Gamified Health Solutions: A Systematic Literature Review

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Abstract

Gamification is a modern method that seeks to influence wellness and health-related frameworks positively. It is not just because gamified solutions can get individuals more engaged but can make them more responsible for their health-related assessments. This paper qualitatively analyzes the concept of the gamified solution in healthcare through systematic literature review by using PRISMA methodology to figure out the health domains and the impact on solicitation of gamification in the healthcare sector. According to WHO, non-communicable diseases (NCDs) kill 41 million people each year, equivalent to 71% of global mortality, which can be controlled through modifiable behavior. Studies proved that intrinsic motivation had got an advantage over extrinsic motivation in the case of health behaviors. Gamification is considered as a solution for motivating people both intrinsically and extrinsically. The need for more research on gamified intervention in health care still remains as a gap. The article attempts to review more about gamification as health solutions, focusing more on research articles reported in Emerald Insight and Science Direct.

Keywords: Gamification, Health, Motivation

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1. Introduction

1.1 Gamification Background

Is there anyone who never played Hide and seek, tag, musical chair, pen - paper – scissors so on, to name a few in their childhood? Do you think playing Cricket, football, field hockey, etc. to name a few just remains only for childhood days? Playing games have always been a cross-generational activity that starts from kids to seniors. Statistically, more than a billion people play games in mobile globally. No doubt that the game makes the play more of a fun and entertainment, and the fact of the matter is that many are part of serious games knowingly or unknowingly, which can be considered as something beyond fun and entertainment. Similar to the concept of serious games, gamification makes use of game elements and game mechanics but as part of an entertainment game for purposes other than their normal expected use. Gamification has been more precisely defined as the use of game design elements in non-game contexts (Deterding et al., 2011, p.9). So we can claim that gamification has the attributes of games like fun, entertainment, a source of positive emotion, feeling, learning, and much more to add on. Furthermore, while the terms game and play are often used interchangeably in common language, the conceptual difference between the game ("ludus") and play ("paidia") as introduced by Caillois (1961), may be useful in understanding and differentiating the specific user experiences related to different applications (Lucero et al.,2014). Playing always denotes the power of improvisation, expressiveness, and delight, as often present in children's play, while gaming refers to formal play, in the context of rules and obstacles, outlining winners and losers as often present in board games and video games.

Unlike past solutions that aim to use games for serious purposes (e.g., serious games), gamification does not require a full-fledged game design. During the 1980s to 1990s, gamification commonly employs elements of game design to improve user engagement and organizational productivity. In recent years, practitioners have tried to exploit the motivational supremacy of game design in such diverse fields as work, fitness tracking, health and well-being, education, commerce, learning, crowdsourcing, information retrieval and organizational engagement. Gamification can also be defined by using or applying the characteristics of game elements as a set of problem-solving activities and processes. Gamification is an efficient design strategy to bring game mechanics into existing contexts.

Gamification is an efficient design strategy to bring game mechanics into existing contexts. Unlike past solutions that aim to use games for serious purposes (e.g., serious games), gamification does not require a full-fledged game design. Game design elements are considered as the basic building blocks for any gamification applications. Points, badges, leaderboards, avatars, and teammates are quite common among those typical game design elements. A lot more game design elements were identified in recent years. Various techniques used in gamification are designed to enhance the natural desires of individuals for socialization, learning, mastery, competition, achievement, status, self-expression, altruism or closure, or simply to respond to a game or play situation. The efficiency of gamification practices, made possible by quick and simple implementation techniques, is even more evident in the services provided by gamification platforms, which are now on the market. Initially, gamification strategies use rewards to engage players to perform the desired tasks or competitions. Reward Types means certain types of incentives, including points, performance badges or levels, the completion of the progress bar, or the provision of virtual currency to the user. However, the spread of pooled techniques, focused mainly on three main components, points, badges, and leaderboards, soon overcame the grammatical difficulty of the game design, focusing on simplicity and convenience.

1.2 Gamification and Health

Today's world's main health challenges had been shifted from traditional health issues, which means the pre-modern risks like malnourishment, poor water quality, and indoor air pollution to the challenges generated by the modern world itself. (Johnson, D., Deterding, S., Kuhn, K. A., Staneva, A., Stoyanov, S., & Hides, L., 2016). Nowadays, the world's leading mortality, non-communicable diseases as mentioned by WHO, and chronic disease risks – high blood pressure, tobacco use, high blood glucose, physical inactivity, obesity, high cholesterol – are immediately linked to a modern lifestyle characterized by sedentary living, chronic stress and high intake of energy-dense foods and recreational medicines (Stevens et al., 2009). According to WHO (June 2018), non-communicable diseases (NCDs) kill 41 million people each year, equivalent to 71% of all deaths globally. Research suggests that quality of life and health can be significantly improved by small individual behaviors (Seligman., 2011). A major factor driving behavior change is the motivation of the individual, which can be either through intrinsic motivation that means you enjoy the activity because it's fun and challenging or through extrinsic motivation that means doing something because you want to earn a reward or avoid punishment as explained in the theory of self-determination (Ryan & Deci., 2000). Research papers prove that, in our modern world of life, health and well-being are strongly dependent on the behavior of the individual, motivation is a major factor in changing health behavior, and intrinsically motivated behavior change is desirable, as it is both sustained and contributes directly to health and well-being (Johnson, D., Deterding, S., Kuhn, K. A., Staneva, A., Stoyanov, S., & Hides, L., 2016). Gamification is the incorporation of game mechanics into non-game contexts to encourage behavioral change (Tobon, S., Ruiz-Alba, J. L., & García-Madariaga, J., 2019), and there are many kinds of research which throws light on the same.

The healthcare domain has seen a rapid rise in self-monitoring and management of health by adopting gamification and serious games. Because of the ability of serious games to motivate, engage and entertain, numerous systematic reviews have evaluated their effectiveness in promoting particular changes in health behavior (Charlier, N., Zupancic, N., Fieuws, S., Denhaerynck, K., Zaman, B., & Moons, P., 2016) and in plummeting a wide range of disorder related symptoms (DeSmet, A., Shegog, R., Van Ryckeghem, D., Crombez, G., & De Bourdeaudhuij, I., 2015). At the same time, there are probably a limited number of papers that provide information on the impact of gamification on health and the domains in which it is applied.

2. Literature review and methodology

In order to meet the objectives, the PRISMA methodology was used to select which papers to include in the analysis. The universe was all of the papers reported in Emerald Insight and Science Direct, published from 2011 to 2020, and that included "gamification*health". This search yielded 1766 papers, out of which 28.65% of them were found in the Emerald Insight database and 71.35 % in Science Direct. This research excluded papers that were not researched articles. Therefore, the number of articles has reduced to 1123 from which 318 papers were from Emerald Insight, and 805 papers were from Science Direct. Table 1 shows the breakup of the gamification literature universe, sorted by document type, and Figure 1 shows the evolution of research articles in the area of gamified loyalty. One thousand one hundred twenty-three articles were screened again based on considering the content available in the abstract, which includes the words gamification and health. Thus the number has again reduced to 59 research articles out of which 13.56% was from Emerald Insight, and 86.44% was from Science Direct. The research included papers relevant for the review after going through full text manually from previously screened 59 articles and also referred relevant articles as required. Finally, 20 studies were included in the qualitative synthesis

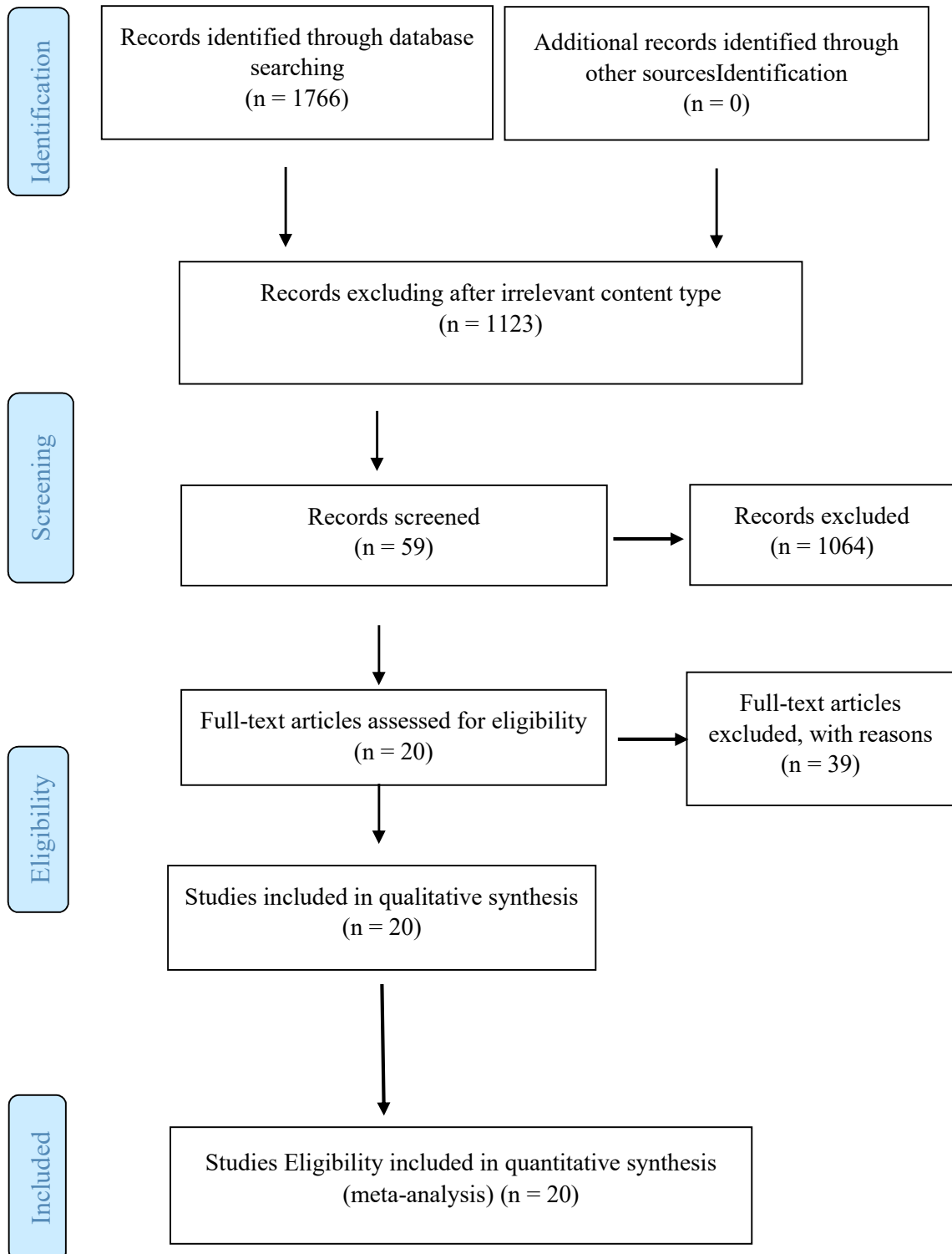## 3. Flow Diagram on Article Selection Using PRISMA Methodology

Identification

Records identified through database searching
(n = 1766)

Additional records identified through other sourcesIdentification
(n = 0)

Records excluding after irrelevant content type
(n = 1123)

Screening

Records screened
(n = 59)

Records excluded
(n = 1064)

Eligibility

Full-text articles assessed for eligibility
(n = 20)

Full-text articles excluded, with reasons
(n = 39)

Studies included in qualitative synthesis
(n = 20)

Included

Studies Eligibility included in quantitative synthesis
(meta-analysis) (n = 20)

Table 1 : Summary of breakup on gamification literature universe article search

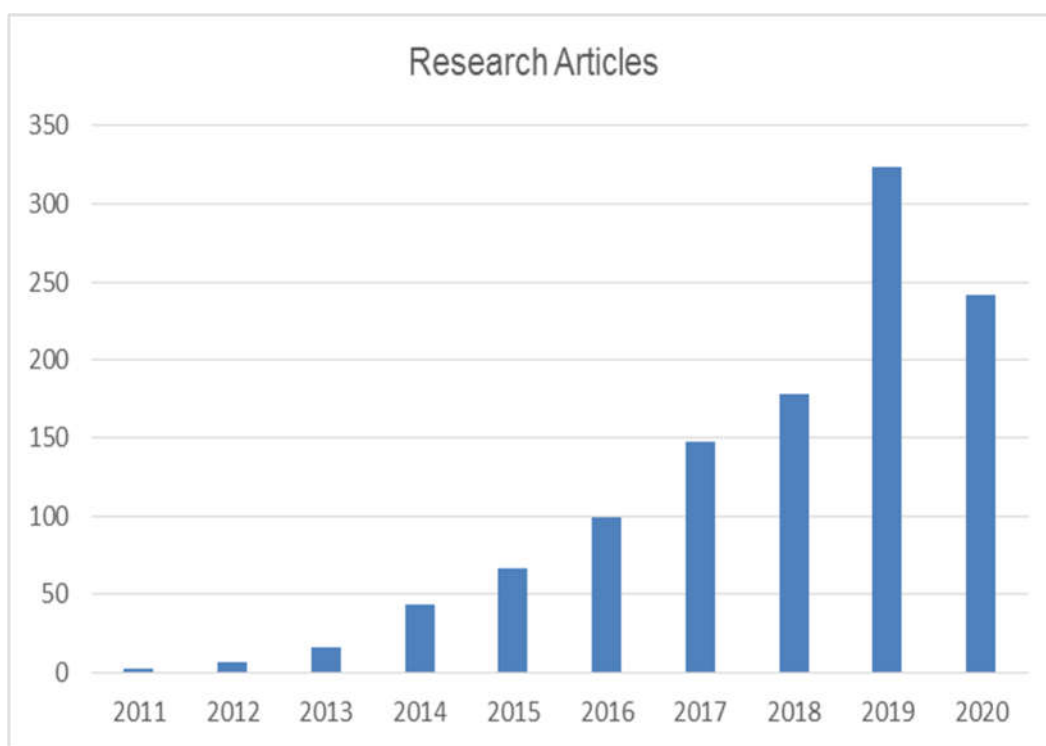|	Science Direct	Emerald Insight
Research Article	63.89 %	62.85 %
Book Part	8.89 %	25.10 %
Case Study	0.16 %	0.59 %
Others	27.06 %	11.46 %
Total	100.00 %	100.00 %

Source: authors' own

Figure 1: Evolution of number of research in the area of gamified loyalty

Source: authors' own

4. Research Questions

Research question: What all are the health domains in which gamification has been probed?

Rationale: To identify the health purviews most often investigated in the studies

Research question: What is the impact of gamification when applied to health?

Rationale: To understand the effectiveness of gamification as a health solution

5. Results

The most recurrently studied health topic for both gamified apps and gamification in e-Health is in chronic disease management and lifestyle diseases. Diabetics, Cancer, Alzheimer's disease, Stroke, and Obesity are some of those health conditions. For example, (Cafazzo et al. 2012) presented a gamified mobile health application designed for blood glucose self-monitoring in adolescents with type 1 diabetes. (Imbeault et al. 2011) used Artificial Intelligence and game mechanics to create a serious game specifically designed to provide cognitive training for Alzheimer's patients. While only two papers focused on serious game design to promote physical activity involving the movement of the body that uses energy, a total of 13 papers (inclusive of above mentioned two papers) investigated physical activity gamification. For example, (Keung et al. 2013) integrated gamification elements into a mobile fitness application designed to motivate young people to burn more calories by exercise outdoors. Three other studies focused on exploiting gamification techniques in applications relating to mental health, which considers emotional, psychological, and social well-being. Two papers presented serious games dealing with mental disorders, especially in children

All the research papers reported the significance of the positive impact on gamification in health, and most of the papers had got empirical shreds of evidence as well. Some of the papers also reported a neutral/mixed impact of gamification on a few variables within the study.

6. Limitation

The most obvious bias that could affect the construct validity of the conclusions of this study is the incompleteness of the search and the selection of the studies, which means the review can be done by taking more papers from different databases as well. The concern regarding external validity is related to the ability to generalize. For the context of this study alone, the validity of the conclusions drawn means the author is selecting papers based on different criteria. More well-designed studies are needed which compare gamified and non-gamified interventions, and it will be a great value addition to the existing literature.

7. Conclusion

This paper reports on a systematic review of literature that clarifies current research on health gamification. Twenty studies presenting gamified applications in health were selected from an initial set of 1766 papers retrieved from two main publication sources. The fact of the matter is that many of the research papers were not having enough empirical evidence, and therefore those papers were excluded. Obviously, there is a need for further empirical assessments to provide a rigorous validation of the effectiveness of gamification in health. The majority of the research papers reported a positive impact of gamification in health, but at the same time, the application of gamification in multiple domains of health still remains a research gap.
Gamification is useful and successful as it benefits from the same human psychology, which makes people enjoy winning at games and dislike or even fear losing. Gamification is becoming much more familiar with the development of technology and also has a wonderful scope in the health sector in the future.

8. Conflict of interest

The author certifies that the author has no connections with or involvement in any organization or entity with any kind of interest in the subject matter or materials discussed in this article.

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