

**Examining Motivation and Concentration Levels when Exploiting Simulation “Optimal Strategy”**

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## Introduction

Disaster preparedness simulations and “wargaming” are an important part of understanding, measuring, and analyzing human behavior like stress and decision making against specific scenarios of catastrophic hazards. Games like *Stop Disasters* provide valuable platforms for investigating these mechanisms by attempting to create realistic but controlled environments where players can practice their response without the threat of real-life consequences. That is all true, provided the simulation or its scoring system cannot be broken or optimized to produce non-realistic, time efficient results by exploiting fundamental game design flaws, leading to a decrease in player motivation and thus concentration on the original, intrinsic task of the simulation: achieve the minimal amount of harm while maximizing your final score.

Deci & Ryan (2000) state that intrinsic motivation can positively influence concentration and performance across various domains, including high-stress environments, and vice versa. The core hypothesis of this self-experiment is that lower motivation positively correlates with lower levels of concentration, but only *after* the player has found an optimal strategy to “min-max” the game’s final score in the least amount of time possible. By examining the relationship between motivation and concentration, augmented by the qualitative experience of gameplay optimization, this study seeks to contribute to our understanding of how these factors influence task engagement and performance in simulated scenarios — with lessons learned on how game designers can implement more robust guardrails to prevent players from skirting the original intention of the game.

## Methods

This study utilizes data from a controlled simulation environment: the *Stop Disasters* game, developed by Playerthree© for the United Nations International Strategy for Disaster Reduction (UN/ISDR). This game simulates a range of natural disasters, challenging players to develop resilient communities in various high-risk areas around the world. For this study, the wildfire scenario was selected, wherein players build and protect a town in Australia while meeting specific development and preparedness objectives. The wildfire map utilizes a grid of interactive tiles that represents objects, people, and buildings. Players can select the tiles to clear flammable brush and trees, construct buildings, and “strengthen” a tile against fire by planting lush foliage or a swimming pool.

The game’s design intention is to force players to make strategic choices to minimize deaths and injuries, prevent property damage (measured in USD), while simultaneously building new homes, hospitals, and schools for the simulated populace. Players face a restrictive budget and a time limit of twenty minutes before the wildfire infiltrates the map. The player cannot start the wildfire earlier than the countdown timer, *except when the player achieves all listed objectives*:

1. Build shelters for 650 people
2. Build one hospital

3. Build two schools
4. Protect the water towers (optional)

The timer and completed objective restrictions can be exploited with an “optimal strategy”— if the player uses the feature to clear brush and trees from tiles near the existing population centers, players can stack all required buildings and create a firewall around the population center. After those objectives are met, players can choose to protect the water towers and clear brush around the tiles host to simulated civilians to minimize casualties. Players can then start the disaster on their own by clicking the timer. All of this, after studying the optimal strategy, can be achieved in less than five minutes, a full fifteen minutes ahead of the previously restricted timer. Casualties and property destruction scores are proportional to the effort put into the optimal strategy.

### Procedure

Each session represented a single gameplay instance, after which the participant completed a subjective questionnaire consisting of 17 items, each measured on a scale from 0 to 100. There were twenty sessions in total, with the first ten completed in one sitting, and the remaining ten in another sitting, approximately two weeks apart. Among these items, **q11\_mot** captured the participant’s motivation level, while **q14\_concen** measured concentration. Additional variables included mental and physical demand, fatigue, and emotional responses, although these were not directly analyzed in the present study.

The primary analysis involved calculating the Pearson correlation coefficient between **q11\_mot** (motivation) and **q14\_concen** (concentration) across the twenty sessions. The hypothesis was that these two variables would show a positive correlation, indicating that decreased motivation is associated with decreased concentration during the task over multiple, successive sessions due to implementation of the “optimal strategy” which turned the simulation from an intriguing task to a chore.

### Results

The analysis revealed a strong correlation of  $r = 0.88$  between motivation (**q11\_mot**) and concentration (**q14\_concen**). Figure 1 illustrates this relationship through a scatter plot, where data points cluster along a linear trend, indicating that lower motivation levels tend to align with lower concentration scores.

This correlation suggests that the participant’s self-reported motivation was consistently aligned with their concentration level during each gameplay session. The strength of this relationship (near 1.0) implies that intrinsic motivation could be a significant predictor of concentration, at least within the context of this simulation.

In Figure 2, the scores of motivation and concentration are displayed continuously over the twenty sessions, showing the participant in the first session learning the game and optimal strategy the first time through, which resulted in initially higher motivation and concentration

scores. As the sessions continued, motivation and concentration decreased, especially in the second “sitting” of the participant after Session 10. This may show that by adopting gameplay breaking behavior, participant motivation and concentration decreases because of the repetitive, under stimulating simulation environment.

**FIGURE 1**

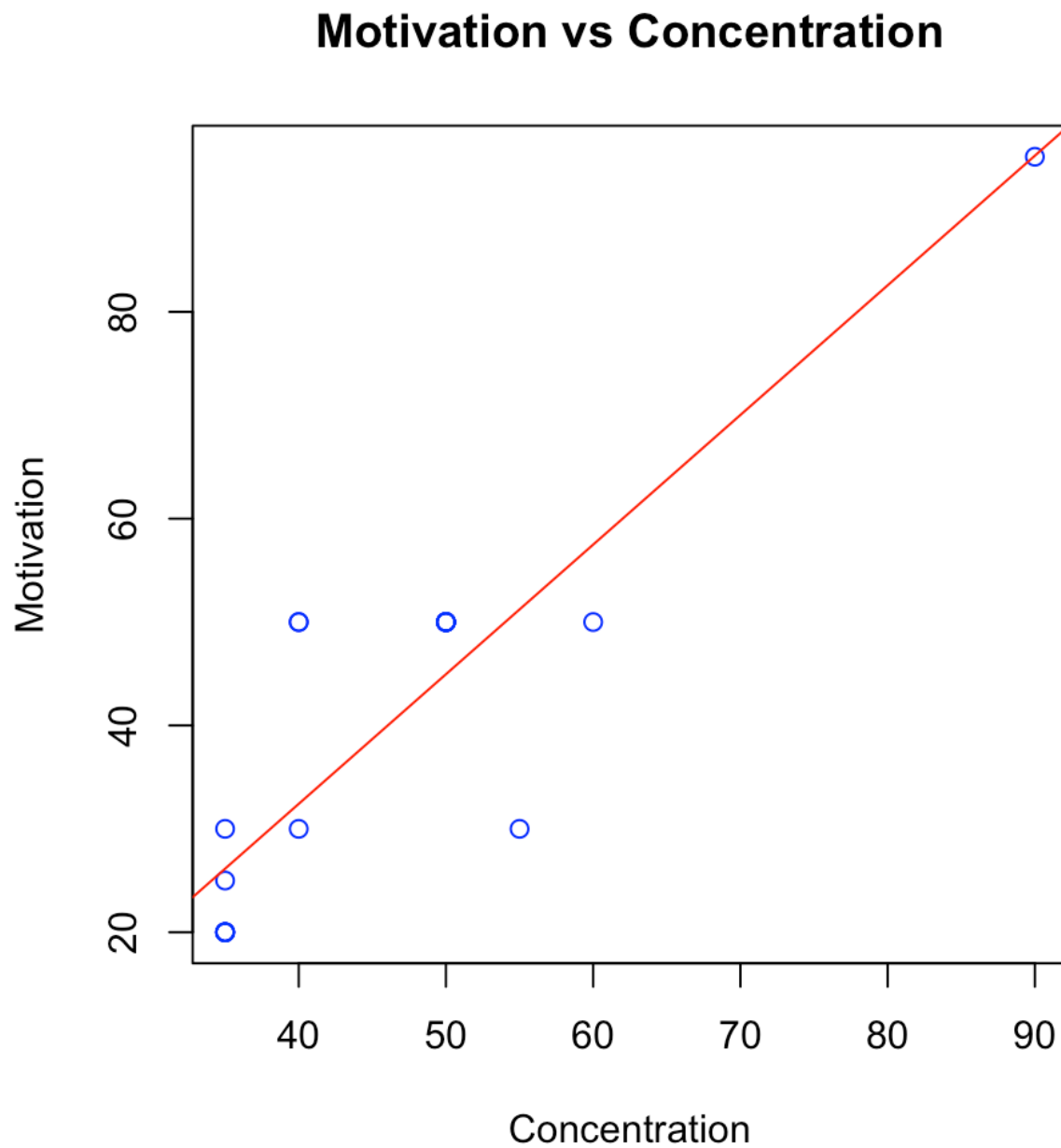
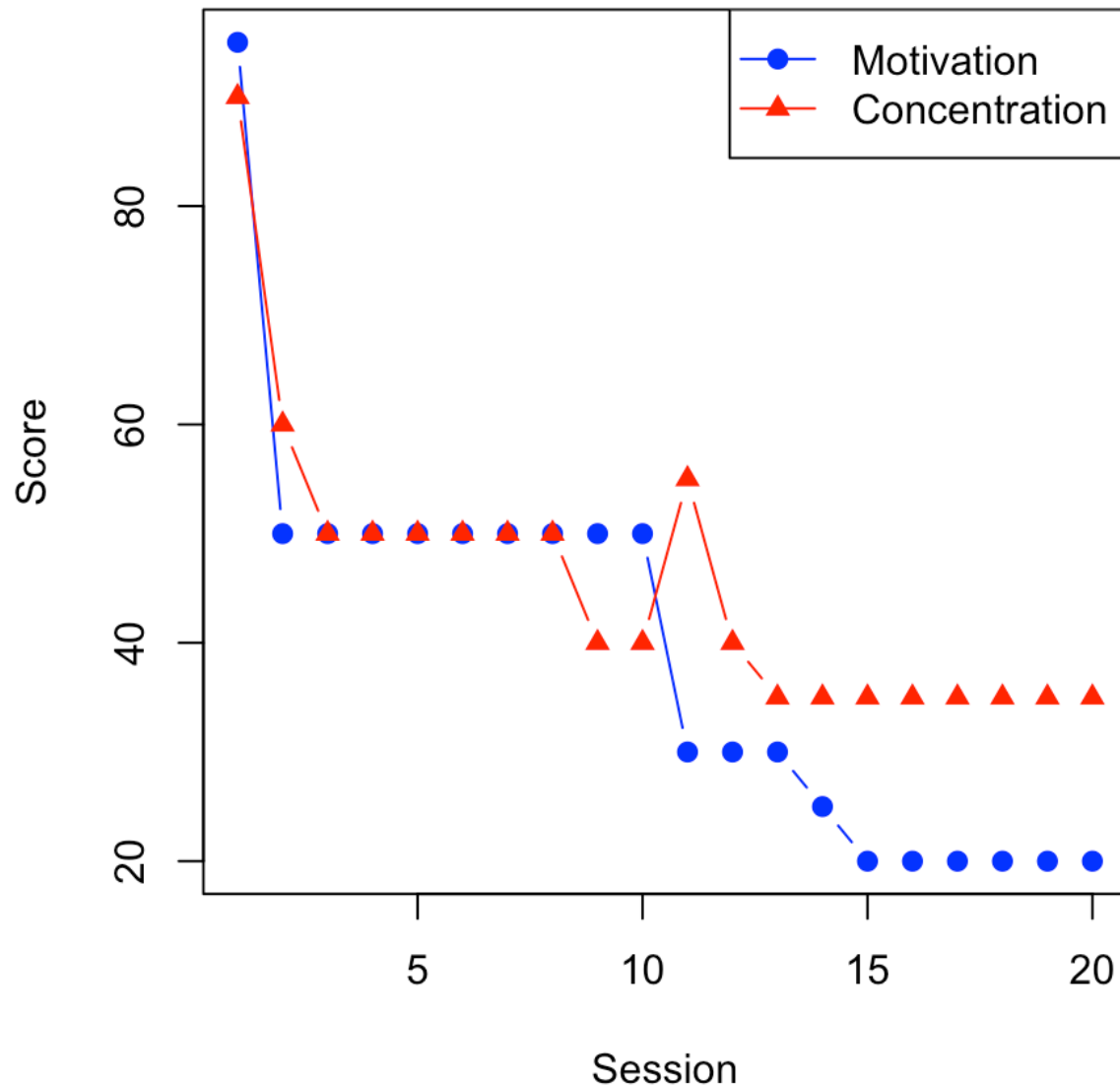


FIGURE 2

## Motivation and Concentration Over Sessions



### Discussion

The session data provide support for the hypothesis that motivation correlates positively with concentration in a simulated environment. This result aligns with established theories in human factors and basic psychology which suggest that motivation enhances task engagement and focus (Deci & Ryan, 1985). The findings also indicate that the reverse is potentially true when a game's design allows for it — if players can exploit an optimal strategy to quickly and efficiently

complete the simulation, then the need for increased cognitive load is minimized, and thus resolves to lower levels of task motivation and concentration. More simply, the simulation runs the risk of becoming boring, and participants lose interest in completing the tasks earnestly.

Designers of today's AAA video and tabletop games perform rigorous playtesting to attenuate for boredom and decreased engagement. Wargaming and "serious simulation" designers should take note of these entertainment industry practices, because the failure to encode the intended learning outcomes on players, such as in the case with the *Stop Disasters* game, may have detrimental residual effects on the targeted population of participants.

### References

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