Decision Making and Technology:

Human to Computer Interactions

Viewed Through the Impact of Warnings on Overconfidence.

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This final project proposes a cognitive psychology research question; it's contemporary relevance, research findings, methodological principles, and conclusion.

Problem

The use of computer-based survey technology to capture data related to decision-making seems to be a commonly used method in modern survey based research. One example that highlights use of technology in surveys is the study of a visual warning's ability to impact overconfidence displayed by respondents. (Fellner & Krügel 2012; Schall, Doll, & Mohnen, 2017) Overconfidence has been identified as having potentially negative impacts on data and outcomes, as demonstrated in Dunning, Heath, & Suls, (2004). Because of the negative impacts of overconfidence, work like Schall, Doll, & Mohnen, (2017) endeavors to provide a means to regulate the occurrence expressed in self assessment surveys, through the use of warnings. The role of applied technology in this process is something I feel needs additional attention, and could provide a deeper understanding of decision making processes that produce phenomena such as overconfidence in assessments, and thereby improve our overall use of technology in psychological research or application.

One of the contemporary problems visible through frequent use of computer based surveys are the inherent limitations in the two way, static, and impersonal relationship that is seemingly inherent in the "person to computer" or "survey taker to computer survey" relationship. What is the difference between a survey administered on a computer, creating a "survey taker to computer survey" relationship, compared to a survey carried out by an individual in which a dynamic relationship is created between the survey taker and the survey administrator? Would stimuli designed to moderate the impacts of phenomena such as overconfidence show the same level of effect if given in

person, as opposed to originating from a computer? In order to more precisely assess the reliability and validity of data gathered from survey based research, and organizational assessments that utilize technology, it seems prudent to confidently state the impacts and potential mediating effects of the survey taker to computer relationship. (Huang & Kuo, 2015). The following discussion attempts to draw relevance from modern cognitive decision making theory in an attempt to outline a path capable of producing meaningful insight into the differences between these two methods of survey delivery. (Schall, Doll, & Mohnen, 2017)

Viewing the act of completing a survey from a decision-making perspective, many of the theories explored by cognitive psychologist regarding decision-making can be explored. Each opportunity for a survey taker to interact with the survey such as when the respondent leaves a response, answers a question, or selects a particular answer, is a glimpse into the decision making process of that person. Thus, computer based surveys interact with cognitive psychological research and theory quite frequently. Dual process theories surrounding decision-making, such as that discussed in Mcbride & Cutting, (2019, p. 341) can be applied to the evaluation of processes undertaken by survey takers throughout a survey. Considering survey taking from this standpoint, multiple levels of conscious and unconscious thought are identified as influencing the decisions made by a survey taker. It is quite easy to imagine that the underlying impacts of the conscious and unconscious dual process thoughts generated and considered in a person to computer relationship will differ from those generated from a person to person relationship. Another theory discussed by Mcbride & Cutting, (2019, p. 330) with relevance to the decision-making processes likely involved in the projection of overconfidence is that of

inductive reasoning and the research area of causal reasoning. Causal reasoning theory is defined and discussed by Bowers, (2017) as concerning associations held by individuals and how those associations are structured, how the structures are used, and how those structures may impact actions. This theory is further discussed in McBride & Cutting, (2019) as relying on an inference that a cause and effect relationship exists between at least two events. This can allow us to make predictions, such as the prediction that we will do well on a test, score higher than average on an assessment, or be more likely than others to respond accurately. Both of these theories, dual process and inductive and causal reasoning apply to the decision-making processes in separate, and distinct manners as discussed above. As a specific attempt is made to consider cognitive decision-making processes that involve the use of technology, it is important to consider the rules of these and similar theories when exploring decision-making and contemporary problems such as the use of technology in psychological research.

Utilizing the research conducted by Schall, Doll, & Mohnen, (2017) that examines the effectiveness of static vs. dynamic computer based warnings used to moderate overconfidence, my proposed research question asks; how is the overconfidence reduction, and the rate of recall of warning content impacted by the use of computer based warnings compared to in person verbal warnings? Put more simply, what is the difference between a computer based survey designed to measure and modify overconfidence compared to the same survey given in person? The information gained from this comparison could provide insight into the differences between the use of computer based, vs. in person surveys. A limitation here is the lack of specific research currently available exploring a similar topic, and the fact that Schall, Doll & Mohnen

(2017) are specifically seeking information regarding the warnings effectiveness within their own model, and not compared to a different method of survey administration. We know that strong cognitive systems and complex theories such as dual processing and inductive reasoning are often at work when decisions are being made. This calls for a deeper understanding of the role computers play in that decision making process, and what impacts they may or may not have. This question specifically seeks to find a correlation between the use of technology and the effectiveness of warnings established in Schall, Doll & Mohnen, (2017), as an indicator of general confounds of computer administration of surveys vs. human administration of surveys. (Wogalter, Conzola, & Smith-Jackson, 2002)

Contemporary Relevance

Van Schaik, (2003) established that surveys carried out online are an important means of collecting data, and the paramount nature of the determination of psychometric aspects of certain constructs, establishing a contemporary call for more information on the intricacies of computer based models. The dual process framework discussed in Mcbride & Cutting, (2019), proposes an explanation for decision making processes that involves multiple pathways. Those pathways can be described as conscious, and unconscious. In this regard, the problems faced by the expanded use of technology in conducting surveys and the subsequent increased opportunities for computer to person based relationships, presents an opportunity for each of the processes explored under the dual process framework to be impacted by the introduction of a computer. The dual process model presents an opportunity to explain decision making regarding prediction levels by offering an all encompassing approach that could offer any one of a number of

modes, conscious and/or unconscious, as being at the stem of a given decision. This however presents limitations when exploring the direct impact of the introduction of a computer, as opposed to a person, during survey administration by failing to precisely identify indicators of the unconscious aspects of that decision.

The dual process theory serves well when considering a relevant theory of cognitive psychology capable of exploring the role or technology, and the expanded use of technology, in decision-making. Likely, the interactions between a person and a computer do not produce the same levels of unconscious, or conscious thought. The dual process theory, by recognizing multiple levels of decision making occurring simultaneously in each decision acknowledges the opportunity for these differences to impact subsequent outcomes. When considering the work of Schall, Doll, & Mohnen, 2017, the reduction of overconfidence through the use of computer-based warnings is desired. By reducing overconfidence in self-assessments, a better understanding of self is possible and quite possibly could lead to improvements in both organizational, and personal goal achievement. (Block, Harper, 1991; Dunning Heath, & Suls, 2004) Schall, Doll, & Mohnen were able to demonstrate specific differences in the impact of certain types of warnings given during the computer based survey. The challenge presented is to isolate the corresponding, and currently invisible impacts of the method of administration as a moderating variable, in order to more precisely describe overconfidence as being impacted or not being impacted by the use of technology.

Interpretation of Research Findings

In order to explore the role of technology in the decision making process involved in completing computer based surveys, a specific aspect of surveys needs to be focused

on with some precision. In order to establish this precision, this proposal chooses to focus on the effectiveness of warnings given during assessments, and how different types of warnings are able to produce different results. Specifically, warnings dissuading overconfidence are explored. The first of these findings regarding warnings and overconfidence come from Schall, Doll, & Mohnen, (2017) whom analyzed the impact of various formats of warnings (static, dynamic, interactive) and their ability to dissuade overconfidence, as well as improve the recall of the warning's content. The article defines overconfidence through a review of prior research highlighting the expansive amount of literature that has been produced identifying and describing overconfidence. The authors go on to provide additional prior research that explores the reduction of overconfidence using warnings, or forms of advice, given prior to opportunities to display overconfidence. Within the research referenced regarding warnings, there are a variety of methods utilized, to include computer based warnings. The primary warnings considered within the experiment by Schall, Doll & Mohnen, (2017) are computer based and will provide data regarding the effectiveness of computer-based warnings of overconfidence compared to other methods. This applies to my research question that endeavors to isolate the role of the computer by establishing a clear set of outcomes regarding the effectiveness of these warnings on dissuading overconfidence in computer based surveys as compared to surveys conducted by humans. Carrying out a study based on my research question would provide data regarding the effectiveness of the warnings, if a computer is not used.

The results in Schall, Doll, & Mohnen, (2017) display a range of effects based on computer based warning type, specifically describing the effectiveness of three types of

warnings; unstructured static warnings, enhanced static warnings, and dynamic warnings. The intricacy's of these results, which define the relationship between each type of warning, and its resultant effect on the subject's projection of overconfidence, creates a foundation on which to design future warnings, computer based vs. in person warnings with the same or similar characteristics. Schall, Doll, & Mohnen, (2017) through their in-depth look into intricacies of effects from various warning types, where each warning is given in a computer based model, strength can be drawn from the format utilized and the specific types of warnings implemented. The study is limited in that the researchers did not explore the effect of computer based vs. non-computer based warnings, with all of the data produced within this study relying on computer based administration. An in-depth look into the research methodology of overconfidence and static vs dynamic warning types, will help to focus the research question regarding the impact of computer based surveys compared to surveys carried out by humans.

In Plous (1995), the author created what would become a foundation for future research regarding overconfidence. This foundation is part of the body of research upon which the work by Schall, Doll, & Mohnen, (2017) was built, and who relied on the work by Plous (1995) to develop their design. Where Schall, Doll, & Mohnen, (2017) focused on individual reduction of overconfidence, Plous, (1995) implemented a group design that analyzed the effect of group judgments in the reduction of overconfidence. One other key difference of relevance to the current research proposal, is the lack of computer based models utilized in 1995 by Plous. The research contains a large number of comparative examples to Schall, Doll, & Mohnen, (2017) where the only difference is the application and setting of the warning given, where many other factors remain the same. This will

serve as an excellent comparative sample to begin a more in-depth look into the role of computers. This study provides evidence in support of my proposal to assess the impact of a computer administered survey compared to a survey administered in person by providing data regarding the effectiveness of warnings to dissuade overconfidence without the use of computers.

The results of Plous, (1995) found very little effect of the warnings, given in the form of explicit warnings from researchers, instructions given prior to survey completion, and extended group discussion regarding warnings. The only technique that was shown to decrease overconfidence was a pooling technique, where members of a group work by themselves, and then pool their answers together prior to submitting a response. The pooling strategy produced more elevated scores than the group interactions, statistically significant at the .001 level. The mean comparison showed the nominal group, the pooling technique group, to have the largest means across all four experiments. These findings could help to begin an analysis of the delivery method of the warnings and their effectiveness. This will be limited by the differences in the methodology between Schall, Doll, & Mohnen, (2017) however the similar measure, overconfidence interval tasking, and other aspects and similarities will help to provide relevance. Expanding on this research, and exploring other similar research that contains group measurement of overconfidence, with a computer based implementation, could allow more specific development of the proposed research question. (Plous, 1995)

Lampinen, Scott, Pratt, Leding, & Arnal (2007) conducted four experiments that explored the effectiveness specifically of computer based warnings, in comparison to no warning at all. Here the researchers established an opportunity for post assessment

feedback, and utilized a warning to inform half of the participants that the feedback they received was randomly generated, and otherwise may not pertain to how they actually performed on the assessment. This was compared with a group of participants who received no warning at all. The researchers found that the warnings, all of which were applied utilizing a computer based method, significantly limited the effects of the post-identification effects displayed by the group that did not receive the warning. These findings serve to support the overall effectiveness of a computer based warnings administered in this setting. (Lampinen, et al. 2007)

The results of this study lay out a clear foundation for the applied use of warnings. In the first experiment, which attempted to determine the impact of warnings, a significant interaction was observed between feedback and warning at the .05 level. A mixed factorial ANOVA was used to analyze the interactions. Here, the criminal justice system is the benefactor, as the researchers identified problems that can arise when post identification feedback is given to witnesses regarding whether or not the subjects they identified in a line up were actually involved in a crime. Although these elements of this article do not apply to my research question specifically, confidence, and computer based warnings are both key factors in this research and does provide valuable information regarding types of warnings, and their effectiveness. It is limited in the lack of non-computer based warnings. (Lampinen, et al. 2007)

Wogalter, Conzola, & Smith-Jackson, (2002) explore the literature surrounding warnings design and provide an applied perspective relevant to purveyors of goods and services, other researchers, and practicing psychologist. The authors highlight the development and expansion of research in this field, and through their review call out

some of the intricacies that have been identified related to variability of warnings effectiveness based on design. The authors introduce a social-cognitive model to the discussion surrounding warnings signs and signals that will help to broaden the research topic proposed. Many of the items discussed in the articles by Schall, Doll, & Mohnen, (2017), and Plous, (1995) are discussed here in more detail such as salience, wording, layout, etc. These elements play an important role when considering the format of warnings themselves as the variable to be manipulated.

The details within this research will provide valuable definitions, evaluations, and supporting theories regarding specific warning format details of the proposed research. Although limited in it's exploration of overconfidence, the amount of specific information provided regarding warnings themselves lends value. This study forces the reader to consider the applied aspects of this proposal, and develop recommendations that would serve to benefit applied fields. (Wogalter, Conzola, & Smith-Jackson, 2002)

Methodological Principles

Considering the gaps in current research as they relate to the question regarding the impact of computers on the decision making processes involved in responding to a survey, and the subsequent phenomena that are observed such as overconfidence the following experimental design idea is proposed: The design of an experiment that seeks to replicate the methodological framework established by Schall, Doll, & Mohnen, (2017) with the addition of a non-computer generated survey group. The proposal would replicate the study verbatim, and simply add a "third" group of survey takers who receive the exact same assessment with the exact same warnings except the warnings and other prompts are delivered by a researcher interacting directly with a respondent. One of the

benefits of using computer based research, and likely a reason for its prevalence, is the sterile environment that is created and easily replicated. By utilizing a person to deliver the survey, many controls will need to be put in place in order to replicate the same survey, over and over, to multiple respondents by one or a group of researchers. This effort could be simplified through the selection of a limited number of survey administrators, who would be trained and given practice in delivering the survey the exact same way, repeatedly to a diverse sample population. (Bonaccio & Dalal, 2006) If the confounds present in a person based survey administration could be properly controlled for, and a computer based version was found to be very similar, the impact of the computer could be assessed. This could provide some insight into the role of technology, such as computers, in the outcomes interpreted by cognitive psychologist considering decision-making models utilized by survey respondents. If the computer, or human to computer relationship vs. human to human relationship is found to have an impact on decision-making processes, such as the effect of warnings on the reduction of overconfidence, this could provide very relevant insight into the future design of computer based applications. Similarly, simply learning if there is variability in the impact of a warning given in a computer based training module, as opposed to being given from a human supervisor, could greatly enhance organizational training programs, helping to prevent mishaps. If there is support for an impact of a computer administered survey on decision making, likely the applied setting of technology could stand to enhance it's effectiveness by creating surveys that more closely resemble a person to person interaction, through the use of more adaptive and responsive technology. If there is no difference between a computer based dynamic warning, and that given from a

human survey administrator, then likely a continued reliance and development of current computer based surveys is warranted.

Conclusion

The research question, concepts, and related findings above propose that a deeper understanding of the role technology plays in the decision making processes of human beings will help to improve the use of technological tools, such as computer based surveys. It also establishes that much of our current understanding of phenomena such as overconfidence, to include the ability of warnings to modify the prevalence of overconfidence, is based on data that is derived from human to computer, or human to survey relationships, and not human-to-human interaction. This understanding lays the framework for the research proposal to explore the relationship between the method of delivery, e.g. computer based vs. human administered surveys, as those surveys pertain to overconfidence and warnings. By implementing a more exact look into the use of computer based assessments and surveys, as opposed to human administered surveys, likely the validity and reliability of the data derived from survey based research can be more clearly supported, and the role of technology in applied settings more fully understood. Considering survey data in terms of the methodological approach used to produce the data as being computer based or human interaction based, will provide unique insights into human decision making not currently being explored. Effective methods to more easily control survey biases such as overconfidence provide more reliable and valid data through their use, enhancing the role of technology in decision-making processes reliant upon cognition, and cognitive processes.

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