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"One of the baddies all along":
Moments that Challenge a Player's Perspective

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ABSTRACT

Reflection has become a core interest for game designers. However, empirical research into the kinds and causes for reflection within games is scarce. We therefore conducted an on-line questionnaire where participants (n=101) openly reported perspective-challenging moments within games, their causes, experience, and impact. Where past work has emphasised transformative reflection that changes player's views and behaviour outside the game, we found that players report predominantly moments of 'endo'-transformative reflection, which is focused on players' game-related behaviour and concepts. We further identify some causes of perspective-challenging moments relating to narrative, game systems, game-external sources, and player expectations. Narrative reveals emerge as a key cause of perspective challenge.

CCS Concepts

•**Human-centered computing** → *HCI theory, concepts and models;*

Author Keywords

Appreciation; meaningful games; perspective challenge; plot twists; reflection; reflective informatics

INTRODUCTION

Within human-computer interaction (HCI), reflection is today considered a core design outcome for interactive systems [40]. Sengers et al. for instance argue that computing "can support both designers and users in ongoing critical reflection about technology and its relationship to human life" (p.50), while others recognize reflection as a crucial component of learning [28]. Digital games are seen to be "highly appropriate vehicles for triggering and supporting reflection" (p.1) [24], which has led game designers to make concentrated efforts to design games that support reflection [3]. As defined by Rilla Khaled [24], such *reflective games* invite the player to exercise their individual reflection and decision-making in ways that engage, problematise, and potentially conflict with cultural and social norms.

The literature has particularly focused on achieving *transformative reflection*, often also cast as the most challenging to design for [5]. Fleck and Fitzpatrick define transformative reflection as moments when "the reflector's original point of view is somehow altered or transformed to take into account the new perspectives s/he has just explored." (p.218) [17]. One prominent way to afford such transformative reflection is surprise, a disorientation produced by the contrast between facts and expectations [10]. Two much-discussed examples for narrative surprise in games supposedly prompting transformative reflection are *Braid* [33] and *Spec Ops: The Line* [56]. The plot of both games leads the player to believe they are the hero of the story, right up until a moment reveals that they were closer to villains all along. Other games have challenged and subverted player expectations and prior beliefs regarding game genre or medium conventions. The infamous 'Psycho Mantis' boss fight within *Metal Gear Solid* [25] for instance 'broke the fourth wall': the game read out the save games from the player's game console, enabling Psycho Mantis to 'mind read' the player, speaking about the kinds of games they liked to play. This was a hint for the player how to beat the boss: they had to physically unplug their controller from the console and plug it into another console controller slot. Here, the game violated the learned convention and player expectation that the diegetic, in-game world was only affected by 'normal' controller inputs. Relatedly, scholars like Ian Bogost [55] have argued that persuasive games like *September 12th* [20] or *JFK Reloaded* [53] persuade people by making procedural claims about real world systems that may contradict the player's existing mental model of said system - thereby causing them to reflect on and possibly change their mental model. Other well known examples afford surprise through their systems, like Brenda Brathwaite's board game *Train* [9].

While designers and researchers are interested in games that challenge players' perspectives and have articulated various theories about how games may achieve this, there is very little empirical work on what gameplay moments players perceive to be perspective-challenging, why these moments challenged their perspective, or what their perceived effects were on the player's experience and behaviour, both in-game and out-of-game. To address these questions, we conducted a questionnaire study that gathered data from 101 participants recounting a total of 132 perspective challenging moments, together with rating how much they enjoyed and appreciated each. We combined bottom-up and top-down qualitative analysis, using Baumer's dimensions of reflective informatics [5]

to identify types of reflective experiences, and developing bottom-up codes for perceived underlying causes. Our results suggest that transformative reflection is rare but more common than previously assumed, yet chiefly consists of *game-internal* 'endo-transformations'. While we found some evidence for 'procedural rhetoric' or mechanics-driven reflection, the majority of perspective challenging moments revolved around narrative reveals.

RELATED WORK

In a conceptual review, Baumer [5] frames reflective informatics as "*a sensibility toward the relationship between computational technology and reflective thought in such a way that highlights it permeation and relevance in numerous different contexts*" (p.585). While there have been alternative classifications of reflection in HCI (e.g. [17]), Baumer's classification is the most recent and collates concepts from multiple disciplines. Baumer reviewed numerous conceptual and theoretical models of reflection across disciplines, arriving at three key aspects of reflection; a *breakdown* (involving surprise, uncertainty or conflict), *inquiry* (involving a re-examination of existing knowledge), and *transformation* (involving an active change of knowledge).

While Baumer asserts that "designing explicitly for breakdown in support of reflection occurs less often" (p.590) in interactive systems, for films, TV and games sudden plot twists or plot tricks are regularly used [39] to elicit surprise and a breakdown of built-up beliefs within the audience. Games can also prompt breakdowns by exposing the player to experiences that conflict with their prior beliefs. For instance, the aforementioned game *September 12th* [20] puts the player in the role of a military tasked with shooting missiles at a middle-eastern village to eliminate terrorists. Yet the player quickly "realises that there is no way to win the game through shooting" [12], as each missile inevitably also kills civilians, which prompts other civilians to turn into even more terrorists. Thus, game creator Gonzalo Frasca wanted to convey the message that violence begets more violence, and challenge player beliefs that there is a purely military solution to terrorism.

Baumer's second dimension of reflection is inquiry, the process of re-examining or testing beliefs in light of new information they are seeking or have sought out [31]. A prime example in games is theorycrafting [13], where players engage in rigorous play and replay of a game to build and test their theories about how the game works and what optimal strategies are. Other examples for inquiry-affording games are games that reward multiple play-throughs like *The Stanley Parable* [19], or those that focus heavily on player choice such as *The Walking Dead* [49].

Baumer's last dimension is transformation, where reflection leads to an active change of some kind, which Baumer suggests "poses the most difficult challenge to designers" (p.591) [5]. Indeed, there is broad consensus that *transformative reflection* is rare and involves some degree of change in beliefs, attitudes, and/or behaviour outside engaging with the interactive system or media offering prompting reflection [17, 46].

One if not the only empirical study expressly targeting reflection in player experience comes from Mekler, Iacovides and Bopp [28]. They used Fleck and Fitzpatrick's levels of reflection framework [17] to identify different types of reflection in player accounts of gameplay. This framework suggests five levels of reflection; revisiting, revisiting with explanation, exploring relationships, fundamental change and wider implications. Mekler and colleagues found that players "considered reflection to be a worthwhile activity in itself", but reported very few instances of transformation, and none at all of critical reflection. The few observed instances concerned chiefly out-of-game transformations like developing a deeper understanding of mindfulness or learning how to control your emotions. In a related study, Iacovides explored how breakdowns and breakthroughs connect to learning in commercial games [21], but did not make a direct connection to reflection. This is arguably a fruitful area for future research, since the conceptualisation of breakthroughs in education - as "observable critical incidents ... initiating ... conceptual change" [42] - appears to overlap with transformative reflection.

The study of reflection in games directly connects to entertainment and player experience research interested in 'meaningful games' and 'meaningful entertainment experiences' more generally, prompted by the observation that people regularly seek out media that produce negative emotional experiences like distress or sadness, such as the movie *Schindler's List*. Work in this area argues that such media may not supply *hedonic enjoyment*, short-term, directly positive experiences like sense-pleasure, but instead generate *eudaimonic appreciation*, that is, experiences people value for providing "greater insight, meaning and purpose in life" (p.34) [34]. Again, we can see examples in critically successful games like *Doki Doki Literature Club* [48] or *The Beginner's Guide* [16] which deliver narratives that deal with sensitive topics like suicide or depression in ways that are arguably not always designed to be hedonistically enjoyable. A recent study by Bopp, Mekler and Opwis indeed found that players "appreciated experiencing negatively valenced emotions, such as sadness." [7] Bartsch and Hartmann similarly found that media providing greater cognitive and affective challenge (such as moral dilemmas) led to greater appreciation, suggesting that "certain types of media entertainment can also be used as an opportunity for challenging experiences that can satisfy individuals' eudaimonic needs for deeper insight and personal growth." [4].

In summary, existing work on meaningful games suggests that play experiences can be positively appreciated for the "deeper insight and personal growth" they provide [4]. Terms like 'insight' suggest that these challenging experiences lead to some form of transformation of player attitudes and beliefs, and the moments of transformative reflection reported by Mekler and colleagues [28] (like a deeper understanding of mindfulness) seem to fit the profile of eudaimonic appreciation. Yet to our knowledge, there exists no work explicitly probing the link between eudaimonic appreciation and transformative reflection. In addition, while classifications of reflection [5, 17] have found first use in games research studies [28], said studies recorded little if any instances of transformative reflection in player accounts. And yet, designers [3, 24] and

researchers [55, 28, 29, 7, 4] seem predominantly interested in understanding and supporting such 'big-T' transformative reflection changing player's attitudes, beliefs, and behaviors outside the game, generating experiences of 'deep' meaning, insight, and growth. We know very little about about what reliably *causes* transformative reflection in gameplay. We believe that transformative reflection is afforded by some gameplay experience that challenges a player's prior concepts, attitudes and expectations, which we here call *perspective-challenging moments*.

To better understand how games can afford transformative reflection, we therefore decided to explore the phenomenon of perspective-challenging moments in games through four main research questions:

- What different types of perspective-challenging moments do players experience?
- What causes these perspective-challenging moments?
- What consequences of perspective-challenging moments do players perceive?
- Do the different types of perspective-challenging moments differentially influence player enjoyment and appreciation?

METHOD

Given the relative lack of prior knowledge, we chose semi-structured, open player reports as data type and a qualitative, category-generating analysis approach. To capture the fullest breadth of perspective-challenging moments, we opted for an online survey and broad target sample. While this format may lead to less depth, it is a commonly used in games HCI for exploratory work that requires data from a wide range of players and games [7, 22].

Procedure

Following a web link, potential participants landed on a Qualtrics survey, where they were asked to read an overview of the study and then give consent to participating. Participants had to be over the age of 18. The questionnaire stated that participants were free to withdraw at any time and that incomplete responses would not be used in the study. Once receiving consent, participants received the following instruction:

Sometimes, we experience or see moments one way, and then something happens that suddenly challenges that perspective. Can you recall any similar moment during playing a video game that challenged your perspective?

After the introductory instruction, participants were asked to write the title of the game, a brief description of the perspective-challenging moment, what the participant thought caused the moment, and if and how it affected their thoughts, feelings, and/or actions inside or outside the game (speaking to research questions 1-3). These open-ended questions were interjected with two multiple choice questions, one asking them when the moment occurred in the game's timeline (toward the start, middle, or end). The second where three subscales (nine items) from Oliver and Bartsch's enjoyment and appreciation questionnaire; the subscales assesses whether

a media offering is fun, thought-provoking, or leaves a lasting impression (where the latter two are construed as appreciation) [34]. We were interested whether player-reported perspective-challenging moments would score highly on appreciation measures, and not on enjoyment measures like fun (research question 4).

Participants

We posted the survey link to various Reddit gaming subreddits (e.g., r/Steam, r/itchio, r/videogames, r/xbox360, r/PS3 and more) and gaming Facebook groups (e.g.,. Steam Gamers, Xbox One Community, SONY Playstation Community and gaming societies). 773 participants clicked the survey link, 148 completed the questionnaire, 47 responses contained zero answers, leaving 101 valid respondents. Participants could report multiple perspective challenging moments. The 101 respondents provided 132 perspective challenging moments (an average 1.29 per respondent), mentioning 88 unique games (0.87 games per respondent, 1.5 moments per game). The most frequently referenced perspective-challenging games were *The Witness* [51] (6 mentions), *Nier: Automata* [36] (5), *The Last of Us* [32] (4) and *Undertale* [52] (4). The average challenging moment report counted 149.5 words (SD = 40.92), and respondents took an average 20 minutes (SD = 25.82) to complete the questionnaire (removing 3 outliers who exceeded 9 hours completion time).

78 participants identified as male (M), 16 as female (F), 3 as non-binary (NB), 4 preferred to not disclose their gender (ND). Ages ranged from 18-45 (M = 25.59, SD = 6.75). The majority of the participants had a long history of playing games, with 51 playing for 20+ years, 25 for 15-19 years, 18 for 10-15 years, 4 for 5-10 years and 3 for 1-5 years. The amount of hours per week spent playing was fairly even across responses. 24 reported playing for 11+ hours, 23 for 7-10 hours, 30 for 4-6 hours, and 24 for under 3 hours. The most frequent session length was 1-2 hours (N=51), followed 3-5 hours (N=34), under an hour (N=12), and lastly 6+ hours (N=4). We also asked participants to list the last three games that they enjoyed playing, resulting in 187 unique games mentioned, covering a wide variety of game genres, e.g., *Super Smash Bros. Ultimate* [2], *Red Dead Redemption 2* [38] or *Apex Legends* [37].

Method of Analysis

Survey data was downloaded into Excel and tidied before being imported into the qualitative data analysis software Nvivo 12. We initially used an iterative qualitative content analysis approach [18], following the grounded theory principle of constant comparison [41]. The unit of analysis was the individual written responses from the questionnaires, with the smallest form being complete sentences. A total of four passes of the data was conducted, the first two being unstructured to develop initial codes from the data, such as "Audio", "Fourth Wall Break", or "Morality". The third and fourth pass connected the initial codes into 44 constructs and 12 final categories relating to *causes* or *consequences* of perspective-challenging moments. When coding for *consequences*, we made use of the fact that our questionnaire asked participants expressly, using two separate text fields, to separately report changed thoughts, emotions, and actions *inside* the game and

outside the game. Since we were interested particularly in transformative reflection, we finally conducted a second top-down coding phase, categorising each perspective-challenging moment using Baumer's dimensions of reflective informatics [5], which we operationalized as follows:

- **Breakdown:** The moment caused the participant to feel doubtful, puzzled, surprised or disturbed.
- **Inquiry:** The moment caused the participant to re-examine past experiences or concepts, testing or revisiting the situation.
- **Transformation:** The moment caused the participant to change their beliefs, approach or behavior.

In the following, all quotes will be followed with a descriptive label outlining the participant number, moment number, game title, gender and age e.g., (N9, M14, *Undertale*, M & 31) refers to participant 9, moment 14, playing *Undertale* [52], male and is aged 31. The moment number is included because participants were able to provide multiple perspective challenging moments. The quotes shown are unedited.

RESULTS
Across the 132 reports, we coded 160 reports entailing a breakdown, 60 an inquiry, and 55 some transformative reflection. This adds up to 275 as a report could contain multiple instances or be coded for more than one category, in line with Baumer's argument that these are aspects not mutually exclusive categories [5]. The distribution aligns with Mekler et al.'s finding that transformative reflection is relatively rare in gameplay [28], even though our data shows a larger proportion of transformative reflection (ca. 20% of reports) than theirs. [1]

During the analysis, we discovered the majority of reported consequences were related to the played game and games alone, not to reality outside the game: following the participants' own classification of a transformation occurring in-game or out-of-game, we coded 36 transformations that were game-related, and 19 that fit the traditional definition of transformative reflection - affecting change outside the game or system. By comparison, Mekler et al. [28] found four foci of reflection across player accounts, three of which where similarly game-related: gameplay, game design, gaming practice, and real-life parallels. But they do not report finding any gameplay- or game design-related transformation, with the vast majority being real-life parallels.

Endo & Exo-transformation
To have a clear analytic handle for discussion, we will in the following distinguish between endo-transformative and exo-transformative reflection. *Endo-transformative reflection* refers to moments where participants experience transformative reflection that remains limited or endogenous to the game played, e.g. changing how the player perceived an in-game character or approached gameplay (e.g. changing gameplay strategy). Take the following example:

"Dwarf Fortress is a rare and beautiful game that generates stories. And this was one of those times that the quirk of the situation created a memorble moment. It made my game feel alive. ... [As a result,] I no longer designed my fortresses for efficency. I made them big bold and beautiful." (N34, M46, *Dwarf Fortress*, M & 37)

N34 states that an absurd emergent in-game moment prompted a change in their conception of the game, which in turn led them to change their play style. In contrast, *exo-transformative reflection* refers to moments where participants experience transformative reflection that affects their beliefs or actions outside or exogenous to gameplay. We consider this terminological distinction important because prior work predominantly equates *all* transformative reflection with exo-transformative reflection, thereby overlooking the more 'mundane' and frequent endo-transformative reflection we found.

"It made me feel more philosophical about my life to a small degree. Whenever I think back to a decision I could have made differently, I also remember the good things that have happened since then, and how had I not made that bad decision in the past I may not have gotten those good things either. In that way I feel more accepting of those decisions now than I might have before." (N62, M47, *Life is Strange*, F & 27)

Sometimes a participant would reflections on an endo and exo-game level. *"It changed the dynamic of the game from teamwork to a competition against one another. I could no longer trust the person I was playing with for the past 4/5 hours of the campaign. There was a lack of communication and more on emphasis on being tactical and trying to get an advantage on the other player." (N60, M82, A Way Out, M & 23)* On one hand they feel sudden lack of trust towards another human , but they had to transform their play style in order to win. (endo-transformative). Alternatively; *"The way the title utilised perspective shifts to make you consider your actions has, I believe, made me a more compassionate person." (N64, M86, Nier: Automata, NB, & 23)* Participant 64 felt as if they were a more compassionate person from the perspective challenging moment. This level of transformation is more in line with the aspirations of HCI literature.

CONSEQUENCES OF ENDO-TRANSFORMATION
Given how our results highlighted an under-explored form of transformative reflection, we here present the most prevalent consequences that result from endo-transofrmative experiences.

Changes in Play Style
The most common consequence was a change in how participants approached playing, such as changing how they responded to certain characters/enemies:

"A slight mechanical difference was that when I had the jump on a group of enemies so I could catch them unaware, I would usually hesitate thinking, is this actually another group of civilians or are they actually armed, and double checking myself to make sure before opening fire." (N33, M45, *Spec Ops: The Line*, M & 24)

This change in play style commonly involved a shift in attention, with players becoming "very cautious about how I reacted to attacking NPC's" (N54, M72, *Undertale*, M & 20) or "examining the environment more carefully, to see if I could find more EPs" (N42, M55, *The Witness*, M & 18). Notably, this transformation was typically preceded by some breakdown: the subversion of a trope (all NPCs can be shot, or killing is the right strategy), or way of perceiving the game state that requires a reframing to enable the player to progress.

Changes in Game Concepts
Changes in game concepts are situations where the participant's thoughts on the game or other games changed after the perspective challenging moment. This could be thoughts on the in-game world or characters within, such as viewing a protagonist in a new light:

"I started thinking of the protagonist, Aloy, as a warrior first, an intellectual second, and a woman third. Her being female became a relatively unimportant aspect of her identity to me (as it should be)." (N94, M124, *Horizon: Zero Dawn*, F & 27)

Other participants reported a change in how they understood the game's narrative as a result of a plot twist, where "revelation at the end of the game completely upends the entire narrative experience that has come before" (N46, M60, *Gone Home*, M & 39), or a change in how they view games overall e.g. "It changed the way I think about games, and made me look at different games to play instead of just platformers or JRPGs" (N19, M28, *Ico*, NB & 35).

CAUSES OF PERSPECTIVE CHALLENGE
To address the question of what causes perspective challenging moments, we also analysed the data set to examined the causes reported by players. The analysis resulted in 12 major codes, which we categorised into five thematic areas: Narrative, Game Systems, Combination of Game Systems and Narrative, Player Expectation, and External Source.

Narrative
These are moments exclusively linked to the story of the game, where the player has no agency over the game state. Narrative causes were the most common. These typically occurred through cut scenes or character dialogue, as the example below highlights:

"The lead character suffered from PTSD and imagined it all. The enemies fighters weren't rebels, they were just trying to defend their home from these foreign invaders who just showed up and started shooting. The bombed enemy warcamp was a refugee settlement." (N86, M114, *Spec Ops: The Line* M & 26)

The moment describes plot points that occur throughout the narrative of the game. There is interactivity with the lead characters PTSD, it is a fixed narrative point. Narrative causes can be broken down further, which led to the discovery of two sub-categories: Reveals and Emotionally Challenging Topics.

Narrative Reveals
The most significant kind of narrative cause was a (sometimes sudden) reveal of information that conflicted explicit prior information or previously held player assumptions, be it related to non-playable characters (henceforth referred as NPCs), the protagonist, or the plot:

"It's a dating simulator game where you play a human in a post-apocalyptic world and you romance the pigeons who go to your school. It starts off as just a bit of fun and then suddenly you start to unveil a massive conspiracy which changes everything." (N87, M117, *Hatoful Boyfriend*, F & 18)

Protagonist-related reveals typically pertained to their actions, motives, or identity: "You are playing the whole game under the assumption that you are a certain character from the previous games. Right near the end, it is revealed that you are not that person, you are someone else entirely." (N14, M20, *Metal Gear Solid V: Phantom Pain*, M & 28) Motive-related reveals of protagonist or NPC often re-framed them from an ally to foe: "At the end, it is revealed that you have been "one of the baddies" all along - you have been working for a group with evil intentions when you thought you were trying to clean up the city" (P95, M126, *Crackdown*, M & 39).

Emotionally Challenging Topics
Player also reported narratives to challenge their perspective where it tackled emotionally challenging subjects such as depression (e.g. "She was instead going through a major depression unrelated to the main character's romantic exploits." (N67, M90, *Doki Doki Literature Club*, M & 26) or child abuse:

"Later in the game, you realize that the Batter's motives for killing the enemies in the game are far from those you imagined; the enemies are merely inhabitants of this imaginary world created by a child, and the Batter, representing an abusive father, seeks to bring an end to this world - and to his own child's life." (N1, M1, *OFF*, M & 21)

These moments could prompt players to rethink their own opinions on the matter or recall personal events of similar nature, sometimes stoking an empathetic response as: "It really made me feel so much because I had such a connection to the daughter by that point... it made me reconsider how much empathy I thought I had for civilians trapped in warzones, because I know I have a lot, but I had NEVER felt so much and so strongly for an innocent child's senseless and preventable death." (N82, M109, *This War of Mine: Father's Promise*, M & 22).

Game Systems
The second causal category links to the interface and mechanics of a game, which Sicart defines as *"methods invoked by agents for interacting with the game world"* [43].

Emergent World and Narrative
Dwarf Fortress [47] is a non-scripted, emergent game where player manipulation of the game systems frequently produce

moments that "makes the world alive and wieird in unexpected ways. It was of those times when the immersion of the world you were playing in just overwhelmed you." (N34, M46, *Dwarf Fortress*, M & 37). The perspective challenge occurred as the mechanics created an unexpected "quirk" which "created a memorable moment.".

Mimetic mechanics and interface
These are instances where the interface or mechanics emulate or embody a particular activity or state. One example is where a player "was made to torture somebody. ... When I played it, it made me so ill, I was physically sick in the stomach and I didn't want to play anymore for a while." (N93, M123, *Grand Theft Auto 5*, F & 29). Here, torturing is not a cut scene, but requires the player to actively steer their character to carry out specific torture acts through controller inputs somewhat iconic of the torture performed. Apart from the above emotional response, this triggered the realization "that that's (torture) really happening to people and it shocked me." Another prime example is from *Eternal Darkness: Sanity's Requiem* [44]:

"One of the features of the game is a 'sanity meter' which steadily decreases as your character encounters supernatural horrors, leading to visual and aural hallucinations– blood dripping from walls, echoing screams, etc. At a certain point these effects become more pronounced, and break the fourth wall." (N8, M12, *Eternal Darkness: Sanity's Requiem*, M & 27)

The intended effect is to cause the player to doubt themselves, to see things which are not real and in turn question their own sanity. "In a sense, it made me question my sanity vis a vis the game–could I trust my eyes and ears? What was real? " (N8, M12, *Eternal Darkness: Sanity's Requiem*, M & 27)

Procedural rhetoric
This category subsumes instances where the mechanics not just mimic an action, but embody the message of the game. *September 12th: A Toy World* [20] was created as a critique on the US-led War on Terror. The game consists of making the player "...responsible for launching strikes on terrorists, looks like you get points (approval) when killing them, until you see that your collateral damage is making more terrorists, and you realize youre just making lots of terrorists." (N25, M37, *September 12th: A Toy World*, M & 40). The game system materially embodies the logic that violence begets violence, the main message of the game. In Participant 25's own words, "It was a great metaphor to use when discussing the 'war on terror' at that particular time, put it into context much better than so many lengthy diatribes trying to say same thing".

Within this category, *The Witness* [51] was the most commonly mentioned game with 6 instances. In the game, players initially progress by moving across an island with various puzzle panels that have to be solved by drawing certain line shapes on them. Here a player describes the main moment of perspective change in the game (spoiler):

"At this point you discover that the puzzles to solve are no longer just on panels, but hidden throughout the world in any pattern that matches the same simple shape profile as the regular panel puzzles - a large circle to start on, a line extending out from it, and a rounded end to finish on. You find them in the sand, in the sky, in flowers, in stonework, in burn marks - always there but only visible to the attentive mind and the right view." (N20, M30, *The Witness*, M & 36)

The Witness uses puzzles requiring visual perspective and problem reframing to embody the message that in life, we sometimes need to 'see things from a different angle'.

Literal Perspective-Changing Mechanics
Related but different, there were also some instances that referred to a literal change of perspective required in the game. For instance, *Portal* [54] was commonly referenced e.g., "You can't see what to do, but then you put portal in right place and boom" (N28, M40, *Portal*, Male & 30).

Combination of Narrative and Game Systems
These are moments where a player action directly interact with the themes, story or characters. Below describes the ending of the game, *Braid* [33]:

"Each level has a unique twist, and the final level's twist is that time runs backwards. In the final room you have to escort a princess running away from a knight, but upon reaching safety, time reverses back to normal, the entire level is played backwards and it's revealed that the princess was running away from the player in the first place, and that it's the mistake that the player character is trying to fix the whole time." (N22, M33, M & 38)

The participant's perspective has been challenged through the intentional re-framing of the mechanics to reveal a narrative point. It is a combination of the narrative leading up to that moment and them being represented using the mechanics. This differs partially from procedural rhetoric as it is subverted for this moment rather than consistently throughout the game.

Choice and Consequence
Choice and consequence constitute a combination of narrative and game systems as they often merge the context of a narrative with an in game action. Choice was a common cause within where players felt that "Small dec[is]ions can have great consequence" (N36, M48, *The Witcher 3: Wild Hunt*, F & 38). One example of a choice from *Life is Strange* [14]: "You are faced with the decision to go back in time once more and allow Chloe to die (the first decision you make regarding time travel in the game) or to simply let the storm consume the town and save Chloe in the process." (N47, M63, *Life is Strange*, F & 27). The implication that the choice has on the story is clear.

Other perspective challenging moments were due to the consequences of their in game actions, after having made a choice:

"I felt that I should have seen it coming, but the game played on my willingness to advance the story, knowing that I would do whatever the quest said. It used the format of games effectively to make ME the bad guy." (N65, M87, *Elder Scrolls: Oblivion*, M & 25)

Participant 65 felt that their actions had narrative consequences, a merging of the games systems and story. Choices and consequences put the player directly in control and provides ownership over their actions. Their perspectives can be challenged when first they have to weigh up the available options, but also in relation by finding out that the consequences are different with what they expected.

Fourth Wall Breaks & 'Meta'-Games
The fourth wall is a concept from plays and television; it describes a convention where the actors behave as if the stage was closed off from the audience, ignoring its presence, while the audience can still 'look in' through this imagined wall, but don't interact with the stage in any other way [1]. 'Breaking the fourth wall' is for characters to directly speak or interact with audience. In the case of video games, this means addressing the player, as in *Doki Doki Literature Club* [48]:

"At one moment, when I was taking to Yuri, Monika blink over the image of Yuri. It first looks like a glitch, though, at the end Yuri's image is completely overwritten by Monika. And Monika talks to me, as a player, breaking the 4th wall." (N9, M13, *Doki Doki Literature Club*, F & 28)

A 'meta'-game is a game about a game or games as a medium. *Doki Doki Literature Club* [48] is a meta-game in that it plays off tropes of the dating simulator genre to scare its audience. *The Stanley Parable* [19] is another example: "The narrator begins to state the player's actions before they happen. Players can go along with it or (attempt to) do something else. Instead of conflicting with other game entities like enemies or the environment the player can conflict with the story itself." (N16, M22, *The Stanley Parable*, ND & 29). Thus, the game raises how agency or choice impacts a narrative. These causes often surprised players, disturbing their expectations of what they believe a game to be or what types of interactions would occur.

External Sources
This type of cause was external to the game, but often co-occurred with others. For instance, some players reported experiencing an external trigger that led to a narrative reveal by providing information regarding the game or external from the game factors (e.g. uncleanliness of their own house; *"I realised thar this was to detriment of my own real house."* (N73, M97, *The Legend of Zelda: Breath of the Wild*, M & 44). The moment could not have occurred if the participant's house was tidy, a source entirely removed from the game. Another example involved an external source and the combination of narrative and game systems:

"I just happened to give the lore a quick read a while later and noticed that the oxygen generated by the terraforming Core was toxic to all species on this planet, and the enemies would seek to run into the core to sacrifice themselves and bring it to a meltdown, in the hopes of letting their kin survive the (read: our) invasion." (N1, M3, *Sanctum*, M & 21)

The example above only occurred because the participant read on a fan created wiki of the game, where their initial assumptions about the game were challenged.

One of the most common references to external sources were comparisons with other games or the game's genre. E.g."It's an older game, but generally at the time, winning the game was a celebration. Quake told you what a hero you were and "id salutes you". I think the takeaway here for me was that not all important actions are acknowledged, or even known." (N15, M20, *Thief: The Dark Project*, M & 45) or "It was to tonally incongruent with that of the Japanese dating sim." (N67, M90, *Doki Doki Literature Club*, M & 26).

Player Expectations
The last identified causes were when player's had expectations, regarding the narrative, mechanics, or other game elements. Much like the External Sources cause, this rarely occured in isolation. For many players, their expectations related to game systems: "As it at first seems as though she won't listen to you in the way other enemies do, I thought I would have to weaken her significantly to get through to her. So I was greatly surprised when one of my attacks did much more damage than expected, thus ending the fight in a way I wasn't planning on." (N54, M72, *Undertale*, M & 20). Narrative expectations emerged as well:

"You are playing the whole game under the assumption that you are a certain character from the previous games. Right near the end, it is revealed that you are not that person, you are someone else entirely." (N14, M19, *Metal Gear Solid 5: Phantom Pain*, M & 28)

For some situations, the game was designed to try and "subverted expectations, which kind of was the point of the game" (N40, M53, *The Stanley Parable*, M & 37), in some cases this was used to send a message to the player; "i only expected a brief diversion clicking pixels not to be forced into reevaluation of modern warfare." (N25, M37, *September 12th: A Toy World*, M & 40).

Summary of Causes
Zooming out, causes of perspective-challenging moments seem to involve two often interacting dynamics. First, they may challenge some implicit or explicit expectation, built up from prior gaming experience, genre, or media conventions; prior in-game puzzles, mechanics, or plot; or, in the case of procedural rhetoric, prior ideas about how the world represented in the game works. Second, they involve a player decision or action that is emotionally or cognitively significant or non-trivial, thereby inviting extended reflection.

ENURPMENT AND APPRECIATION
ENJOYMENT AND APPRECIATION

Reported moments scored almost uniformly high across sub-scales: Moments were rated an average of 5.99 (SD = 1.59) for fun, 6.2 (SD = 1.3) for thought-provoking, and 6.4 (SD = 1.24) for leaving a lasting impression on a seven-point Likert scale, where higher is better. We explored splitting moments along the different qualitative categories we developed (causes and consequences), but no significant differences became apparent. In short, all recalled perspective-challenging moments were characterised as enjoyable, thought-provoking and leaving lasting impressions. This somewhat contradicts the finding by Bartsch and Hartmann [4] that audiences experienced the least fun when affective and cognitive challenge were high. There are multiple possible explanations for this: small samples; a survivorship bias in our data where only the most 'outstanding' moments were recalled; or the fact that Bartsch and Hartmann used movies while we studied games. That said, the 12 instances we found that scored low on one subscale tended to have low fun (AV = 2.75, SD = 0.89) yet high lasting impression (AV = 6.5, SD = 2.06), which would align with Bartsch and Hartmann. This certainly warrants more research.

DISCUSSION

The wealth of data gathered has allowed this study to explore a few distinct areas; surrounding the causes of perspective challenging moments and the nature of them within games. Below we discuss (1) the mundane nature of reflection in perspective challenging moments, (2) how the causes of perspective challenging moments rely on the narrative or the reveals of sudden information and (3) classifying procedural rhetoric as an example of a reflective game.

The Mundanity of Transformative Reflection

'Higher' levels of critical or transformative reflection are often deemed a 'more desirable' yet rarer outcome within HCI [17]. In regards to games, Mekler, Iacovides and Bopp for instance *"observed little to no instances of higher-level transformative and critical reflection"* [28]. Our data qualifies this somewhat. First, in line with prior work, the majority of moments we found indeed presented 'only' breakdowns or inquiries, not transformations. However, we still did find a significant number of 'transformative' situations where participants expressed having actively changed their understanding. This is explained by the fact that the transformations we captured did not touch game-exogenous beliefs, but were *endo-transformative reflections*: they where belief transformations relating to the played game or games themselves. These are 'mundane' by the implied standard of 'deep' belief changes about self, society, or the universe, which may explain why they have been over-looked in prior research. Nevertheless, endo-transformative reflection are real and somewhat frequent according to our data.

Returning to Fleck and Fitzpatrick's definition of transformative reflection as *"the reflector's original point of view is somehow altered or transformed to take into account the new perspectives s/he has just explored."* [17], it is interesting to note their use of the term 'perspectives'. From our data, it appears that games are capable of presenting events that challenge or completely change a player's existing perspective on

game elements, and sometimes even themselves. Using this definition, it is not so surprising that situations that challenge the player's perspective can lead to endo-transformative reflection. Situations within the data set often showcase a distinct change in the way the player approached situations e.g., by interacting with NPC's differently, shifting their tactics or even considering the game-world in a new manner are examples of a change prompted by reflection. Each participant was shown something that challenged their existing behaviour and as a result changed their original perspective was altered.

Reliance on Narrative Reveals

As mentioned, the majority of causes related to the games' narrative, especially narrative reveals, as in *Gone Home* [50], where the designers set up the player's expectations so that the eventual reveal is more impactful [27].

One survey question we asked was *when* the perspective challenging moment occurred within the overall time line of the game. For narrative causes, moments were most frequent towards the end of the game, which is consistent with other media, where significant plot twists occur towards the climax of a narrative. This is a potential interesting area to further explore.

Protagonist- or NPC-related reveals (like unexpected betrayals) were particularly common across role-playing games, platforming games, and first-person and third-person shooters. Some of the more frequent moments came from *The Last of Us* [32] where, after players have spent the entire game getting to know the protagonist, they are left with feeling disappointed because of actions the protagonist makes at the end that they have no control over. In fact, in many cases related to narrative causes, the players is left with a sense that their agency has been reduced. This is not to say that these games are not enjoyable. But as Elson [15] argues, choices (and therefore agency) allow for even more personally engaging narratives.

The findings suggest that there is potential however to consider how to utilise mechanics to give the player agency over their actions; the games that merge the narrative with "meaningful choice" are good exemplars of how this might work. Meaningful choices being also *"characterised by consequences, often relevant for the course that a narrative would take"* [23]. Iten et al through the analysis of a qualitative survey on meaningful choices discovered that player's frequently referred to the choice having three core elements; moral, social, and being consequential. [23]

This concept is supported within the data set as some instances of deeper reflection, such as inquiry involved challenging moral choices. Where in one of the games mentioned, *Fallout 3* [6], participants were presented with moral dilemmas. In these situations, participants had to use their own critical ethical reasoning to justify their choice. Simkins and Steinkuehler [45] found that there were four main categories for players to believe to be facing a moral issue; effecting change (what and how can things be changed), mirroring (the way NPC's respond to the player's actions, showing a mirror to the player), social context, and significant decisions (where the choices available have clear differing consequences).

There is a clear overlap between Iten et al's and Simkins and Steinkuehler's work, however the participants themselves did not frequently report the moment changing their moral thoughts outside of making them simply aware of them. The implications these findings have for designing meaningful choices for reflective games would be that participants typically think of these choices within the context of the game, but ultimately it only changes the way a very few individuals think, feel or act.

Leading on from this, the reliance on narrative reveals mimics what is fairly common within other mediums such as books, films & plays [35] which games appear to be part of. This could be the very nature of narratives, but in relation to the unique affordances of games; we return to the interactivity and in turn its mechanics and how they can be used to challenge perspectives.

Reflective Games & Procedural Rhetoric

Khaled [24] states that *"reflection is in fact under-represented within both serious games and mainstream entertainment games"*, however her definition refers to Mezirow's [30] concept of critical reflection of "assessing the validity of our presuppositions" (p.2) [24], as confirming our assumptions before making a choice of action. However, even from that standpoint a case could be made there are rising numbers of 'mainstream' games that promote critical reflection like *Spec Ops: The Line* [56] or *The Witness* [51], but these types games may still be in the minority when considering the sheer number of game available.

Khaled [24] states that 'reflective games" should *"concern sensitising players towards underlying assumptions and values inherent in familiar systems and provoking them into deeply exploring, questioning and co-creating responses to problems in light of their own experiences and beliefs."* By that definition, perspective challenging moments could provide that effect the experience may just be singular and fleeting. However, there may an opportunity to consider the design of such reflective games through thinking more carefully about how to deliver perspective challenging moments through implementing mechanics as the message.

As we discovered situations where the games' systems where embodying the message of the game, lead to participant's perspective being challenge. We drew a parallel with those moments and Bogost's concept of procedural rhetoric [55]. Where procedural rhetoric is *"a technique of making arguments with computational systems and for unpacking computation arguments others have created."* (p3) [55]. Bogost gave examples of games like *September 12th: A Toy World* [20] and *The McDonald's Game* [26] being procedural rhetoric. We argue that our findings complement Bogost, with discovering the types of moments that challenge a player's perspective there were a multitude of examples where player's report their perspective changing as a result of the game (the procedural rhetoric).

However, admittedly the majority of changes were in regard to the played game and not the real world where Bogost focused. We still argue that the category of procedural rhetoric overlaps with Brathwaite's *mechanic is the message* series. While they tackle using systems or mechanics to deliver a message or rhetoric, the difference lies in underlying game design approach.

While the initial implementation of The Mechanic is the Message was a series of six board games, Brathwaite and Sharp [9] they consider that *"tradtional AAA-title game players and game developers being the group most likely to be impacted. Their assumptions about what games can and cannot do will be challenged by the series."*, in regards to using sensitive themes (e.g., the holocaust or the slave trade). Brathwaite and Sharp's contribution was published within 2010 (p.328). There have been a few commercial games that could classify as having their mechanics -be- the message such as with *The Witness* [51] or *An Aspie Life* [8].

Limitations and Future Work

This study gathered a broad sample, however it cannot make any claims that would be applicable to a wider generalisation relating to specific game titles, given that as some of the discussions relate to differing individual experiences. In addition, due to our participant recruitment methods, it is likely that the responses collected are from individuals who harbour a vested interest in and around games. For instance, more casual players may have different experiences of perspective challenging moments. In relation to the design of the questionnaire, one potential limitation was that it did not ask participants to clearly express how they felt after the perspective challenging moment. Given the high scores on both the enjoyment and appreciation scales, it would have been useful to have more data into people's emotional reactions to have a deeper understanding of how different types of perspective challenged impacted players. In addition, it is possible that the high scores across these scales is a methodological artefact relating to the way in which the survey questions were phrased. Referring back to participants reporting games where their literal perspective was changed; (e.g., *Portal* [54]) This is likely due to the description of a perspective challenging moment being vague and not fully expressing what the study intended by *perspective*.

In the discussion we mentioned the games reliance on plot twists or reveals towards the end of the narrative, we believe that this is an area that requires further research but it was beyond the scope of this paper to discuss it here. We acknowledge that this may be the very nature of narrative, especially given the emphasis placed on closure of a story [11] but it would be worth further investigation.

In relation to directions for future work, it would be interesting to conduct an in-depth analysis (e.g., collected from targeted interviews or analysing recorded gameplay) of games that appear to utilise mechanics as the message. The findings could provide insight into how to design to support perspective challenging moments using this approach, but could also focus on how players react. Another avenue for further work, is to consider the design of games that intentionally aim to challenge existing perspectives, measuring how participants respond or enjoy/appreciate that sort of experience.

CONCLUSION

Given the attention that HCI places on reflection and the growing research in reflection within games themselves, the study has taken a further step towards understanding reflection in the context of perspective challenging moments. In analysing a wealth of responses from a questionnaire, developing categories for the causes and types of responses, it seems that players who come across perspective challenging moments in games do experience transformative reflection yet it this is often on a mundane level, contained mostly within the context of the game played. We have put forward some of the core causes of perspective challenges in games, that indicate the reliance on mainly narrative driven reveals, but illustrate an alternative way to challenge perspective through considering how the mechanics can convey key game messages.

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