“I may only be able to sit through 30 minutes”: Gaming Sickness and Its Impact on Players’ Experiences With Games

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ABSTRACT

Gaming sickness, where players experience dizziness, nausea, or even vomiting while playing video games, is typically viewed through a quantitative lens, limiting our insights into the lived experience of the phenomenon and thus concealing mitigation strategies. To gain a more nuanced understanding of gaming sickness, and to explore possible lanes of future research, we conducted twelve semi-structured interviews with people affected by gaming sickness. Our results show that the experience of gaming sickness is highly individual, with a wide spectrum of symptoms and varying severity. Environmental factors can influence gaming sickness, and many participants have developed individual contextual and game-related coping strategies, which they apply with varying degrees of success. For games to be more accessible to everyone, future work should focus on studying specific triggers, and needs to explore different forms of adjustments so players can tailor games to their individual needs.

CCS CONCEPTS

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

KEYWORDS

Cybersickness, Video Games, User Experience, Accessibility

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1 INTRODUCTION AND BACKGROUND

Virtual environments causing symptoms similar to motion sickness is a frequently observed problem [21], with cybersickness [20] being triggered by broad groups of interactive technology, including video games [6, 7, 14]. Given the popularity of video games as leisure, as well as widespread education and training [30], and their relevance in culture [28], what we call *gaming sickness* is a concern in the context of game accessibility, i.e., a barrier-free and positive play experience for broad groups of players. Here, we note that people of all ages are affected by gaming sickness, with prevalence ranging from only a small fraction of users [19] to as many as 67% of adults and 56% of children reporting sickness symptoms under specific circumstances [7], and a range of gaming platforms triggering the phenomenon, including consoles and tablet computers [32] and head-mounted displays (HMDs) [4, 27]. There are three theories trying to explain the bodily cause of sickness that are widely used in cyber- or gaming sickness research, i.e. *sensory mismatch* [20], *postural instability* [29] and *rest frame* theory [25]. Research shows that each theory on its own can only explain and predict some occurrences of cybersickness symptoms [27].

Existing work has a strong quantitative focus (e.g., see [15], [18], and [14]), and suggests that contributing factors may be found in the software (e.g., field of view [5] or speed of the game [26]), hardware (e.g., kinds of displays used [13, 15, 24], or the graphics set-up [4]), how the hardware is used (e.g., sitting or standing up [23], or input mode [31]) as well as in individual factors of the user (e.g., age [18] and gender [10]).

Yet, little is known about the lived experience of gaming sickness, how players individually approach and manage the phenomenon, and how it impacts their player experience. This is a missed opportunity for game research and game design to better understand gaming sickness in an effort to develop design strategies that help reduce its impact. To close this gap, we raise the following research question (RQ): *How is gaming sickness subjectively experienced and managed by players when engaging with digital games?* We address this question using a qualitative approach [11], in which we invited 12 participants to take part in semi-structured interviews [1] to reflect on their experiences with gaming sickness. Our results show that there is a broad spectrum of different influential factors and ways of coping with and managing gaming sickness. On this basis, we outline the following opportunities for future work: (1) researching specific triggers - individually as well as in combinations - and (2) creating new accessibility features to customize the individual experience. Overall, we hope that our work will contribute to further research into gaming sickness, as it hampers game accessibility for a significant group of players.

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2 METHOD

We engaged in a qualitative research process using semi-structured interviews [1], which are well-suited to examine lived experience, thereby addressing our research question, *How is gaming sickness subjectively experienced by players when playing video games?*

2.1 Participants and Procedure

We recruited participants via Discord, WhatsApp, mailing lists, and snowballing. Inclusion criteria were: Aged 18+ and having previously experienced gaming sickness. The 12 participants, seven women, one transfem (self-description), and four men, ranged in age from 22 to 54 years. Participants' occupations were equally split between university students and (retired) workers. Aside from playing video games, they reported interests in other kinds of sports, or culture. All participants experienced motion sickness also in other areas of life.

At the beginning of each interview, we provided the volunteers with information on the content and goal of the study and obtained their informed consent. The participants were allowed to discontinue the interview at any given moment. The first part of the interview focused on demographic data, which served as a characterization of the participants (see Appendix 1). To ease the participants into the main part of the interview, we started with talking about their gaming behaviors and susceptibility to motion sickness in other areas. Then, we asked them to recount their experience with gaming sickness in digital games, describing the respective scenario in as much detail as comfortably possible. We were especially interested in information regarding software, hardware, and context. This part was followed by prompts on how the interviewees cope with gaming sickness and what impact gaming sickness has on their gaming behavior. Further, we asked participants whether they had ideas on what might help them to reduce their encounters with gaming sickness. Lastly, an oral summary was given to tie up any loose ends and to offer an opportunity to add information or ask questions. On average, interviews lasted for about 30 minutes (range: 17–54 min). Data was collected by recording in-person interviews using a voice recorder, or OBS for interviews conducted via our institution's self-hosted BigBlueButton instance. The research plan was approved by the local Ethics Committee and Data Protection Office.

2.2 Data Analysis and Positionality

We used a local installation of Buzz Captions' Whisper to transcribe interviews. The primary researcher manually checked each transcript at least twice for errors. For data analysis, we followed a Thematic Analysis approach [8]. After transcription, the main researcher familiarized herself with the data by listening to recordings and reading transcripts repeatedly to gain an overall understanding of the material. She then created codes to determine points of interest in the data, e.g., point of view or camera controls as triggers, or the variety of symptoms experienced. Initial themes were discussed within the research team, resulting in final themes dealing with the *Experience of Gaming Sickness*, *Triggers*, *Prevention and Management*, and *Impacts on Player Experience*. After analysis, the recordings were deleted from the research devices. Given our analytical approach, we also want to make transparent our own positionality. The main author and another member of the research team both experience gaming sickness, which is a personal motivational factor for this research. The researchers' shared first language is German, which is also the language of the interviews. Two of the researchers have extensive experience in conducting qualitative research of this type.

3 FINDINGS

In this section, we present four themes we crafted from our data, (1) past experiences, (2) triggers, (3) prevention and management, and (4) impact on player experience. Terms and phrases set in quotation marks in this part are taken directly from the interview transcripts.

3.1 The Experience of Gaming Sickness is Individual in Intensity and Temporality

Our data shows that the experience of gaming sickness differs from person to person. The vast number of symptoms can appear in various intensities and different forms, start at different points in time, and may accumulate over time. Symptoms can be categorized into general discomfort, nausea, eye/head related symptoms, vertigo, and physical responses. Individuals perceive the intensity of symptoms differently, comparing them to motion sickness (ID02, ID03, ID04) or intoxication (ID11). General nausea was one of the most reported symptoms, ranging from a queasy stomach (ID02, ID11) to "nearly vomiting" (ID10). Eye and head related symptoms include headaches and disorientation as well as losing visual focus (ID04). Some participants reported feeling heating up or sweating. Two participants explained that once sickness was triggered, the time until symptoms could be re-triggered would become shorter. Taking breaks did not counteract this fact (ID01, ID05). All participants experienced lingering symptoms after exiting the game that had triggered the sickness. Symptoms could persist for two minutes (ID05) to one to two hours (ID08, ID10), or, in extreme cases "*until you go to sleep until the next day*" (ID11). Some participants reported noticing a change in gaming sickness over the course of their lives. For example, one participant reported being able to play first-person shooters in their youth, while today this is their "problem genre" (ID11).

3.2 Triggers Are Wide-Ranged and Personal

3.2.1 Game. The majority of games reported to cause gaming sickness were 3D games where movement is a crucial part of game play, like first person shooters (ID11). One participant reported experiencing gaming sickness when playing story games (ID12). Nearly every participant mentioned frantic, sudden, and quick movements or rotations as a problem: the quicker the movement, the worse the gaming sickness. Narrow scenery, e.g., canyons (ID07) or caves and castles (ID12) were additionally named as triggers. Regarding character movement, walking or running were discussed, as well as flying (ID04, ID05), jumping through buildings (ID02), or changes of viewing direction (ID09, ID09, ID12). First-person view was the most named trigger regarding camera angle. However, one participant explicitly stated third-person view as their trigger (ID05). Further view and graphics related triggers were field of view (ID03, ID05), view bobbing (ID11), motion blur (ID09), parallax (ID03), and

graphics performance in general (ID03). Some participants theorized that the combined movements of character and environment might cause a loss of focus, thus causing gaming sickness (ID03, ID05).

3.2.2 Hardware. Participants reported experiencing gaming sickness on different devices (10 incidents on PC, 5 on VR, one on Nintendo 3DS, Xbox, Nintendo Switch and PS5 each). In the VR gaming sessions, players had used different VR headsets. Regarding input, one participant used the PlayStation motion controller, and on PC users mainly used a keyboard and mouse, sometimes other controllers. Among the participants who encountered gaming sickness using VR, the majority expressed these experiences as the most severe. Three participants expressed that the size of the displays used mattered for them (ID04, ID07, ID09). Two theorized that a bigger screen might be a trigger since it required more head movements (ID04, ID09).

3.2.3 Context. Participants experienced gaming sickness in different settings. While gaming sessions at home were most prevalent, experiences also took place in a VR Playspace (ID01), during a car ride (ID02), or on a VR-enhanced roller coaster ride (ID12). No participant saw context to be an explicit trigger. However, a few felt that some ambient variables could affect their symptoms, e.g., air ventilation (ID01), room lighting (ID02, ID05), seating arrangement (ID07), room temperature (ID01, ID07) and proximity to the display (ID08). Some participants explained that they noticed gaming sickness more quickly if they were already experiencing headaches or fatigue.

3.3 Prevention and Management Strategies Are Only a Way to Delay Gaming Sickness

In our interviews, we discussed the strategies users employ to prevent or cope with gaming sickness. It is important to note that not every tactic works for every person or in all situations. This is probably due to different causes, individual sensitivities and strategies partially depending on pleasantness of additional stimuli.

3.3.1 Preparation, Avoidance and Quitting. One prevention strategy is avoidance: several participants decided to simply not play games that would trigger their gaming sickness anymore. Some participants reported to subconsciously avoid "risky" games (ID01), while others explicitly try to assess their risk, e.g. by looking up prospective games on specific websites (ID12), watching videos (ID08), or playing demos (ID06). One participant explained that if they were to test a game for gaming sickness triggers, they would do so before sleep to avoid it affecting the rest of their day (ID11). The majority of participants reported quitting the game to recover from gaming sickness and, e.g., play a different game, go for a walk (ID03) or lie down (ID02).

3.3.2 Adapting Game Play. Some participants chose to continue playing the game if the gaming sickness-inducing stimuli were an avoidable sequence (ID02), the game requirements were still manageable (ID07), or if symptom intensity was "bearable" (ID09). To continue the game, players needed to adapt how they played: some would play the game more slowly, use teleportation in VR rather than walking, sit back (ID05, ID09), reduce their head movements (ID09), or actively look at their surroundings (ID07). One participant noticed that they were less susceptible during the morning and more so after work (ID05). Some participants also tried to take breaks during play sessions. However, this did not have the effects they had hoped for (ID01, ID10).

3.3.3 Adapting the Game. Another often-mentioned strategy was changing game settings. One participant stated that every game on PC could be playable for them, given the right options for adjustments, e.g., field of view, motion blur, view bobbing, or accessibility options like highlights for the characters (ID03). Some also stated that changing from a first to a third-person view had a positive impact (ID07, ID08, ID11). ID12 would reduce camera speed and controller stick sensitivity, while ID07 would adjust the dynamic of rotary motions. Another strategy was playing on higher graphics and frames-per-second settings (ID03, ID05). Two participants reported that adapting settings in "*Skyrim*" (ID08) and "*Minecraft*" (ID11) did not make these games playable for them.

3.3.4 Adding External Stimuli. Several participants reported that looking away from the screen frequently, e.g., after each round (ID05), or during sickness-inducing sequences (ID01), would alleviate symptoms for them. Fresh air was mentioned to be a relief by several interviewees (ID01, ID05, ID10). ID11 could reduce and delay gaming sickness by eating chocolate, and ID01 would not play specific games on an empty stomach or directly after eating.

Overall, participants understood strategies more as a way of extending a game session rather than being able to play without any repercussions (ID08, ID12). For one participant, this meant they could play a game that caused gaming sickness for up to 2.5 hours, including necessary breaks (ID07). In any case, when a player realizes they are developing symptoms of gaming sickness, they need to make a decision: Do they continue to play, or do they quit the game? The answer is strongly related to the value the game holds for the player (ID01, ID11).

3.4 Gaming Sickness Impacts the Player's Experience in Emotional, Social, and Temporal Dimensions

Nearly all participants reported avoiding certain games or whole game genres, especially if their strategies and adjustments were not working. Participants often mentioned feeling a loss of desire to play games that would cause gaming sickness. Rather than risking a bout of gaming sickness, participants would choose a game that was "less fun" or "not matching their profile" (ID01, ID08, ID12). Two participants would consider playing a triggering game, if it was interesting enough and "playable to some degree", even if it meant they could only play it for a short amount of time (ID08, ID12). When being able to continue playing, both the gaming sickness itself and the coping strategies may impact player experience. Some participants described their coping strategies to reduce immersion (ID01) and make them feel restricted (ID05).

Apart from the physical effects on the players, gaming sickness also affects their enjoyment of video games (ID04, ID05, ID11), causing negative emotions such as discomfort or annoyance. The highly social aspect of video games also impacts how participants deal with gaming sickness. Some participants stated they would consider

playing games which might induce gaming sickness during social gatherings (ID01, ID04, ID05). ID05, e.g., explained that they would stop playing or take a break if they noticed symptoms when playing on their own, but would continue playing, despite symptoms, when playing with others. Participants reported that they had to limit the duration of playing sessions for games that would cause gaming sickness (ID11, ID12). ID11 reflected on having to balance playing an enjoyable game with feeling sick for multiple days.

4 DISCUSSION

Here, we situate our findings with regard to previous work. We also highlight where our work adds to and extends existing research.

4.1 Understanding the Lived Experience of Gaming Sickness

Answering our research question, *How is Gaming Sickness experienced by players in video games?*, our results offer a multifaceted picture of gaming sickness experiences. While symptoms are similar on a general level, individual experiences vary in intensity: Most prominently, symptoms may range from a slightly queasy stomach to sweating, headaches, and vomiting, with symptoms lingering even after quitting the game. Triggers could be met in all kinds of games, from first person shooters to story games, and on various devices. This is in line with, and also extends, previous work examining gaming sickness for example with respect to in-game settings such as field of view [5] and high speed animations [26] that have previously been reported to trigger sickness, while story games have, to our knowledge, not been studied yet. Likewise, our findings support that the size of the display may cause gaming sickness [13, 26], which participants ascribed to increased head movements. For some of our participants, HMD VR was highly symptom-inducing [4, 5, 15, 24, 33]. In addition to physical symptoms, participants also discussed emotional and social effects of gaming sickness, which adds context and depth of the individual experience to previous work. Participants described playing through symptoms because of the communal and social aspects of a game, and talked of others belittling their experiences. Our data provides anecdotal evidence that gaming sickness may be more likely to occur in some situations, e.g., when one is tired. This is highly relevant as other research has shown players often engage with games at the end of their day, making it more likely that they play in such moments [2]. Overall, our work also describes how gaming sickness affects player experience and behavior: As a result of discomfort and annoyance, many of our interviewees reported reducing play duration and frequency. This implies that gaming sickness has an impact on game accessibility on a fundamental level, denying a group of players access to benefits of play such as post-work recovery [22] or the experience of relatedness in social settings [12], highlighting the relevance of further researching strategies to reduce gaming sickness.

4.2 Designing Games to Support Management of Gaming Sickness

Our work shows that gaming sickness has profound implications for player experience and player engagement with games. Therefore, it is relevant to examine strategies to address the phenomenon through game design. With respect to the management of gaming sickness, the results show that players leveraged various strategies (see Section 3.3), ranging from adaptations of the game to adjustment of environmental factors. This is in line with previous work suggesting that ventilation [9], room lighting, temperature and seating arrangement [16, 17], as well as proximity to the display are variables that can be adapted to reduce sickness. Concerning game design, our interviewees' reports imply the need for games that allow for adjustment of relevant settings, which is a common approach to increase game accessibility [3]. Additionally, game designers need to take into account management strategies external to games: If players need to adjust their environment, this requires game play that can be paused, and offering an exit from play without progress loss, which requires additional consideration in multiplayer settings, and can also be problematic in single player games [2]. We discuss in the following section how future work could explore effectiveness of options.

5 LIMITATIONS AND OUTLOOK

Gaming sickness is a complex and highly individual problem. Considering the qualitative nature of our work, we explored a limited amount of experiences, albeit in depth. Additionally, we only did so in retrospect, asking participants to recall previous gaming experiences. Here, we see an opportunity for experimental work including on-site game sessions, leveraging, e.g., think-aloud protocols. Given our open-ended approach, our results provide evidence that some genres and ways of playing may be particularly relevant in the context of gaming sickness (e.g., first-person shooter games). Future work could examine player experiences with gaming sickness on a larger scale or applying multiple methods to arrive at more specific recommendations. Focusing studies on specific genres of games could lead to the development of genre-specific mitigation strategies. Further, focusing on game developers as a target group may offer new insights into how developers account for gaming sickness in their processes, allowing for the creation of more in-depth guidelines and strategies.

Overall, we envision future research to focus on specific triggers and influences on gaming sickness, e.g., adjustable game settings or game modes, and a structured evaluation thereof. Such studies could address both participants' symptoms of gaming sickness and the player experience in adapted modes of play, providing researchers and developers with implications for the design of games that allow players to more effectively address gaming sickness, thereby contributing to game accessibility as a whole.

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Participants List					
ID	Age	Gender	Preferred Platforms	Gaming Habits	Preferred Games Genre
01	26	F	PC, PS5, Xbox	Varies	Action-Adventure, Strategy
02	22	Transfem	PC, Switch	Once per week	MMO, RPG
03	24	M	PC	2h per day	MOBA, RPG
04	23	F	Laptop, Switch, iPad	10h per week	Casual Games
05	23	F	PC	12 - 14h per week	FPS, MOBA, Battle Royal
06	32	M	PC, PS4, Switch, Mobile	3 - 4h per day	RPG, Simulation, Shooter
07	49	F	PC	Varies	RPG, MMORPG
08	54	F	PC	3h per week	Farming Simulation
09	24	M	PC	Occasionally max. 2h	Action-Adventure, FPS
10	23	F	PS5, Switch	15 - 20min per day	Cozy Games, RPG
11	29	M	PC, Switch	Multiple hours per day	MMORPG, Strategy, MMO
12	28	F	PS5, Switch, Xbox One	2 - 6h per week	Story Games, Mario Games, Open World

Table 1: Participant demographics. FPS: First Person Shooter, MMO: Massively Multiplayer Online, MMORPG: Massively Multiplayer Online Role Playing Game, MOBA: Multiplayer Online Battle Arena, PC: Personal Computer, PS: PlayStation, RPG: Role Playing Game, Switch: Nintendo Switch