness, those who wish to ignore them must spend even more willpower in order to set the thoughts aside and continue devoting attention to the survey (Wegner, 1994). When this occurs, goal

commitment may take the form of continuance commitment, leading to the abandonment of discretionary behaviors (Meyer & Herscovitch, 2001). Thus, without information about the effectiveness of their effort (i.e., progress toward survey completion) respondents may allocate less attention to the survey.

One tool researchers have to combat this issue is feedback. Though a variety of different types of feedback exist, knowledge-of-results type feedback should be particularly effective in helping survey respondents sustain their attention (Kahenman, 1973; Kluger & DeNisi, 1996). The option to include such a feedback intervention is included in many popular survey platforms in the form of a survey progress bar. A survey progress bar is a dynamic, graphical representation of the portion of a survey that has been completed by a respondent, and how much yet remains (Yentes, Toaddy, Thompson, Gissel, & Stoughton, 2012). Unlike a paper survey where respondents have tangible evidence of their progress toward completion, an online survey in and of itself does not indicate survey length or completion progress. A survey progress bar helps provide that information. Although a limited amount of research has investigated the effects of progress bars on survey completion rates (Crawford, Couper, & Lamias, 2001; Matzat, Snijders, & van der Horst, 2009), no published work has yet examined their effects on attention and data quality. However, consistent with goal setting theory, the presence of a survey progress bar should increase performance by providing survey respondents with knowledge of their progress toward their goal (Locke, 1997).

Hypothesis 4. Exposure to a survey progress bar will cause respondents to focus more attention on a survey

Hypothesis 5. Attention will mediate the effects of the presence of a survey progress bar on data quality.

Survey progress bars vs. survey length. Ideally, researchers should always keep surveys as short as possible in order to minimize the burden placed on respondents. However, in some situations “as short as possible” can result in a survey that is still, objectively, quite lengthy. As a result, identifying ways to reduce the threat of careless responding in lengthy surveys is highly desirable. If waning attention is the mechanism through which the length of a survey decreases data quality, then factors that facilitate attention should help to safeguard data quality in lengthy surveys. Therefore, because survey progress bars are thought to facilitate attention to surveys, they may mitigate the deleterious effects that longer surveys have on data quality.

Hypothesis 6. The presence of a survey progress bar will moderate the mediational effects of attention on the relationship between survey length and data quality.

Methods

Participants. Survey respondents were recruited using Amazon’s Mechanical Turk system. Mechanical Turk is a service that allows researchers to post human intelligence tasks (HITs), which are then completed by workers in return for compensation. An initial wave of data was collected from 446 respondents who were required to reside within the United States in order to be eligible for the study and compensated \$1.00 for their participation. Due to concerns that the residence restriction and relatively high compensation were hindering variance in data quality, the residence restriction was relaxed and compensation was adjusted to \$0.20 for the remaining 305 respondents yielding a total study 1 sample of 751 respondents who completed the survey. Because data quality is one of the outcomes of

interest for this study, no penalty was assigned to those who provided low-quality data. Respondents were 48.2% female and 51.1% Caucasian, 34.2% Asian (or Asian American), 5.7% African (or African American), 4% Hispanic, and 5% other ethnicities. Their mean age was 31.97 ($SD = 9.80$). Respondents were predominantly from the United States of America (64.71%) and India (32.62%), with 2.67% residing in other countries.

Design and procedure. Study 1 employed a 2x2 fully crossed design. The two independent variables that were manipulated were: survey progress bar (SPB; absent vs. present) and the length of the survey administered to respondents (209-item long version vs. a 35-item short version). Dependent variables included an attention measure and three separate indices of data quality, all adapted from Meade and Craig (2012). The three indices of data quality included instructed response items, psychometric synonyms, and outlier status.

After signing up for the study on Amazon's Mechanical Turk System, respondents clicked a link that used a JavaScript routine to randomly assign them to one of the four study conditions and forwarded them to the appropriate version of the survey. The survey questions assessed employee attitudes, and respondents were led to believe that the purpose of the study was to collect employees' opinions about their jobs from workers employed in a wide variety of positions and organizations. After providing informed consent respondents began the survey. Respondents in the SPB conditions were exposed to a survey progress bar depicting their progress at the top of the survey page. The survey progress bar displayed to respondents was rectangular in shape and filled from left to right. It also included text indicating the percentage of the total survey items that respondents had completed. Respondents in the non-SPB condition completed the survey without a progress indicator.

The survey consisted of three parts. The first part of the survey included several demographic questions, and was the same for all respondents. The second part of the survey consisted of a variety of measures that might be used in an employee opinions survey. A list of these measures can be found in Table 1. Though respondents' answers to these items were used to compute the indices of data quality, no study hypotheses were addressed using the constructs assessed by these measures.

Respondents in the short survey length condition were only given a 35 item subset of the 209 employee opinion questions presented to respondents assigned to the long survey length condition. Following completion of the employee opinions portion of the survey, all respondents were interrupted with a screen displaying the message "You're almost done. There are only 24 questions remaining. Please take particular care that your answers to the remaining questions are as truthful and accurate as possible." Following this message respondents completed the third portion of the study, which was identical for all respondents and included an attention measure followed by some other items administered for exploratory purposes.

In terms of format, the survey contained 20 items per page, to which respondents provided their answers using radio buttons. Respondents were not allowed to skip items, and upon completing a page of items and clicking the button to advance to the next page, respondents were not permitted to return to previous pages of the survey.

Measures

Attention. Attention (Cronbach's coefficient alpha = .85) was operationalized using a nine-item scale from Meade and Craig (2012). Respondents answered each item using a seven-point Likert-type scale with anchors at "*strongly disagree*" and "*strongly agree*." An

example item was “I carefully read every survey item.” A full list of items for this scale can be found in Table 2.

Data quality. Data quality was operationalized in three ways. Separate analyses were conducted using instructed response items and two other indices of careless responding adapted from Meade and Craig (2012), namely: outlier status and psychometric synonyms. All indices of data quality were keyed such that a higher value was considered indicative of higher data quality

Instructed response items. Instructed response items are items inserted into the normal flow of a survey that prompt a respondent to select a specific answer (e.g., “Please respond with strongly agree for this item”). Each instructed response item was scored as either “0” for answering incorrectly, or “1” for a correct response. A total of three instructed response items were included and a data quality score was computed as the proportion of instructed response items answered correctly. Low scores on this index are considered indicative of low data quality. In the short survey these items were inserted on both pages of the employee opinion section (items 5, 15, and 33, respectively). For the long version of the study these items were inserted on pages two, five, and eleven (items 22, 99 and 201, respectively).

Outlier status. Mahalanobis distance is a multivariate statistic that is used to detect outliers. It is determined by calculating the multivariate distance between two vectors, in this case a respondent’s vector of item responses and the vector of item means for the entire sample. Recent research has found Mahalanobis distance to be effective in detecting respondents who are answering survey items in a careless or random manner (Ehlers, Greene-Shortridge, Weekley, & Zajack, 2009; Meade & Craig, 2012). Thus, Mahalanobis

distance was calculated for respondents based on their answers to the employee opinion items they responded to. As Ehlers and colleagues (2009) indicated, a cut score for Mahalanobis distance can be established based on a probability estimate using the chi-square distribution. Because the short form of the survey did not contain all of the employee opinion items that the long form contained, Mahalanobis distance was computed on the 35 employee opinion items common to both the short and long forms of the survey. Following Tabachnick and Fidell's (2013) guideline, an alpha value of .001 was used (along with the degrees of freedom equal to the number of items) to compute the critical value, yielding a cut score of 66.62. Respondents whose Mahalanobis distance value exceeded the cutoff score were categorized as outliers and considered to have provided low-quality data. Respondents who were not categorized as outliers coded as having an outlier status of 0, and those who were outliers were given an outlier status of 1

Psychometric synonyms. Psychometric synonyms are pairs of items that are identified post hoc as being highly correlated (Meade & Craig, 2012). Respondents who consistently fail to give similar answers to items that are otherwise highly correlated in the sample are likely not responding carefully. Therefore, for the purposes of this study, item pairs with a correlation of .60 or stronger were considered psychometric synonyms, and a psychometric synonyms index was computed as the within person correlation between all such identified item pairs. Respondents with lower scores on this index were determined to have provided lower quality data. In order to facilitate comparisons between survey conditions, only employee opinion items common to both the long and short forms of the survey were considered for identification as psychometric synonyms.

Exploratory items. Two additional items were included to assess respondents' exposure to and attitudes toward survey progress bars. The first item asked respondents to use a no-yes scale to respond to the question: "Have you ever taken a survey that included a survey progress bar?" Those who replied in the affirmative were then asked, "When you take surveys, would you rather they have a survey progress bar or not?" Respondents answered this item by selecting between two available responses: "I would prefer not to have a survey progress bar" and "I would prefer to have a survey progress bar."

Results

Means, standard deviations, and correlations for all dependent variables can be found in Table 3. Table 4 shows the means, standard deviations, and sample sizes per condition.

Hypothesis 1: Attention and data quality. As shown in Table 3, the correlation between respondents' attention and their outlier status was not statistically significant. However, attention was significantly correlated with both instructed responses and psychometric synonym scores. Therefore, Hypothesis 1 was partially supported.

Hypothesis 2: Survey length and attention. Hypothesis 2 predicted that lengthy surveys would cause respondents to pay less attention. As shown in table 5, the average attention score for the longer survey was lower than the attention score produced by respondents who took the shorter survey. A one-tailed independent samples *t*-test revealed that, on average, people who took a long survey reported paying significantly less attention to the survey than respondents who took a shorter survey ($t(749)=4.07, p < .001, d=.30$). Thus, Hypothesis 2 was supported.

Hypothesis 3: Attention as a mediator for survey length. One of the reasons to examine the length-attention relationship is that decreased attention as a result of a long

survey could impact data quality. In order to evaluate hypothesis 3, Hayes' (2013) PROCESS macro was used to perform simple mediation analyses using ordinary least squares path analyses. The first step in mediation analysis is to establish that the independent variable is related to the mediator. This step was identical for all operationalizations of data quality. Further, because survey length is dichotomous, this value is simply the mean difference in attention for respondents in the short and long survey length conditions, and identical to hypothesis 2. Thus, a long survey resulted in respondents paying less attention to the survey ($a = -.33$).

The remaining steps for mediation were completed using a separate model for each operationalization of data quality. Confidence intervals reported are bias-corrected bootstrap confidence intervals based on 10,000 bootstrap samples. As can be seen in Tables 6-8, the attention respondents devoted to the survey was unrelated to outlier status ($b = -.04$); however attention improved data quality as measured by instructed response items ($b = .10$) and psychometric synonyms ($b = .15$). Through attention, survey length had significant indirect effects on both respondents' instructed response scores ($ab = -.03$, LLCI = $-.05$, ULCI = $-.02$) and psychometric synonyms ($ab = -.05$, LLCI = $-.07$, ULCI = $-.03$), but not on outlier status ($ab = .01$, LLCI = $-.10$, ULCI = $.12$). There was no evidence that survey length affected either psychometric synonyms ($c' = .03$, $p = .30$), or instructed response scores ($c' = .03$, $p = .07$) independent of its effects on attention. However, survey length did have a direct effect on respondents' outlier status ($c' = .71$, $p = .04$). Thus, Hypothesis 3 was partially supported.

Hypothesis 4: Survey progress bars and attention.

Hypothesis 4 tested whether or not the presence of a survey progress bar (SPB) would help respondents maintain attention on a survey. As shown by the mean values provided in Table 9, attention appeared slightly higher when respondents had a survey progress bar. However, a one-tailed independent samples *t*-test revealed that the presence of a SPB had no significant effect on the attention respondents devoted to a survey ($t(749) = -1.24, p = .11$). Hypothesis 4 was not supported.

Hypothesis 5: Attention as a mediator for survey progress bars. Hypothesis 5 stated that attention should mediate the relationship between the presence of a survey progress bar and data quality. Once again, because the presence of a survey progress bar is dichotomous, the first step in mediation analysis is identical to the test of Hypothesis 4. As a result of our failure to find support for Hypothesis 4, we also failed to meet the necessary preconditions for a hypothesis in which attention mediates the effects of the presence of a SPB on respondent data quality. Further one-tailed independent samples *t*-tests revealed no evidence for direct effects of exposure to a SPB on data quality. Hypothesis 5 was not supported.

Hypothesis 6: Moderated mediation hypothesis. Hypothesis 6 was designed to test whether or not the presence of a survey progress bar mitigate the indirect effect of length on data quality. As a pre-test to running a moderated mediation model we first tested to see whether the presence of a survey progress bar moderated the relationship between length and attention. No significant interaction was found ($\beta = -.09, t(747) = -.59, p = .56$), and as a result, conducting a test of moderated mediation is not appropriate. Thus, Hypothesis 6 was not supported.

Exploratory items. Of the total sample, 589 respondents had taken a survey with a survey progress bar present. Among those, 543 indicated that they would prefer to have a survey progress bar present while taking a survey.

Study 2

Introduction

Taken together, the results of Study 1 tentatively suggest that attentional deficits and concomitant data quality problems are relatively minimized for shorter surveys. However, longer surveys may be more susceptible to data quality problems due to attentional shortfalls, and survey progress bars may not be an effective way to address this problem. These findings led to two important decisions, prompting Study 2. First, the problem scope can be refined, to focus additional investigation particularly on longer surveys. Second, the problem scope can, in other ways, be expanded; there is a need to test additional interventions, beyond survey progress bars, for increasing attention and data quality during longer surveys.

Although Study 1 did not find significant effects for the survey progress bar (SPB) on attention and data quality, the decision was made to re-test the effects of the SPB in Study 2. There were two reasons for this decision. First, mean trends in Study 1 were in the expected direction, at least with respect to attention. Second, because very little research has looked at the effects of survey progress bars on attention and data quality, additional tests are warranted to determine whether Study 1's non-significant findings replicate to a new sample.

As noted above, the lack of significant results for SPBs in Study 1 also suggests the need to identify and test additional interventions for encouraging respondents to focus and produce high-quality data when taking longer surveys. One strategy that is sometimes employed is to disclose to respondents, up front, the amount of time it will take them to

complete the survey. Study 2 will investigate the effects of such disclosure. Similar to a survey progress bar, time disclosure at the outset of an online survey can potentially bolster attention and data quality by providing feedback to respondents regarding their progress toward the goal of survey completion. Assuming that respondents trust the survey sponsor's estimated time to survey completion, they can gauge their progress by looking at a clock or by relying on their "internal clock" – that is, their perception of the passage of time – to determine how close they are to finishing. Presumably, such feedback that one is progressing toward the goal of survey completion will help motivate the decision to allocate discretionary attentional resources to thoughtful survey response.

Hypothesis 7. Respondents who focus more attention on the survey will produce higher quality data.

Hypothesis 8. Exposure to a survey progress bar will cause respondents to focus more attention on the survey.

Hypothesis 9. Attention will mediate the effects of a survey progress bar on data quality

Hypothesis 10. Survey time disclosure will cause respondents to focus more attention on the survey

Hypothesis 11. Attention will mediate the effects of survey time disclosure on data quality.

Methods

Participants. As with Study 1, respondents for Study 2 were recruited using Amazon's Mechanical Turk system. All respondents were paid \$.20 for completing the survey, and no restrictions were enforced with respect to country of origin. As data quality

was, again, an outcome of interest, no penalty was assigned to those who provided low quality data. Respondents were 39.4% female and 22.8% Caucasian, 60.8% Asian (or Asian American), 4.3% African (or African American), 3.6% Hispanic, and 8.5% other ethnicities. Their mean age was 30.45 years ($SD = 8.78$). Respondents were predominantly from India (63.45%) and the United States of America (27.18%), with 9.37% residing in other countries.

Design and Procedure. Study 2 employed a 2x2 fully crossed design, and used the same paradigm and materials as Study 1. Once again, respondents' exposure to a survey progress bar was experimentally manipulated. The other independent variable, survey time disclosure, referred to whether or not respondents were given an estimate of the amount of time it would take them to complete the survey (no disclosures vs. disclosure). As in Study 1, after signing up for the study through Mechanical Turk, respondents were randomly assigned to a condition using a JavaScript routine.

On the informed consent screen, an extra sentence was included for respondents assigned to the disclosure conditions. It provided an estimate of time required to complete the survey, which was calculated as the average completion time from respondents in the long condition of Study 1. The sentence read: "Completing this survey takes most people about 33 minutes." Following informed consent, respondents in all conditions took the long version of the survey from Study 1. Those respondents in the SPB conditions took the survey with a SPB presented at the top of the page. The attention, data quality, and exploratory measures in Study 2 were identical to the ones used in Study 1.

Results

Overall means, standard deviations, and correlations for all dependent variables can be found in Table 10. Table 11 shows the means, standard deviations, and sample sizes per condition.

Hypothesis 7: Attention and data quality. As shown in Table 10, attention was significantly correlated with respondents' instructed responses, psychometric synonym scores, and outlier status. Therefore, Hypothesis 7 was supported.

Hypothesis 8: Survey progress bars and attention. Hypothesis 8 re-tested whether or not the presence of a SPB would help respondents maintain attention on a survey. As shown in Table 12, the means were in the expected direction, with respondents who completed the survey with a progress bar reporting higher attention than their counterparts who did not receive the progress bar. However, a one-tailed independent samples *t*-test testing the magnitude of this difference fell short of statistical significance ($t(1076) = -1.51, p = .07$). Hypothesis 4 was not supported.

Hypothesis 9: Attention as a mediator for survey progress bars. Hypothesis 9 sought to verify whether attention could mediate the effect of the presence of a survey progress bar on data quality. One of the preconditions for mediation is that the predictor (X) is related to the mediator (M). As explained in Hypothesis 8, the presence of a survey progress bar has no significant effect on attention, thus continuing with a mediation analysis was not appropriate. Hypothesis 9 was not supported.

Hypothesis 10: Survey length disclosure and attention. Hypothesis 10 tested whether or not survey length disclosure would help respondents pay more attention to the survey. Table 13 shows the average attention scores produced by respondents who did and did not receive a time estimate at the beginning of the survey. A one-tailed independent

samples *t*-test of the effects of survey length disclosure on attention was not significant due to the direction of hypothesis 10 ($t(1076) = 1.92, p = .03, d = .12$). As an additional check, the effect of the interaction between survey length disclosure and survey progress bars was tested and found to be non-significant ($\beta = -.11, t(1076) = -.80, p = .42$). Thus, Hypothesis 10 was not supported.

Hypothesis 11: Attention as a mediator for disclosure. Survey length disclosure was hypothesized to improve data quality by increasing the attention respondents focused on a survey. Given the failure of Hypothesis 10 it was unnecessary to continue with Hypothesis 11; however, these analyses were conducted for exploratory purposes. Once again, we used Hayes' (2013) PROCESS macro to conduct our mediation analysis. However, the first regression model that PROCESS runs for mediation is equivalent to a two-tailed independent samples *t*-test when the predictor is dichotomous, and given the directional nature of our hypothesis, this test is too conservative. Thus, the *p*-value of *a* reported in text and in Tables 14-16 is equivalent to a one-tailed independent samples *t*-test.

As shown in Tables 14-16, results of the mediation analysis indicate that disclosure causes respondents to focus less attention on a survey ($a = -.13$). Attention predicted data quality as operationalized by psychometric synonyms ($b = .39$), instructed responses ($b = .11$), and outlier status ($b = .11$). Through attention, disclosure had significant indirect effects on respondents' psychometric synonyms ($ab = -.01, LLCI = -.03, ULCI = -.0002$), instructed response scores ($ab = -.01, LLCI = -.03, ULCI = -.0001$), and outlier status ($ab = -.05, LLCI = -.15, ULCI = -.002$). There was no evidence that disclosure directly affected respondents data quality as measured by psychometric synonyms ($c' = -.04, p = .11$), instructed response scores ($c' = .01, p = .53$) and outlier status ($c' = -.35, p = .20$), independent of its effects on

attention. Though these results were statistically significant, they were in the opposite direction to those implied by the one-tailed t -test and specified in hypothesis 10. Thus, Hypothesis 11 was not supported.

Exploratory items. Of the total sample, 783 respondents had taken a survey with a survey progress bar present. Among those, 682 indicated that they would prefer to have a survey progress bar present while taking a survey.

Discussion

Careless responding is a popular area of inquiry for organizational researchers (Berry et al., 1992; Huang et al. 2012; Meade & Craig, 2012; Ward & Pond, 2015). Prior studies investigating careless responding have focused on developing methods for detecting it, or testing interventions designed to reduce its incidence. This paper extends that literature in two ways. First, we argued for the distinction between careless responding, as a failure of discretionary performance, and its consequent, data quality. Second, despite a growing body of research on careless responding, the antecedents for careless responding have largely been assumed. Thus, this study empirically tested three antecedents (survey length plus two interventions) in such a way that a mediating mechanism, attention, was explicitly included.

Consistent with assumptions made by previous researchers, across both studies attention influenced two out of the three indices of data quality. However, in contrast with earlier findings by Meade and Craig (2012), respondents' outlier status generally exhibited small or nonexistent relationships, both with attention and the other indices of data quality. One explanation for this discrepancy is that, in the current paper, Mahalanobis distance was computed based on the relatively small pool of employee opinion items that were in the short version of the survey from Study 1. As a measure of data quality, Mahalanobis' distance may

require a larger item pool in order to accurately identify careless responders. Additionally, outlier status was influenced by survey length. One possible reason for this effect is that the items on which Mahalanobis distance was based were presented contiguously for the short version of the survey, while in the long version of the survey they were dispersed throughout the remainder of the employee opinion items.

Despite explanatory power of attention, substantial variance in data quality remained unexplained. While this is likely partially related to some level of measurement error, a more comprehensive explanation is that attention is only the beginning of the process of responding to a survey item. Researchers studying the response process typically view it as a collection of interrelated tasks, namely; comprehension, retrieval, judgment, and response (Schwarz, 2007; Tourangeau, Rips & Rasinski, 2000). The construct domain for careless responding likely spans comprehension, retrieval, and some part of the judgment domain. Attention and effort, as discretionary aspects of performance, likely play an important role during tasks or stages of the response process that correspond to careless responding. On the other hand, faking and socially desirable responding seem to pertain mostly to the judgment and response domains. It may be that faking, socially desirable responding, poorly worded items and answer options, and other issues may cause declines in data quality even if a respondent diligently completes the first stages of the response process.

In terms of antecedents to both attention and data quality, survey length, the presence of a survey progress bar, and average survey time disclosure were experimentally manipulated. A long survey resulted in lower data quality for all three operationalizations of data quality. For instructed responses and psychometric synonyms, attention did serve as the psychological mechanism through which survey length influenced data quality. These

findings suggest that wavering attention and its consequent data quality problems are particularly worthy of consideration as surveys increase in length. In contrast, attention and data quality, while still important, may be less of a concern when shorter surveys are used.

An examination of the uneven sample sizes in Study 1 raises an additional consideration. Although survey attrition was not a focus of the current study, it is an important factor when considering the integrity of a survey data collection effort. As shown in Table 5, 441 respondents completed the short survey, and only 310 completed the longer survey. It is possible that this discrepancy is due to random assignment. However, this study only analyzed data for respondents who completed the survey; therefore, while not measured, the discrepancy may be attributable to attrition rather than random assignment, suggesting that longer surveys not only adversely affect data quality through attention, but they may also affect attrition in undesirable ways.

Across both studies, survey progress bars failed to demonstrate any statistically significant effects on attention. Additionally, they also had no direct effects on subsequent data quality. In Study 2, survey length disclosure may have even caused slight declines in attention and subsequent data quality. One explanation for these findings is that information that makes progress salient may be used by respondents to monitor their perceived burden (Crawford, Cooper, & Lamias, 2001). These considerations may distract respondents' attention away from the survey, negating possible benefits bounding the task might have. For example, as these interventions make salient the amount of time being spent completing a survey, respondents may begin to feel that finishing the survey requires more effort than they intended to commit when they agreed to complete a survey. As a result, they may also feel taken advantage of, giving rise to concerns about justice and trust. Alternatively, as people

often complete surveys as part of a higher-order goal (e.g., making money or benefitting their work organization), they may come to believe that their higher-order goal could be better accomplished by pursuing a different task. In such a cases, an unwillingness to abandon effort already invested could lead some respondents' to finish the survey as quickly as possible rather than dropping out.

Despite the survey progress bar's failure to significantly influence attention or data quality, there may still be reasons to include one in future surveys. For example, in one prior unpublished study, the presence of SPBs was shown to increase respondent enjoyment of a survey (Yentes et al., 2012). Corroboration of this result was found in each of the current studies, as respondents indicated they would prefer to have a survey progress bar present when completing surveys. As data quality and response rates are concerns for every researcher who collects data using surveys, any tool that makes the survey process more enjoyable to respondents is worth considering for the good will it may foster. That said, such a decision may come with a cost, as some studies have found that the presence of a survey progress bar can increase survey attrition (Crawford, Couper, & Lamias, 2001; Matzat, Snijders, & van der Horst, 2009)

Limitations and Future Research Directions. The scope of any study is necessarily bounded, imposing limitations on our learning and the generalizability of the results. One limitation for this study is that survey respondents were paid specifically to complete the survey. Survey completion was, in a sense, a "job requirement." In some settings, responding to a survey may not be an explicit job requirement. Thus, completing a survey may often be a form of organizational citizenship behavior. As a result, respondents in this study may have been more diligent than usual in responding, leading to less variation in data quality than

might be present with an employee survey. That said, there are no small number of researchers in the social and behavioral sciences using Mechanical Turk for data collection. The results of this study are especially relevant to that context.

Another limitation of this study pertains to generalizability. The items we examined for data quality were all measured on a Likert-type scale. Surveys using predominantly free response, or some other type of item may function differently. Similarly, the survey progress bar used in this study is only one form of survey progress bar, and many other types exist with respect to appearance and how progress is calculated. Additionally, we did not attempt to distinguish between mobile respondents and those completing the survey on a more traditional computer. Further research may very well yield different results when these issues are incorporated into the study design.

Future studies in this area would benefit from better measurement of attention. As a measure of attention, Meade and Craig's (2012) scale may create some contamination of the construct, which could have attenuated some of the relationships between study variables. Unfortunately, validated measures of state attention suitable for use in an online survey context are lacking. In the same vein, state attention could be measured in a laboratory setting with an eye tracker or physiological measures. Such improvements would likely yield a stronger observed relationship between critical study variables.

Another direction for future research is to expand our understanding of the causes and mechanisms that influence data quality. In this study, survey progress bars failed to influence attention or data quality. Even when accounting for length, disclosure, and attention, substantial variance in data quality remains unaccounted for. Thus further work could focus

on identifying additional psychological mechanisms and other interventions that influence data quality.

Conclusions

Careless responding is a concern among researchers using online surveys. When careless responding is recognized as a failure of discretionary performance, goal setting theory provides useful perspective on the nomological network surrounding it. The present studies suggest that, consistent with common ideas about best practice, in order to obtain high-quality data, surveys should be kept short whenever possible. When short surveys are not possible, neither survey progress bars nor survey time disclosure should be relied upon to protect data quality from the effects of careless responding. Finally, while survey respondents prefer the inclusion of a survey progress bar, researchers who would include one must weigh the benefits against the likelihood that doing so may increase survey attrition.

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Table 1
Employee opinion measures

Construct	# of items	Citation
Perceived Organizational Support	36 (5)	Eisenberger et al., 1986
Work Locus of Control	16 (3)	Spector, 1988
Job Satisfaction	36 (4)	Spector, 1985
Organizational Commitment	24 (3)	Allen & Meyer, 1990
Job Characteristics	30 (7)	Sims et al., 1976
Organizational Culture	53 (8)	O'Reilly, Chatman, & Caldwell, 1991
Work Engagement	17 (5)	Schaufeli et al., 2002

Note. Numbers in parentheses indicate the number of items included in the short version of the survey.

Table 2
Diligence items from Meade & Craig (2012)

Items
Im in a hurry right now (R)
This survey was too long (R)
I was dishonest on some items (R)
I put forth my best effort in responding to this survey
I carefully read every survey item
I rushed through this survey (R)
I didn't give this survey the time it deserved (R)
I could've paid closer attention to the items than I did (R)
I probably should have been more careful during this survey (R)

Note. Items marked with an (R) were reverse coded

Table 3
Correlations between dependent variables in Study 1

Variables	Mean	SD	1	2	3	4
1. Attention	5.82	1.09	-			
2. Instructed responses	.93	.22	.47**	-		
3. Psychometric synonyms	.49	.46	.37**	.25**	-	
4. Outlier status	.05	.21	-.02	-.11**	-.09**	-

Note. ** $p < .01$

Table 4

Means, standard deviations, and sample sizes by condition for study 1

	Short		Long	
	No SPB <i>n</i> =209	SPB <i>n</i> =232	No SPB <i>n</i> =165	SPB <i>n</i> =145
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Attention	5.89 (1.12)	6.01 (1.14)	5.61 (1.05)	5.64 (0.97)
Instructed responses	.92 (.23)	.94 (.22)	.93 (.22)	.92 (.22)
Psychometric synonyms	.51(.44)	.50 (.47)	.51 (.45)	.45 (.46)
Outlier status	.03 (.17)	.04 (.19)	.06 (.24)	.08 (.27)

Note: SPB stands for survey progress bar

Table 5
Dependent variable means for participants in short and long survey conditions

	Short ^a		Long ^b	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Dependent variable				
Attention	5.95	1.13	5.63	1.01
Instructed responses	.93	.22	.93	.22
Psychometric synonyms	.50	.46	.49	.46
Outlier status	.03	.18	.07	.25

Note. (a) $n = 441$ (b) $n = 310$

Table 6
Model coefficients for the effects of survey length on instructed responses

Antecedent	Consequent							
	M(Attention)			Y(Instructed responses)				
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
X(Survey length)	<i>a</i>	-0.33	0.08	< .001	<i>c'</i>	0.03	0.01	.07
M(Attention)		-	-	-	<i>b</i>	0.10	0.01	< .001
Constant	<i>i₁</i>	5.95	0.05	< .001	<i>i₂</i>	0.36	0.04	< .001
$R^2 = .02$				$R^2 = .23$				
$F(1,749) = 16.57, p < .001$				$F(2, 748) = 110.64, p < .001$				

Table 7
Model coefficients for the effects of survey length on psychometric synonyms

Antecedent	Consequent							
	M(Attention)			Y(Psychometric synonyms)				
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
X(Survey length)	<i>a</i>	-0.33	0.08	< .001	<i>c'</i>	0.03	0.03	.30
M(Attention)		-	-	-	<i>b</i>	0.15	0.01	< .001
Constant	<i>i₁</i>	5.95	0.05	< .001	<i>i₂</i>	-0.41	0.09	< .001
$R^2 = .02$				$R^2 = .13$				
$F(1,749) = 16.58, p < .001$				$F(2, 748) = 57.99, p < .001$				

Table 8

Model coefficients for the effects of survey length on outlier status

Antecedent	Consequent							
	M(Attention)			Y(Outlier status)				
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
X(Survey length)	<i>a</i>	-0.33	0.08	< .001	<i>c'</i>	0.71	0.28	.04
M(Attention)		-	-	-	<i>b</i>	-0.04	0.16	.80
Constant	<i>i₁</i>	5.95	0.05	< .001	<i>i₂</i>	-4.76	0.75	< .001
$R^2 = .02$				Pseudo $R^{2*} = .02$				
$F(1,749) = 16.57, p < .001$				$-2LL = 284.47, n = 751$				

Note. *Pseudo R^2 reported is from McFadden (1974)

Table 9
*Dependent variable means for respondents with and without a SPB
 in Study 1.*

Dependent Variable	SPB			
	No SPB ^a		SPB ^b	
	<i>m</i>	<i>SD</i>	<i>m</i>	<i>SD</i>
Attention	5.77	1.10	5.87	1.09
Instructed responses	.93	.22	.93	.22
Psychometric synonyms	.51	.45	.48	.46
Outlier	.04	.20	.05	.21

Note: SPB stands for survey progress bar. (a) $n = 374$ (b) $n = 377$

Table 10
Correlations between dependent variables in study 2

Variables	<i>M</i>	<i>SD</i>	1	2	3	4
1. Attention	5.04	1.10	-			
2. Instructed responses	.84	.31	.40**	-		
3. Psychometric synonyms	.37	.39	.30**	.28**	-	
4. Outlier status	.05	.22	.09**	-.01	.00	-

Note. ** $p < .01$

Table 11

Means, standard deviations, and sample sizes by condition for study 2

	No disclosure		Disclosure	
	No SPB <i>n</i> =272	SPB <i>n</i> =284	No SPB <i>n</i> =271	SPB <i>n</i> =251
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Attention	5.03 (1.10)	4.96 (1.08)	5.18 (1.06)	5.00 (1.14)
Instructed responses	.84 (.32)	.83 (.30)	.85 (.29)	.82 (.33)
Psychometric synonyms	.39 (.40)	.37 (.37)	.40 (.39)	.32 (.40)
Outlier status	.08 (.27)	.05 (.20)	.04 (.21)	.04 (.20)

Note: SPB stands for survey progress bar.

Table 12
*Dependent variable means for participants with and without a SPB
 in Study 2*

Dependent Variable	SPB			
	No SPB ^a		SPB ^b	
	<i>m</i>	<i>SD</i>	<i>m</i>	<i>SD</i>
Attention	5.00	1.09	5.10	1.10
Instructed Response	.84	.31	.84	.31
Psychometric Synonyms	.38	.39	.36	.40
Outlier Status	.06	.24	.04	.20

Note. SPB stands for survey progress bar. (a) $n= 556$ (b) $n= 522$

Table 13
Dependent variable means for participants in no disclosure and disclosure survey conditions

Dependent Variable	No Disclosure ^a		Disclosure ^b	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Attention	5.11	1.08	4.98	1.11
Instructed response	.85	.30	.83	.31
Psychometric synonyms	.40	.39	.35	.39
Outlier status	.06	.24	.04	.20

Note. (a) $n= 543$ (b) $n= 535$

Table 14

Model coefficients for the effects of disclosure on instructed responses

Antecedent	Consequent							
	M(Attention)			Y(Instructed responses)				
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
X(disclosure)	<i>a</i>	-0.13	0.07	< .05	<i>c'</i>	-0.01	0.02	.53
M(Attention)		-	-	-	<i>b</i>	0.11	0.01	< .001
Constant	<i>i₁</i>	5.11	0.05	< .001	<i>i₂</i>	0.27	0.04	< .001
$R^2 = .003$				$R^2 = .40$				
$F(1,1076) = 3.68, p < .05$				$F(2, 1075) = 104.71, p < .001$				

Table 15

Model coefficients for the effects of disclosure on psychometric synonyms

Antecedent	Consequent							
	M(Attention)			Y(Psychometric synonyms)				
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
X(disclosure)	<i>a</i>	-0.13	0.07	< .05	<i>c'</i>	-0.04	0.02	.11
M(Attention)		-	-	-	<i>b</i>	0.11	0.01	< .001
Constant	<i>i₁</i>	5.11	0.05	< .001	<i>i₂</i>	-0.14	0.06	< .001
$R^2 = .003$				$R^2 = .09$				
$F(1,1076) = 3.68, p < .05$				$F(2, 1075) = 54.04, p < .001$				

Table 16
Model coefficients for the effects of disclosure on outlier status

Antecedent	Consequent							
	M(Attention)			Y(Outlier status)				
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
X(disclosure)	<i>a</i>	-0.13	0.07	< .05	<i>c'</i>	-0.36	0.28	.20
M(Attention)		-	-	-	<i>b</i>	0.39	0.13	< .01
Constant	<i>i₁</i>	5.11	0.05	< .001	<i>i₂</i>	-4.76	0.75	< .001
$R^2 = .003$				Pseudo $R^{2*} = .0047$				
$F(1,1076) = 3.68, p < .05$				$-2LL = 443.98, n = 1078$				

Note. Pseudo R^2 reported is from McFadden (1974)_

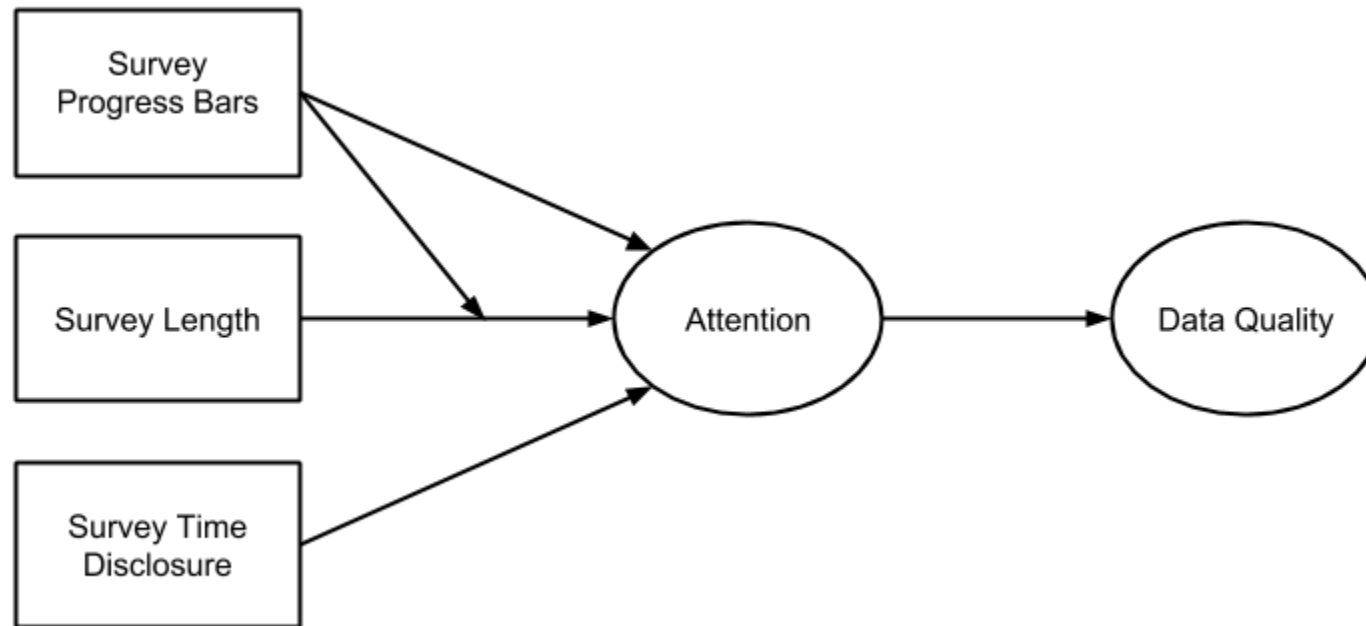


Figure 1. Conceptual model of the hypotheses investigated in the current paper.

APPENDIX

Staving Off Survey Fatigue: The Role of Survey Progress Bars

by
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Staving off survey fatigue: The role of survey progress bars

Online surveys are used by organizational researchers for a variety of purposes. Although they may differ in their reasons for conducting them, researchers commonly use the data they obtain from online surveys to make important theoretical and practical decisions. Decisions made in this manner can only be as good as the data on which they are based, making considerations of data quality in online surveys important to researchers in nearly every field. Of specific importance is the investigation of factors that lead to low data quality from online surveys, and how these factors can be mitigated or avoided. For example, research has documented that participants completing lengthy surveys often begin to respond carelessly to survey items after a period of time (Berry et al., 1992; Meade & Craig, 2012). This phenomenon, which is sometimes referred to as survey fatigue, is likely related to waning attention on the part of survey respondents (Meade & Craig, 2012). In view of the importance of data quality, this area of inquiry merits further investigation. The purpose of this study is to empirically examine the relationship between attention and data quality, as well as the factors that may facilitate the collection of high quality data by encouraging attention. In particular, the effects of survey progress bars will be investigated.

Attention

Attention is a state in which elements from short term memory are the focus of conscious consideration (Cowan, 1996). When stimuli cause arousal attention may be directed to them automatically, but attention can also be directed effortfully, as is likely the case when completing an online survey (Kahneman, 1973). A large body of research on attention indicates that higher levels of attention focused on a task are associated with increased task performance, while having attention divided among several tasks is usually

associated with decreased task performance (Cowan, 1988). When taking an online survey, the task assigned to participants is not mere survey completion, but also to provide responses that are the result of careful consideration of the survey prompts or questions. Consequently, the relationship between attention and data quality in online surveys should closely mirror that of attention and task performance in broader literature. No prior work in the survey research domain has investigated this proposition to date.

Hypothesis 1: Higher levels of attention focused on a survey task will be associated with higher data quality.

Because ensuring that respondents maintain focused attention is arguably critical to collecting high quality data from online surveys there is theoretical and practical value in understanding the conditions that facilitate or impede attention to survey tasks. Factors of potential relevance include: the presence (or absence) of a survey progress bar, whether or not the expected duration of the survey is disclosed to participants, and survey length.

Survey Progress Bars

A survey progress bar is a dynamic, graphical representation of the portion of a survey that has been completed by a participant, and how much yet remains (Yentes, Toaddy, Thompson, Gissel, & Stoughton, 2012). As such, survey progress bars can be considered a feedback intervention, which is defined by Kluger and DeNisi (1996) as “actions taken by an external agent to provide information regarding some aspect of one’s task performance” (p. 255).

Whether progress bars motivate effort in the context of an online survey remains an open question; however, several well researched theories of motivation argue that feedback

serves an important role in motivational processes. For example, both goal-setting theory (Locke & Latham, 1990) and the Job Characteristics Model (Hackman, Oldham, Janson, & Purdy, 1975) regard feedback as a variable of interest in self-regulation, but neither explains exactly how feedback works to sustain motivation. Some others have suggested that attention is the key, such that the effortful direction of attention to a task is influenced by feedback (Kahneman, 1973; Kanfer & Ackerman, 1989). Therefore, when included in an online survey, a survey progress bar should provide feedback that can help facilitate attention.

Although a limited amount of research has investigated the effects of progress bars on survey completion rates (Crawford, Couper, & Lamias, 2001; Matzat, Snijders, & van der Horst), no published work has examined their effects on attention and data quality. This is notable because survey progress bars are readily available in most common survey administration platforms and have, at times, been recommended as best practice (Dillman, 2007; Dillman, Tortora, & Bowker, 1998); however, their effects remain largely untested, raising questions about whether their inclusion is justifiable.

A strong theoretical argument based on the ego depletion literature helps explain why feedback, in the form of a survey progress bar, could be expected to facilitate attention and data quality. The term *survey fatigue* implies that participants lose the ability to respond to survey items diligently, at least for a time. As a result, survey fatigue can be thought of as a state of ego depletion. The term *ego depletion* refers to a temporary reduction in a person's capacity for self-regulation as a result of previous or prolonged self-regulation (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Because people are limited in their capacity for self-regulation the term *willpower* is often used to refer to the resource that is consumed by self-

regulatory behavior. In order to maintain attention while completing surveys respondents must expend willpower to screen out external distractions and thoughts that are unrelated to the survey. Thus, if respondents completely exhaust their reserves of willpower while taking an online survey they would almost certainly provide lower quality data.

In most cases respondents are unlikely to encounter this scenario during online surveys because humans tend to act to conserve willpower unless their motivation to complete a task is high (Muraven, 2003). This finding is consistent with Hobfoll's (1989) conservation of resources (CoR) Theory. According to CoR theory individuals seek to amass reserves of resources, in this case willpower, and avoid wasting them. This can become problematic for organizational researchers. Many online surveys provide respondents little or no feedback regarding their progress toward completion. As a result respondents may have little understanding of the extent to which their survey related efforts (i.e., expended willpower) have been efficiently converted into progress toward completion of the survey. Because of this lack of information respondents may become concerned that their efforts have been wasted or are highly inefficient. This can reduce their willingness to continue expending their limited willpower resources, which are necessary to properly focus attention on the online survey. When this occurs the presence of external distractions and thoughts not related to the survey task may lead to attentional resources being divided between the survey and distractions, resulting in lower data quality.

The presence of a survey progress bar should help prevent respondents from reducing the allocation of willpower to the survey task by providing them with evidence of returns on their investment of willpower in the form of feedback, which communicates to respondents

that their expenditure of willpower has resulted in meaningful progress toward the completion of the survey. This effect is dependent upon respondents' perception that their self-regulatory effort is not being wasted. This means that only respondents who deem the progress shown in the survey progress bar to be sufficient enough to justify their expended willpower should feel willing to continue expending willpower on the survey task, thus providing higher quality data.

Hypothesis 2: The presence of a survey progress bar will (a) increase data quality, and (b) this effect will be mediated by attention focused on the survey.

In order to more fully explore this effect it is useful to examine conditions that are expected to enhance or attenuate it. Two conditions worthy of consideration are survey length and whether or not respondents are informed of the survey's expected duration.

Survey Length

As noted, survey fatigue has mostly been observed in surveys that take a relatively long time to complete and have many items (Berry et al., 1992; Meade & Craig, 2012). This makes sense when viewed in terms of the ego depletion literature. Respondents presumably begin a survey task with a certain amount of determination to finish it, and when they have only negligibly engaged in self-regulatory behavior. In the absence of a survey progress bar it is likely that a certain period of time must pass before respondents begin to experience ambiguity as to whether the effort they have expended maintaining attention has been fruitful or wasted. Thus in shorter online surveys there may be no difference between a group exposed to a survey progress bar and a group without one because the survey does not take enough time for respondents to experience the ambiguity that causes them to reduce their

self-regulatory efforts. Further, once respondents do reach this point, those without a survey progress bar will have to expend additional willpower to screen out doubts about the effectiveness of their self-regulatory efforts. These effects should combine to cause the presence of a survey progress bar to be more effective at increasing data quality in longer online surveys rather than shorter online surveys.

Hypothesis 3: Survey length will moderate the effects of a survey progress bar on (a) attention and (b) data quality such that the effects of a survey progress bar will be greater for a longer survey compared to a shorter one.

Disclosure of Expected Survey Duration

In addition to including a survey progress bar, some surveys begin by disclosing to respondents an estimate of the survey's expected duration. Such disclosure represents an alternative intervention that is also expected to cause respondents to be more willing to continue devoting willpower in order to attend to the survey task. In this case respondents track their progress in relation to the expected duration of the survey, using either an internal representation of how much time has elapsed (e.g., mental clock) or an external representation such as a watch. Assuming respondents are willing to devote the specified amount of time to completing the survey, they will likely not begin to question whether or not the willpower they expend is wasted unless they perceive that they have spent (or are likely to spend) more time on the task than it was supposed to take. Therefore, disclosing a survey's expected duration to respondents is thought to create an effect that operates through the same mechanism as a survey progress bar, that is, by assuaging concerns of wasted effort

and increasing the likelihood that respondents will continue to expend willpower in order to focus on the survey task.

Accordingly, the presence of a survey progress bar is expected to have a greater impact when respondents have not been informed of the expected duration of the survey. Said differently, when included together, disclosing the estimated survey length will likely capture some of the variance normally attributable to a survey progress bar, thus decreasing its effectiveness.

Hypothesis 4: Disclosure of the expected duration of a survey will moderate the effects of a survey progress bar on (a) attention and (b) data quality such that the effects of a survey progress bar will be greater in surveys that do not disclose their expected duration to respondents.

Survey Progress Bar vs. Disclosure of Expected Survey Duration

Survey progress bars and disclosing the expected survey duration are both thought to increase the likelihood that respondents will maintain focused attention on a survey. They are thought to do this by providing respondents with knowledge about their progress toward completion of the survey. If they do, in fact, operate through the same mechanism it is reasonable to question whether one intervention is more effective than the other at facilitating attention to online surveys.

While both interventions give information about progress toward completion of the survey, the information conveyed by a survey progress bar is more accessible to respondents because it is calculated by the computer and depicted graphically for respondents. In contrast, if the information provided by disclosing the expected duration of a survey to respondents is

to be useful, then respondents must take attention away from the survey to calculate the proportion of the estimated time that has elapsed. This loss of attention is likely to result in diminished data quality. If true, this would be consistent with previous research suggesting that the less a feedback intervention draws respondents' attention away from a task the more effective it is at facilitating performance (Kluger & DeNisi, 1996).

Additionally, even when respondents are told the expected duration of a survey, their perception of progress may be inaccurate if their perception of the time they have spent completing the survey is inaccurate. Recent research suggests that participants engaged in tasks involving self-regulation will tend to overestimate the amount of time that has passed (Vohs & Schmeichel, 2003). Therefore, one way respondents may come to have an inaccurate perception of time spent on the survey is if they do not check a clock before beginning, or if they rely entirely upon their own mental estimate of how much time has elapsed.

Finally, survey progress bars frequently use the proportion of items completed in order to calculate progress. As such the information about progress it conveys to respondents is related to how much work they have actually done, whereas estimates of progress derived from the disclosure of a survey's expected duration is influenced by how long it takes the average person to complete a survey. Therefore, survey progress bars should be more effective at facilitating attention and data quality than disclosing a survey's expected duration.

Hypothesis 5: Survey progress bars will have a larger effect than disclosing the survey's expected duration on (a) attention and (b) data quality.

Method

Participants

Participants were recruited using Amazon's Mechanical Turk system. Mechanical Turk is a service that allows researchers to post human intelligence tasks (HITs), which are then completed by workers in return for compensation. Each worker who successfully completed the study was given \$1.00. Because data quality is one of the outcomes of interest for this study, no penalty was assigned to those who provided poor quality data. The study was restricted to workers currently residing within the United States of America.

Participants were XX.XX% female and XX.XX% Caucasian, XX.XX% African American, XX.XX% Hispanic, and XX.XX% other ethnicities. Their mean age was XX.XX (SD = X.XX).

Design and Procedure

This study employed a 2x2x2 fully crossed design. The independent variables that were manipulated include: the presence or absence of a survey progress bar (SPB); disclosure, or lack thereof, of the survey's expected duration; and survey length (long vs. short). Dependent variables included a measure of attention adapted from Meade and Craig (2012), and three separate indices of data quality computed using instructed response items, Mahalanobis distance, and psychometric synonyms.

After signing up for the study on Amazon's Mechanical Turk system participants followed a link to the study site. There they were led to believe that the purpose of the study was for them to complete an assessment of their personality. After giving informed consent a JavaScript routine embedded within the website

randomly assigned participants to one of the eight experimental conditions, forwarding their browser to the appropriate version of the survey. Just prior to starting the survey itself participants in the duration disclosure conditions were shown a page with a brief message disclosing an estimate of the survey's expected duration. The specific estimate disclosed to participants was equivalent to the average time it took for a pilot group to complete the survey, and differed depending on the survey length condition to which they were assigned. Those in the short condition receiving an estimate of XX minutes, while those in the long condition received an estimate of XX minutes.

Participants then began the actual survey, where those in the SPB condition were exposed to a survey progress bar depicting their progress at the top of survey page. The survey progress bar displayed to participants was rectangular in shape and filled from left to right. It also included text indicating the percentage of the total survey items that participants had completed. Participants in the non-SPB condition simply saw the survey.

The survey consisted of two parts. In the first part participants responded to survey items from the International Personality Item Pool (IPIP) Five-Factor Model personality measure (Goldberg, 1999) using a seven-point Likert-type scale with anchors at "*strongly disagree*" and "*strongly agree*." Depending upon their survey length condition participants were either exposed to the full 300-item measure (Appendix A), or the mini-IPIP, a 20 item measure (Appendix B) based on the 50 item short form of the IPIP Five Factor Model (Donnellan, Oswald, Baird, & Lucas,

2006). No specific study hypotheses were addressed using the constructs assessed by these personality measures. Following completion of the personality measure participants in all conditions were interrupted with a screen displaying the message “The following items will ask about your attention during the first part of the survey. Please respond as truthfully as possible as they are critical to this study. Your compensation will not be affected by your responses to these items.” Then, all participants completed the same second portion of the survey, which included an attention measure followed by items addressing the demographic qualities of the sample.

In terms of format, the survey contained 15 items per page, to which participants responded using radio buttons. Participants were not allowed to skip items, and upon completing a page of items and clicking the button to advance to the next page participants were not permitted to return to previous pages of the survey.

Measures

Data quality. Data quality was assessed using both instructed response items and two indices of careless responding adapted from Meade and Craig (2012), namely: Mahalanobis distance and psychometric synonyms.

Instructed response items. Instructed response items are items inserted into the normal flow of a survey that prompt a participant to reply with a specific response (e.g., “please respond with strongly agree for this item”). Each instructed response item was scored as either “0” for answering incorrectly, or “1” for a correct response. A total of three instructed response items were included and a total score was computed as the proportion of instructed

response items answered correctly. Participants with low scores on this index will be considered to have provided low quality data.

Mahalanobis distance. Mahalanobis distance is a multivariate statistic that is used to detect outliers. It is determined by calculating the multivariate distance between two vectors, in this case a participant's vector of item responses and the vector of item means. Recent research has found Mahalanobis distance to be effective in detecting participants who are responding in a careless or random manner (Ehlers, Greene-Shortridge, Weekley, & Zajack, 2009; Meade & Craig, 2012). Thus, a Mahalanobis distance was calculated for each participant based on their responses to the personality items they responded to. As Ehlers et al. (2009) mentioned a cut score for Mahalanobis distance can be based on a probability estimate using a chi-square distribution. Because the number of personality items each participant responded to varied based on their survey length condition, a separate cut score was computed for each group. Following Tabachnick and Fidell's (2013) guideline, an alpha value of .001 was used along with the degrees of freedom (equal to the number of personality items answered) for this calculation, yielding cut scores of 45.31 and 381.43 respectively for participants in the short and long survey length conditions. Participants whose Mahalanobis distance value exceeded the cutoff score were treated as outliers and considered to have provided low quality data.

Psychometric synonyms. Psychometric synonyms are pairs of items that are identified post hoc as being highly correlated. Participants who consistently fail to respond with similar answers to items that are otherwise highly correlated in the sample are likely not responding carefully. Therefore, for the purposes of this study item pairs with a correlation of .60 or

stronger will be considered psychometric synonyms, and a psychometric synonyms index will be computed as the within person correlation between all such identified item pairs. Participants with lower scores on this index will be considered to have provided lower quality data.

Attention. Attention was operationalized using a sub-set of four items (Appendix C) from Meade and Craig's (2012) Diligence subscale (Chronbach's coefficient alpha = .81). Participants responded to each item using a seven-point Likert-type scale with anchors at "*strongly disagree*" and "*strongly agree*." An example item was "I carefully read every survey item."

Proposed Analyses

Hypothesis 1. In order to address hypothesis 1 two Pearson's r correlations will be computed between attention and each of the two continuous operationalizations of data quality (i.e., instructed response items and psychometric synonyms). A point-biserial correlation will be used to assess the relationship between attention and the dichotomous operationalization of data quality (Mahalanobis distance). If all three correlations are positive and statistically significant hypothesis 1 will be fully supported.

Hypothesis 2a. Hypothesis 2a will be evaluated two separate analyses. A one-way multivariate analysis of variance will be conducted using the presence of a survey progress bar as the independent variable and the two continuous operationalizations of data quality (i.e., instructed response items and psychometric synonyms) as dependent variables. Additionally, a chi-squared test will be used to determine whether the presence of a survey progress bar decreases the likelihood that participants will have a high enough Mahalanobis

distance to be flagged as an outlier. To the extent that the presence of a survey progress bar results in statistically significant improvements in each operationalization of data quality hypothesis 2a will be supported.

Hypothesis 2b. Hypothesis 2b will be evaluated using Baron and Kenny's (1986) method to test for mediation. First, the presence of a survey progress bar must be shown to be related to both attention and data quality through the use of two separate regression analyses. An additional regression must demonstrate that attention is related to data quality. Finally, in order to conclude that attention mediates the relationship between the presence of a survey progress bar and data quality, an additional regression equation must demonstrate that the relationship between the presence of a survey progress bar and data quality is non-significant once the affects of attention on data quality are controlled for. A separate test of this hypothesis will be conducted with each operationalization of data quality. However, the third test was slightly different than the first two in that it utilized Baron and Kenny's rules in conjunction with a logistic regression in order to properly examine the mediational model with a dichotomous dependent variable (Mahalanobis distance). Hypothesis 2b will be strongly supported if the test for mediation is successful with each of the three operationalizations of data quality.

Hypothesis 3a and 3b. A path model will be estimated using Preacher, Rucker, and Hayes's (2007) SPSS macro for testing moderated mediation hypotheses. This will test the degree to which the survey progress bar's effect on data quality, mediated through attention, varies by survey length. A separate model will be run with each operationalization of data quality. As in hypothesis 2b, the model utilizing Mahalanobis distance as the dependent

variable will be modified to incorporate a logistic regression. If each of these models are significant, they will support hypotheses 3a and 3b.

Hypotheses 4a and 4b. Hypotheses 4a and 4b will be evaluated using the same method as hypotheses 3a and 3b, except in this case it will test disclosure of the survey duration rather than survey length as a moderator of the survey progress bar's effect on attention and subsequent data quality. A separate model will be run with each operationalization of data quality. If these models are significant, they will support hypotheses 3a and 3b.

Hypothesis 5a. In order to address hypothesis 5a t-test for two independent samples will be conducted, comparing the attention scores of those randomly assigned to the survey with a progress bar and no disclosure of the survey's duration with the attention scores of those randomly assigned to the survey with no progress bar but the expected duration disclosed. Support for hypothesis 5a will be obtained if those in the survey progress bar condition produce significantly higher attention scores.

Hypothesis 5b. Hypothesis 5b will be tested using two separate analyses. First, a 2x2 multivariate analysis of variance (MANOVA) will be conducted using the presence of a survey progress bar and whether or not the survey's expected duration was disclosed as independent variables, and the two continuous operationalizations of data quality (i.e., instructed response items and psychometric synonyms) as dependent variables. Assuming the omnibus MANOVA is statistically significant, this analysis will be followed by univariate ANOVAs. Full support for hypothesis 5b will be shown if the two conditions significantly differ such that those assigned to the survey progress bar condition provide higher quality data on both metrics. Next, Mahalanobis distance will be entered as the dependent variable in

a chi-square analysis including the presence of a survey progress bar and disclosure of expected survey duration as predictors. Further support for hypothesis 5b will be garnered if the chi-square analysis indicates that those who received the survey progress bar but were not told the expected survey duration are significantly less likely to be flagged as outliers compared to their counterparts who were told the expected survey duration but did not receive a survey progress bar.

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300 Item International Personality Item Pool (IPIP) personality inventory

Factor	Item	Coding
Neuroticism		
Anxiety	Worry about things.	+
	Fear for the worst.	+
	Am afraid of many things.	+
	Get stressed out easily.	+
	Get caught up in my problems.	+
	Am not easily bothered by things.	-
	Am relaxed most of the time.	-
	Am not easily disturbed by events.	-
	Don't worry about things that have already happened.	-
	Adapt easily to new situations.	-
Anger	Get angry easily.	+
	Get irritated easily.	+
	Get upset easily.	+
	Am often in a bad mood.	+
	Lose my temper.	+
	Rarely get irritated.	-
	Seldom get mad.	-
	Am not easily annoyed.	-
	Keep my cool.	-
	Rarely complain.	-
Depression	Often feel blue.	+
	Dislike myself.	+

	Am often down in the dumps.	+
	Have a low opinion of myself.	+
	Have frequent mood swings.	+
	Feel desperate.	+
	Feel that my life lacks direction.	+
	Seldom feel blue.	-
	Feel comfortable with myself.	-
	Am very pleased with myself.	-
Self-consciousness	Am easily intimidated.	+
	Am afraid that I will do the wrong thing.	+
	Find it difficult to approach others.	+
	Am afraid to draw attention to myself.	+
	Only feel comfortable with friends.	+
	Stumble over my words.	+
	Am not embarrassed easily.	-
	Am comfortable in unfamiliar situations.	-
	Am not bothered by difficult social situations.	-
	Am able to stand up for myself.	-
Immoderation	Often eat too much.	+
	Don't know why I do some of the things I do.	+
	Do things I later regret.	+
	Go on binges.	+
	Love to eat.	+
	Rarely overindulge.	-
	Easily resist temptations.	-
	Am able to control my cravings.	-
	Never spend more than I can afford.	-

Vulnerability	Never splurge.	-
	Panic easily.	+
	Become overwhelmed by events.	+
	Feel that I'm unable to deal with things.	+
	Can't make up my mind.	+
	Get overwhelmed by emotions.	+
	Remain calm under pressure.	-
	Can handle complex problems.	-
	Know how to cope.	-
	Readily overcome setbacks.	-
Am calm even in tense situations.	-	
Extraversion		
Friendliness	Make friends easily.	+
	Warm up quickly to others.	+
	Feel comfortable around people.	+
	Act comfortably with others.	+
	Cheer people up.	+
	Am hard to get to know.	-
	Often feel uncomfortable around others.	-
	Avoid contacts with others.	-
	Am not really interested in others.	-
	Keep others at a distance.	-
Gregariousness	Love large parties.	+
	Talk to a lot of different people at parties.	+
	Enjoy being part of a group.	+
	Involve others in what I am doing.	+
	Love surprise parties.	+

	Prefer to be alone.	-
	Want to be left alone.	-
	Don't like crowded events.	-
	Avoid crowds.	-
	Seek quiet.	-
Assertiveness	Take charge.	+
	Try to lead others.	+
	Can talk others into doing things.	+
	Seek to influence others.	+
	Take control of things.	+
	Wait for others to lead the way.	-
	Keep in the background.	-
	Have little to say.	-
	Don't like to draw attention to myself.	-
	Hold back my opinions.	-
Activity Level	Am always busy.	+
	Am always on the go.	+
	Do a lot in my spare time.	+
	Can manage many things at the same time.	+
	React quickly.	+
	Like to take it easy.	-
	Like to take my time.	-
	Like a leisurely lifestyle.	-
	Let things proceed at their own pace.	-
	React slowly.	-
Excitement-seeking	Love excitement.	+
	Seek adventure.	+

	Love action.	+
	Enjoy being part of a loud crowd.	+
	Enjoy being reckless.	+
	Act wild and crazy.	+
	Willing to try anything once.	+
	Seek danger.	+
	Would never go hang gliding or bungee jumping.	-
	Dislike loud music.	-
Cheerfulness	Radiate joy.	+
	Have a lot of fun.	+
	Express childlike joy.	+
	Laugh my way through life.	+
	Love life.	+
	Look at the bright side of life.	+
	Laugh aloud.	+
	Amuse my friends.	+
	Am not easily amused.	-
	Seldom joke around.	-
Openness		
Imagination	Have a vivid imagination.	+
	Enjoy wild flights of fantasy.	+
	Love to daydream.	+
	Like to get lost in thought.	+
	Indulge in my fantasies.	+
	Spend time reflecting on things.	+
	Seldom daydream.	-
	Do not have a good imagination.	-

	Seldom get lost in thought.	-
	Have difficulty imagining things.	-
Artistic Interests	Believe in the importance of art.	+
	Like music.	+
	See beauty in things that others might not notice.	+
	Love flowers.	+
	Enjoy the beauty of nature.	+
	Do not like art.	-
	Do not like poetry.	-
	Do not enjoy going to art museums.	-
	Do not like concerts.	-
	Do not enjoy watching dance performances.	-
Emotionality	Experience my emotions intensely.	+
	Feel others' emotions.	+
	Am passionate about causes.	+
	Enjoy examining myself and my life.	+
	Try to understand myself.	+
	Seldom get emotional.	-
	Am not easily affected by my emotions.	-
	Rarely notice my emotional reactions.	-
	Experience very few emotional highs and lows.	-
	Don't understand people who get emotional.	-
Adventurousness	Prefer variety to routine.	+
	Like to visit new places.	+
	Interested in many things.	+
	Like to begin new things.	+
	Prefer to stick with things that I know.	-

	Dislike changes.	-
	Don't like the idea of change.	-
	Am a creature of habit.	-
	Dislike new foods.	-
	Am attached to conventional ways.	-
Intellect	Like to solve complex problems.	+
	Love to read challenging material.	+
	Have a rich vocabulary.	+
	Can handle a lot of information.	+
	Enjoy thinking about things.	+
	Am not interested in abstract ideas.	-
	Avoid philosophical discussions.	-
	Have difficulty understanding abstract ideas.	-
	Am not interested in theoretical discussions.	-
	Avoid difficult reading material.	-
Liberalism	Tend to vote for liberal political candidates.	+
	Believe that there is no absolute right or wrong.	+
	Believe that criminals should receive help rather than punishment.	+
	Believe in one true religion.	-
	Tend to vote for conservative political candidates.	-
	Believe that too much tax money goes to support artists.	-
	Believe laws should be strictly enforced.	-
	Believe that we coddle criminals too much.	-
	Believe that we should be tough on crime.	-
	Like to stand during the national anthem.	-
Agreeableness		
Trust	Trust others.	+

	Believe that others have good intentions.	+
	Trust what people say.	+
	Believe that people are basically moral.	+
	Believe in human goodness.	+
	Think that all will be well.	+
	Distrust people.	-
	Suspect hidden motives in others.	-
	Am wary of others.	-
	Believe that people are essentially evil.	-
Morality	Would never cheat on my taxes.	+
	Stick to the rules.	+
	Use flattery to get ahead.	-
	Use others for my own ends.	-
	Know how to get around the rules.	-
	Cheat to get ahead.	-
	Put people under pressure.	-
	Pretend to be concerned for others.	-
	Take advantage of others.	-
	Obstruct others' plans.	-
Altruism	Make people feel welcome.	+
	Anticipate the needs of others.	+
	Love to help others.	+
	Am concerned about others.	+
	Have a good word for everyone.	+
	Look down on others.	-
	Am indifferent to the feelings of others.	-
	Make people feel uncomfortable.	-

	Turn my back on others.	-
	Take no time for others.	-
Cooperation	Am easy to satisfy.	+
	Can't stand confrontations.	+
	Hate to seem pushy.	+
	Have a sharp tongue.	-
	Contradict others.	-
	Love a good fight.	-
	Yell at people.	-
	Insult people.	-
	Get back at others.	-
	Hold a grudge.	-
Modesty	Dislike being the center of attention.	+
	Dislike talking about myself.	+
	Consider myself an average person.	+
	Seldom toot my own horn.	+
	Believe that I am better than others.	-
	Think highly of myself.	-
	Have a high opinion of myself.	-
	Know the answers to many questions.	-
	Boast about my virtues.	-
	Make myself the center of attention.	-
Sympathy	Sympathize with the homeless.	+
	Feel sympathy for those who are worse off than myself.	+
	Value cooperation over competition.	+
	Suffer from others' sorrows.	+
	Am not interested in other people's problems.	-

	Tend to dislike soft-hearted people.	-
	Believe in an eye for an eye.	-
	Try not to think about the needy.	-
	Believe people should fend for themselves.	-
	Can't stand weak people.	-
Conscientiousness		
Self-Efficacy	Complete tasks successfully.	+
	Excel in what I do.	+
	Handle tasks smoothly.	+
	Am sure of my ground.	+
	Come up with good solutions.	+
	Know how to get things done.	+
	Misjudge situations.	-
	Don't understand things.	-
	Have little to contribute.	-
	Don't see the consequences of things.	-
Orderliness	Like order.	+
	Like to tidy up.	+
	Want everything to be "just right."	+
	Love order and regularity.	+
	Do things according to a plan.	+
	Often forget to put things back in their proper place.	-
	Leave a mess in my room.	-
	Leave my belongings around.	-
	Am not bothered by messy people.	-
	Am not bothered by disorder.	-
Dutifulness	Try to follow the rules.	+

	Keep my promises.	+
	Pay my bills on time.	+
	Tell the truth.	+
	Listen to my conscience.	+
	Break rules.	-
	Break my promises.	-
	Get others to do my duties.	-
	Do the opposite of what is asked.	-
	Misrepresent the facts.	-
Achievement- striving	Go straight for the goal.	+
	Work hard.	+
	Turn plans into actions.	+
	Plunge into tasks with all my heart.	+
	Do more than what's expected of me.	+
	Set high standards for myself and others.	+
	Demand quality.	+
	Am not highly motivated to succeed.	-
	Do just enough work to get by.	-
	Put little time and effort into my work.	-
Self-discipline	Get chores done right away.	+
	Am always prepared.	+
	Start tasks right away.	+
	Get to work at once.	+
	Carry out my plans.	+
	Find it difficult to get down to work.	-
	Waste my time.	-
	Need a push to get started.	-

	Have difficulty starting tasks.	-
	Postpone decisions.	-
Cautiousness	Avoid mistakes.	+
	Choose my words with care.	+
	Stick to my chosen path.	+
	Jump into things without thinking.	-
	Make rash decisions.	-
	Like to act on a whim.	-
	Rush into things.	-
	Do crazy things.	-
	Act without thinking.	-
	Often make last-minute plans.	-

Note. The pronoun “I” was prepended to each item stem.

20 item mini-IPIP

Factor	Item	Coding
Neuroticism	Have frequent mood swings.	+
	Am relaxed most of the time.	-
	Get upset easily.	+
	Seldom feel blue	-
Extraversion	Am the life of the party.	+
	Don't talk a lot.	-
	Talk to a lot of different people at parties.	+
Openness	Keep in the background.	-
	Have a vivid imagination.	+
	Am not interested in abstract ideas.	-
	Have difficulty understanding abstract ideas.	-
Agreeableness	Do not have a good imagination.	-
	Sympathize with others' feelings.	+
	Am not interested in other peoples' problems.	-
	Feel others' emotions.	+
Conscientiousness	Am not really interested in others.	-
	Get chores done right away.	+
	Often forget to put things back in their proper place.	-
	Like order.	+
	Make a mess of things.	-

Note. The pronoun “I” was prepended to each item stem.

Attention scale comprised of a subset of items from Meade & Craig's (2012) Diligence scale

Item	Coding
I put forth my best effort in responding to this survey	+
I carefully read every survey item	+
I could've paid closer attention to the items than I did	-
I probably should have been more careful during this survey	-