

Personality research on the Internet: A comparison of Web-based and traditional instruments in take-home and in-class settings

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Students, faculty, and researchers have become increasingly comfortable with the Internet, and many of them are interested in using the Web to collect data. Few published studies have investigated the differences between Web-based data and data collected with more traditional methods. In order to investigate these potential differences, two important factors were crossed in this study: whether the data were collected on line or not and whether the data were collected in a group setting at a fixed time or individually at a time of the respondent's choosing. The Visions of Morality scale (Shelton & McAdams, 1990) was used, and the participants were assigned to one of four conditions: in-class Web survey, in-class paper-and-pencil survey; take-home Web survey, and take-home paper-and-pencil survey. No significant differences in scores were found for any condition; however, response rates were affected by the type of survey administered, with the take-home Web-based instrument having the lowest response rate. Therefore, researchers need to be aware that different modes of administration may affect subject attrition and may, therefore, confound investigations of other independent variables.

Each day, the Internet becomes a larger and larger part of our lives. It is being used for activities in ways that we would not have imagined 10 years ago, and researchers today are beginning to use the Internet to conduct research and collect data. Many of us assume that if a paper instrument is converted to a World-Wide Web form, the responses will be equivalent. Although that appears to be true, there continues to be some uncertainty about the reliability and validity of the data collected on the Web, because of increased variability (Stanton, 1998), participant dropout and attrition (O'Neill & Penrod, 2001), disinhibition of participants (Joinson, 1999), response style (Davis, 1999), and self-monitoring (Buchanan & Smith, 1999), to name just a few factors. Still, all of the studies cited above have concluded that results from the two instruments are essentially equivalent.

There also have been several studies that have compared paper-and-pencil surveys and computerized surveys in which software loaded on the computer, rather than software available over the Internet, was used. Rosenfeld, Booth-Kewley, and Edwards (1993) reviewed studies in which paper-and-pencil surveys and computerized surveys were compared in a wide range of applications, such as personality measures, substance abuse, and personal problems, and in organizational, academic, military, and government

settings. They concluded that the paper-and-pencil and the computer surveys had yielded similar results. Vispoel (2000) compared scores from computerized and paper-and-pencil versions of the Self-Description Questionnaire (SDQ) and assessed participants' preferences with respect to the two versions. The results of this study suggested that the scores on the two versions were comparable. The participants indicated that they preferred the computerized version of the SDQ over the paper-and-pencil version. Vispoel, Boo, and Bleiler (2001) found that computerized and paper-and-pencil versions of the Rosenberg Self-Esteem scale yielded comparable results. Also, their participants reported that the computerized version was more enjoyable and comfortable and that it was easier and less fatiguing to use, even though it took more time to complete, than the paper-and-pencil version. In a study by Hallfors, Khatapoush, Kadushin, Watson, and Saxe (2000), over 3,000 middle school and high school students were randomly assigned to either a paper-and-pencil survey or a computer-assisted survey on the issue of alcohol, tobacco, and drug use. The results from this study showed that the reports of substance abuse did not differ significantly across survey methods. The students reported preferring the computer-assisted version over the paper-and-pencil version, and the researchers reported that the data analysis was less costly with the computer survey and that missing data were less likely to occur.

In addition to the two advantages of computer-based surveys found in the study just cited, there are other possible benefits. When computer surveys are used, data entry is automated. This not only saves time, but also eliminates transcription and coding errors that can be made when data are entered manually. Computer surveys have also been reported

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by participants as being more interesting, and they have been perceived as taking less time (Rosenfeld et al., 1993).

There are also some drawbacks to consider with computer surveys (for a full discussion of the advantages and disadvantages, see Schmidt, 1997). With Web-based surveys, the problem of confidentiality must be considered. Many participants may be uncomfortable with providing information over the Web, for fear it will be seen by others. They might respond differently than they would if they were certain that their responses would be anonymous. Rosenfeld, Booth-Kewley, Edwards, and Thomas (1996) examined responses from computer and paper-and-pencil surveys. In this study, 247 male Navy recruits were randomly assigned to one of three conditions—paper, stand-alone computer, and networked computer—and were either anonymous or identified. In the networked condition, higher levels of impression management were found.

Another suspected drawback to computer surveys is that by allowing participants to complete a survey on their own, unsupervised, there may be less motivation to complete the survey or their responses may be affected. However, Carlsmith and Chabot (1997) studied response differences in participants who completed a computerized survey—specifically, whether location and supervision affected their responses. The participants were assigned to either a supervised (laboratory setting) or an unsupervised (e.g., at home) condition and were asked to complete the survey. The researchers found no significant differences in their responses and concluded that the data collected in the two conditions were similar. O'Neill and Penrod (2001) also found that responses were similar, but that there were large dropout rates in Web-based samples. Requiring personal information (e-mail addresses) decreased attrition; but it may have other effects, because of increased self-monitoring by nonanonymous subjects.

Most research has supported the conclusion that computerized and paper-and-pencil surveys yield similar results. However, most of the computerized surveys studied so far were distributed by floppy disk or e-mail or were installed only on a specific computer. Although Web-based surveys are a form of computerized surveys, they may differ across some variables and, therefore, cannot be combined into one category without further study. Stanton (1998) did compare data collected from a Web-based survey with a traditional paper-and-pencil survey in organizational settings. Fifty participants completed an on-line survey, and 181 participants completed a paper-and-pencil survey. The results suggested that both types of surveys were, in general, comparable. However, the sample size in the Web-based condition was considerably smaller than that in the paper-and-pencil condition.

The present study attempts to address some of the limitations of these other studies and to provide further data regarding Web-based survey administration. The present study varies both form of administration (paper and pencil vs. Web based) and whether the study is conducted in a supervised group setting (in-class) or individually (take-home).

METHOD

Participants

The participants were 236 students who were enrolled in general psychology classes at a mid-sized college in Missouri. Four different classes were used, and each class was randomly assigned to a condition. Out of the 236 participants, 196 completed surveys. The students were offered points toward their final grade for participating.

Materials

A survey that consisted of 30 items from the Visions of Morality scale (Shelton & McAdams, 1990) was given to participants in either a paper-and-pencil format or a Web-based format. This scale measures responses to everyday prosocial situations. Three additional items (major, year in school, and age range) were included to give demographic information. The participants were asked to rate their responses to each survey item on a 5-point scale ranging from *totally agree* to *totally disagree*. Some items were reverse-keyed to control for response sets.

The paper-and-pencil and the Web-based versions of the survey were created so as to be as similar as possible. To do that, the Web version was created first, and the paper version consisted of a print-out of the Web version. There was a slight difference in the directions given to the participants in the two conditions. The participants completing the paper-and-pencil surveys were asked to circle their answers, and the participants completing the on-line version were asked to click on the desired response and on a "submit" button at the bottom of the survey.

Procedure

There were four conditions. In two of the conditions, the paper-and-pencil survey was used, and two conditions were Web based. Fifty-five participants were given the paper-and-pencil survey in class, and 47 participants took the paper-and-pencil survey home and returned it at the next class meeting. Fifty-one participants were given the Web-based survey in class at one of two computer labs available in the same building on campus, and 83 participants were asked to complete the Web-based survey outside of class. The participants in both Web-based conditions were handed a sheet containing the Web address of the survey and brief instructions. Two Web addresses were used in order to measure the responses of the take-home participants separately from those of the in-class participants. So that the participants in the Web-based condition would receive credit for completing the survey, an ID code appeared after they clicked on the "submit" button. The participants were instructed to write their names down with that code. In the paper-and-pencil condition, the participants were given credit when they turned the surveys in. The participants were assured that their responses were confidential and anonymous.

RESULTS

A 2×2 between-subjects factorial analysis of variance (ANOVA) was calculated that compared morality scores for the participants who had completed each type of survey. The main effect for Web-based testing was not significant [$F(1,192) = 0.473, p = .492$]. The main effect for take-home testing also was not significant [$F(1,192) = 0.399, p = .528$], nor was the interaction significant [$F(1,192) = 0.045, p = .832$]. The Web-based in-class group was not significantly different from the Web-based take-home group, the paper-and-pencil in-class group, or the paper-and-pencil take-home group (see Table 1). Thus, it appears that there was no effect on scores that arose from

Table 1
Mean Morality Scores and Response Rates for Each Condition

Condition	Morality Score		Response Rate (%)
	<i>M</i>	<i>SD</i>	
Web-based materials			
In-class	110.4	11.1	102 (52 of 51)
Take-home	108.7	17.9	58 (48 of 83)
Paper-based materials			
In-class	108.6	14.1	100 (55 of 55)
Take-home	107.8	9.8	87 (41 of 47)

completing the survey on the Internet or using a take-home instrument.

Because any conclusions about equivalency rely on failure to reject the null hypothesis, a power analysis utilizing the SamplePower software (Borenstein, Rothstein, & Cohen, 1997) was conducted. This analysis showed a power of .94 in the ANOVA model, and our very low *F*s (all under 1) provide further evidence for the equivalence of the conditions.

It is interesting to note that unlike other studies (Buchanan & Smith, 1999; Pasveer & Ellard, 1998; Stanton, 1998) in which variation was found to be larger for Web-based conditions, this was true in the present experiment only for the take-home conditions.

A chi-square test of independence was also calculated, comparing the response rates in all four conditions. A significant interaction was found [$\chi^2(1) = 15.54, p < .01$]. The participants in the take-home Web condition were the least likely to complete the instrument, as compared with the take-home paper-and-pencil, in-class Web, and in-class paper-and-pencil conditions (see Table 1).

DISCUSSION

Implications for Test Scores

Consistent with previous studies (Hallfors et al., 2000; Rosenfeld et al., 1993; Stanton, 1998; Vispoel, 2000; Vispoel et al., 2001) no significant differences in scores were found between the paper-and-pencil and the computerized versions. The participants who completed the survey on the Web received scores comparable to those of the participants who completed the paper-and-pencil surveys. Although this conclusion is based on the failure to reject our null hypothesis, the high level of power in this study and its consistency with previous research strongly suggests that no differences exist. Further research should be conducted, however, to determine which demographic variables (if any) might affect the scores obtained. The anonymity of the Internet makes it difficult to control the demographics of a sample drawn over the Web. In an out-of-class setting, those participants most likely to complete the survey may be those who have computers at home or who are more adept at technology. In addition, scales that are more personal or sensitive may show differences.

Implications for Response Rates

It is interesting to note that the participants who were asked to complete the survey on the Web at home were

substantially less likely to complete it than were those in the other conditions. This demonstrates a strong selection bias that may alter the outcomes of some types of instruments. Possible explanations for this dramatic decrease in response rates could involve such factors as convenience, access, comfort with technology, and so forth.

The response rate data also highlight some cautions that should be taken with Web-based surveys. Although in the Web-based condition, 51 participants were asked to complete the survey in class, the data show that 52 surveys were completed. Such double submissions (or more generally, unsolicited submissions) are difficult to control for. There are several solutions available, such as monitoring IP addresses (Buchanan, 2000) or providing access codes to users. These methods are not foolproof, however, and it remains hard to balance the need for ease of subject use and access with the need to control who completes the survey.

Procedural Implications

Data collection on the World-Wide Web has advantages over that with traditional paper-and-pencil instruments. Most of the work involved in Web-based data collection is done before the surveys are administered, when the survey is created and the programming is done so that scores can be calculated. For paper-and-pencil surveys, on the other hand, some time is required to create the instrument before data collection, and substantial time is needed after collection to score each survey and enter the data manually. Another advantage of Web-based surveys is the cost effectiveness of eliminating reproduction of paper-and-pencil surveys. Web-based surveys also can be easily updated or changed, as needed. However, Web-based data collection does have some drawbacks. Programming Web-based surveys does require some expertise. Knowledge of Web publishing, as well as of computer programming, is necessary to set up a Web-based survey, although some Web sites (e.g., Birnbaum, 2000) are being developed that will allow one to set up a Web-based survey without such knowledge. Individuals who are not familiar with the use of computers may decline to participate, as well as those who do not have access to the Internet. This could result in samples that are not representative of a population.

Overall, the Web-based method of data collection appears comparable to traditional paper-and-pencil methods. However, further research should be done to explore the motivational factors relating to completing surveys that use the World-Wide Web, ways to control access to the surveys without sacrificing confidentiality, and useful and beneficial ways to apply this method of data collection. Further studies should also expand the findings relating to variation of samples, since the present study demonstrates that Web-based data may not always produce more variability than do paper-and-pencil-based data.

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