Fighting Fire v. Hunting Treasure: Examining How Context Affects Decision Making

Elena Sakosky[a], Stephen B. Blessing[a], & Geoff Engelstein[b]

[a]Department of Psychology, University of Tampa [b]Game Center, New York University

Abstract

Decision makers are often influenced by superficial aspects of a situation, such as a problem's context or theme. In general, these aspects affect novices more than experts (Chi, Feltovich, Glaser, 1981). We examined how contextual features affect performance initially and how performance changes across time as the decision maker gains experience in the domain. Using an existing game, we constructed two additional variants that had the same deep structure but different context. We hypothesized that any initial differences would be attenuated with more experience. Additionally we collected personality measures such as impulsivity to see if that too affected performance. We had 124 participants total in one of three game conditions: playing as an adventurer, a firefighter, or in a third condition that had no theme. Regardless of context, gameplay was identical with participants choosing how risky to play based on the card revealed each turn. We collected several behavioral measures, such as riskiness of moves, number of wins, and time spent playing. We found support for our main hypothesis that context did affect making decisions while playing initially, but those differences disappeared across rounds. Participants in the two themed conditions tended to play with more risk. We found no differences due to personality.

Introduction

Past researchers have demonstrated how decision makers can be influenced by superficial aspects of a situation, such as a problem's context or theme (Blessing & Ross, 1996; Braithwaite & Goldstone, 2015). In general, these contextual aspects affect novices more than experts (e.g., Chi, Feltovich, Glaser, 1981). The work of Chi and colleagues demonstrated that novices are very tied to context when categorizing problems and that has ramifications for how novices solve problems. Other researchers have shown similar results, with this effect of context being very pronounced at the initial learning of the domain.

Given these observations, a common discussion among educators is how to leverage this reliance on context at the early stages of learning as students ultimately need to transition to more emphasis on deep structure (Bassok, 2013). Whereas context is often correlated with deep structure, the correlation is not perfect. As the results of Chi and colleagues show (1981), truly expert performance is marked by reliance on deep structure.

In a similar manner, game designers often debate the relative importance of theme (i.e., surface context) versus mechanics (i.e., deep structure). Put another way, when playing a game, what relationship does the game's context have to how the player approaches the game. Some designers place a very integral role with regards to theme and how the game plays, whereas other designers de-emphasize this relationship. The emphasis, or lack of emphasis, affects the way in which designers create games. Finding a relationship between context and structure and how players play the game would inform designers in this process.

We examined how contextual features affect performance initially and how performance changes across time as the decision maker gains experience in the domain. Using an existing game, we constructed two additional variants that had the same deep structure but different surface context. We hypothesized that the different surface structure would affect decisions early in the game. Furthermore, we hypothesized that any initial differences would be attenuated with more experience. Additionally we collected personality measures such as impulsivity to see if that too affected performance.

Methods

Participants

A total of 124 University of Tampa undergraduate students volunteered to participate for course credit in their General Psychology class.

Materials and Procedures

We tested participants in a computer lab at the University of Tampa. The Dell computers ran the custom-written game program, which mimicked a commercially available boardgame, *Incan Gold* (Moon & Faidutti, 2008). We created three versions of the game that had the same rules but different context. One version had temple adventure context, the second had firefighting context, and another had abstract context (see Figure 1). In all versions participants played against 3 computer players. The card decks and computer moves were pre-determined and appeared in the same order for all participants.

The game is a push-your-luck game, where on each turn players decide simultaneously whether to continue playing or to exit. If they exit, they keep any points earned. If they continue, they may get more points, but if a second hazard of the same type is revealed, no points are earned for the round. After all players show their decision, the next card is drawn from the deck, revealing either a treasure or hazard card. The round continues until either all players have exited or the second hazard is revealed. A game consists of 5 rounds.

After completing the informed consent, participants played 4 games in one of the 3 versions. The computer presented the rules to the participant, tailored specific to each condition. For example, the firefighter condition described running into a burning house while avoiding hazards like explosions to earn honor points. The computer recorded time and move information as the participant played.

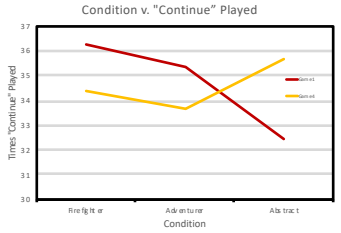
After playing the game, participants answered demographic questions and three personality inventories: 1) the BIS/BAS Reward Responsiveness scale to determine the inhibitory or responsive nature of the participants (Carver & White, 1994), 2) the Barratt Impulsiveness Scale (Patton, Stanford, & Barratt, 1995), and 3) the IPIP personality scale for conscientiousness (Goldberg, 1992).

Figure 1. The three context conditions

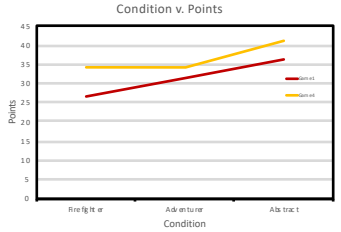
Results

The computer program collected several behavioral measures while the participants played the game, such as total number of times they played the "Continue" card, total points, time between plays, and others. In correlating these measures to the personality measures we found no significant effects. That is, none of the collected personality measures were predictive of game play.

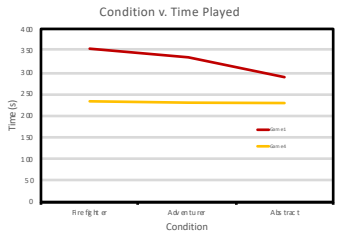
The context condition participants were placed in affected gameplay, as the following statistics and graphs demonstrate. Note that Game 4 used the same card decks and computer player logic as Game 1, so this comparison allows for a clean look at how play changes over time and if context affects that as well.



No main effects
Significant interaction, $F(2,118) = 5.52$, $p = .005$, $\eta^2 = .09$



Main effect for condition, $F(2,118) = 5.50$, $p = .005$, $\eta^2 = .09$
Main effect for game number, $F(1,118) = 10.79$, $p = .001$, $\eta^2 = .08$
No significant interaction



Main effect for condition, $F(2,118) = 3.86$, $p = .024$, $\eta^2 = .06$
Main effect for game number, $F(1,118) = 172.97$, $p < .001$, $\eta^2 = .59$
Significant interaction, $F(2,118) = 6.29$, $p = .003$, $\eta^2 = .10$

Discussion

The game's surface context (that is, theme) affected how participants played the game. Playing the "Continue" card is a measure of how willing participants were to press their luck. Participants in the two themed conditions initially pressed their luck more than the abstract condition players, but this reversed in Game 4, producing the interaction.

Points significantly increased between Games 1 and 4. However, condition also significantly affected points. A Scheffe's post hoc test reveals that the abstract theme participants scored significantly more points than the firefighter theme participants.

Lastly, the analysis time reveals significant differences between both game number and condition, as well as a significant interaction. The firefighter players took longer than the abstract players (Scheffe's test), but by the end all players took about the same time to play Game 4.

Taken together, these results suggest that the participants in the firefighter theme played more deliberately than those in the abstract theme, taking more time and ultimately taking more turns—which in a press-your-luck game means taking greater risk, which resulted in fewer points for these players. The adventurers were in between on these measures.

We were a little surprised by the lack of any effect between the personality measures and game play. Perhaps the ones we used were not sensitive enough to pick up on any differences in personality that might lead to differences in play style. Another possibility is that the type of game we used did not provide appropriate interaction to correlate with different personality measures of impulsiveness.

This initial experiment provided evidence between gameplay and theme, like past research found linkages between surface context and cognitive skills like categorization and problem solving. Future experiments will examine additional factors that affect decision making in this domain, such as the nature of the deep structure and the environmental factors in which the game is played, such as enclothed cognition.

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Acknowledgements

We thank the University of Tampa's Office of the Provost for support with a RISE grant to conduct the research and for support of our undergraduate research students.

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