Systematic Review of Enjoyment Element in Health-Related Game-Based Learning

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Abstract—Educational games are often used as teaching and learning tools, with studies showing that game-based learning is widely accepted among children and teenagers. The experience of enjoyment typically associated with playing games sparks creativity, provides a deeper learning experience and allows the individual to connect various concepts, skills, and knowledge together. This paper builds upon previous studies on enjoyment in health-based gaming and aims to articulate a definition of enjoyment in gaming. Drawing on Miles' taxonomy, the review further sets out to identify and bridges gaps in our theoretical understanding of enjoyment. Three theories were found to be particularly relevant for explaining the concept of enjoyment concerning health-based gaming: self-determination theory, flow theory, as well as uses and gratification theory.

Keywords—Enjoyment, Fun, Pleasure, Health Games, Health-Based Games, Serious Games, Theoretical Gaps

1 Introduction

With the ubiquity of digital technology and the subsequent proliferation of computer gaming, educational institutions have been under intense pressure to incorporate these innovations into the learning ecosystem [22]. "With the progression of ICT technology in recent years, an increasing number of games used in educational environments can also be used for high-level learning" [21, p.18]. Nonetheless, education providers have been challenged over how best to incorporate games in a pedagogically meaningful manner [59]. It is important, therefore, that we understand how learning takes place when playing games, and as such, we must focus on aspects of fun and enjoyment in learning [54].

Debate ranges regarding how best to gamify learning and development. This concept of gamification involves the use of games or game-like features in learning. Understanding gamification, however, also requires some clarification of the distinction between serious games and game-based learning. Moreover, researchers need to better define these terms to justify the data reviewed in this study, which is

mostly related to serious games [19]. For reference, gamification is the inclusion of game elements or mechanics when applied to non-game activities to make them more compelling [13]. Gamification and serious games both attempt to solve a problem in terms of how to promote and motivate learning using game-based techniques and thinking [11].

Serious games are games that have been designed primarily for entertainment purposes [14]. Nevertheless, serious games are designed to challenge the player in some way, with these challenges impacting the player's physical or cognitive abilities, knowledge, attitudes, health, or mental wellbeing [11]. Game-based learning, on the other hand, is focused on defined learning outcomes, with gameplay elements simply a means to an end [51].

Various studies have been conducted to investigate the positive impact of serious games for health education [15,45,47,65]. Several scholarly attempts have also been mounted to identify the core features of serious games and how to improve their learning effectiveness [13,15,47,54,59]. Few of these studies, however, have attempted to reconcile learning outcomes in serious games with traditional learning theories. Having identified this gap in the theory, the present study aims to expand the body of knowledge surrounding health game-based learning through an investigation of the theory underpinning learning in gaming.

2 Health Game-Based Learning

Similar to game-based learning, health-based games incorporate health-related knowledge with defined learning outcomes [25]. Serious gaming and the gamification of health knowledge has the potential to reach a global audience and has been identified as a possible strategy for the health education professionals [24]. The main purpose of this study is to examine the concept of enjoyment to health-based games, which fall under the umbrella of serious games; therefore, this study includes any serious games with relevancy to health.

Health-based games are often used to improve the player's health knowledge and outcomes through a process of engaging distraction. Moreover, the repetitive nature of many video games is key to promoting the acquisition of procedural or behavioral health knowledge [48]. Consequently, health-based games have gained considerable attention in recent years as an alternative means to educate and train people [15,16,47]. Moreover, if these games are sufficiently enjoyable then they might also be commercially successful as serious games [5].

3 Enjoyment in Game-Based Learning

Not all games are created equal, with some games being more enjoyable than others. Games that lack enjoyment fail to engage the player or to promote learning [52]. The notion of learning through play is well established [3]. Children learn through social experiences and by simulating emotional consequences in the context

of play [17]. Additionally, play provides children with a means with which to rehearse solutions to real-life problems, pressure, and desires [44].

Play and games seem to serve a myriad of functions, with players returning to a game even in the face of prior failure. These observations have led to some confusion among researchers to define the concept of enjoyment in gaming. Researchers from the fields of psychology and neuroscience use the term pleasure to describe enjoyment in general; communication researchers, on the other hand, define enjoyment in terms of one's positive reactions to media and its content [18,63].

Enjoyment in gaming seems to be a composite concept made up of physiological, cognitive, and affective components [18]. Feelings of enjoyment occur once a balance has been struck between skill and challenge in the process of the player trying to accomplish the game's goal. This trade-off between skill and challenge is known as the flow state [9]. As such, enjoyment in a game is not only an intrinsically motivating activity for children, it also provides a way for them to construct different perceptions about their reality [44].

Concerning the education setting, game-based learning can only be successful if there is a willingness on the part of the player/learner to engage with the game and to be persistent. To this end, researchers have begun to identify various factors that influence enjoyment and learning, including interactivity [35], competition [60], and spatial presence and perceived reality [50]. Taking advantage of these factors, game-based learning has become increasingly popular over recent years with the medium not only engaging individuals in quality learning experiences and but also their ability to consume player's attention [34,58].

4 Purpose of the Review

This systematic review aims to conceptualize the notion of fun and enjoyment in games through an investigation of the various definitions in the literature to games which are used to enhance fun and enjoyment in teaching and learning. This paper begins with an overview of our systematic review methodology wherein we explore: (a) how fun and enjoyment are defined in health-based games, (b) what theoretical perspectives might be appropriate for different learning ecosystems, and (c) what key themes can be elucidated from the empirical results. With this in mind, this research is informed taxonomy of research gaps [42]. This taxonomy articulates seven research gaps, including gaps in the evidence, knowledge, practice-knowledge, methodology, empirical gaps, theoretical gaps, and population gaps. For this review, we have explored the subject of enjoyment in health-based gaming from the perspectives of theoretical and empirical gaps. Each of the findings from this analysis will be discussed separately, after which we offer proposals for future research directions of fun and enjoyment in health-based games.

5 Methods

5.1 Purpose

A systematic review was conducted to identify the various definitions used throughout the literature to enjoyment in health-based games. Furthermore, this review aims to identify the theoretical gaps in the research literature. Consequently, the findings of this systematic review were categorized according to the taxonomy of research gaps [42].

5.2 Search strategy

The articles for systematic review were identified via a structured search strategy utilizing:

a) Electronic databases (i.e. IEEE Xplore, Emerald Insight, Science Direct, and EBSCO host)
b) Google Scholar
c) By following up on works cited in articles already identified

Most of the identified articles were retrieved from the online databases using the Boolean operator "OR" and the keywords enjoyment, fun, and pleasure; and Boolean operator "AND" followed by the keyword health games. Articles were searched until the point of saturation, whereby the same articles were being reported despite using different keyword combinations.

Figure 1 provides a diagrammatic representation of the literature search and review process. According to Figure 1, the initial search (without data parameters) resulted in the identification of 675 articles. To ensure that the search targeted studies related to the current use of games in health education, the time frame for the search was limited to the period from 2013 to 2018. This narrowed the results down significantly and, after the application of the inclusion criteria (Table 1), resulting in the final inclusion of 16 articles for review.
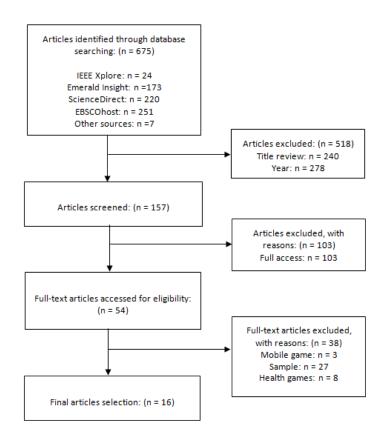
```
Articles identified through database
         searching: (n = 675)

    IEEE Xplore: n = 24
    Emerald Insight: n =173
    ScienceDirect: n = 220
    EBSCOhost: n = 251
    Other sources: n =7
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Articles excluded: (n = 518)
   Title review: n = 240
   Year: n = 278
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Articles screened: (n = 157)
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Articles excluded, with
   reasons: (n = 103)
   Full access: n = 103
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Full-text articles accessed for eligibility:
              (n = 54)
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Full-text articles excluded,
   with reasons: (n = 38)
   Mobile game: n = 3
   Sample: n = 27
   Health games: n = 8
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Final articles selection: (n = 16)
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Fig. 1. Diagrammatic representation of the literature search and review process

5.3 Inclusion and exclusion criteria

Table 1 shows the inclusion and exclusion criteria for articles in this review. To be included in this systematic review, each study had to satisfy all inclusion and exclusion criteria.

Table 1. Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Enjoyment in health games Fun in health games Serious games Games in the health context Games used by young children and students (include school and higher education institution) The article is available to the public	The games must not be for adult use The games must not be for other than learning purpose

5.4   Data abstraction

A table was constructed into which the following data were extracted from each article: author(s) last name, year, the title of the article, research objectives, underlying theory or theoretical framework, methodology, participants or sampling, and research findings.

6   Results

6.1   Definition of enjoyment

The concept of enjoyment in gaming has been a source of considerable scholarly attention over the past decade. According to the current systematic review, enjoyment has repeatedly been found to be an important element in mobile games. A broadly accepted definition of enjoyment in technology research alludes to enjoyment as the product of any computer-based activity that induces feelings of enjoyment as distinct from any other experience [12].

Table 2 shows that five studies (n=5) defined enjoyment as a pleasure or positive feedback, two studies (n=2) reported that different types of games were preferred by different genders, three studies (n=3) reported that enjoyment was a function of the degree of freedom players experiences in a game, two studies (n=2) highlighted the importance of prompt feedback on the experience of enjoyment, three studies (n=3) found that enjoyment was based on the degree of complexity that a game presented to players, two studies (n=2) found that enjoyment was related to ease-of-use, three studies (n=3) found that enjoyment was a function of engagement, and two studies (n=2) found that the experience of enjoyment was based on the computer user's attitudes.

Table 2. Literature review on related theory and definition of enjoyment.

Theory	Key Findings
Self-determination theory, uses and gratification theory, and flow theory [3]	Experience failure in playing games is an important element in game enjoyment. The complexity and multifaceted nature of the concept of engagement indicated that engagement can predict enjoyment. Past studies have widely defined enjoyment as a pleasure response. The level of enjoyment players get from a collaborative experience is dependent on how they perceive their skills to collaborate with others in the group. Attitude towards the use of technology. The satisfaction of competence, relatedness, and autonomy.
Flow theory and affect transfer theory [9]	An experience of enjoyable and optimal time in which an individual feels a sense of exhilaration, in control of their actions, as well as a deep sense of enjoyment.
Self-determination theory [22]	A positive state of emotion that reflects generalized feelings such as pleasure, fun, and liking.
Self-efficacy theory and achievement goal theory [23]	A positive psychological state characterized by a sense of pleasure, fun, and liking. Gender differences influence children's enjoyment.
Mood management theory and the theory of planned behavior [29]	Increases satisfaction of the gaming experience and is a strong predictor of game enjoyment. A higher level of presence experienced was positively correlated with game enjoyment and mood experience.

Cognitive load theory and communication theory [32]	Problem-solving, situated and social form of learning with prompt and differentiated feedback. Enjoyment is primarily attributed to a game's freedom.
Communication theory and self-determination theory [37]	The ground for emotion, attitude, action, and positive reaction towards the satisfaction of intrinsic needs and the content of the games.
Self-determination theory, uses and gratifications theory, cognitive dissonance theory, flow theory, and mood management theory [41]	Enjoyment is to the continued use and to be a predictor of intentions to use utilitarian information technology. Perceived ease of use. Interactivity appeared irrelevant.
Flow theory [61]	The relaxation that enables them to take things in more easily and motivation which enables learners to put effort without displeasure. Enjoyment is based on values, qualities, and rules of play or serious frames.

Previous studies have differed widely on the definition of enjoyment as a pleasure response [57]. Enjoyment defined as a positive psychological state characterized by a sense of pleasure, fun, and liking while playing mobile games [23]. Enjoyment in gaming acts as the basis for various emotions, attitudes, actions, and positive reactions to the satisfaction of intrinsic needs and the content of the game [2,37]. Enjoyment is conceptualized as an attitude and suggested that the experience of enjoyment in response to gaming has behavioral, cognitive, and affective consequences [43].

There is also an increasing evidence showing how gender differences might influence children's enjoyment in games [32]. Girls appear to enjoy interactive dance games more than boys [23]. These gender differences might be the result of socialization, with boys feeling as though they are not able to appreciate interactive dance games, such as Dance Revolution, as much as they might enjoy traditional male sports or other competitive/combative activities. Therefore, enjoyment might be defined based on the type of game and gender. Previous studies have also shown that children who work together in small groups experience heightened levels of enjoyment [4]. Precisely, how much enjoyment players derive from a collaborative experience, however, is dependent upon their self-perceived skill level in comparison to others in the group.

According to classical game theorists, such as [30] and [7], enjoyment is largely attributable to the degree of freedom that a game affords the player. Such theories suggest that enjoyment is defined by the player's sense of being in control of their actions [11]. In short, players who feel that they are more in control when playing a game will generally enjoy more as compared to when they are playing games with rigid rules that restrict their freedoms. As such, [64] we conclude that enjoyment is based on values, qualities, and rules of play or serious frames.

Lyons also observes that feedback while playing games might affect enjoyment [39]. Given that the express purpose of game-based learning is for the player to learn from differentiated feedback on their performance promotes a more enjoyable learning experience [31]. Paradoxically, interactivity might be irrelevant, at least in so far as mobile gaming is concerned, with respondents preferring responsiveness in their gaming experience as the prime enjoyment [41].

The experience of failure in gaming also seems to be an important element that contributes to enjoyment [33,43]. The sense of being challenged while playing a game

affects enjoyment, with the experience of failure motivating players to persist in trying to accomplish their goals [39]. The experience of enjoyment in the learning process causes the player to feel more relaxed, overcoming future challenges more easily and motivating them to apply greater effort [46]. Consequently, ease-of-use was by far the most significant construct contributing to player enjoyment, thus highlighting the importance of intuitive playability [41].

Moreover, the extant literature consistently correlates enjoyment with continued use [41], with [12] reporting that enjoyment is an important predictor of the intention to use utilitarian information technology. Other studies support a positive relationship between perceived enjoyment and attitudes to the use of technology. For example, [4] reported a significant correlation between user enjoyment and attitudes toward computer use. In sum, engagement with technology predicts usage enjoyment.

6.2 Theoretical gaps

The literature reviews summarized in Table 2 indicate that self-determination theory was used in five studies (n=5) looking to understand enjoyment in gaming. While most studies have defined enjoyment in terms of pleasure response, we argue that this conceptualization is inadequate. Tamborini has developed and validated a more expansive model of enjoyment, having investigated three basic needs according to self-determination theory: autonomy, competence, and relatedness [57]. Table 2 also shows that flow theory was used in four studies (n=4). According to this theory, players of educational games may experience flow, which defines as being completely involved in an activity for its own sake, with every subsequent thought, movement, and action inevitably flowing from the previous one, like playing jazz [10]. Uses and gratifications theory (UGT) has also been used in three studies (n=3). UGT essentially reverses the traditional psychological process of inquiry, taking an "outside-in" approach to identifying how motivation directs media use and how individuals respond to media "inside-out" [20]. For instance, Schramm [49] argue that more valuable insights might be gained from looking at how children use television as opposed to simply assuming that television does something to children.

7 Discussion

7.1 Self-determination theory

The potential to satisfy basic psychological needs related to competence, autonomy, and socialization are grounded in self-determination theory [20]. The enjoyment was derived from playing games that rely on three basic psychological needs: relatedness, autonomy, and competence [3]. These perspectives would suggest that playing games are internally motivated and directed. Westwood and Griffiths similarly found that games fell within several motivational categories, including those that motivate the players to socialize or to absorb themselves in the game's storyline [62]. This approach is consistent with the conclusions of other studies, that games –

such as massively multiplayer online games (MMOs) – cater to players' basic need to socialize [19], and as such, children can meet their basic psychosocial developmental needs through gaming [19].

Having fun when gaming fulfills numerous needs. The competency–needs approach would suggest that it is necessary to have fun to achieve victories and to be good at something. Gaming also satisfies socialization needs when games provide players opportunities to connect socially with other players. Ferguson [20] argues that consistent with self-determination theory, children's motives for playing games can be categorized in terms of autonomy, competence, and social relatedness.

Self-determination theory alludes to three types of behavioral regulation: intrinsic motivation, extrinsic motivation, and motivation [23]. Intrinsic motivation refers to participation in activities for their own sake, enjoyment, and satisfaction. In contrast, extrinsic motivation is characterized by the player's pursuit of some goal or consequence (i.e. reward or avoiding punishment). Motivation, on the other hand, refers to the absence of an intention to act (i.e. the absence of motivation).

7.2   Flow theory

Csikszentmihalyi defines flow in terms of being completely involved in an activity for its own sake [10]. In terms of learning games, flow theory refers to the ability of the player to learn while playing and still manage to enjoy the experience [64]. Likewise, a player can feel different emotions, such as excitement, challenge, pleasure, and interest [26]. Past studies have shown that the flow state experienced while playing games positively affects the player's attitudes, behavior, and learning outcomes [55]. Therefore, we would argue that flow theory must be taken into account in the design of educational games. To this end, Sweetser and Wyeth developed the GameFlow model, based on flow theory [54]. The GameFlow model outlines seven criteria for identifying issues and reviewing games, as well as for understanding the effect of these issues on player enjoyment. These criteria include clear goals, challenge, concentration, control, feedback, player skills, and immersion [56].

As previously noted, quantifiably enjoyable games will challenge the player; however, it is important to distinguish between positive and negative challenges in games. Negative challenges in games are associated with problems, such as navigation difficulties or slow download times [36]. Positive challenges, on the other hand, can be recognized by the player's sense of flow and enjoyment, put more simply, by the player's perception of pleasurable feelings when the gameplay matches the player's skill level [4]. Hsu and Lu recognize the challenge, interactivity, and variety as important components of flow [29].

Primary reward systems, such as in-game stars or badges, are often used in gaming to maintain the player's motivation. Aabom argues that completing in-game challenges and story or quest-related goals is considered an important achievement that goes beyond the graphical rewards inside the game [1]. In the context of learning, Shernoff argues that flow experiences help the player to achieve their goals by enjoying the challenges in fun ways [53]. Therefore, as a learning behavior,

enjoyment is the catalyst for other positive behaviors, such as persistence, learning, and motivation.

7.3 Uses and gratifications theory

Various studies have argued the value of applying UGT in games. Greenberg found that young children were particularly strong in fantasy motivations, while older children were more likely to be driven by competitive motives, with males generally being more motivated to play games than females [27]. Similarly, while [28] found that children were motivated by challenges in games, [38] found that children were instead more strongly subject to social motives. Chory advocate for the integration of the UGT approach with traditional psychological approaches to understanding media, with it being argued that a composite approach might yield valuable insights into the motivational and social context of children's use of media [8]. This approach stands in stark contrast to the traditional mechanistic media effects model, which focuses on the media itself. Consistent with this idea, Sherry proposed players have six motives to play games: diversion, fantasy, arousal, challenge, competition, and social interaction [27].

7.4 Consolidating theories in game development

Gamification has been used to increase the motivation of learners [6,61]. Gamifying learning, however, demands some recognition of which part of the game produces the most motivation. Gamification is usually concerned with the core aspects of the game, thus focusing primarily on issues of game mechanics, storyline, and the user experience [21]. Knowing this, we can design the core game based on various psychological theories aimed at increasing the player's motivation and level of enjoyment.

Self-determination theory, which aims to satisfy players' competence, autonomy and need for social relatedness, can be implemented through the careful selection of game design elements, such as game theme, non-fixed structures in the game flow, available missions or challenges, short-cycle of game time, cooperation or competition among the players, and the provision of feedback [61]. Flow theory would require that a game include challenging activities with clear goals and regular feedback [64]. As such, the player is required to exercise some skills in playing the game, with the outcome of the game being uncertain and based on the player's actions.

Malone promotes three game design specific attributes: challenge, fantasy, and curiosity [40]. As the player seeks to be challenged, the game must provide personally meaningful in-game goals, created through fantasy (e.g. storyline and characters) with which the player can empathize. Moreover, the game should build upon the player's existing body of knowledge to maintain their cognitive and sensory curiosity over time [40].

The elements suggested here can be incorporated into the design of health-based games, thus satisfying the player-learner's psychological needs. The various research

articles contributing to this systematic review articulate a picture of enjoyment as a player response to having their needs or motives satisfied. The theories outlined here ultimately support one another concerning understanding human motivation [57]; indeed the UGT approach appears to fit well with self-determination theory.

8   Limitation

This review is limited by the number and rigor of the research articles identified to enjoyment in health-based games. Nonetheless, this systematic review is timely, highlighting several future research directions for promoting a more effective and comprehensive understanding of enjoyment in health-based games. Besides, this review incorporated data obtained via a structured search strategy inclusive of both quantitative and qualitative studies. Given the small number of participants in qualitative studies, questions might reasonably be asked concerning the generalizability of the findings of this review. Nonetheless, we would argue that data obtained from qualitative studies still represents a valuable contribution to this review, while also acknowledging possible issues with the validity and reliability of these studies.

9   Implication

The findings presented here can serve as a guide for future research directions attempting to the issue of enjoyment element or other elements in health-based games. Future research should focus on the identified gaps by the taxonomy of research gaps in this study [42]. We also want to encourage researchers to conduct experimental research to provide more conclusive data concerning the enjoyment element in health-based games. The availability of such data would expand our understanding of the role of causality in gaming and provide for greater generalizability in the results. Besides, research efforts could also be undertaken to explore the best approaches for game-based learning in the teaching and learning process.

10   Conclusion

Playing games and having an enjoyable experience provides for a deeper learning that facilitates the process whereby the learner connects concepts, skills, and knowledge together in different situations and ultimately becomes more creative in their thinking and problem-solving. Despite the concept of enjoyment in gaming having been broadly defined, researchers have differed somewhat in their precise definition of the concept. The purpose of this study, therefore, was to expand the pool of knowledge concerning enjoyment in health-based gaming and to prompt discussion surrounding the definition of enjoyment in gaming. This systematic review of the research literature found various definitions of enjoyment in health-based games. Nevertheless, these studies would suggest that enjoyment is:

a) A sensation of pleasure or positive feedback, and varies
b) Based on the type of games preferred by different genders
c) Based on the degree of freedom that they game allows
d) Based on prompt feedback
e) Based on game's complexity
f) Based on ease of use
g) Based on the degree by which the game engages with the play
h) Based on the computer user's attitudes

In conducting this review, we drew upon the taxonomy of research gaps [42] to better understand the subject under scrutiny; as such, the three most relevant theories to explain enjoyment in gaming include self-determination theory, flow theory, and UGT.

11 Acknowledgements

12 References

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