Choice blindness and trust in the virtual world

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Abstract - Choice blindness is the experimental finding that people may miss changes to the outcome of their actions. This effect has been demonstrated in decision tasks concerning attractiveness of faces, as well as smell and taste of different consumer products. But so far, choice blindness experiments have only been done in the "physical" world, using real objects like photographs. Here we extend this research by demonstrating the choice blindness effect in the virtual world of computers. An important component of this study is that we emulate the social interaction from the original studies by letting a virtual agent run the experiment, presenting the choice alternatives and performing the manipulations.

Keywords : Choice blindness, virtual agents, levels of trust, virtual worlds, social interaction.

1. Introduction

It has recently been shown that people may miss even dramatic mismatches between the intended and the actual outcome of their choices and actions, a phenomenon called choice blindness [1]. This effect has been demonstrated in decision tasks concerning attractiveness of faces, as well as smell and taste of different consumer products [1-3]. In one of the studies, the participants were shown pairs of pictures of female faces, and were instructed to choose which face in each pair they found most attractive. In addition, on some trials, immediately after their choice, they were asked to verbally describe the reasons for choosing the way they did. Unknown to the participants, a double-card ploy was sometimes used to covertly exchange one face for the other. On these trials, the outcome of the choice became the opposite of what they intended. Counting across all conditions of the experiment no more than a fourth of all such manipulated trials were detected. But in addition to this, the participants also gave introspectively derived reasons when explaining their manipulated choices, explanations that differed very little from reports given in non-manipulated trials [2] (see fig. 1).

So far, the size and presence of the choice blindness effect has been studied primarily by varying easily quantifiable cognitive factors, such as the time allowed for deliberation (from 2sec to free deliberation time), and varying degree of similarity and attractiveness between the two choice alternatives. All experiments have also been performed using "real" physical objects, such as hand-held photographs of faces. In this paper we want to explore if the choice blindness effect extends to the virtual world of computers, as well as looking at the social context of the situation. For several reasons, we believe this to be a far from trivial research question.

One important psychological dimension that differs between the virtual and the physical world is the level of trust people extend to the environment in which they act. In our ordinary lives, we rely on the constancy of the world. Physical objects do not change identity unannounced; if you reach for a specific item it seldom turns into something else once you pick it up. In the original choice blindness studies, the participants believed on a both conscious and unconscious level that the choices *could* not have been manipulated without them noticing. As a part of the debriefing procedure in those studies, before revealing that we had manipulated their choices, we asked if the participants thought they would have noticed if we switched the pictures, and 84% answered that they were certain that they would have noticed such a manipulation [4]. But in contrast to this, anything can happen in the digital world, and it often does: both as a result of our own mistakes as well as computer failure. People know things can go wrong in a way they never do outside the screen.

Another aspect of trust is the relation between the participants and the person running the experiment. In the original studies, the aims and goals of the study were presented and made reasonable, and followed up with questions and attentive note-taking by the experimenter throughout the study. There were simply no reasons for the participants to mistrust neither the experiment nor the experimenter. There is also a basic

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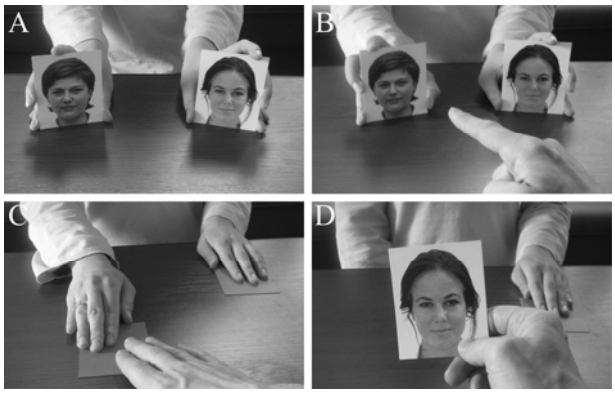

Fig. 1. (A) The participants are shown two pictures of female faces and are asked to chose the one they find more attractive. (B) The participants point at the picture they prefer the most. (C) The experimenter slides the chosen card to the participant. (D) The participants pick it up, but it is now the opposite of their choice. The trick consists in holding two different cards in each hand, with the hidden card depicting the picture displayed in the other hand.

element of trust in social interaction; if we have no reason to assume otherwise we take other people's sincerity for granted.

As we see it, there are thus two different forms of trust at play in the experiment, both towards the physical world as such, and towards the person the participants socially interact with. To pry apart these two aspects, we included a social element in the computerized on-screen version of the task: A virtual agent that runs the choice blindness experiment.

Since the pioneering work of [5], a lot of research has been aimed at investigating how we relate to computers and new media. In later years, one of the main focuses has been the effect of virtual agents, i.e. "living" characters, like the Clippit-assistant in Microsoft Office, that help, guide or challenge you in computer software [6]. Naturally, a majority of the software that uses virtual agents do this for educational purposes, in which the agent is assumed to facilitate learning [7]. It seems like context determines what features or behaviours that are most relevant from a facilitating perspective [8, 9], but believability and trustworthiness of the agent is generally considered to be a key concept [10]. One of the most telling examples of the possibility to create virtual agents "real" and believable enough to be able to establish social relations with the computer user is a recreation of Milgram's classic obedience to authority study [11, 12]. In this case, the participants were "forced" to give virtual agents electric shocks, and while complying with request to increase the severity of the shocks, the participants themselves displayed the same forms of distress as was observed in the Milgram experiment.

For our purposes, this means that it is possible to create a virtual agent that might fill the social role played by the experimenter in our original study, which in turn will make it possible for us to study the effects of moving the choice blindness studies into the virtual world.

2. Method

2.1 Participants.

Nineteen undergraduate students at Lund University and Columbia University participated in the study. The experiment was described as a test of rapid and intuitive judgement of attractiveness. All participants were naïve about the actual purpose of the experiment.[1]

2.2 Material.

Colour photographs of female faces (Swedish students) were used. The pictures were organized in pairs, roughly matched for similarity and attractiveness. The matching was performed by the authors. The experiment was implemented as an online webpage, the content designed and written in Flash (see fig. 2).

2.3 Procedure.

The participants were given a link to the webpage, and performed the test at their own pace, without guidance or further instructions. At the start of the experiment, the participants were greeted by a female virtual agent. She explained the procedure of the experiment as follows: "You will soon be presented with two pairs of photos, showing female faces. Each pair of photos will be presented for 3 seconds. After each pair, you will be asked to pick the face you find most attractive. Every now and then you will also be asked to motivate your choice". When the pictures had been shown for 3 seconds, the agent turned them face down on the "table" in front of her, and the participants had to indicate their choice by clicking on the chosen picture. The participant was presented with 15 pairs, and on 7 of them they were asked to motivate their choice. On these trials, the chosen picture was enlarged and placed at the top of the screen, and stayed on the screen while the participants answered the questions.

[1] Two participants were removed due to prior knowledge of the experiment.

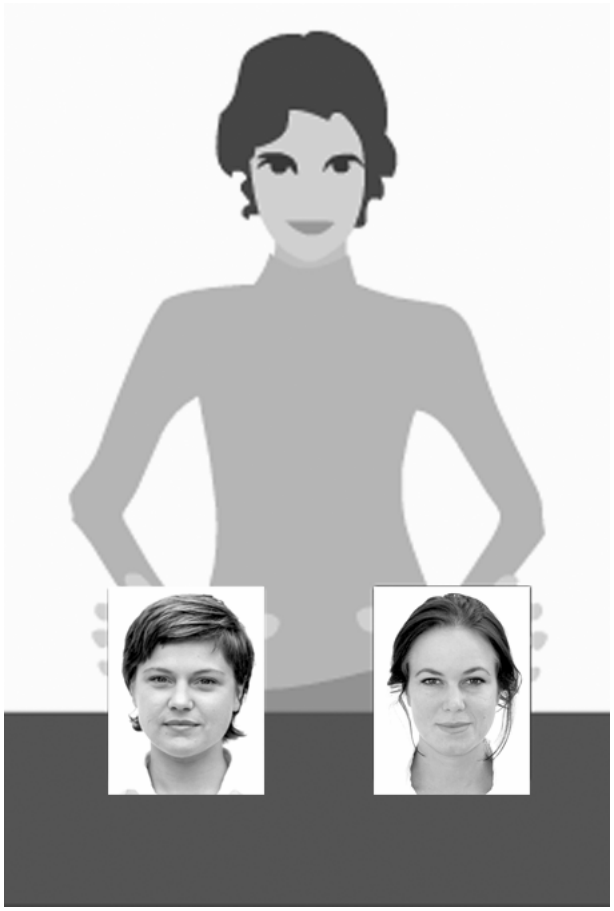

Fig. 2. The virtual agent presenting the pictures

The motivation was performed by rating the perceived influence of four different attributes: the face, the eyes, the hair, the smile. The rating had a five point scale, ranging from “very much” to “not at all”. The participants also hade the option of answering “I don’t know” for the influence of each option, as well as writing free comments in a textbox.

On trial 7, 10 and 14, the participants’ choices were manipulated, i.e. when they clicked on their chosen card they received the card they did not prefer instead. On these trials the participants were also asked to motivate their choices, and now the originally non-chosen picture stayed visible at the top of the screen.

A short debriefing was included after the presentation of the pictures, in all four different questions: “What did you think of the experiment?” (1-5, from interesting to not at all interesting), “Did you feel that anything was odd or intrusive with the experiment?” (Y/N and free comments), “We plan to do a follow up experiment in which we will switch some pictures. Do you think you would have noticed such a change?” (Y/N), “We did switch the pictures! Did you notice?” (how many times? 0-6). The participants were then asked if they would like to mail the log of the results to the experimenter.

2.4 Results.

In relation to the aims of this study, the most important measure is the number of manipulations detected by the participants. A manipulated trial was classified as detected if the participants wrote any comments indicating a detection when asked to motivate their choice (concurrent detection), or if the participants in the debriefing claimed to have noticed when the pictures were switched (retrospective detection). In this experiment, 20% of the manipulated trials were concurrently detected, and 33% were retrospectively detected. Out of 17 participants, only 4 detected all three manipulations, the remaining 13 detected missed one or two of the manipulations.

In an online test, it is very hard to determine if retrospectively reported detections actually took place. The questions posed to the participants during the experiment was mainly included to lend credibility to the cover story, but some of the results can also be used when looking for “implicit” measures of detection. When comparing the average answer to how much various aspects of the face influenced the decision, we get a significant difference between the trials classified as concurrently detected, and the manipulated trials classified as retrospectively detected or not detected at all $F(2, 48)=13.4$, $p<0.0005$. A post-hoc test also shows that there is no difference between the trials retrospectively detected and the non-detected trials. There are no significant patterns in the results of the debriefing questions; the only noticeable figure is that the 4 participants that did not detect any of the manipulations also did not find anything to be odd with the experiment.

3. Discussion

The main finding of this study is that it is possible to obtain the choice blindness effect in a computer based environment, something which has not been conclusively shown before. Due to differences in the stimulus material (a new picture set and colour instead of black and white photographs), it is not possible to do a statistical comparison with previous studies. But the result still indicates that the detection rate is somewhat

higher in the current experiment, which would suggest that the transfer to a virtual world change the susceptibility to choice blindness. As this is an online test it is also a bit complicated to determine the actual detection rate; the participants may exaggerate the number of detected trials in the post-test. An indication that this might have been the case in this study is the fact that we could not find any differences in the response patterns given in non-detected manipulated trials and trials classified as retrospectively detected, while both these kinds of trials differed significantly from trials concurrently detected. If there had been a clear and immediate detection in the retrospectively reported trials, this should have been visible in the response as well.

To fully examine the relation between the physical/virtual and the social context of the experiment, we plan to conduct two new studies. The first would be a replication of the current set-up but using our old hand-held presentation of the pictures. The second would be to just present two cards on a computer screen, without any agent involved. A comparison between these three conditions would enable us to say exactly how much of a difference these factors make in relation to the choice blindness effect.

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