

# An Investigation of Response Bias Associated with Electronically Delivered Risk-Tolerance Assessment

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*A randomized experimental study was designed to compare risk-tolerance scores for those who completed a paper-and-pen risk-tolerance assessment instrument (i.e., the control group) to those who answered the same questions using an electronic method. It was hypothesized that the possibility of an electronic bias might be present. Controlling for financial knowledge, which was positively associated with risk tolerance, men were found to report much higher risk-tolerance scores than women when responding to electronically delivered questions. Results suggest that financial therapists ought to consider this possibility as a factor that influences responses to risk assessments, especially as they incorporate additional technological evaluation tools into their practice.*

*Keywords: risk tolerance; financial therapy; electronic bias*

## INTRODUCTION

Nearly all financial therapists, at one time or another, have been tasked with assessing and evaluating a client's tolerance for financial risk. Financial therapists whose work entails financial counseling and planning may be required under Securities and Exchange Commission, Financial Industry Regulatory Authority, or state securities rules to assess a client's risk tolerance. Therapists who find that financial products and services are secondary to their core practice of behavioral treatment may, on occasion, find it useful to also assess the risk tolerance of their clients. Beyond risk tolerance, financial therapists and clinicians tend to rely on other psychometric tests to assess the attitudes and behaviors of clients. Increasingly, counselors and clinicians have been turning to electronically delivered psychological assessment procedures (Buchanan, 2002). This paper presents results from an experiment that was designed to determine if such mediated methods of assessment influence the way individuals respond to evaluation questions, especially in the domain of risk-tolerance assessment.

## **THEORETICAL BACKGROUND**

Financial risk tolerance has been defined in various ways. Practitioners sometimes refer to a client's maximum risk tolerance as the level of volatility the client is willing to endure before losing sleep. Researchers are more likely to define risk tolerance specifically as a person's willingness to engage in an activity in which outcomes are uncertain (Grable, 2000). Regardless of how risk tolerance is conceptualized, the definition of risk tolerance must include reference to a person's willingness to take risk. The methods used to assess risk tolerance tend to be quite diverse (Roszkowski, Davey, & Grable, 2005). Examples of measurement techniques include the following: (a) traditional pen-and-paper surveys, (b) electronically delivered versions of questionnaires, and (c) face-to-face (i.e., narrated) encounters.

Each assessment method has its own unique advantages and disadvantages. For example, the pen-and-paper approach is familiar and easy to administer, but somewhat time consuming. The electronically delivered version of assessment—Internet, direct computer input, response to electronic media queries, etc.—offers a more efficient method in terms of time, money, and consistency (Huang, 2006). The face-to-face method is perceived as more interpersonal, although the evaluation of a risk profile tends to be based on professional judgment rather than on a prescribed scoring system (Butcher, Perry, & Hahn, 2004).

Increasingly, financial counselors and planners and financial therapists have been eschewing traditional paper-and-pen survey assessment approaches in favor of electronically mediated data collection methods. As suggested above, this procedure introduces outside factors that might influence the way in which someone responds to risk questions. This study was designed to determine whether or not electronically delivered evaluation, as a method of questionnaire delivery, might influence the way risk questions are answered. The theoretical basis for this study is based on the Fundamental Interpersonal Relationship Orientation (FIRO) theory of interpersonal interaction (Schutz, 1958). According to Lucas and Sherry (2004), the theory holds that people are "oriented by three interpersonal needs: inclusion, affection, and control" (p. 504). A desire to interact with others defines inclusion. The level of closeness someone desires in a relationship is known as affection, whereas control includes aspects of the need to have power over others and one's environment.

Past research shows that both women and men equally tend to desire inclusion, affection, and control, but that a person's ability to meet these three desires can be influenced by gender differences and social and environmental factors (Phillips, Rolls, Rouse, & Griffiths, 1995). FIRO has been tested as an exploratory theory of video game play. Lucas and Sherry (2004) noted that from the earliest of ages, "boys may be directed toward and girls steered away from video game playing, regardless of intrinsic interest and possible benefits" (p. 507). For females, the need for inclusion and affection is not generally met through video game playing, which is considered culturally to be a male-focused activity. For males, on the other hand, "playing video games creates opportunities for

young men to meet their needs for inclusion and affection ..." (Lucas & Sherry, p. 507). Additionally, video games provide a mechanism for environmental control, particularly for men who tend to show skill in mental rotation, maze navigation, and action directing.

It is possible that a male's preference for video gaming may cause some type of response bias when risk-tolerance assessment questions are presented in an electronic mediated framework. That is, the use of software and media interaction in relation to attitude and behavioral assessment may be perceived to be more closely related to video gaming than traditional assessment. Within the context of FIRO, a female's motivation for inclusion and affection may lead her to respond differently to electronically delivered questions. It is also possible that the sense of control provided by electronic mediation might cause both women and men to score differently than those who use a paper-and-pen procedure.

While there have been previous attempts to compare traditional paper-and-pen assessment techniques with electronically delivered assessments (Buchanan, 2002; Buchanan & Smith, 1999; Huang, 2006; Lucas & Sherry, 2004; Pasveer & Ellard, 1998; Sax, Gilmartin, & Bryant, 2003; Schwarzer, Mueller, & Greenglass, 1999), there is mixed evidence as to the similarity of results attained from such assessment methods. In general, measures of reliability seem to be similar when personality tests are administered online and in clinical settings; however, computer anxiety (Tseng, Tiplady, Macleod, & Wright, 1998), which may be related to gender-stereotyping, is known to influence the way women respond to electronically delivered assessments (Buchanan). Women report less motivation and orientation when faced with electronic interactions. When viewed from a survey response perspective, this means that men may be more willing to complete Internet based surveys (Palmquist & Stueve, 1996), whereas, when given the choice, women may opt for paper-and-pen surveys (Sax et al.).

Apart from exploring preference for delivery method, Huang (2006) found that individuals who were pre-assigned to a paper-and-pen versus an Internet survey responded differently to identical survey questions. In particular, individuals were more likely to report higher scores on less socially desirable behavior on the Internet survey compared to those in the control group. Huang concluded that increasing respondents' sense of anonymity increases the probability of truthful responses. Although more women than men participated in the experiment, Huang did not find significant gender differences.

## RESEARCH QUESTIONS

The paper-and-pen approach to risk-tolerance assessment has been the norm for decades. Nearly all baseline measures of risk-tolerance have been generated from such tests. As practitioners move away from traditional assessment methods, especially in the direction of electronic delivery of assessment tools, what might be the impact on the way people respond to evaluation measures? Theory from marketing and the biological sciences hints at the possibility that non-traditional evaluation techniques (e.g., electronic presentation) may inadvertently be introducing bias in response patterns. In particular, the

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FIRO theory suggests that people are driven by the internal need for inclusion, affection, and control which may be influenced by communication method. Based on the theoretical review from above, the following questions were used to direct the analysis:

- (a) When controlling for financial knowledge, do women and men respond differently when answering risk-tolerance questions?
- (b) When controlling for financial knowledge, does method of delivery (i.e., paper-and-pen versus electronic) bias the way people respond to risk-tolerance questions?

### **METHODS**

#### ***Participants***

Forty participants<sup>1</sup> were recruited from undergraduate and graduate classes at a Midwestern U.S. university; the size of sample allowed for the identification of large effect sizes (Steinberg, 2008). In terms of a demographic profile, the average participant was 22.75 years of age ( $SD = 5.88$ ), not married, White, and enrolled in college on a full-time basis. Participants were recruited using a combination of faculty announcements and handouts advertising the study. Each participant received a \$10 Wal-Mart gift card as an incentive to encourage participation. The gift card was funded by the authors' academic unit. Each participant's financial knowledge was measured through a paper pre-test survey, prior to the experiment, by asking participants to "Rate yourself on your level of knowledge about personal finance issues and investing" on a 10-point Likert-type scale, with 1 indicating the lowest level of knowledge and 10 indicating the highest level. The mean score for the sample was 5.99 ( $SD = 1.88$ ), which is comparable to the original means reported by the authors of the scale (Joo & Grable, 2004). Men reported a mean knowledge score of 6.30 ( $SD = 1.65$ ), whereas women reported a mean score of 5.68 ( $SD = 2.06$ ). A *t*-test indicated that the difference in knowledge between women and men was not statistically significant, whereas previous research of college students has found women to have less financial knowledge than men (Chen & Volpe, 2002).

#### ***Procedure***

*Stimuli.* The stimuli in the experiment consisted of electronically delivered risk questions. The procedure involved having participants answer 13 multiple-choice risk items, which were later combined into one risk-tolerance profile score. The measure was originally designed by Grable and Lytton (1999) and has been used extensively in academic research. The questionnaire has historically shown a reasonable level of validity and reliability, with Cronbach's alpha estimates ranging from .70 to .85. In this study, Cronbach's alpha for the participant group was  $\alpha = .74$ .

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<sup>1</sup> The mean score was substituted for three men who did not complete the assessment fully.

A control group was established by randomly assigning 10 women and 10 men to complete the risk questionnaire using a traditional pen-and-paper method. Individuals were either alone or in a small group of no more than four participants when they completed the questionnaire. Participants did not communicate with one another during the administration of the questionnaire. Each question was presented on a separate 8½ x 11-inch white piece of paper to replicate the electronic slide transition participants in the treatment group saw as they answered questions. Those in the control group were asked to sit in a quiet assessment room apart from the research staff when answering the questions. When complete, the research team scored the questionnaire, with higher scores representing an elevated risk-tolerance profile.

The treatment group viewed the same risk questions using an electronic delivery assessment method. As with the paper-and-pen control group, the treatment group had an equal gender distribution and participants were either alone or in a small group of no more than four when they viewed the questionnaire. Participants in the treatment group were asked to sit in comfortable arm chairs while watching the risk-assessment questions appear via electronic delivery on a large-screen television. The progression of the questions was timed. Participants read the questions and used an I-Clicker® to choose their response to each question. An I-Clicker® looks and works similarly to a television remote control device. The use of I-Clickers® is familiar to many individuals because the tool also resembles a video gaming device. Users click buttons in response to stimuli in the same manner as a hand-held gaming device and remote control apparatus.

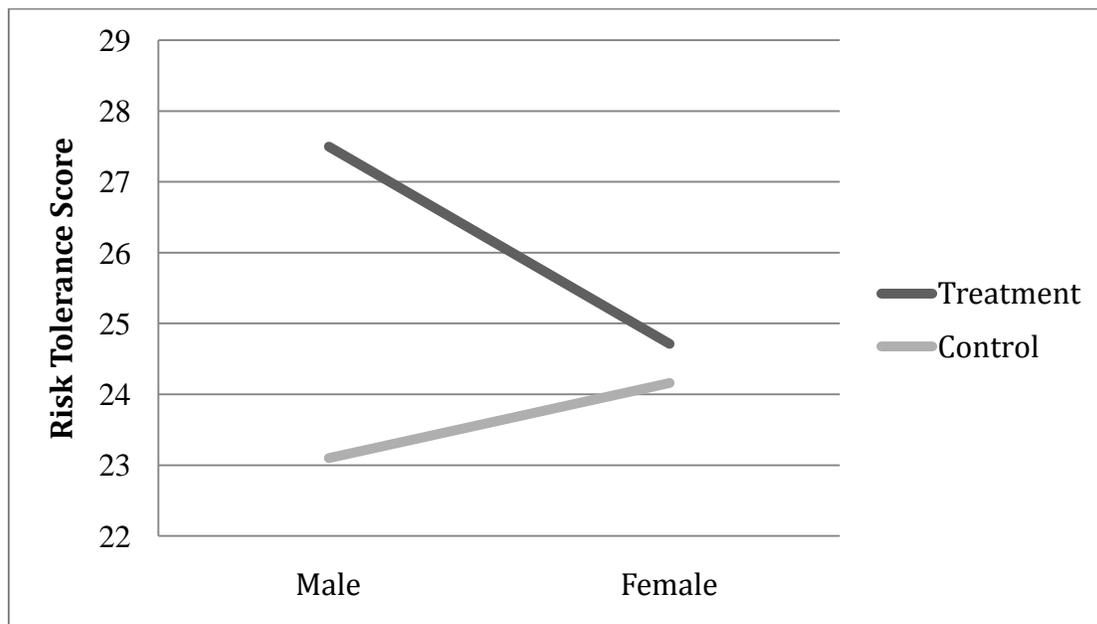
The I-Clicker® tool has five buttons, with each button corresponding to a letter in the alphabet—A, B, C, D, or E. If a participant wanted to choose answer C, for example, he or she would click the button and his or her response would be recorded electronically. Scores, representing risk profiles, were then calculated by the researchers by summing responses for each participant. About one-half of participants had used an I-Clicker® in a classroom situation prior to the study. Upon completion of the experiment, participants were asked about difficulties using the tool. No one indicated that he or she had trouble with the assessment format.

*Method.* An analysis of covariance (ANCOVA) statistical model was used to test the research questions. Specifically, financial risk-tolerance scores from the 13-item risk questionnaire were used as the dependent variable. Two between-subjects factors were tested: (a) gender, with men coded 0, women coded 1, and (b) electronic question delivery, with those answering questions electronically coded 1 and the control group coded 0. The covariate was a participant's subjective financial knowledge. Financial knowledge was controlled in this study for two reasons. First, the research team was unable to pre-determine the level and extent of personal finance and investing knowledge of participants prior to randomly assigning them to a group. Secondly, the risk literature shows that financial knowledge and risk tolerance tend to be highly correlated (Grable, 2008). If knowledge was uncontrolled for in the study, variations in responses to questions might have been overlooked.

## RESULTS

The model was found to be statistically significant,  $F_{4,35} = 3.81, p < .01$ . Results indicated that the treatment (i.e., electronic question delivery) and financial knowledge had positive main effects on risk-tolerance scores. No gender differences were noted ( $M_{women} = 24.43$  versus  $M_{men} = 25.30$ ). The main effect for electronic delivery showed that participants who responded electronically exhibited higher risk scores ( $M = 26.10$ ) compared to the paper-and-pen control group ( $M = 23.63$ ). The difference was significant ( $F_{1,35} = 4.37, p < .05$ ). It was also noted that the covariate, financial knowledge, was positively associated with risk-tolerance scores and the association was statistically significant ( $F_{1,35} = 5.71, p < .05$ ). Participants who reported higher subjectively measured financial knowledge exhibited higher risk-tolerance profiles. The effect size associated with these values was medium to large. No interaction between question delivery method and the gender of participants was observed.

Figure 1 provides a visual representation of the findings from this study. Scores for women were estimated to be 24.16 for those who used the traditional paper-and-pen method and a score of 24.71 was estimated for women who responded to the same questions electronically. Effectively, women scored similarly using both methods of assessment. Men, on the other hand, were predicted to exhibit higher scores when asked to respond to the risk questions electronically. As shown in Figure 1, the estimated average paper-and-pen score for men was 23.10, which was actually lower than the predicted score for women. However, the predicted mean score of the electronically delivered score for men, controlling for financial knowledge, was 27.50, which was significantly higher than the control group risk-tolerance mean scores.



**Figure 1. Estimated Risk-Tolerance Mean Scores Compared Using Gender and Electronic Question Delivery**

## DISCUSSION

Results from the ANCOVA test provide answers to the two research questions presented earlier in the paper. The first question asked whether women and men respond differently when answering risk-tolerance questions controlling for financial knowledge. When risk-tolerance scores were combined for the control and treatment groups, no significant difference was noted between women and men, although men's scores ( $M = 25.30$ ) were slightly higher than scores for the women ( $M = 24.43$ ).

The second research question asked if electronically delivered risk-tolerance assessments bias the way people respond to risk questions (when controlling for financial knowledge). The answer appears to be yes. Data estimates showed that both women and men participants who viewed the risk questions electronically scored higher than those who answered the same questions with a traditional pen-and-paper process. The bias associated with electronic mediation was more pronounced for men. Results suggest that the way in which male clients receive and respond to data gathering questionnaires can have a significant impact on their subjective judgments, which lends support to the assertion that male clientele have a preference for electronically delivered assessment methods (Hilgert & Hogarth, 2003).

As predicted by the Fundamental Interpersonal Relationship Orientation (FIRO) theory and the related literature, women responded differently than men when the risk-tolerance questions were delivered electronically. What is most intriguing is the finding that men's scores, controlling for financial knowledge, were found to be highest when they responded to the questions electronically. It may be that men have a preference for electronic delivery assessment. That is, men may be predisposed to responding to direct electronic delivery instructions, whereas for women the method of question delivery may not be as important. The male preference for electronic delivery may be, as Hilgert and Hogarth (2003) noted, a method that men use to reduce the time needed to respond to questions. That is, electronic delivery may be perceived for men, more so than for women, as a time saving device that matches their learning style (Hilgert & Hogarth). This may be a result of gender-stereotyping that leads men to respond differently to imaging that resembles a video game. Another explanation may be that men are more attuned to using electronic systems to respond interactively to stimuli. The use of an I-Clicker device to capture data may alter perceptions about questions the same way video gaming influences inclusion, affection, and control experiences.

## CONCLUSION

The results from this experiment are, by nature, exploratory. This is among only a handful of experimental studies to look at the role of electronic delivery as a factor influencing the assessment of risk-tolerance. The findings are intriguing and warrant further study. Specifically, future experimental tests should introduce another stimulus, namely, narration of questions. Obviously, this brings into play other issues such as the relative attractiveness of the narrator and environmental factors such as clothing, color,

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and background effects. However, the introduction of a visual narrator may help answer questions related to perceived client biases based on the gender of the planner.

The key finding from this study is that women and men reacted very differently when exposed to the electronic delivery assessment stimulus. Women's risk tolerance scores were not influenced by whether they are obtained via an electronic or paper-based assessment. Men, on the other hand, scored significantly higher in risk tolerance when scores were obtained electronically versus on paper. The use of technology as a data-gathering tool appears to alter the way in which participants evaluate risk-tolerance questions. Financial therapists ought to expect that risk scores will be higher for men who respond to an electronic delivery based assessment compared to a traditional pen-and-paper assessment. Further, if the financial therapist views risk-tolerance as being a personality construct that may have a socially desirable component (c.f., Weber, Blais, & Betz, 2002), Huang (2006) might argue that the electronically assessed scores are more accurate than paper-and-pen scores.

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