

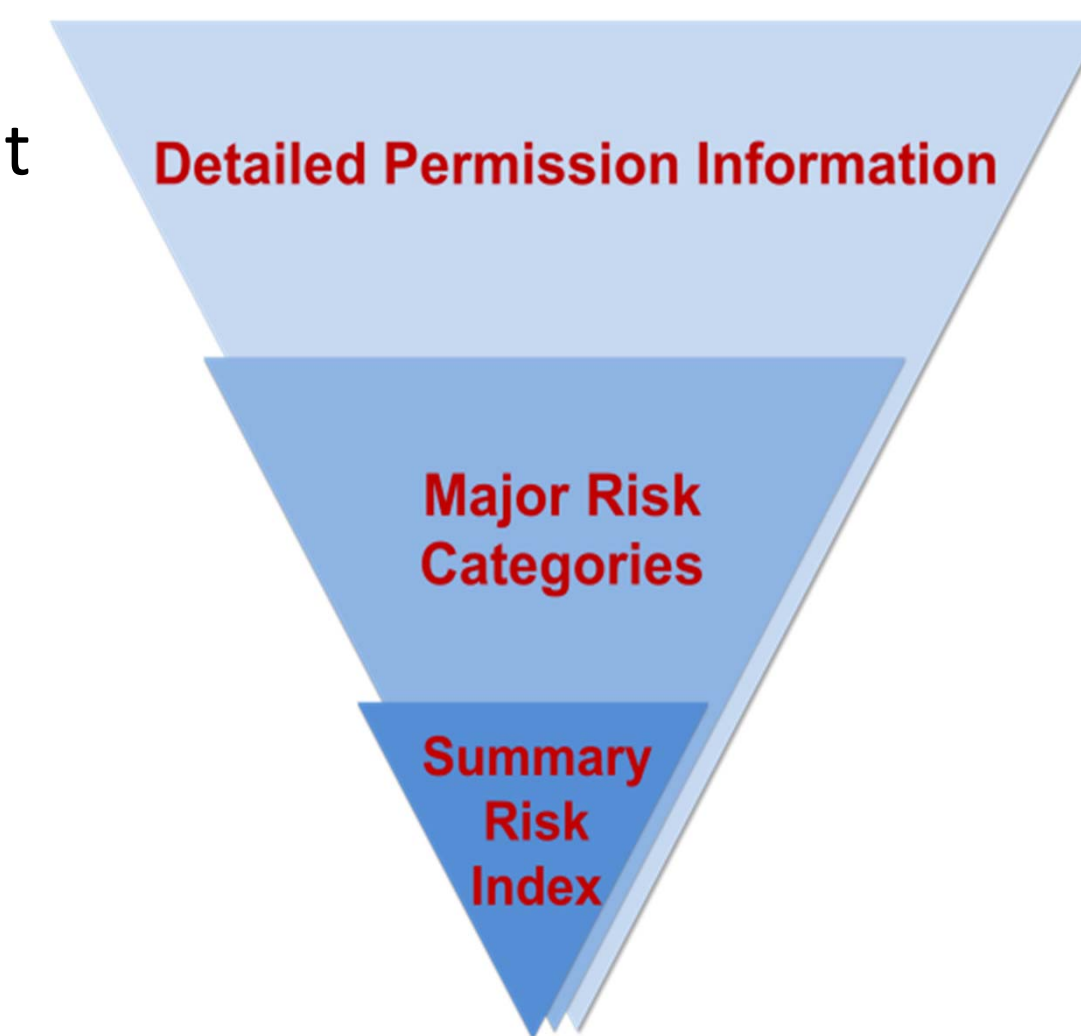
Display of Major Risk Categories for Android Apps

Scott Moore¹, Huangyi Ge², Ninghui Li, Ph.D.³, Jing Chen Ph.D.⁴, Robert W. Proctor Ph.D.⁵

¹ Purdue University, Industrial Engineering ² Purdue University, Computer Science ³ Purdue University, Computer Science ⁴ New Mexico State University, Psychology ⁵ Purdue University, Psychological Sciences

Background

Smart mobile devices have become very common but there are risks associated with using these devices. In the current Android app market, it relies on the users to understand a list of permissions before downloading an app. Research has shown that the average user does not understand or even read the risks associated with an app. The goal of our team was to provide recommendations for designing a risk display that can be easily understood by most users and conveys necessary risk information. Referencing the diagram on the right, summary risk scores may not provide enough detail about risk concerns, and the current usage of the detailed permissions can be enigmatic. A new design is needed - one that can be easily understood by most users and conveys all necessary risk information.

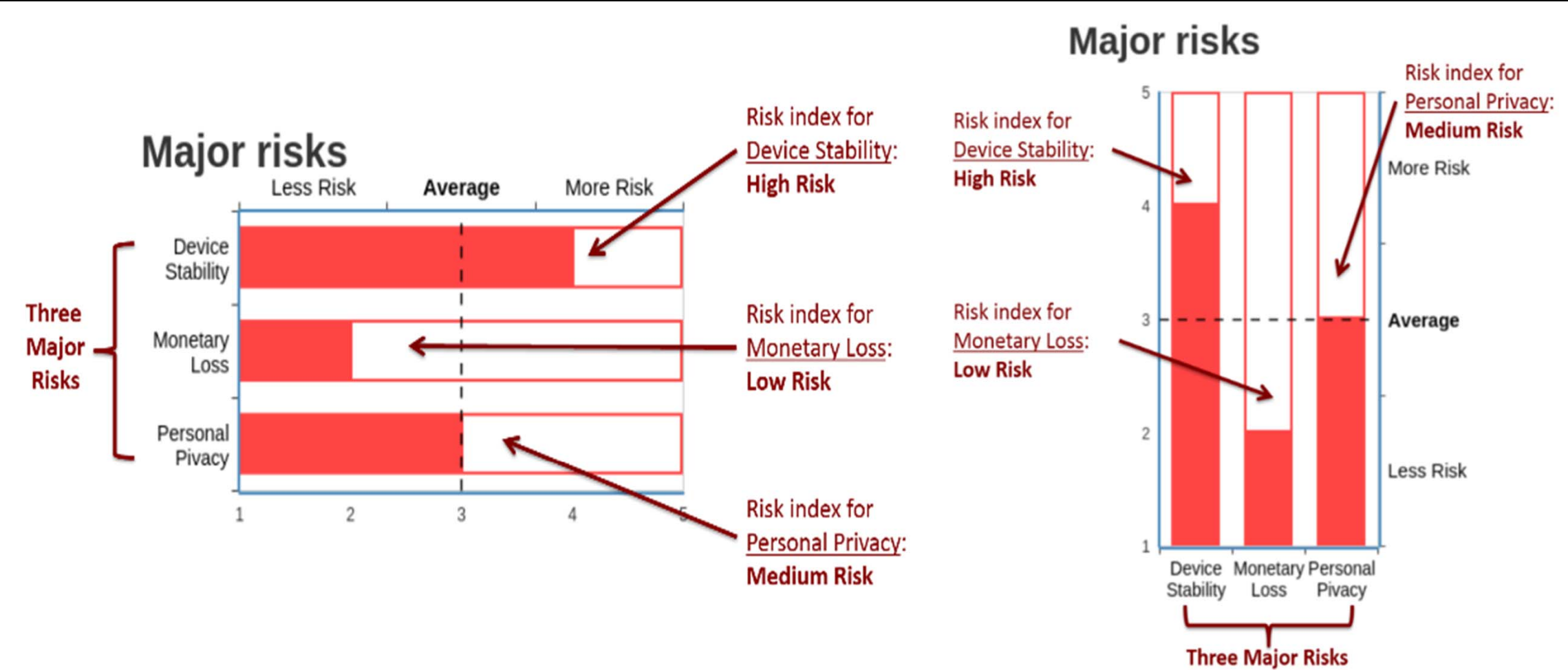


Abstract

This study contributes to effective risk communication for mobile devices by evaluating an intermediate-level display containing three major risk categories (personal privacy, device stability, and monetary loss). Participants performed an app-selection task, with risk scores for each category provided. Increased risk score in each category led to lower app-selection percentage, and this effect was influenced by self-reported risk concerns. The vertical and horizontal displays did not show differences in either task.

Procedure/Methods

- 408 participants were recruited from Amazon Mechanical Turk
- Risk scores were balanced so that one category risk score was equal on both apps, one was lower than the other app's option, and one was higher than the other app's option
- Each participant performed the app-selection task with horizontal and vertical displays
- 40 trials (20 vertical and 20 horizontal), including 2 "catch" trials to filter out random guessing
- A pre-task questionnaire was given prior to the task to test and make sure participant's understanding of risk categories. A post-task questionnaire included what risk category was most important to the participant.



Results

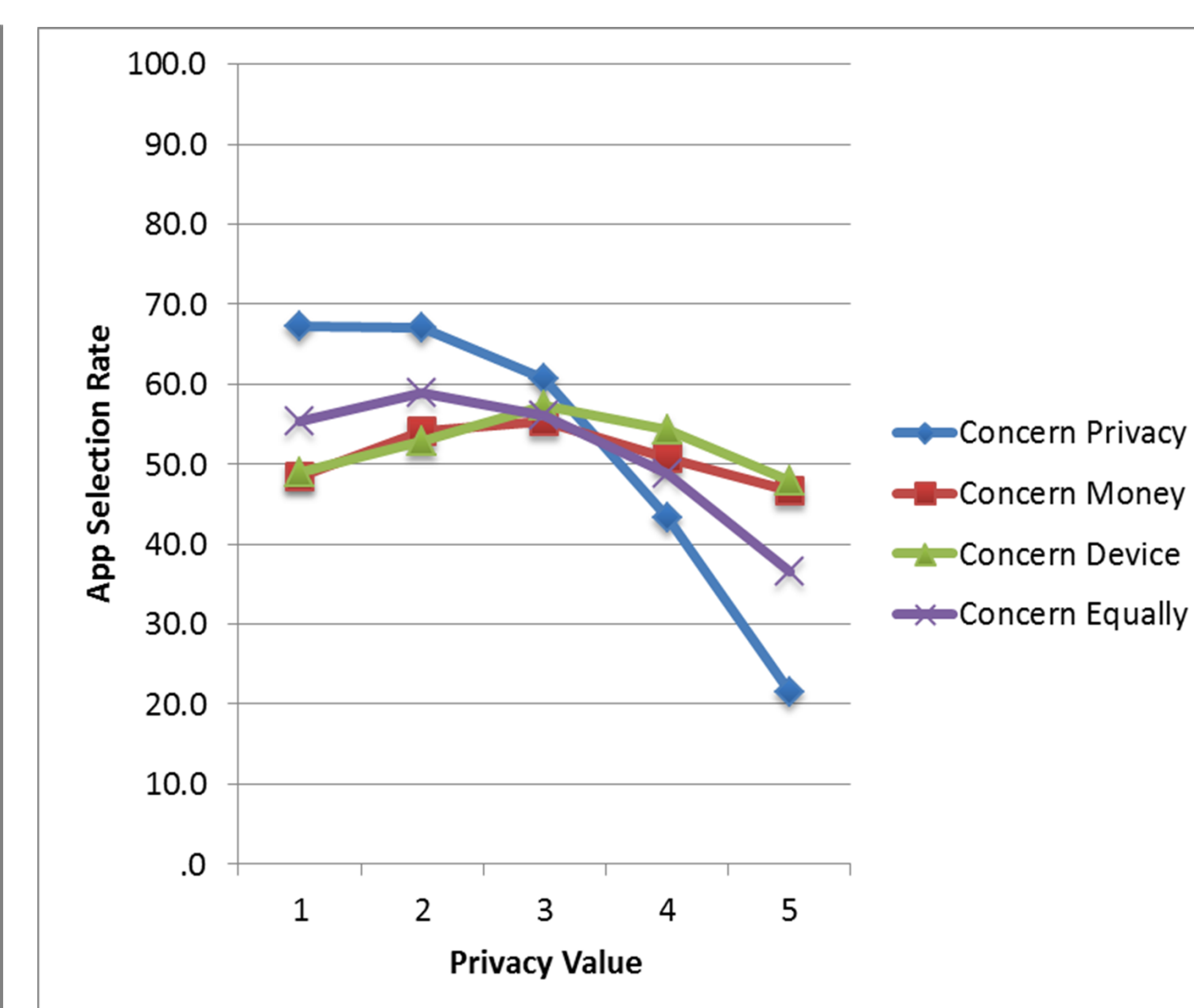
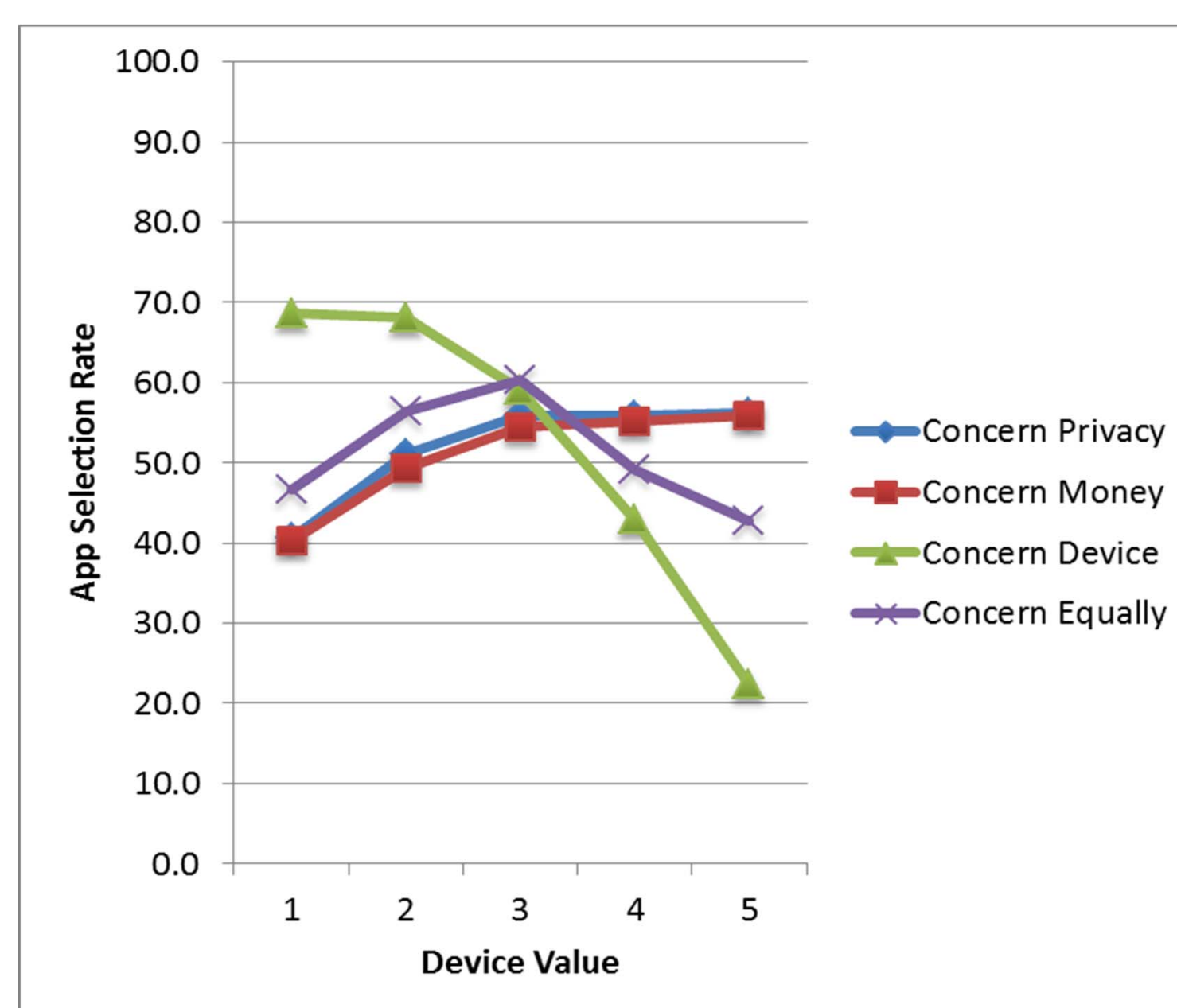
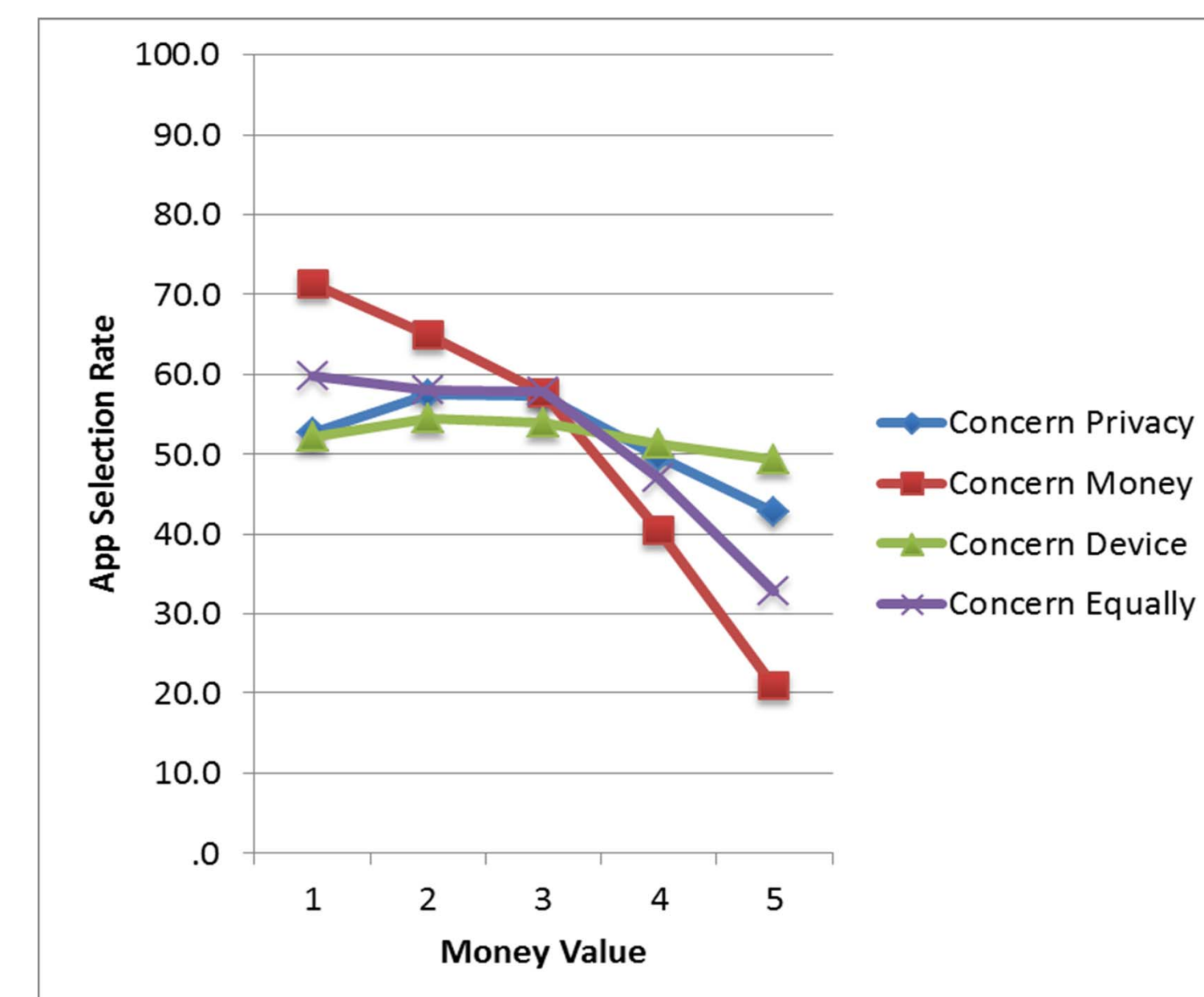
- Participants are able to respond to the risk information from a horizontal display more quickly compared to a vertical display
- There was a significant three-way interaction among the personal privacy, device stability, and monetary loss selection rate between the two apps. Participants were less likely to choose an app when the risk score in one of the three categories increased (see table below), but this effect was minimized when the risk scores in other categories increased.
- No main effect of risk concern but reported risk concern interacted with all 3 risk categories (see graphs).

of participants selecting Risk Concern

Risk Concern	Personal Privacy	Monetary Loss	Device Stability	All Equal
	133 (34.5%)	179 (46.5%)	28(7.3%)	45 (11.7%)

% of participants who chose app at given risk score

Risk Score	Personal Privacy	Monetary Loss	Device Stability
1	56.0	62.0	43.6
2	59.2	61.0	52.1
3	57.2	57.7	56.0
4	48.5	45.1	54.0
5	37.0	32.0	52.1



Future Directions and Other Work

- We also conducted an "app rating" experiment for which the results showed that graphical displays took less time and provided higher overall risk ratings than table presentations. In addition, the increased risk score in each category led to higher rated risks, and this effect was influenced by self-reported risk concerns.
- We currently are conducting a study on how "app selection" changes when categories are viewed from the perspective of safety rather than risk. Chen et al. (2015) found that users understood and used the risk information better when it was presented in the form of a safety score compared to when it was presented in the form of a risk score.
- Chen, J., Gates, C. S., Li, N., & Proctor, R. W. (2015). Influence of risk/safety information framing on Android app-installation decisions. *Journal of Cognitive Engineering and Decision Making*, 9, 149-168.