
Effects of fear-inducing elements in video game narrative design on users' perceived challenge and post-tension satisfaction

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Abstract: This foundational study explores whether fear-inducing elements can result in users feeling post-tension satisfaction, a positive response after completing a challenging task, without requiring faster physical input. A fire-safety serious game prototype was developed to test 63 users' cognitive and affective responses across five levels (houses). House A (low-reflex) and House B (high-reflex) served as controls. Houses C, D, and E matched A in reflex demand but contained jump scares, dark atmosphere, and foreshadowing with subversion, respectively. Across conditions, the presence of narrative fear elements consistently increased stress, effort, and post-tension satisfaction relative to the baseline. These findings suggest that narrative tension may improve engagement in failproof games and serious training contexts. Due to the fixed order and House E's combination of narrative cues and puzzle demands, comparisons among individual fear-inducing elements cannot be interpreted as causal, highlighting the need for counterbalancing and clearer manipulations in future studies.

Keywords: narrative design; serious games; flow theory; cognitive workload; horror; perceived difficulty.

Reference to this paper should be made as follows: Chaiyanan, P. and Teeravarunyou, S. (2025) 'Effects of fear-inducing elements in video game narrative design on users' perceived challenge and post-tension satisfaction', *Int. J. Human Factors and Ergonomics*, Vol. 12, No. 2, pp.167–181.

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This paper is a revised and expanded version of a paper entitled 'Exploring how horror design elements impact the perception of game difficulty' presented at 22nd Congress of the International Ergonomics Association (IEA), Jeju, South Korea, 25–29 August 2024.

1 Introduction

1.1 Adding challenge to serious games

Challenge plays an important role in sustaining flow, providing sufficient stress to balance users between anxiety and boredom, potentially creating satisfaction after completing a challenging task just above the user's skill level (Sweetser and Wyeth, 2005). Serious games, a type of game designed with purposes beyond entertainment such as training, rehabilitation, or awareness (Lau et al., 2017), are often required in many contexts to minimise challenge or even be failproof in order to ensure completion across a wide range of users (Salvador-Ullauri et al., 2020). Traditionally, especially in entertainment games, increasing challenge has meant that the enemy and the game itself become faster, demanding faster reflexes from users [e.g., *Space Invaders* (1978), *Donkey Kong* (1981), *Tetris* (1984)]. However, even with difficulty adjustment options, users with limited reflex abilities would be forced to choose a low-reflex configuration, excluding them from higher-intensity flow states (Sweetser and Wyeth, 2005). This limits a large group of users from experiencing what will be referred to in this study as post-tension satisfaction, the positive release that follows overcoming a demanding challenge.

Post-tension satisfaction has been examined in past research. Philippe et al. (2022) described related ideas as flow exit state, a distinct phase of flow that occurs after the activity. In their study of athletes and musicians, participants reported that the conclusion of flow was often marked by a sense of relief and emotional release. This exit phase is not a neutral ending but an integral part of the experience, providing a positive affective payoff following intense concentration, but more rigorous research has conceptualised it under competence satisfaction (Przybylski et al., 2010). Meng et al. (2016) found that players experienced stronger emotional payoff when narrowly overcoming a difficult match compared to easy wins, while Corcos et al. (2018) found that enjoyment was highest when players perceived challenge as balanced with their skill level.

According to Qin et al. (2009), challenge is considered one of the foundations necessary for user immersion, but it does not necessarily have to come from faster reflex demand, even if that is how most games have traditionally done so. For action-oriented genres (e.g., shooters, fighting games, platformers), not asking users for quicker reactions and precision is rare. One genre, however, is known to create high-stress scenarios using narrative design without demanding higher reflexes from users: horror (Domingues et al., 2024).

Many independent horror video games, often categorised as walking simulators (e.g., *Fear to Fathom* series, Chilla's Art titles), are constantly being released. Hawco (2023) observed that many horror games, such as *Amnesia: The Dark Descent*, rewarded users not only for slowing their movement but, on many occasions, simply for remaining still. A common recurring mechanic in the genre involves the user's character hiding for

extended periods, during which any real-world noise picked up by the microphone can alert the in-game monster. The general positive reception to these games suggests that users are satisfied with this arrangement and that low-reflex demand is expected of the genre. This raises the question of what might occur if elements from horror games were introduced into failproof serious games.

1.2 Hypothesis

This study hypothesises that narrative designers can increase perceived challenge in serious games by utilising fear-inducing elements commonly found in the horror genre. Typical elements in horror narratives include jump scares, dark atmosphere, foreshadowing, time pressure, and disempowerment. Time pressure implies that the user must think and make decisions quickly, increasing perceived cognitive challenge (Cox et al., 2012). This increased cognitive load often came with a demand for faster reactions (Denisova and Cairns, 2015), which conflicted with the present study's aim of identifying a low-reflex alternative to increase the challenge. Disempowerment requires time for the user to become familiar with an ability given to them before it is removed (Filipe, 2017), so exploring this element might be better suited for research that has a longer gameplay session. However, disempowerment can be understood as a form of subversion that flips audience expectations. Subversion is recognised in narrative design as a means of deepening engagement (Bizzocchi and Woodbury, 2003), and in horror experiences, it often operates hand in hand with foreshadowing, where anticipation is set up only for the expectation to be violated (Perron, 2004). Accordingly, this research focuses on how jump scares, dark atmosphere, and foreshadowing with subversion affect the user's experience in serious games.

If fear-inducing elements can provide post-tension satisfaction without demanding higher reflexes, they may strengthen the motivational design of serious games. Mandatory training and simulations are widespread across industries, yet they often struggle to sustain engagement. Narrative devices that introduce cognitive and emotional tension, such as jump scares, dark atmosphere, and foreshadowing with subversion, offer a possible solution. By embedding these elements within failproof contexts, serious games may reintroduce a sense of challenge, improve engagement, and sustain post-tension satisfaction.

This study was intended to be exploratory. Fear-inducing elements such as jump scares, dark atmosphere, and foreshadowing with subversion are commonly deployed together in games, functioning in tandem rather than in isolation. An attempt to separate them within a controlled design should therefore be viewed primarily as a methodological exercise to observe whether each element can elicit measurable effects, rather than as a definitive account of their independent impact or relative strength. At the same time, any shortcomings in this design can serve as a useful reference point for future researchers, illustrating the complexities of disentangling narrative elements that are rarely experienced in isolation.

2 Existing theories

2.1 *Post-tension satisfaction in games*

Post-tension satisfaction builds on the foundations of flow theory, which describes optimal challenge as occurring when difficulty slightly exceeds a player's skill level (Csikszentmihalyi, 1990). When users complete a task under conditions of clarity and perceived control, the resolution of tension is more likely to generate a distinct payoff. In this sense, post-tension satisfaction can be understood as an extension of the flow cycle: the affective release that occurs once flow is resolved, made possible by the same conditions that supported immersion during play.

While this release at the end of the challenge has been referred to variously as 'flow exit states' or 'completion relief', these terms remain scattered and inconsistently applied. The current study introduces post-tension satisfaction as a more systematic label for this affective outcome. Prior research provides converging evidence for its distinction. Meng et al. (2016) found that players in closely matched games exhibited heightened attention, intrinsic motivation, and an increase in positive feeling when success was narrowly achieved, supported by neurophysiological data. Similarly, Przybylski et al. (2010), drawing from Self-Determination Theory, argued that overcoming challenge produces competence satisfaction, situating the positive emotional payoff not merely as enjoyment but as fulfilment of a core psychological need.

Recent work has further highlighted that the affective aftermath of challenge is itself a meaningful phase of experience. Philippe et al. (2022), studying athletes and musicians, reported that the conclusion of flow was often marked by relief and positive affect, framing the exit phase not as a neutral return to baseline but as an integral and rewarding component of the cycle. This perspective is reinforced by media psychology, where Zillmann (1983) argued that arousal generated during suspenseful or threatening episodes does not dissipate immediately but lingers, intensifying the emotions that follow. In this view, it is the resolution of arousal, rather than the buildup, that produces the most distinct pleasure, with the relief and joy of resolution heightened by the tension that preceded it. Together, these accounts suggest that the conclusion of challenging activity provides its own affective reward, rather than functioning merely as the cessation of strain. Within games, Corcos et al. (2018) advanced this argument empirically, showing that enjoyment was highest when players perceived challenge as optimally balanced to their ability, and that this perception predicted engagement more reliably than conventional difficulty metrics such as completion time or number of deaths.

Beyond competitive or reflex-driven contexts, post-tension satisfaction also connects to stress regulation and narrative engagement. Domingues et al. (2024) expanded this framing to narrative-driven games, showing that effective engagement does not require high reflex demand. Instead, affective forms of challenge: uncertainty, tension, and emotional consequence were found to elevate users' sense of challenge within narrative-driven gameplay. These elements operate cognitively and emotionally rather than mechanically, demonstrating that immersion and satisfaction can be maintained through atmosphere and anticipation alone. This study formalises post-tension satisfaction as a distinct construct that consolidates previously scattered terminology.

2.2 *Fear-inducing elements in horror games*

Prior research has suggested that jump scares provoke strong emotional responses through sudden visual and audio stimuli, which heighten stress levels (Graja et al., 2021). They may also evoke measurable physical reactions, from involuntary muscle contraction to increased heart rate (Terkildsen et al., 2023), which in turn can contribute to a strong sense of release or satisfaction once the threat is resolved. While jump scares are effective fear triggers, their overuse may diminish impact due to user desensitisation, a concern frequently noted in game design discourse but not yet empirically resolved. Unlike reflexive responses, jump scare arousal involves complex cycles of anticipation and resolution. Tinwell et al. (2010), in their study of uncanny behaviour in survival horror games, argue that immersion is better sustained through persistent emotional tension and discomfort, often achieved via unsettling character design and environmental cues. Their findings suggest that psychological fear amplified through audio-visual dissonance and atmospheric unease can be more immersive than reliance on repeated startle tactics.

Dark atmosphere is one of the most impactful elements in horror game design (Huaman et al., 2024). Hegedues et al. (2023) demonstrated that perceived challenge can be elevated purely through threatening visual design, without altering gameplay mechanics. In their EEG-based study, participants played four simple minigames presented in three variations: baseline, mechanically more challenging, and visually more threatening. Results showed that visual alterations alone significantly increased cognitive engagement, underscoring how horror games can elicit strong emotional responses through aesthetic cues rather than gameplay complexity. This supports the notion that horror games often reinforce immersion through atmospheric design rather than mechanical challenge. Branje et al. (2014) found that frightening horror music alone significantly increased autonomic responses, reinforcing the ability to affect users mentally through audio in horror media. Krzywinska (2015) emphasises that both oppressive visual environments (e.g., dark corridors, fog) and unsettling audio design are central to constructing fear in horror games.

While foreshadowing is integral to building suspense in horror, this study focuses specifically on foreshadowing with subversion, in which the game communicates directly with the user through environmental details or textual messages (e.g., warning signs, dialogue), and then deliberately forces disobedience of those warnings. This is called subversion, which in horror experiences often operates hand in hand with foreshadowing, where anticipation is set up only for the expectation to be violated (Perron, 2004).

Building on this, Perron (2004) examined the role of warning systems in survival horror games, emphasising how foreshadowing cues such as audio signals and visual indicators serve as primary mechanisms for inducing fear. These elements create sustained psychological tension by alerting users to impending threats, thereby improving immersion through heightened emotional responses. When foreshadowing resolves in exactly the way players anticipate, the resulting payoff often feels diminished. As Carroll (1990) observes, the satisfaction of horror arises from the interplay of expectation and surprise, with resolutions that both confirm and defy what has been anticipated. In this way, the pleasure of horror derives not from outcomes that unfold exactly as expected, but from twists that overturn anticipation while still cohering with the narrative.

Granic et al. (2014) explore how users' emotional investment in video game narratives, such as attachment to characters or story outcomes, improves engagement.

Drawing on studies involving surveys and gameplay observations, they suggest that narrative-driven games elicit emotional arousal that heightens users' immersion. This arousal, tied to investment in narrative elements rather than physical skills, contributes to a sense of challenge. When users achieve narrative goals, especially when payoff requires overcoming misleading or contradictory cues, they experience emotional outcomes like satisfaction or relief, which further deepen engagement. These findings highlight the role of narrative design in shaping users' emotional experience and perception of challenge.

3 Methodology

3.1 Participants

Sixty-three participants were recruited through convenience sampling. The only inclusion criterion was that participants had to have previously completed a video game they perceived as challenging, ensuring familiarity with the sensation of post-tension satisfaction. Of these, 47 identified as male and 16 as female. All participants were adults over the age of 20, with ages ranging up to the early fifties (though not all participants reported age). The study did not systematically control for prior horror game familiarity. Individuals with very low tolerance for horror typically declined to participate during recruitment, resulting in a self-selected sample of average gamers with sufficient tolerance to engage with the prototype.

The research proposal, informed consent form, survey instrument, and participant information sheet were submitted to and approved by the Human Research Ethics Committee (Approval number: KMUTT-IRB-COE-2025-057). All procedures complied with ethical guidelines for research involving human participants. No identifiable personal data was collected. Video recordings of the play sessions were accessible only to the two researchers and will be disposed of within one year.

3.2 Procedure

This study built upon a conference paper that used entertainment game prototypes with a smaller sample size (Chaiyanan and Teeravarunyou, 2025). A fire-safety serious game prototype was developed specifically for this study using the Unity engine. Participants took on the role of a firefighter conducting home inspections across five houses. The prototype was not designed as a horror game, but as a serious game intended to inform players about the expiration dates of fire extinguishers and alarms, as well as potential fire hazards. This ensured that the two baseline levels without fear-inducing elements still functioned as complete and authentic serious game experiences.

The prototype's five levels were presented in a fixed order (A, B, C, D, E). While this decision ensured consistent exposure across participants, it introduced a major limitation of this study: the potential for ordering and conditioning effects. Specifically, the strong jump scare in House C may have primed players to anticipate subsequent threats, thereby amplifying their responses in Houses D and E. This raises the possibility that the high ratings for House E's foreshadowing with subversion were influenced not only by the narrative device itself but also by the cumulative tension built across the sequence. This confound limits the internal validity of the findings and represents the most serious methodological constraint of the study. Future research must randomise or

counterbalance house order to properly separate these factors and more reliably assess the distinct contributions of jump scares, dark atmosphere, and foreshadowing with subversion.

The participants were asked to be alone and to use headphones to increase the feeling of immersion. Neither online nor onsite involved a live observer to offer guidance, as the presence of a researcher could affect the participants' behaviour and reactivity (Elvnäs et al., 2024). Upon finishing a level, the participants were required to complete the part of the survey that corresponded to that level immediately.

The first two levels of the serious game prototype, House A and House B, contained no fear-inducing elements and served as control conditions for comparison with the last three levels. House A featured low-reflex demand, whilst House B increased reflex demand by having a two-minute time limit. Houses C, D, and E each contained a single fear-inducing element (jump scare, dark atmosphere, and narrative foreshadowing, respectively). All three levels contained the same low reflex demand with House A (Table 1).

Table 1 Structural design of the prototype's five houses, showing reflex demand, fear-inducing elements, time constraints, and number of precision quick-time events

	<i>Reflex demand</i>	<i>Fear-inducing elements</i>	<i>Time limit</i>	<i>Precision QTEs</i>
House A	Low	None	No	6
House B	High	None	Yes (two minutes)	14
House C	Low	Jump scare	No	6
House D	Low	Dark atmosphere	No	6
House E	Low	Foreshadowing with subversion	No	6

Low-reflex demand levels (Houses A, C, D, and E) shared the same three sequential objectives:

- 1 checking a fire extinguisher's expiration date using a hold-and-release quick-time event (QTE)
- 2 inspecting and replacing outdated smoke detectors through six precision QTEs
- 3 identifying clearly marked fire hazards.

Each of these levels required six precision QTEs in total, with no time limit imposed. In contrast, House B increased reflex demand by imposing a two-minute timer and raising the number of precision QTEs to 14, a threshold calibrated through pilot playtesting to ensure moderate challenge (Table 1).

The fear-inducing manipulations were isolated per condition. House C introduced a single jump scare in an otherwise brightly lit setting (Perron, 2004). House D added a dark vignette resembling a flashlight beam (Krzywinska, 2015; Kim and Kim, 2024) with monotone background audio designed to avoid startle cues (Roux-Girard, 2011). House E relied on narrative foreshadowing through ominous warnings such as 'Don't Open', paired with a forced subversion that required users to disobey the cue in order to progress. This combination reflects how foreshadowing often culminates in a reversal or payoff, thereby sustaining anticipatory tension without reflex demands (Wouters et al., 2011). Accordingly, this study does not attempt to separate foreshadowing from

subversion and examines their combined effect as implemented in House E. Anticipatory fear in Houses D and E may also have been influenced by expectations established earlier in the sequence (Terkildsen et al., 2023).

The unique door puzzle also introduced an additional source of cognitive demand beyond narrative foreshadowing. This complicates the interpretation of whether the elevated ratings for House E were due to foreshadowing alone or to the added problem-solving element and thus must be regarded as a potential confound. To capture narrative foreshadowing, House E incorporated a forced subversion: the final fire hazard was hidden behind a door marked with a warning not to open. This ensured that the anticipatory cues were paired with a reversal or payoff, since foreshadowing without resolution risks leading nowhere (Wouters et al., 2011). This design choice introduced a serious confounding variable that prevents the findings for House E from being attributed to foreshadowing alone.

3.3 *Instrument*

To test the hypothesis of this exploratory study, which stated that adding fear-inducing elements can increase the feeling of challenge for the player playing a low-reflex failproof serious game, an assessment tool that can measure workload was needed. For this purpose, a modified version of the NASA Task Load Index (NASA-TLX) was applied, as its workload-oriented subscales directly address whether fear-inducing levels (Houses C, D, and E) were experienced as more stressful than the baseline conditions (Houses A and B).

Large-scale player-experience instruments such as The Game Experience Questionnaire, or GEQ, provide a broad set of player-experience measures, including both in-game and post-game, with even a question asking about relief in their post-game module (Law et al., 2018). The Game User Experience Satisfaction Scale, or GUESS (Phan et al., 2016), provides broad post-play measures of satisfaction across domains such as enjoyment, aesthetics, and usability. The player experience of need satisfaction, or PENS (Ryan et al., 2006), is grounded in Self-Determination Theory and examines how games satisfy needs for autonomy, competence, and relatedness for the users. While all three tests remain valuable for their intended purposes, this study does not wish to ask participants direct questions about their enjoyment towards the game or whether the game felt challenging. By asking questions related to workload, the study aimed to capture the participants' feelings of tension without prompting them to analyse or rationalise their experience, for example, by noticing that the fear-inducing houses had no time limit and that all levels except House B were failproof. The modified NASA-TLX measures workload instead of positive and negative affect, making it suitable for distinguishing baseline levels from levels with fear-inducing elements.

The challenge originating from recent gameplay interaction scale (CORGIS) has been developed and validated to assess perceived cognitive, emotional, performative, and decision-making components of challenge in digital games (Denisova et al., 2020). Unlike other player experience instruments, which focused on overall enjoyment or motivation, CORGIS focused on challenge specifically. It also distinguishes between cognitive and emotional demands as well as performative and decision-making aspects, and has been shown to be reliable across multiple game contexts. Still, some CORGIS items, such as 'the game required me to be quick with my actions,' presuppose a reflex-based demand within the game design. In a failproof serious game prototype,

where reflex challenges were intentionally minimised, such items may not capture the possible self-imposed reflex demand by the user.

Table 2 Modified NASA-TLX dimensions

<i>Dimensions</i>	<i>Description</i>
Reflex effort	The level of physical and perceptual activity required to respond under pressure (e.g., rapid reactions, swift decision-making, and coordination to complete tasks quickly).
Mental demand	The cognitive load involves problem-solving and decision-making elements.
Emotional intensity	The degree of emotional arousal experienced during the task, such as fear, discomfort, anxiety, or unease.
Stress level	The amount of psychological tension, pressure, or discomfort induced by the task or environment.
Post-tension satisfaction	The emotional release experienced after successfully completing what was perceived to be a challenging task.

The modified NASA-TLX included five dimensions: reflex effort, mental demand, emotional intensity, stress level, and post-tension satisfaction (Table 2). The original subscale ‘frustration’ was rephrased as ‘stress’ to adopt a more neutral framing, as stress encompasses both positive and negative responses to demands (Anjum et al., 2023). The original subscale ‘temporal demand’ was rephrased as ‘reflex effort’ to capture whether participants felt pressure to respond quickly, even though the fear-inducing levels had no explicit time limit.

The alteration of the established factor structure of the NASA-TLX means that the resulting scores cannot be assumed to carry the same psychometric properties as the original tool. As a single-item measure, post-tension satisfaction further carries inherent psychometric weaknesses: it cannot provide internal consistency reliability and risks omitting facets of the underlying construct. For this reason, the study frames the current use of post-tension satisfaction as strictly exploratory. Future work should therefore both triangulate with existing player experience instruments and develop a validated multi-item post-tension satisfaction scale, ideally complemented by physiological measures (e.g., heart rate, galvanic skin response) to strengthen construct validity.

3.4 Data analysis

A series of one-way ANOVAs was planned to compare reflex effort, mental demand, emotional intensity, stress level, and post-tension satisfaction across the five houses (A, B, C, D, and E). To prepare the data for analysis, outlier trimming was performed to improve homogeneity of variance. Levene’s test was selected to assess whether the assumption of equal variances held for each dependent variable.

If Levene’s test indicated a violation of the homogeneity assumption, Welch’s ANOVA would be used in place of the standard one-way ANOVA. In cases where a statistically significant effect was found, Tukey’s HSD post-hoc test was applied when variances were equal.

4 Results

Levene’s test revealed that the assumption of homogeneity of variances was satisfied for reflex effort ($p = .865$) and post-tension satisfaction ($p = .308$). Accordingly, a standard one-way ANOVA was used for these two variables. For mental demand ($p = .007$), emotional intensity ($p < .001$), and stress level ($p < .001$), the assumption was violated, and Welch’s ANOVA was used. Post-hoc comparisons were pre-specified: Tukey’s HSD for reflex effort and post-tension satisfaction, and Games–Howell for mental demand, emotional intensity, and stress.

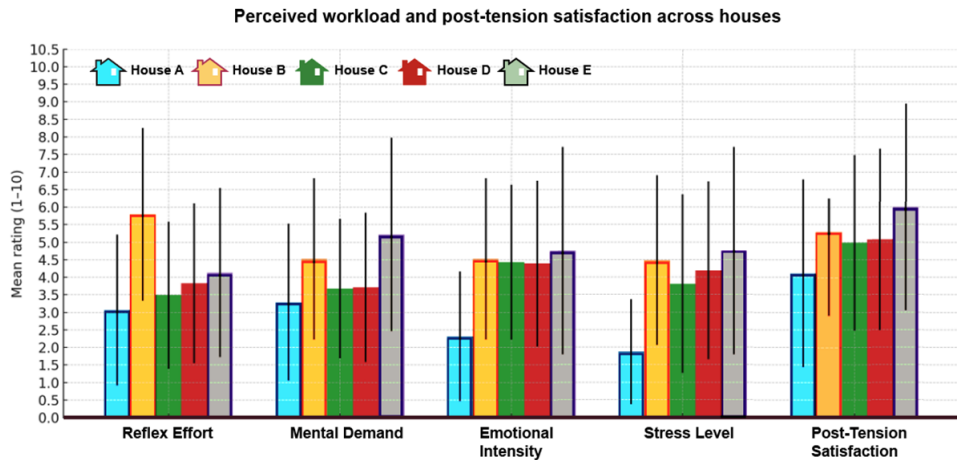
Table 3 One-way ANOVA results for assessed variables across five conditions.

Variable	Test Type	$F(df1, df2)$	p	η^2	Post-hoc
Reflex effort	ANOVA	$F(4, 310) = 13.22$	$<.001$	.15	Tukey’s HSD
Mental demand	Welch’s ANOVA	$F(4, 155) = 6.11$	$<.001$	.14	Games-Howell
Emotional intensity	Welch’s ANOVA	$F(4, 152) = 22.50$	$<.001$	.37	Games-Howell
Stress level	Welch’s ANOVA	$F(4, 152) = 24.00$	$<.001$	.39	Games-Howell
Post-tension satisfaction	ANOVA	$F(4, 310) = 4.21$	.002	.05	Tukey’s HSD

Notes: η^2 = partial eta squared. Reflex effort and post-tension satisfaction were analysed with ANOVA and Tukey’s HSD. Mental demand, emotional intensity, and stress were analysed with Welch’s ANOVA and the Games-Howell procedure. $N = 315$ (63 participants \times 5 conditions)

The results indicated significant differences across all measured variables: reflex effort ($F(4, 310) = 13.22, p < .001$), mental demand ($F(4, 155) = 6.11, p < .001$), emotional intensity ($F(4, 152) = 22.50, p < .001$), stress level ($F(4, 152) = 24.00, p < .001$), and post-tension satisfaction ($F(4, 310) = 4.21, p = .006$). To identify specific pairwise differences, post-hoc tests were pre-specified using Tukey’s HSD for reflex effort and post-tension satisfaction, and the Games-Howell procedure for mental demand, emotional intensity, and stress level.

Figure 1 Mean ratings (\pm SD) across Houses A–E (see online version for colours)



The pattern (Figure 1) suggests that Houses with fear-inducing elements (House C, House D, and House E) elicited higher average ratings than the baseline House A across most measures, apart from reflex effort. These results should be interpreted only as preliminary patterns, since Houses C, D, and E were played in a fixed order and House E incorporated an additional puzzle element, complicating interpretation. Randomised presentation and cleaner manipulations will be required in future studies to clarify the specific role of each element.

For reflex effort, House B ($M = 5.79$, $SD = 2.46$) yielded the highest scores, as expected for a high-reflex non-horror level. House C ($M = 3.49$, $SD = 2.10$), House D ($M = 3.83$, $SD = 2.28$), and House E ($M = 4.13$, $SD = 2.41$), all containing fear-inducing elements, showed higher reflex scores than House A.

For mental demand, Houses A ($M = 3.29$, $SD = 2.24$) had observably lower scores than other houses: House B ($M = 4.52$, $SD = 2.30$), House C ($M = 3.68$, $SD = 1.99$), House D ($M = 3.71$, $SD = 2.13$), and House E ($M = 5.22$, $SD = 2.76$). The task of locating the final fire hazard behind a warning-marked door in House E introduced an additional cognitive step. Combined with the fact that House E was always played last in the fixed order, this makes its similarity in mental demand to House B difficult to interpret with confidence.

For emotional intensity and stress, all four houses showed higher scores than House A ($M = 2.18$, $SD = 1.63$) and House A ($M = 1.87$, $SD = 1.50$), respectively. The jump scare in House C occurred earlier in the sequence, which may have contributed to elevated ratings in Houses D and E, meaning these results cannot be treated as isolated causal effects. Lastly, for post-tension satisfaction, House C ($M = 4.98$, $SD = 2.50$), House D ($M = 5.08$, $SD = 2.59$), and House E ($M = 6.00$, $SD = 2.95$) had higher average scores than House A ($M = 4.11$, $SD = 2.68$).

5 Discussion

Jump scares, dark atmosphere, and foreshadowing with subversion were introduced in separate conditions for the purposes of this exploratory study, yet in practice, these devices rarely function independently. Horror design conventionally layers atmosphere, anticipation, and sudden shocks to create tension; isolating them analytically may therefore misrepresent how they normally operate. The findings are best understood as evidence that narrative devices collectively elevated stress, effort, and post-tension satisfaction, rather than as indications of the strength of any single element.

The results showed that the houses with fear-inducing elements (C, D, and E) elicited higher emotional intensity and stress than House A, which functioned as the baseline low-reflex condition. House A was always played first and served primarily as an anchor for comparison rather than as a counterbalanced condition. While this confirms that fear elements add to players' cognitive and emotional demand without increasing reflex effort, the observed differences among Houses C, D, and E, along with all three houses' scoring higher than A, should still be interpreted as provisional. Because participants always encountered the jump scare in House C before experiencing the dark atmosphere or foreshadowing in later houses, conditioned anticipation may have inflated their responses. Factors such as fatigue may also have influenced outcomes.

This framing highlights a methodological lesson. The fixed sequence of levels introduced carry-over effects that could not be disentangled from the intended impact of

each condition. Future studies will need to employ counterbalancing or randomisation, as well as clearer separation of narrative variables, to assess whether fear-inducing elements can be meaningfully examined on their own. Such refinements are especially important for serious game prototypes, where the design goal is not to rank narrative devices but to understand how they may be applied to sustain engagement in failproof contexts.

All established player-experience measures were considered. Instruments such as the GEQ and the more recent CORGIS directly assess perceived challenge and related dimensions, and may in some contexts be more suitable alternatives. However, given the exploratory aim and the failproof, low-reflex nature of the serious game prototype, the modified NASA-TLX remained appropriate for capturing workload, stress, and effort without prompting participants to explicitly evaluate enjoyment or competence.

6 Conclusions

This study provided preliminary evidence that narrative fear elements can heighten the perception of challenge and let users have access to the experience of post-tension satisfaction without increasing reflex demand. The findings suggest that a range of narrative devices can sustain engaging experiences even under low-reflex conditions typically found in serious games. This supports the idea that accessible, failproof scenarios can still deliver meaningful engagement when designed with attention to narrative tension, making post-tension satisfaction a useful marker of interactive experience.

While horror elements as a whole may have potential to impact perceived difficulty, the relative effects of the individual fear-inducing elements should be disregarded. The fixed order of level presentation, potential carry-over expectations, participant fatigue, and the interdependent nature of horror conventions where atmosphere, foreshadowing, and jump scare typically work together, limit the degree to which any element can be cleanly isolated.

This study demonstrates the risks of design errors that undermine interpretability. The fixed sequence introduced systematic carry-over effects, and the inclusion of the extra puzzle element in House E meant that the relative influence of each narrative element could not be determined. These flaws limit the validity of the comparative findings, and future research should avoid similar pitfalls by employing counterbalancing, randomisation, and clearer separation of narrative variables. From this perspective, the study should be regarded as exploratory and cautionary, providing insight into both the promise of narrative fear elements and the methodological limitations introduced by the design choices in this study.

Nevertheless, the broader implications remain significant. Challenge is central to sustaining flow and enjoyment in interactive media, and narrative design can function not merely as a vehicle for story but as a mechanism for shaping immersion, engagement, and emotional release through tension-building devices. By emphasising cognitive and emotional demands rather than reflex difficulty, narrative approaches can make both entertainment games and serious game prototypes more inclusive and rewarding. For serious games in particular, narrative tension offers a way to sustain engagement in mandatory training scenarios that cannot rely on failure, extending the relevance of this work beyond entertainment to institutional and educational contexts.

Declarations

All participants provided informed consent prior to participating in the study, in accordance with the approval granted by the Human Research Ethics Committee (KMUTT-IRB-COE-2025-057).

The author acknowledges the use of AI tools (ChatGPT, Grok) to assist with reviewing. The final manuscript, including all interpretations, analysis, and conclusions, was completed solely by the authors.

The authors declare no conflicts of interest in connection with this study.

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