



# Questionnaire layout and national culture in online psychometrics<sup>☆</sup>



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## ABSTRACT

Given the proliferation of online psychometric questionnaires on the Internet and other platforms, the design of online psychometrics becomes increasingly important to ensure good measurement properties. The current study reports four experiments testing how questionnaire layout and national culture affect people's responses to online questionnaires. Flow- and the disorientation scales for web navigation had good psychometric quality overall and across experimental manipulations of questionnaire layout, field dependence, national culture, response correction and question grouping. However, single-item layout (presenting one question at a time) had the advantage of faster completion than whole-form layout (presenting each page filled with items). Support was also found for the idea that whole form divides and thereby requires more attention to respond. Future research should be directed at online psychometrics on small and large displays.

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## 1. Introduction

The advent of popular online survey tools facilitates the creation of psychometric and other online questionnaires that can be administered on different platforms, including desktop and laptop computers, but also tablets and smartphones. As a result, the design of online psychometrics becomes increasingly important to ensure good measurement properties of the data that are collected (Evans et al., 2009). Indeed, research into online psychometrics to inform this design is especially timely, given the widespread use of online questionnaires internationally. This research has potential implications for software developers and, more generally, private-sector, public-sector and third-sector organisations that use online questionnaires. A distinction needs to be made between surveys to collect factual information (e.g. census information; Norman et al., 2001) and psychometric questionnaires to measure people's abilities, attitudes or perceptions in various domains, including human-computer interaction (e.g. disorientation experienced by the users of a website; Ahuja

and Webster, 2001). When factual information is collected, the aim is to collect responses that are deliberate and accurate, but in psychometric measurement the aim is to collect responses that are spontaneous (van Schaik and Ling, 2007); the latter normally involves giving speedy, but not careless answers.

### 1.1. Questionnaire layout in psychometrics

Despite the ubiquity of online psychometrics, research into human-computer-interaction design of online psychometrics is still scarce (but see van Schaik and Ling, 2003; 2007). Existing research on attitude surveys that has examined the context in which an item is presented and how an item is combined with others in a scale (Moore, 2002; Schwarz et al., 1991; Schwarz, 1999). However, the research reported here is directed at a different important consideration in the design of online psychometrics: questionnaire layout. Norman et al. (2001) studied different questionnaire layouts to present and administer an online factual survey, at least two of which can also be used in online psychometric questionnaires. First, single-item layout involves presenting one questionnaire item (question) at a time. Respondents move to the next question automatically when they have answered the current question (as in Figs. 1a, 2a and 3a) or by pressing a control (e.g. a button labelled Next). Second, in whole-form layout the screen is filled with items and respondents can move through the items by pressing controls

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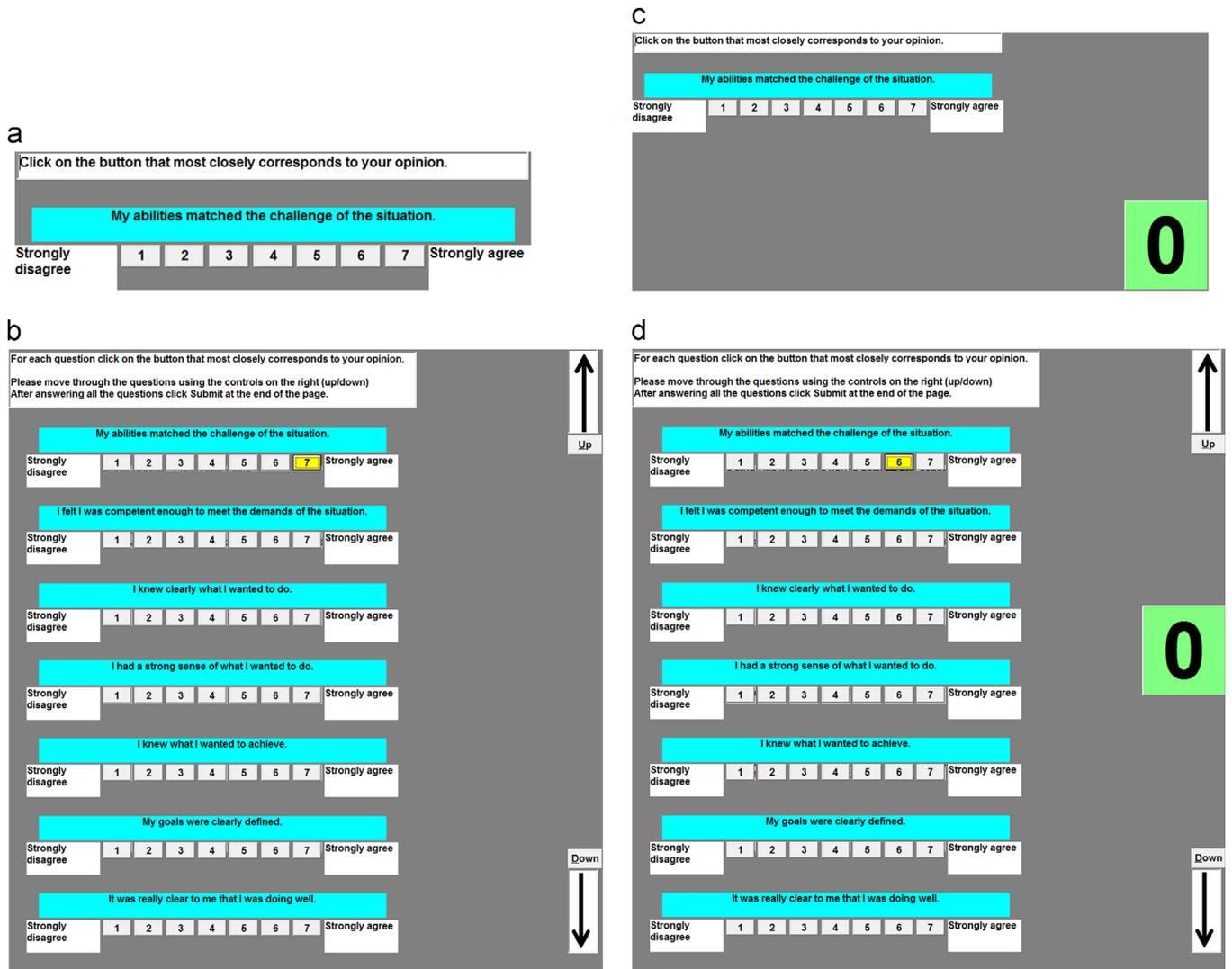


Fig. 1. Questionnaire layout (pilot experiment and Experiment 2). (a) Single-task condition, single-item questionnaire layout. (b) Single-task condition, whole-form questionnaire layout. (c) Dual-task condition, single-item questionnaire layout. (d) Dual-task condition, whole-form questionnaire layout.

(e.g. Up and Down, as in Figs. 1b, 2b and 3b). Van Schaik and Ling (2007) found that single-item layout was faster and had some advantage in terms of psychometric structure. However, this research studied neither the role of attention nor individual-difference variables in relation to questionnaire layout, and only one type of task and one type of website were investigated, and traditional factor analysis was used to assess psychometric structure.

A justification for using single-item layout is that it precludes distraction by simultaneously presented items that can occur with other layouts (such as whole form) (van Schaik and Ling, 2007). This layout supports the aim of collecting spontaneous responses from respondents because there is only one presented item to attend to at any one time. Whole-form layout, by contrast, facilitates extensive deliberation by making responses to previous questions and future questions visible at the same time as the next question to be answered. In other words, single-item layout promotes focused attention on one item at a time. By contrast, whole-form layout can break attention because it allows many presented items to compete for attention. Thus, respondents' attention may inadvertently switch back and forth between the next question to be answered and simultaneously presented previous and following items. Therefore,

**Hypothesis 1.** Time to complete psychometric items is longer under whole-form layout than under single-item layout.

Because whole-form layout is expected to divide the attention of respondents to online questionnaires among items, more attention may be needed to focus on the next question to be answered. To test this idea, it becomes important to measure the amount of attention that is needed for performing the task of responding to psychometric items. One common research technique to measure this is dual tasking (Wickens and McCarley, 2008). Participants are asked to perform two tasks simultaneously, generally one primary task (e.g. responding to a psychometric questionnaire) and a secondary task (e.g. responding to a specific number in a continual series of random numbers). If secondary-task performance deteriorates more in one questionnaire layout (e.g. whole-form layout) than in another (e.g. single-item layout) then this is an indication that the former requires more attention (Wulf and Lewthwaite, 2010). Given the potential effect of whole-form layout in dividing attention and thereby requiring more attention to answer psychometric items, and dual tasking as a technique to measure the amount of attention needed for primary-task performance, follows

**Hypothesis 2.** Secondary-task performance is better with single-item layout than with whole-form layout.

When the primary task (here responding to psychometric items) requires more attention (as established with dual tasking), people

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