Technological Biases in Online Research: Personality and Demographic Correlates of Macintosh and Javascript use.

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Abstract

This study addressed the issue of whether software or computing platform compatibility restrictions could lead to sampling biases in online research. The increasing technical sophistication of Internet-mediated studies raises the possibility that some potential participants could be excluded on the basis of the hardware and software they have (or rather do not have) access to or that they choose. If these people differ psychologically from those who actually participate, biases with the potential to affect research outcomes may arise. Responses of 2148 participants to an online Five Factor personality inventory (Buchanan, Goldberg and Johnson, 1999) and demographic items were compared for users of different computing platforms. The responses of participants whose Web browsers were Javascript-enabled were also compared with those whose Web browsers were not. It was found that Macintosh users were significantly more *Open to Experience* (Factor "O" in the Five Factor Model) than were PC users, and that people using Javascript-enabled browsers had significantly lower education levels. Possible reasons for these differences, and implications for online research methodology, are discussed.

Introduction

The WWW is being put to many innovative uses in psychological research. However, more technically sophisticated approaches require specific software (and sometimes hardware) configurations to be successful. For example, many online experiments and surveys are at least partly written in Javascript (a scripting language which can be used to make WWW pages more interactive). Certain Web browsers can not process or may interpret them in an unintended way, which may lead participants to encounter problems or to drop out of the study (Schwarz & Reips, 2001). Other browsers can have their Javascript functionality "switched off" by users. Thus, experiments written in Javascript may not be usable by all. The same is true of other scripting languages used in online experimentation. For example, experiments hosted at the PsychExps website (McGraw, Tew & Williams, 2000) require use of the Authorware Web player. This requires users who do not already have the player to download an extra plug-in component for their browser (and Macintosh users may have to install a whole new browser: the player is currently available only for Netscape on that platform). These increasing technical requirements may thus lead to exclusion of some participants, and selective drop-out on the part of others who do not wish to install the requisite software. While losing a few participants will not hurt most studies, there is a potential problem: **if the excluded people differ psychologically from those who do participate, results of WWW studies conducted using such advanced techniques may well be biased.**

Method

2148 participants (865 men, 1283 women; modal age group 16-20) were recruited passively through search engines and links on other websites.

Participants with **Javascript-enabled** browsers were automatically routed to one condition (using a Javascript forwarding routine), those **without Javascript** to another (these are people who used a Web browser or setting that <u>would not allow them to participate</u> in a Javascript-based study). Participants in both conditions received identical treatment thereafter.

Having been briefed and indicated consent, participants completed an online Five Factor personality inventory (WWWFFI - Buchanan, Goldberg & Johnson, 1999), demographic items (**age**, **sex**, **location**, **occupation** and **education**) and other questions including **which type of computer they were using** ("*PC*", "*Mac*", "*Other*" or "*Don't Know*").

The WWW-FFI measures the five domain-level dimensions of personality as specified by the Five Factor / Big 5 models: **Openness to Experience**, **Conscientiousness**, **Extraversion**, **Agreeableness**, and **Neuroticism**.

On submitting their data, respondents were automatically presented with a report explaining their scores and a debriefing page.
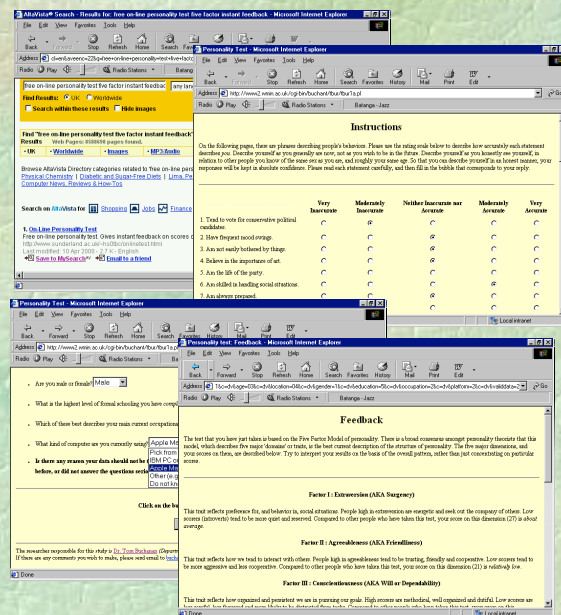
Results

Modal responses to demographic questions indicated that the "average" respondent was aged between 16 and 20 (28% of sample), lived in the USA (52%), and had at least some higher education (27%). 47% were employed and 41% were students.

Of the 2148 respondents, 1996 (93%) were using Javascript enabled browsers, and 152 (7%) were not. 1626 (76%) reported using PCs, 114 (5%) using Macs. The remaining 408 were using another platform or reported not knowing which platform they were using.

Mac users had significantly higher Openness* scores ($t_{(1738)}$ = 4.60, p < .0005) than PC users (*Mean* = 28.04, *SD* = 4.93 and *Mean* = 25.84, *SD* = 4.94, respectively). Users of different platforms did not differ significantly on any other personality measure.

Participants with Javascript-enabled browsers did not differ from non-Javascript participants in terms of personality variables. However, a Mann-Whitney test indicated that **Javascript users had lower education levels** (U = 133321.5, p < .012).

*This trait reflects 'open-mindedness' and interest in culture. High scorers tend to be imaginative, creative, and to seek out cultural and educational experiences. Low scorers are more down-to-earth, less interested in art and more practical in nature.

Discussion and Conclusions

From these results the following conclusions may be drawn:

- **Javascript-based WWW studies are likely to lead to different samples than Javascript-free WWW studies, for example in terms of educational background.**

- **Using software not suited to all computing platforms may lead to samples biased in terms of personality traits.**

Some interesting questions remain:

- <u>Why</u> **did Mac and PC users differ in Openness?**
  - a function of personal choice of computer, with personality mediating preferences?
  - a function of the computer's influence on first users' personalities (the "*Apple theory*")?
  - a function of the computers used in respondents' workplaces (where people in more "arty" jobs may use Macs)?
- **Will samples in studies relying on other computer languages (e.g. Flash, Java) be similarly biased?**
- **Will users of other computing platforms (e.g. handhelds) also differ from "standard" PC users?**

To avoid biases, the technology used in WWW research should be <u>platform independent</u> **and thus accessible to all potential participants. There is already evidence that using "fancy" questionnaire layout (e.g. colour and tables) increases participant dropout rate (Dillman, Tortora, Conradt & Bowker, 1998). The present study shows that using "fancy" designs may prevent some people from participating, and that this may bias samples in terms of demographic or personality characteristics. The implication is thus that studies should be kept as simple as possible, and use the most basic and ubiquitous techniques with which their aims can be achieved.**

References

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