

The Psychological Reality of Procedural Rhetoric

Barrett R. Anderson
UC Santa Cruz
Santa Cruz, California
barander@ucsc.edu

Christopher R. Karzmark
UC Santa Cruz
Santa Cruz, California
ckarzmar@ucsc.edu

Noah Wardrip-Fruin
UC Santa Cruz
Santa Cruz, California
nwardrip@ucsc.edu

ABSTRACT

Game scholars make arguments that depend on the idea that games are capable of conveying meaning and making arguments via their mechanics, an information channel unique to games (and other forms of system-driven media) which Bogost has termed “procedural rhetoric.” This concept is not intended to just be an interpretive technique for experts, but is also meant to describe the way the general player population experiences games. However, there has never (to our knowledge) been any attempt to use the tools of psychology to ascertain whether procedural rhetoric is a psychological reality for players in general and, if so, under what circumstances and in which ways it is experienced. This paper reports on the first steps in such an investigation. We found (a) that procedural rhetoric has psychological reality, with players accurately understanding that two games meant to have arguments have them, and the purely abstract game we included did not; (b) the understanding of procedural rhetoric appears to be strongly shaped by accompanying media, with the more abstract of the rhetorical games we studied much less clearly understood; and (c) as with any media, even when audiences understand the goal of a procedural rhetoric argument, the impact on their thoughts and feelings may not be as authors intend.

CCS CONCEPTS

• Applied computing → Psychology; Computer games;

KEYWORDS

Procedural Rhetoric, Persuasive Games, Psychology, Empirical Research

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1 BACKGROUND

Many arguments in game studies begin with the assumption that games can communicate through their systems, which is sometimes justified with a reference to Bogost’s concept of “procedural rhetoric” [5]. His argument describes game mechanics as a unique rhetorical affordance, in contrast with the features that games share with traditional media, such as art and narrative. Previous research has explored the psychological effects of some of these features for other kinds of media [16, 44], but these impacts have not been as thoroughly explored for games [35]. Procedural rhetoric has never (to our knowledge) previously been subject to psychological investigation.

The concept of procedural rhetoric is not only a critical lens through which games can be examined, but also an argument about how players interpret and experience games. While these interpretations will vary between players, depending on their individual perspective [36, 40] and on their experience and facility with this kind of comprehension [19, 29], there is value in developing an understanding of a typical player’s experience of procedural rhetoric. This understanding can help ground critical conversations about games in a broader psychological reality and help game scholars and critics avoid the trap of falling into excessive self-reference.

Methods for investigating players’ common experiences are found in psychological research, but prior work on the possible benefits of games has focused primarily on their educational potential [28, 30, 32]. The present study is a psychological investigation of the rhetorical potential in a small set of games. While procedural rhetoric has been subject to critical analysis [8, 11, 15, 34, 39], it has yet to be explored from a psychological research perspective. Therefore, this work could also be described as an initial test of the psychological reality of procedural rhetoric, exploring the nature of its existence independent of critics’ interpretations. This is a novel application of a psychological research method to concepts that were generated, and have primarily been explored, via more humanistic critical methods. The primary contributions of this work are as follows:

- PC1** To supplement more humanistic games criticism with another way of understanding how individuals experience rhetoric in games.
- PC2** To provide an example of a research method that can be employed by anyone interested in another way of investigating amenable humanistic critical concepts in games.

A secondary contribution is the development of a scale to quantify a game’s perceived rhetorical content. These contributions will primarily be of value to game creators and scholars.

1.1 Meaning from Game Mechanics

Bogost [5, p. ix] coined the term procedural rhetoric and defined the concept as “the art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images, or moving pictures.” Focusing on the positive aspect of this definition, he discusses the way that videogames make claims through their mechanical systems, beginning with an example from a simulation *Tenure* [18]. In this program, the player took on the role of newly hired high school teacher. The player is then presented with difficult situations where social, educational and professional goals come into conflict, and their decisions could potentially have unknown long-term consequences. In doing this, Bogost argues, the system is making a claim about how the process of high school operates, in this case the claim that personal politics are intertwined with pedagogical decisions.

This concept has been explored and expanded on by other researchers, who have written about interpreting and generating procedural meaning in games [8, 36, 38]. An important related concept is the *SimCity* effect, which Wardrip-Fruin defines as the effect of a system that “through play, brings the player to an accurate understanding of the system’s internal operations” [42, p. 2]. Here the canonical example comes from the game *Sim City* [45], in which a player manages a developing city by zoning districts, creating transit links, and making other adjustments to infrastructure and policy. The player is provided with some guidance about what their city needs, but their choices can also interact in ways that are not immediately apparent (e.g., a residential area might be negatively impacted by proximity to a power plant). A player comes to understand these interactions through play, internalizing a mental model of the simulation. The player becomes more skilled at the game to the degree that they do so completely and accurately, and this simulation can help players develop an intuitive understanding of complex processes [43].

For any simulation, there are choices being made about what aspects of reality to model. While this might lead players to an understanding of the limitations of such a computational model, it could also be understood as a way of making an argument about what aspects of a situation or system are most important. One common type of cognitive bias involves replacing an unsolved and difficult question with an already solved problem, described by Kahneman [25] as “answering an easier question.” Like most other cognitive biases this is usually a useful mental shortcut, but it can sometimes lead to error. If a player has internalized a simplified model of a complex system, as in the *SimCity* effect example above, they might use that model as a cognitive shortcut when trying to reason about a real-world city. Wardrip-Fruin points out that the game models “some relationships (e.g., crime and police presence) and not others (e.g., crime related death and weapons availability)” [43, p. 310]. While it is possible to read these simplifying assumptions as a statement, made in the procedural rhetoric of the game, about which relationships are more important, it seems possible that a less reflective player would internalize the model less critically [34]. In a similar way, readers have been shown to incorporate the metaphorical content of a fictional newspaper article into their real-world policy preferences [37], and users of a simulated physical system have been shown to apply the mental models they learned to

very different situations, even when they are not conscious of doing so [9]. After some time spent playing a city simulation game it is possible that biases that exist in the game’s model might reappear in the player’s mental model of a city, and impact their real-world decisions.

1.2 Procedural Rhetoric and Analogical Transfer

Because the present study is a psychological investigation, it also exists in relation to previous psychological research on games. Prior work in this tradition has, when exploring the possible benefits of games, primarily focused on their educational potential [30, 32]. While transfer from procedural rhetoric is certainly a form of learning, we would posit that is closer to learning from story than it is to learning from drill or from a lecture. For this reason we believe that it may also be understood as a form of analogical transfer.

1.2.1 Analogical Transfer. Analogical transfer, or the ability to map relationships between elements of a system in one context to another [23], is often considered a pillar of human cognition [4, 22]. A classic study in this domain asked participants to develop an analogy-based insight from a story they had been presented with from one context to another [13]. The initial story that participants in this study read described a general who wished to attack a tower which was surrounded by mined roads, and who solved this problem by dividing their forces into smaller more maneuverable units. Participants then read about a doctor who wanted to treat a patient’s tumor with a laser, without excessively damaging intervening healthy tissue, and were asked to suggest solutions. Participants were intended to adapt the concept of a solution based on convergence from a military context to a medical context, but there were generally unlikely to see the structural similarity unless they were explicitly cued to think about the previous story. Further studies in this domain found similar results, where successful analogical transfer is possible but needed to be between similar domains [23, 31], or facilitated by explicit clues [20]. Analogical transfer is paradoxically difficult to elicit in a lab setting, but something people have been observed to do frequently and with great facility in the workplace or other real-world settings [10, 12].

1.2.2 Analogical Transfer from Simulated Systems. Another approach to analogical transfer is to look at transfer from a simulated physical system. In one such study [9] participants interacted with a computer simulation of a ball oscillating between two pins. The ball was attached to each pin by an elastic band, and participants could manipulate the motion of the ball by adjusting an adjacent fan. Participants were given a specific goal to achieve; either keeping the ball stationary or maximizing its movement in one direction. Succeeding at either goal would require developing a strategy through trial and error. After an appropriate interval, participants were presented with an ostensibly unrelated task that involved managing the population of a city. For this task participants chose the time in which to buy advertisements for their city, with the goal of either stabilizing or maximizing the population (goals analogous to the stabilize or maximize goals in the fan task). The interface for this task was entirely textual, and changes took place in discrete time steps, but the underlying principles (e.g., the system mechanics)

were identical between both the fan and population management tasks.

Participants required reliably fewer trials to complete the population task when the goal was aligned with the training task, and they were more likely to complete the task before a given deadline. Significantly, this transfer was independent of reported recognition of the analogical relationship between these tasks. These findings suggest that games and simulations are effective at facilitating analogical transfer, even in the absence of explicit cues. They also suggest that transfer can be covert, in the sense that it may be independent of the player's explicit awareness.

1.3 Research questions.

In order to better understand the possible influence of rhetorical games, we asked four questions:

- RQ1** Will our participants identify a rhetorical game they play as containing an argument?
- RQ2** What argument will participants perceive, and how well will it match what we would have expected given our understanding of the game's intended procedural rhetoric?
- RQ3** Will playing a rhetorical game result in any change in the participants behavior or values, as it related to the game's content?

While it is possible that participants will be aware of and influenced by the game they play in the course of this study, based on our understanding of analogical transfer from systems, and of the influence of metaphorical language, it also seems plausible that games will exert a covert influence on players. This has theoretical and practical implications, for both how we understand analogical transfer and for and for the analysis and development of meaningful games.

2 METHODS

2.1 Participants

Participants included 43 undergraduates enrolled in psychology courses, recruited from a university psychology subject pool, ranging from 18-33 years of age ($M = 21.00$, $SD = 2.73$) including 33 who identified as female (76.74%) and 8 who identified as male (18.60%). Slightly more than one third of participants identified as Latinx ($n = 15$, 34.88%), and slightly less than one third identified as Asian ($n = 13$, 30.23%) The remaining participants identified as White ($n = 9$, 20.93%), Multiethnic ($n = 5$, 11.63%), and Black ($n = 1$, 2.33%). While women are over-represented in this sample compared to the general public, an industry report also recently identified adult women as the single largest demographic group (36%) of all videogame players [3].

2.2 Materials

2.2.1 Games. Games used in the present study included *September 12th* [17], an example of a game [39] with a clear and explicit message conveyed through a combination of procedural and traditional rhetoric, *LIM* [26], a minimalist abstract stealth game with an implied social message conveyed primarily through mechanics, and a math puzzle game called *Threes JS* [41], which was included as a non-rhetorical control (See Fig. 1). The non-control games were

chosen for inclusion in this study because they are widely-discussed examples of procedural rhetoric [1, 6, 17, 24, 39], rather than as a representative sample of games overall. There is no canonically correct procedural reading [40], but to answer RQ2 we developed our expectations based on statements of authors and critics as described below.

September 12th. When the *September 12th* [17] program is launched the player is presented with a messages stating that it is not a game, but a "simulation" or "simple model" that can be used to explore aspects of the war on terror. Consistent with this, the player is given no explicit goal and informed that the game does not have an ending. Illustrations on the left-hand side of the screen show the players silhouettes of "terrorists" and "civilians." After dismissing this dialogue, players see a city from above, bustling with activity. The mouse cursor becomes a target and a click will, after a brief delay, send down a bomb that destroys part of the city and any figures it lands on. Players can try to eliminate terrorists, but will inevitably cause civilian casualties. When other civilians come across those who have been killed, they will wail and mourn briefly, and then transform into additional terrorists. This game has been described as having "an easy to understand procedural message, making it an excellent point of entry for understanding procedural rhetoric" [39, p. 5]. *September 12th* is included here as a game that combines procedural and other forms of rhetoric.

LIM. In *LIM* [26] players use the arrow keys to move a block through a two dimensional maze. This is another game that does not give players an explicit goal, although they typically pick up on the only one afforded (trying to get to the end of the maze). The maze is inhabited by other blocks, which can violently push the player's block around, and will impede progress if they become hostile. It's possible to avoid this by holding a key to "blend in" while navigating around these blocks, which causes the normally multicolored player block to temporarily resemble one of the other block types that inhabits the maze. However, blending in also causes the player to move more slowly, reduces the visible space of the map, and if the key is held for too long, the screen will shake and the player will come to a complete stop. If they do manage to reach the end of the maze, the player is rewarded by meeting another block that exhibits the same multicolor pattern that they do, before the screen fades to black. Critics have said that "*LIM* is a classic example of procedural rhetoric at work: it is a sparse, abstract game which conveys a powerful message to the player through its systems alone" [1]. *LIM* has also been described as being about "the tension and violence and dread and suffocation of passing" [24], and as a metaphor for passing in a queer context, where the mechanics reinforce the idea that the effort of blending in is constant emotional labor [6]. In a previous study, we observed that individuals who had to deal with conflicting social categories interpreted *LIM* as relating to their personal experiences [2]. Here *LIM* is included as an example of a rhetorical game that communicates primarily through mechanics.

Threes JS. In the game *Threes JS* players match number tiles on grid, attempting to achieve a high score before further moves become impossible. It is an abstract puzzle game, which was a precursor to and conceptual inspiration for the popular game *2048* [7]. While it is possible to interpret any game rhetorically, for the

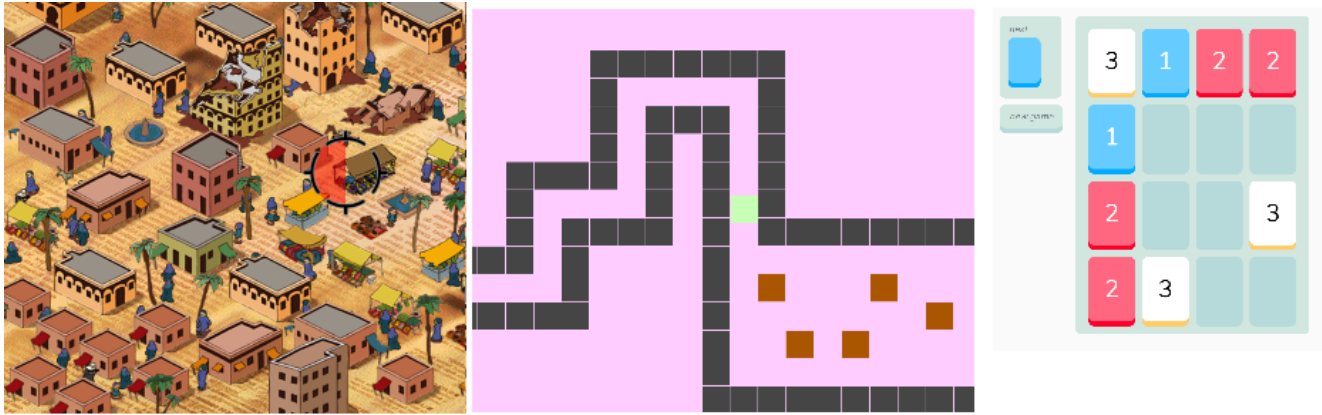


Figure 1: Games played by participants in this study. From left to right, *September 12th*, *LIM*, and *Threes JS*

purpose of this study *Threes JS* serves as a control in comparison to the more explicitly and intentionally rhetorical games described above.

2.2.2 Questionnaires. All participants completed questionnaires about their experiences playing each game, about their perception of each game's rhetorical content, about their attitudes and beliefs about issues related to our interpretation the game's rhetorical intent, and about media in general. Participants also provided demographic information.

Game Experience Questions. For all games we asked questions related to the game experience itself. This included asking the participant the degree to which they felt they understood and enjoyed the game they had just played, qualitative questions about their interpretation of the games' meaning, and responses to a scale intended to provide a more quantitative measure of their perception of the game's rhetorical content.

Qualitative game experience questions. For each game, all participants were asked what they thought the game was about, if they thought the game was making an argument, and to describe the argument that the game was making.

Rhetorical Content Scale. For the current study we also developed a scale intended to capture the degree to which player's perceived it as having rhetorical content, and the degree to which they perceived the game as being biased or reflecting a specific authorial intent. Example items included in the rhetoric content scale included "This game made an important point" and "The game I played was trying to teach me something." Example items in the authorial intent/bias scale included "The game I played was biased" and "The game I played was misleading." For the full list and scoring see Table 1.

Game Specific Content Questionnaires. For each of the games with an intentional rhetoric we included questions in the pre-test and post-test that were related to our interpretation of the game's message.

For the *September 12th* game we adapted questions from an existing moral disengagement scale [14], to measure the degree to which participants were willing to downplay or ignore moral concerns in

1. The game was making an argument.
2. The game I played was trying to teach me something.
3. The game I played was biased.
4. The game was misleading.
5. The game made an important point.
6. I considered a new perspective because of the game.
7. The rules of the game were based on wrong ideas.
8. The game rules captured an important truth.
9. The rules of the game were created with a point of view.
10. The game was convincing.

Table 1: Rhetorical Content Scale items. Each item was rated on a scale from 1(Strongly Disagree) to 5(Strongly Agree). Perceived Rhetorical Content Scoring: Average of 1-2,5-6,8-10; Perceived Rhetorical Bias Scoring: Average of 3-4,7.

the context of fighting terrorism. Participants were asked to indicate their degree of agreement with statements such as "In fast and clean military actions, central bases of hostile movements can be neutralized and collateral damage can be minimized," "If extreme political groups are guilty of cruel crimes against humanity and serious human rights violations, they do not deserve to be treated sparingly," and "Terrorists are like pests in cornfields — one has to approach them relentlessly."

For *LIM* we adapted questions about identity and conformity from an existing scale about multiracial challenges and resilience [33]. Because *LIM* can be interpreted to be about different aspects of identity (e.g., not only racial, but also gender, etc.), we made most of these questions more generic. For example, participants were asked to indicate their degree of agreement with "Generally, changing yourself to fit in with a group is harmful" and "I feel pressure to distance myself from a group to which I feel connected." This resulted in a measure of anti-conformity attitude, and a measure of conformity related stress.

No separate scale was adapted in relation to *Threes JS*, because it was included as a control game without explicit rhetorical content.

Media Relationship Questions. Because we suspected that an individual participants' relationship to media, and particularly to

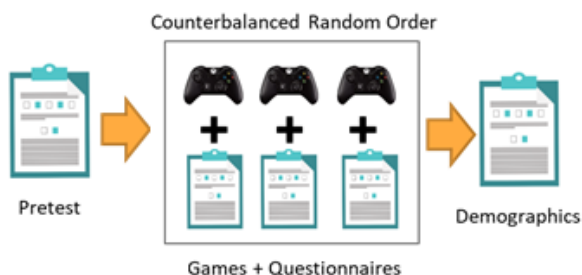


Figure 2: Summary of the study procedure.

games, might have a moderating effect on their perception of and reaction to a game's rhetoric, we also asked participants questions about this relationship. These questions were placed after all game play and responses to avoid any demand characteristics. Degree of agreement with statements such as "I think about the meaning of the games I play," and "When I'm playing a game, I just want to have fun." (reverse coded) were combined to create a measure of media criticality. We also asked participants to indicate the degree to which they identified as a "gamer" and for the number of hours each week they played any kind of (non-sports¹) games.

2.2.3 Demographic Questions. The final questionnaire that players completed in this study asked them to provide their age, gender, ethnicity, and political affiliation.

2.2.4 Procedure. After arriving and providing informed consent, participants were asked to complete a battery of questionnaires to establish baseline values related to the topics of each of the games they were to play (e.g., attitudes terrorism and conformity). Following the completion of this general pretest, participants played each of three games (*LIM*, *September 12th*, and *Threes JS*). The order that these games were presented in was counterbalanced across all participants to mitigate any order effects. After playing each game participants responded to a questionnaire about the game experience and, for those games where it was relevant (*LIM*, *September 12th*), to questions about their attitudes towards issues addressed by the game. After playing all games and responding to the related questions, participants completed two final questionnaires, one asking about their experience with and attitudes towards games and media in general, and a final demographic survey. The procedure is summarized in Fig. 2.

3 RESULTS

Our findings are organized around answering each of the research questions listed above.

3.1 Q1. Did the game contain an argument?

3.1.1 Yes or No. Participants were asked, after playing each game, whether they felt that the game that they had just played contained an argument. For *September 12th*, the majority of participants answered "Yes" ($n = 37$, 90.24%). After playing *LIM*, a smaller majority

¹The intent of this qualification was the exclusion of physical sports, not the exclusion sports-themed videogames.

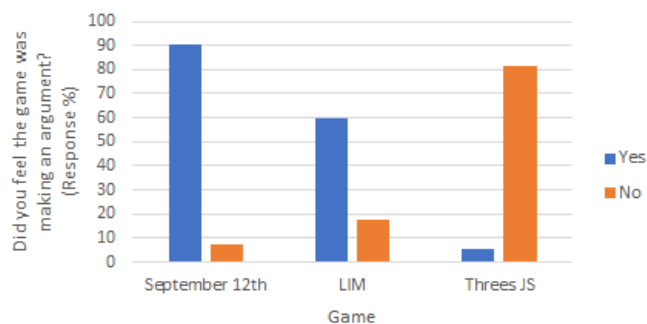


Figure 3: Responses to "Did you feel like the game was making an argument?" by game.

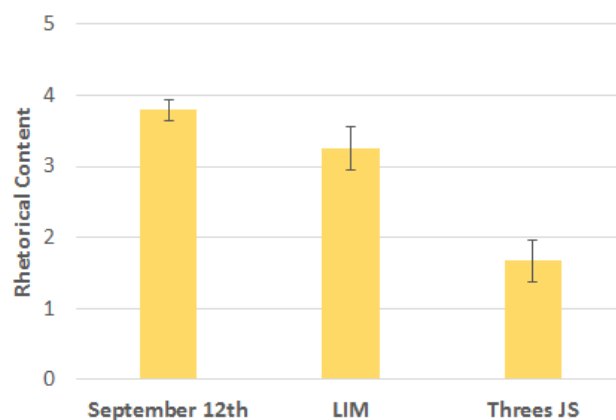


Figure 4: Rhetorical Content by Game. Note: when present, error bars are 95% confidence intervals for all figures.

of participants also reported that they felt that the game contained an argument ($n = 24$, 60.00 %). As we expected, after playing *Threes JS*, only a small minority indicated that they believed that the game contained an argument ($n = 2$, 5.26%), (See Fig. 3).

3.1.2 Rhetorical Content Scale. Looking across all games, we saw that the degree to which participants perceived a game as being rhetorical varied, $F(2,68)=63.20$, $p<.001$. Post hoc tests using the Bonferroni correction revealed that *September 12th* was rated as having more rhetorical content ($M = 3.79$, $SD = .99$) than *LIM*, ($M = 3.26$, $SD = .97$), $p = .036$, or *Threes JS*, ($M = 1.67$, $SD = .66$), $p < .001$, and *LIM* was rated as having more rhetorical content than *Threes JS*, $p < .001$, (See Fig. 4).

A similar pattern of results was observed for the rhetorical bias score, where the degree of perceived bias varied between games, $F(2,68)=38.67$, $p<.001$, and post hoc tests using the Bonferroni correction revealed that *September 12th* was rated as having more bias ($M = 2.99$, $SD = .67$) than *LIM*, ($M = 2.30$, $SD = .82$), $p < .001$, or *Threes JS*, ($M = 1.62$, $SD = .84$), $p < .001$. *LIM* was also rated as having more bias *Threes JS*, $p = .001$, (See Fig. 5).

Category	Example Responses
Civilian Deaths	“It is very difficult, if not impossible, to avoid civilian casualties when attempting to combat terrorism” “There could be innocent lives that are involved.”
Cycle of Violence	“Preemptive strikes are a horrible measure that only make a problem worse” “Violence will only lead to more violence”
Unintended Consequences	“no matter what you choose to do there will be consequences” “The military force, inevitably has a negative impact on innocent people”
Futility of War	“War does more harm than good” “There really is no safe and secure way to have no innocent casualties.”

Table 2: *September 12th* “What argument was the game making?” Qualitative response categories.

Category	Example Responses
Necessity/Benefits of Conforming	“That you need to blend in to get through certain parts of your life.” “Sometimes you need to blend in for certain situations”
Conformity Induces Stress/Harm	“Trying to blend in and becoming something you’re not causes a lot of pressure on the individual” “trying to fit in can have a damaging effect, especially once you get found out”
Encouragement of Individuality	“It was trying to persuade people...You should not hide who you are.” “Hiding yourself to match with others is a process that shouldn’t be done”
Power of Peer Pressure	“People are pressured to change their image to fit what a group finds acceptable or tolerable” “there are individuals out there who change to fit in”

Table 3: *LIM* “What argument was the game making?” Qualitative response categories.

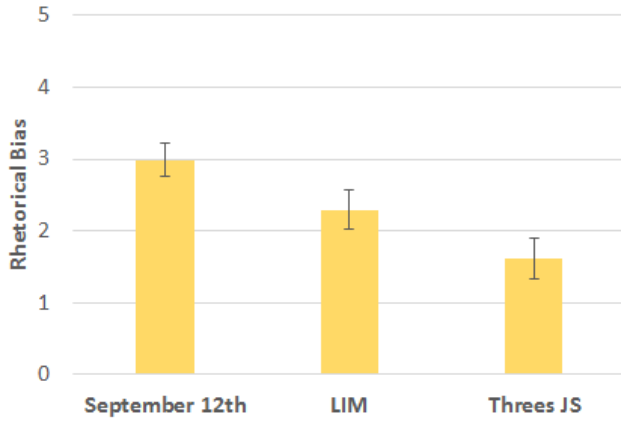


Figure 5: Rhetorical Bias by Game.

3.2 Q2: What argument did participants perceive from the game, and how well did it match our understanding of the game’s intended procedural rhetoric?

3.2.1 Coding Qualitative Responses. After playing each game and indicating whether or not it contained an argument, participants were asked to describe in their own words what that argument was.

These responses were then coded into categories, which were generated using a grounded-theory based process [21]. Each response was coded for whether it belonged in each category independently, so a single response might appear in more than one category. In order to answer the second part of this question we compared participant’s readings against our own. There is no single correct procedural reading [40], but to the degree it was possible our readings were grounded in statements from authors and critics.

3.2.2 *September 12th*. For *September 12th* the generated categories included civilian deaths, the cycle of violence, unintended consequences, and the futility of war (See Table 2). All identified categories were consistent with our understanding of the intended rhetoric of *September 12th*. Overall the most common response category was civilian deaths (58.82%). This was followed by cycle of violence (38.24%) and unintended consequences (35.29%). The fewest responses were coded as being about the futility of the war on terror (26.47%) (see Fig. 6).

3.2.3 *LIM*. For *LIM*, the generated categories included the necessity/benefits of conforming, that conformity can induce stress/harm, an encouragement of individuality, and an acknowledgement of the power of peer pressure (see Table 3). These categories do appear to be generally consistent with the intended rhetoric of *LIM*, though in contrast with the descriptions provided by the author [26, 27], we did not observe a category containing an explicit reference to violence. Another surprise here was the high response count for the necessity/benefits of conforming (44.00%) in contrast with the lower

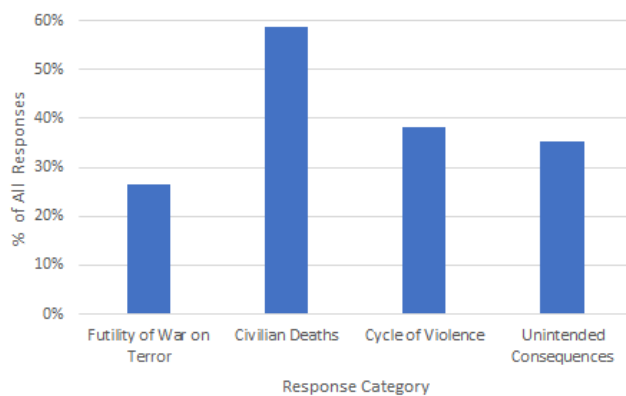


Figure 6: *September 12th* argument category response counts.

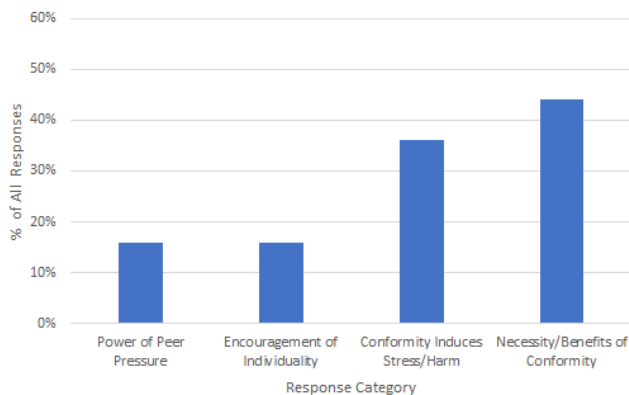


Figure 7: *LIM* argument category response counts.

response count for the encouragement of individuality (16.00%) (see Fig. 7).

3.3 Q3. Did playing the game result in any change in the participants behavior or values, as it related to the game's content?

3.3.1 *September 12th's* influence on Moral Disengagement. After playing *September 12th*, participants moral disengagement ratings ($M = 2.41$, $SD = .92$) fell compared to their pretest levels ($M = 2.90$, $SD = .81$), $t(38) = 3.73$, $p = .001$ (see Fig. 8). These attitude changes are consistent with our interpretation of *September 12's* intended message.

3.3.2 *LIM's* influence on Anti-conformity Attitudes and Conformity-related Stress. Based on our interpretation of *LIM* we examined its influence on attitudes toward conformity generally and on participant's personal adaptation-related stress. We did not observe any significant difference in anti-conformity attitude from the pretest ($M = 3.69$, $SD = .80$) after playing *LIM* ($M = 3.69$, $SD = .98$), $t(38) < .001$, $p > .999$ (see Fig. 9). Similarly, we did not observe any significant difference in self-reported conformity-related stress before ($M = 1.81$, $SD = .89$) or after ($M = 1.94$, $SD = 1.05$) play, $t(38) = 1.03$, $p =$

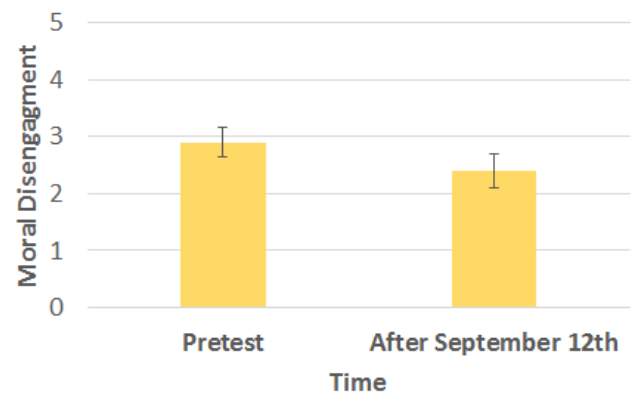


Figure 8: After playing *September 12th* moral disengagement decreased compared to pretest scores, $t(38) = 3.73$, $p = .001$.

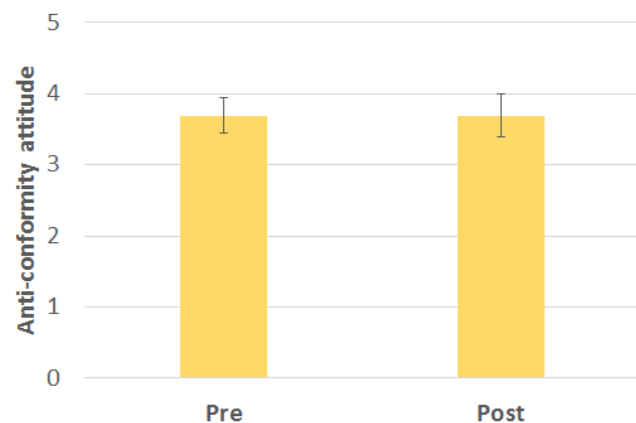


Figure 9: Anti-conformity Attitude before and after playing *LIM*. No difference was observed, $t(38) < .001$, $p > .999$.

.308, (See Fig. 10). Inclusion of media criticality or gamer identity as covariates did not change either of these results.

4 DISCUSSION AND CONCLUSIONS

We examined the psychological reality of the rhetorical content of games, looking at individuals' awareness of and interpretations of a game's procedural rhetoric, as well as its influence on their attitudes and beliefs. Our initial results suggest that players are generally aware of a game's rhetorical intent, and when combined with other kinds of rhetoric it has the potential to influence their beliefs and attitudes.

4.1 Summary of Results

Our first research question asked if players would perceive persuasive games as having any rhetorical content, and we found that they did. Participants generally perceived an argument in those games that we understood to be explicitly rhetorical, and they rated those games as having greater rhetorical content. They also rated those games as being more biased. These perceptions and ratings

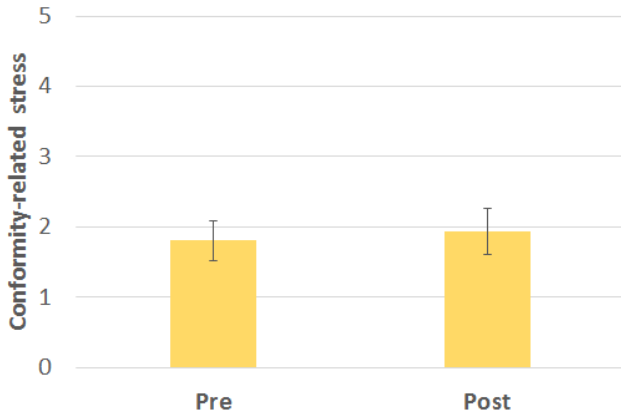


Figure 10: Conformity-related Stress before and after playing LIM. No difference was observed, $t(38) = 1.03$, $p = .308$.

appear to be stronger for *September 12th*, which combines traditional and procedural rhetoric, than for LIM, which primarily relies on procedural rhetoric to convey its message. That said, rhetorical content ratings for LIM were also clearly higher than for *Threes JS*, our non-rhetorical control game. These responses confirmed our intuitions and were a necessary precursor for our other research questions. These results also serve as an initial external validation for our novel scale of rhetoric content.

Our second research question asked if participants' perception of the game's rhetoric matched what we expected. This was generally true as well. Participants were at least aware of the domain in which the game was arguing. Our biggest surprise here was from the abstract rhetorical game LIM, which many participants said argued for the benefits of conformity. While this is an argument in the expected domain, it is almost the exact opposite of what we understood LIM to be arguing for, based on author statements and critical interpretations described above. Perhaps this different reading should be the expected impact of taking a very abstract message game out of context from its typical framing messages, or perhaps it reflects a difference in our participant's life experiences compared to those of LIM's intended audience. LIM may have provoked this reactance because its queer rhetorics were a mismatch for our participant audience, but we did not explicitly ask participants if they identified as queer and too few of our participants indicated that their gender identities were other than male or female ($n=2$) for us to be able to make useful comparisons.

Our third research question asked if the game had any influence on player's attitudes or beliefs. Here we found mixed results, where a game conveying its rhetoric primarily via mechanics had little to no impact, while a game in which the mechanics reinforced rhetoric being communicated via other channels was more effective. Playing the *September 12th* game had a quantifiable impact on the participants' response to a values related question, and may have changed the players' minds in a way that was consistent with the game's intended message. In contrast, playing LIM did not appear to have an effect on attitudes towards conformity or related stress. On the other hand, *September 12th* was rated as being highly biased

in addition to being rated as highly rhetorical, so it is possible that these results were caused by demand characteristics, where participants changed their responses to produce what they believed was the expected result of the experiment. Similarly, LIM might not have resulted in an overall change in attitudes or beliefs about conformity not because it did not influence them, but because its intended message was not as explicitly obvious and individual interpretations of its meaning varied.

4.2 Challenges and Limitations

There are at least two major challenges to investigating the psychological reality of procedural rhetoric. The first is that any message in the mechanics of a game is also embedded in all the other specifics. No matter how abstract, an interactive game will have a certain appearance, and a certain set of affordances. There is no way to make all those elements of the game neutral. Experiment is arguably the best answer to this challenge, holding as much of the game experience as possible constant while trying to isolate and vary only the feature we are interested in. This challenge can also be mitigated by including a large range of games in future investigations. The second related challenge is that the understanding of that message is an interactive process that depends on making a particular reading, which is dependent on the player's previous experiences, attitude, and other factors outside the experimenter's control. Answering this challenge will require maintaining good control of the context, making good estimates of which individual differences are most likely to be relevant, and including them as covariates in the analysis when appropriate.

4.3 Implications and Future Directions

There are several ways that we can building on the present study. We only investigated a small number of representative games, and our understanding of the psychology of procedural rhetoric would be enriched by continuing this work across a larger range. Another approach would be to construct an intentionally rhetorical game for research purposes. Such a game could be grounded in theory, could include built-in data collection of play traces, and be designed to be modified to facilitate additional experimentation. We also explored player's explicit understanding of arguments from games, but previous research on analogical transfer from simulation suggests that it might occur without conscious awareness [9]. Investigating this kind of covert transfer would require a different approach, perhaps testing transfer of a procedural argument by observing a change in behavior between two structurally similar interactive contexts.

The variety of outcomes we observed are evidence for the value of conducting this kind of investigation, which has unique insights to offer those who seek to understand, evaluate, and create games. There is evidence for the psychological reality of procedural rhetoric, and that evidence calls for a critical approach that examines the impact of game systems with a variety of methods and perspectives.

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