Computers in Human Behavior 44 (2015) 250–257

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Research Report

# Not *really* the same: Computerized and real lotteries in decision making research

Aileen Oeberst [a,*], Susanne Haberstroh [b], Timo Gnambs [c]

[a] Knowledge Media Research Center, Tübingen, Germany
[b] University of Oldenburg, Germany
[c] Institute of Psychology, Osnabrück University, Germany

ARTICLE INFO

*Article history:*

*Keywords:*
Decision-making
Risk taking
Computer
Mode effect
Payoff

ABSTRACT

Computer technologies are routinely employed for many experimental procedures in decision-making research. Because computer-supported conduct has been shown to bias certain types of measures, the study evaluated the impact of computerized presentation of lotteries on risky choice tasks. A sample of 187 German undergraduates (147 women) participated in an experiment on financial decision-making. After presenting two types of lotteries participants had to choose between the risky and the conservative lottery. The experiment followed a 3 (presentation mode) × 2 (type of payoff) factorial design. Results indicated that the risky lottery was chosen more frequently when the lotteries were presented on computer as compared to real lotteries where participants drew balls from a closed box. Differences in risk perceptions mediated the mode effect on choice behavior. Moreover, risk taking decreased when the monetary payoff was made salient. Hence, computerized sampling and artificial payoffs (e.g., points) increased risky choices. Our findings therefore suggest that computer-supported sampling procedures in decision-making research might overestimate risk-taking behavior as compared to risk-taking in applied practice (i.e. in non-virtual sampling scenarios using monetary payoffs).



## 1. Introduction

Computers have become indispensable commodities for many research endeavors. An increasing number of studies rely on computer technologies to collect data in the lab, over the Internet or even in ambulatory assessments (cf. Buhrmester, Kwang, & Gosling, 2011; Couper, 2011; Mason & Suri, 2012; Stiglbauer, Gnambs, & Gamsjäger, 2011; Trull & Ebner-Priemer, 2013). However, the introduction of computers also raised concerns whether results from these studies can be generalized to traditional non-computerized research scenarios (Noyes & Garland, 2008). Indeed, a number of studies found that computer-supported conduct might bias measures and distort research findings (e.g., Andersson, Westöö, Johansson, & Carlbring, 2006; Drapeau, Bastien-Toniazzo, Rous, & Carlier, 2007; Mead & Drasgow, 1993; Steinmetz, Brunner, Loarer, & Houssemand, 2010). The present study contributes to this debate by investigating the impact of computer-supported procedures in an area, which has not received much attention so far – research on risky choice. A controlled lab experiment examined whether computer presentation of lotteries made a difference and led to more risky choices than real lotteries. In addition, the study explored the recently identified description-experience gap in decision making research (Barron & Erev, 2003; Hertwig, Barron, Weber, & Erev, 2004) and examined whether administration mode effects might contribute to this gap. Finally, auxiliary analyses evaluated whether the type of payoff (i.e. using money) used in decision making experiments had an impact on participants' choices and risk perceptions.

## 2. Mode effects of computerized assessments

In light of the continuous rise of computer use in research and practice a number of studies examined whether computerized forms of stimulus presentation and test administration introduced a bias that might distort resulting effects. However, respective findings were quite inconclusive (Noyes & Garland, 2008). For example, studies assessing personality traits generally concluded that the presentation mode does not affect the measurement properties of self-report questionnaires (e.g., Meade, Michels, & Lautenschlager, 2007; Vecchione, Alessandri, & Barbaranelli, 2012; Weigold, Weigold, & Russell, 2013). Similar results were obtained for many cognitive measures (cf. Schroeders & Wilhelm,

* Corresponding author at: Knowledge Media Research Center, Schleichstraße 6, 72076 Tübingen, Germany.
*E-mail address:* a.oeberst@iwm-kmrc.de (A. Oeberst).

http://dx.doi.org/10.1016/j.chb.2014.10.060
0747-5632/

2010). Meta-analyses indicated that results from mathematical tests (Wang, Jiao, Young, Brooks, & Olson, 2007), reading assessments (Wang, Jiao, Young, Brooks, & Olson, 2008), or non-timed cognitive tests (Mead & Drasgow, 1993) are not distorted by a switch from paper-and-pencil to computerized modes. Even experimental studies conducted over the Internet seem to replicate well-known effects from respective lab studies (Germine, Nakayama, Chabris, Chatterjee, & Wilmer, 2012). However, equivalence across assessment modes cannot be taken for granted. For example, the manual and computer version of the Wisconsin Card Sorting Test, a popular measure of executive and frontal lobe functioning, lacked psychometric equivalence (Steinmetz et al., 2010), making it doubtful that scores obtained from the different test versions can be meaningful compared. Participants also exhibit poorer performance on many computerized variants of speeded cognitive tests (Drapeau et al., 2007; Mead & Drasgow, 1993). Some procedures such as the well-known Stroop task even produced opposite effects when transferred to the computer (Andersson et al., 2006), leading the authors to conclude that traditional and computerized Stroop tasks measure two entirely different concepts. On the other hand, in some instances computer-supported conduct seems to be superior, such as in the case of text composition (Goldberg, Russell, & Cook, 2003) or the assessment of sensitive information (Kays, Gathercoal, & Buhrow, 2012; Gnambs & Kaspar, 2014; Tourangeau, 2004).

In sum, the findings on computerized research paradigms are highly inconsistent and comparability of results across different assessment modes is all but self-evident. Rather, previous research points to different conclusions for different types of task: for some tasks (e.g., self-report questionnaires) computerized conduct does not seem to produce systematically different results than traditional procedures, whereas other tasks (e.g., speeded cognitive tests) might result in quite different conclusions when conducted on the computer. So far, no study has contrasted computer-supported with traditional conduct in the realm of risky decision making. Although several computerized versions of specific research paradigms such as the Iowa Gambling Task (Bechara, Damásio, Damásio, & Anderson, 1994), which have previously been conducted without computers, are routinely employed in research, no systematic comparisons have been reported to date. The only study including both the original card version and a computerized version unfortunately did not allow for a meaningful comparison because both versions differed with regard to a number of aspects such as the frequency of punishment, the magnitude of rewards, or the number of cards per deck (Bechara, Tranel, & Damásio, 2000). However, based on descriptive comparisons of the response patterns of healthy participants and patients with brain lesions (no statistical analysis were reported) the authors clearly argued for non-equivalence of the computerized and the traditional version of the Iowa Gambling Task. This indicates that an exploration of potential mode effects in decision-making research is highly warranted.

## 3. Implications for research on risky choice

Many everyday decisions such as the choice to buy a lottery ticket or the selection of a vacation destination for next summer are guided by experiences gathered throughout one's lifetime (Betsch & Haberstroh, 2005). In contrast, for a long time decision making research has adopted a rather different approach. Instead of gathering active experiences participants in experimental lab studies were confronted with short vignettes of risky choices that visually stated all possible outcomes including the respective probability for each outcome. For example, in a classical study by Kahneman and Tversky (1979) subjects were instructed to choose between two gambles that either resulted in a certain (or less risky) but smaller payoff ("Get $3 for sure") or an uncertain (or risky) but larger payoff ("Get $4 with probability .8 and $0 otherwise"). These situations neither required participants to gain experience with the presented gambles, nor was it even possible (see Goldstein & Hogarth, 1997, for an overview). Thus, it has been questioned whether such artificial results from description-based research scenarios can indeed be generalized to real world decisions. In light of this critique decision making research has recently undergone a paradigm shift: Instead of requiring decisions from description (DFD) that presented all outcomes including their exact probabilities Barron and colleagues (Barron & Erev, 2003; Hertwig et al., 2004) introduced a study design that required subjects to form decisions from experiences (DFE). Here, participants sampled from the environment (e.g., by repeatedly drawing from two decks of cards) and only through this process learned about the probability distributions of the outcomes. For example, Barron and Erev (2003) had their participants make repeated selections between two gambles by pressing one of two buttons and infer the outcome distribution from the returned results. Crucially, this approach yielded significantly different decisions than the DFD paradigm. Whereas DFD studies consistently demonstrated an overweighting of rare events (Kahneman & Tversky, 1979) that resulted in preferences for the options with rare, but highly valuable gains (i.e. the risky option) the DFE paradigm typically led to fewer risky choices, indicating an underweighting of rare events (Barron & Erev, 2003; Hertwig et al., 2004). The discrepant findings from DFD and DFE designs have since then been replicated under a variety conditions (cf. Fantino & Navarro, 2012; Glöckner, Fiedler, Hochman, Ayal, & Hilbig, 2012) and, thus, been coined the description-experience gap (Hertwig & Erev, 2009). Somewhat unnoticed, the switch from the description-based to the experience-based research paradigm was also accompanied by changes in the assessment mode. Whereas description-based experiments on decision making primarily used paper-and-pencil based formats, the overwhelming majority of studies using information sampling were computer-supported; that is, participants gathered "experience" on screen in virtual scenarios. Although more realistic than DFD, these types of DFE tasks still remained somewhat artificial as compared to decision tasks in everyday situations. So far, no study has addressed whether participants' decisions are affected by computerized stimulus presentation and mode effects contribute to the description-experience gap.

## 4. Overview of research hypotheses

Recent decision making research heavily relied on computerized stimulus presentation to create experience sampling tasks. Despite the implicit assumption that computerized conduct yields comparable results to offline methods equivalence is all but self-evident (Noyes & Garland, 2008). There is even reason to expect mode differences in risky choices across computerized and real tasks: First, marked mode effects have already been identified in research on pathological gambling. Electronic gambling such as Internet poker has been found to be more addictive and cause more problems than traditional forms of gambling (Breen & Zimmerman, 2002; Griffiths, Wardle, Orford, Sproston, & Erens, 2009). For example, Breen and Zimmerman (2002) observed that electronic gamblers developed pathological patterns of gambling behavior nearly three times as fast as participants in traditional gambling environments. This has been attributed to differences in the illusion of control, erroneous beliefs that the outcome of random events can be influenced by deliberate actions of the gambler. Indeed, a recent study confirmed that Internet gamblers are significantly more prone to such cognitive distortions than non-Internet