

What's the Point?: A Review of Reward Systems Implemented in Gamification Interventions

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Abstract

Rewards are commonly used in interventions to change behavior, but they can inhibit development of intrinsic motivation, which is associated with long-term behavior maintenance. Gamification is a novel intervention strategy that may target intrinsic motivation through fun and enjoyment. Before the effects of gamified interventions on motivation can be determined, there must be an understanding of how gamified interventions operationalize rewards, such as point systems. The purpose of this review is to determine the prevalence of different reward types, specifically point systems, within gamified interventions. Electronic databases were searched for relevant articles. Data sources included Medline OVID, Medline PubMed, Web of Science, CINAHL, Cochrane Central, and PsycINFO. Out of the 21 articles retrieved, 18 studies described a reward system and were included in this review. Gamified interventions were designed to target a myriad of clinical outcomes across diverse populations. Rewards included points ($n=14$), achievements/badges/medals ($n=7$), tangible rewards ($n=7$), currency ($n=4$), other unspecified rewards ($n=3$), likes ($n=2$), animated feedback ($n=1$), and kudos ($n=1$). Rewards, and points in particular, appear to be a foundational component of gamified interventions. Despite their prevalence, authors seldom described the use of noncontingent rewards or how the rewards interacted with other game features. The reward systems relying on tangible rewards and currency may have been limited by inhibited intrinsic motivation. As gamification proliferates, future research should explicitly describe how rewards were operationalized in the intervention and evaluate the effects of gamified rewards on motivation across populations and research outcomes.

Introduction

REWARDS AND INCENTIVES HAVE been used for decades as motivational techniques.^{1,2} Rewards offer a *quid pro quo*, providing some kind of positive reinforcement contingent on performance or engaging in a desired behavior.^{1,2} There is evidence that rewards effectively change dietary³ and exercise⁴ behavior and improve patient compliance⁵ in the short term, but there is limited evidence of their long-term effectiveness.³⁻⁵ The lack of maintained behavior may be the result of diminished intrinsic motivation.⁶

Self-Determination Theory (SDT) defines intrinsic motivation as completing an activity because of inherent satisfaction and pleasure. Alternatively, extrinsically motivated behaviors are not specifically valued by an individual.⁷⁻⁹ Extrinsic motivation may result in short-term changes, but sustained behavior change has been found to be associated with intrinsic motivation.^{9,10} Historically, SDT has suggested that external

rewards can decrease intrinsic motivation.⁶ However, the effects of rewards on motivation can be complex and may depend on the type of reward.^{11,12} Additionally, the behavior being rewarded may be internalized into a self-regulated and valued behavior.^{7,8} Gamification may be a method to provide rewards that inspire individuals to internalize behaviors.¹³

Gamification is defined as “the use of game design elements in nongame contexts.”¹⁴ It is a concept that has been readily adopted and reviewed.^{13,15-19} The theory of gamification follows the same principles of SDT: relatedness, competence, and autonomy.^{14,19} These principles are necessary to satisfy psychological needs and foster motivation.⁷⁻⁹ Unlike traditional incentives, rewards under gamification are theorized to have the ability to target intrinsic motivation because they follow the principles of SDT and they provide fun and enjoyment.¹³ However, because of their reliance on contingent external rewards, some forms of gamification are scrutinized for their controlling

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nature and lack of user autonomy.^{20,21} Ideally, rewards should foster perceptions of autonomy and competence in particular without being perceived as overly controlling.²² Gamified rewards often come in the form of points, which are defined as the unit of measurement in the score of a game.²³ Points offer feedback while potentially enhancing perceptions of competence and relatedness through point collections and point-based ranks.^{11,24}

There is evidence that gamified rewards are motivating in the realm of game-based learning,²⁵ but there is little evaluation of their effect on intrinsic motivation and behavior change across all gamified interventions. However, before this can be done research is needed to delineate how points and other rewards are operationalized within these interventions. This review intends to act as an initial step in understanding rewards in the context of gamification. Our aim is (1) to determine the prevalence of different reward types within self-described gamified interventions with an emphasis on point systems and (2) to report the efficacy of gamified interventions.

Materials and Methods

Z.H.L. and M.C.S. searched multiple research databases, independently, to capture gamified interventions in September 2015. The databases included Medline OVID, Medline PubMed, Web of Science, CINAHL, Cochrane Central, and PsycINFO. Articles were collected in the database by searching for “gamification” and “rewards” and “intervention.” “Gamification” was truncated to gamif*. Medical subject heading terms and other related words for “rewards” and “intervention” were identified with the help of a reference librarian. The search terms were truncated in efforts to include all variations of the word. Terms related to “rewards” were reward*, incentive*, reinforce*, conting*, motivate*, encourag*, entic*, or point*. Terms related to “intervention” were interven* or randomiz*. Reference lists were not screened for eligibility because gamification was not operationally defined for this review. Rather, the authors wanted to capture and review studies that were self-classified as “gamified.” Interventions that did not describe gamification were ultimately not captured in the search.

All captured articles were screened by full text for eligibility. The titles and abstracts of retrieved articles were not screened because the description of the reward system is often not present in these sections. Articles were excluded if they did not describe a reward system. This eliminated interventions that use other gamified strategies. We did not exclude articles by population, publication date, study design, or research outcome because the purpose of this review is to explore the utilization of rewards in all gamified interventions. All articles were screened independently for eligibility by Z.H.L. and M.C.S.

The two reviewers (Z.H.L. and M.C.S.) independently coded the types of rewards in each study based on the author’s description of the reward. Similar reward types were grouped together based on similar characteristics (e.g., intangible rewards that were provided immediately and frequently as a result of a change in behavior, rewards delivered as a result of the accumulation of points). Disagreement between the reviewers was resolved through joint review of the text.

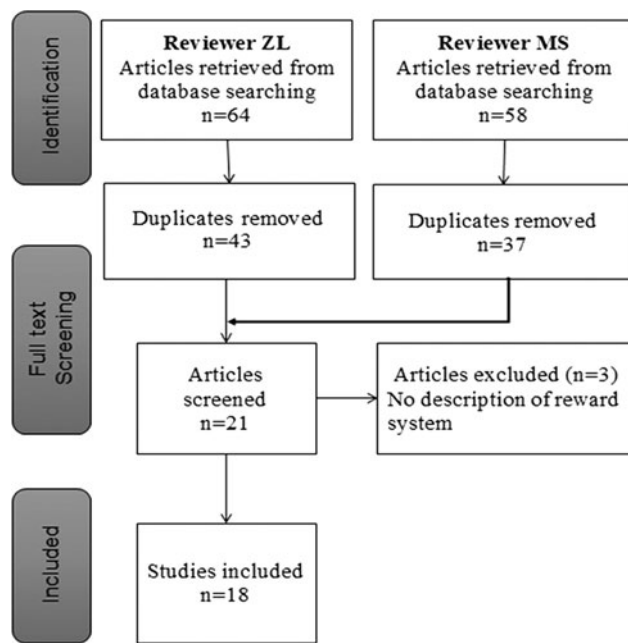


FIG. 1. Screening process.

Results

In total, 64 articles were retrieved by Z.H.L., and 58 articles were retrieved by M.C.S. After duplicates were removed, there were 21 original articles left for full text screen. Of these 21, 3 articles were excluded because they did not describe the reward system. Figure 1 displays the screening process. There was 100 percent agreement for the number of articles to screen and the number of articles included in the review.

Study characteristics

The 18 studies^{26–43} included in this review encompassed a range of study designs for gamified interventions. Studies were randomized controlled trials,^{28,33} quasi-experimental pilot trials,^{30,35,36,38,41} reviews,^{29,32,37,43} and content analyses.^{40,42} Other studies described the protocol of a randomized controlled trial^{26,27} and the development of technology to be used within interventions.^{31,34,39} Participants ranged from children,^{32–36} adolescents,^{29,30,32} adults,^{26,27,38,41} children and adults,^{37,43} to older adults.²⁸ Studies were conducted in the workplace,^{26,38,39,41} in schools,^{35,36} and in the community.^{27,28,30,33} among residents and medical doctors,^{26,41} military recruits,²⁷ rheumatoid arthritis patients,²⁸ diabetic patients,^{30,37,43} asthma patients,³⁴ children with attention deficit/hyperactivity disorder,³³ students,^{35,36} and employees.^{38,39} Table 1 outlines the study characteristics.

Gamified interventions

Gamified interventions were designed to target a myriad of clinical outcomes. These included increasing medical knowledge,^{26,41} increasing physical activity,^{27,28,40,42} decreasing healthcare utilization,²⁸ decreasing substance use,²⁹ improving diabetes symptoms,^{30,37,43} decreasing weight,³¹ promoting sexual health,³² improving attention deficit/hyperactivity disorder symptoms,³³ improving asthma symptoms,³⁴ increasing fruit and vegetable consumption,^{35,36} and improving healthcare compliance.^{38,39} Most studies relied on technology as a

TABLE 1. STUDY CHARACTERISTICS

<i>Reference</i>	<i>Study design</i>	<i>Population</i>	<i>Outcome</i>	<i>Technology used</i>	<i>Reward types</i>
Agoritsas et al. ²⁶	RCT, protocol	Adults, medical residents/faculty	Medical knowledge	Computer-based	Badges, scores
Ahola et al. ²⁷	RCT, protocol	Adults, military recruits	Physical activity	Web site	Unspecified reward
Allam et al. ²⁸	RCT	Older adults, rheumatoid arthritis patients	Physical activity, healthcare utilization	Web site	Points, badges, medals, tangible reward
Boendermaker et al. ²⁹	Review	Adolescents	Substance use	Computer-based	Animated feedback, points
Cafazzo et al. ³⁰	Quasi-experimental	Children/adolescents, type 1 diabetes patients	Diabetes management	Mobile app	Points, tangible reward
Curtis et al. ³¹	App development	Children	Weight (portion sizes)	Mobile app	(Apple app store credit)
DeSmet et al. ³²	Review	Children/adolescents	Sexual health	Web site/computer-based	Achievements/badges, points
Dovis et al. ³³	RCT	Children	ADHD symptoms	Computer-based	Currency, score, unspecified reward
Elias et al. ³⁴	Development	Children/adolescents	Asthma symptoms	Mobile app	Tangible rewards (stickers, ribbons, medals)
Jones et al. ³⁵	Quasi-experimental	Children/adolescents, students	Fruit and vegetable consumption	None	Points
Jones et al. ³⁶	Quasi-experimental	Children/adolescents, students	Fruit and vegetable consumption	None	Tangible rewards (stickers, pencils, flying discs), currency
Kamel Boulos et al. ³⁷	Development	Children and adults	Diabetes management	Internet/mobile devices	Currency, medal
Lin and Zhu ³⁸	Quasi-experimental	Adults, employees	Healthcare compliance	Web site	Kudos, points, badges, currency
Lin et al. ³⁹	Development	Adults	Health compliance	Web site	Achievements, likes, points
Lister et al. ⁴⁰	Content analysis		Behavioral constructs	Mobile apps	Points, likes, unspecified reward
Nevin et al. ⁴¹	Quasi-experimental	Adults, medical residents/faculty	Medical knowledge	Web-based	Badges, tangible rewards, points
Payne et al. ⁴²	Content analysis	Children and adults	Health behavior theory	Mobile apps	Badges, score
Theng et al. ⁴³	Review		Diabetes management	Videogames/virtual environments	Points

ADHD, attention deficit/hyperactivity disorder; app, application; RCT, randomized controlled trial.

modality for a gamified intervention,^{26–34,37–43} with the exception of two school-based studies.^{35,36} Technologies used across interventions included a computer,^{26,29,32,33} the Internet/Web sites,^{27,28,37–39,41} mobile applications (apps),^{30,31,34,40,42} and videogames.⁴³

Reward types

All rewards were given in response to a change in a targeted behavior. The frequency of reward delivery varied across studies. They were delivered immediately,^{28–30,33–36,42} after a specified amount of time,^{28,30,33,39} and at random intervals.²⁹ The most prevalent reward type was points, which were incorporated into over half of the interventions,^{26,28–32,34,37–43} followed by achievements/badges/medals,^{26,28,31,37,38,40,41} tangible rewards,^{28,30,33,35,36,40,43} currency,^{32,35–37} other unspecified rewards,^{27,32,39} likes,^{38,39} animated feedback,²⁹ and kudos.³⁷ All reward types were evenly distributed across children and adult populations, with the exception of tangible rewards: six of the seven studies that described tangible rewards were among children and adolescents.^{30,33,35,36,40,43} There was no discussion of noncontingent rewards or how the rewards interacted with other game features (e.g., narrative).

The reviewers agreed on the reward types discussed in 13 of the 18 articles; after review of the text, the reviewers agreed on the remaining 5 articles.^{28,32,35,38,42} Types of rewards are described below, followed by specific examples of the reward type(s) used in each study:

1. Points/score. Points and scores were the most common type of reward. Points and scores were the result of a change in behavior.^{26,28–32,34,37–43} Reviews of interventions and technologies found that points were used to encourage participants to complete cognitive tests,³⁰ and videogames designed for diabetes management often provide points for taking blood tests.⁴³ Furthermore, approximately 55–73 percent of apps, commercially available through the Apple (Cupertino, CA) app store, delivered points.^{40,42} One study defined points as nonspecific and providing feedback,³¹ whereas other studies didn't clearly define points.

Most points were explicitly task- or performance-contingent. Examples of task-contingent points included completing quizzes and missions,^{38,39} conducting blood glucose readings,³⁰ or completing an Internet-based game.³⁷ Performance-contingent points were awarded for completing a correct spirometry maneuver³⁴ or answering questions correctly.³² Other points were awarded for interacting with the intervention Web site.^{28,41} One study intended to provide a score based on the total number of badges collected.²⁶
2. Achievements/badges/medals. Achievements, badges, and medals were delivered virtually through the technology platform.^{26,28,31,37,38,40,41} Achievements and badges were awarded directly for a change in behavior,^{26,38} after the accumulation of points for behavior change,^{28,37,41} or after reaching a specified level.^{37,41}
3. Tangible rewards. Tangible rewards were awarded outside of the intervention modality. These included Apple app store and iTunes® (Apple) credit,^{30,43} stickers, ribbons, or medals to display on a tangible game board,^{33,36} small or large prizes (e.g., stickers, mechanical pencil, flying disk),^{33,35} and other unspecified prizes.^{28,40}

4. Currency. Intangible currency was awarded as a result of a change in the desired behavior.^{32,35–37} The currency could be used for progression in the game^{35,36} or on in-game power-ups.³⁷
5. Other unspecified rewards. The type of reward was not described, but they were awarded for a change in behavior.^{27,32,39}
6. Likes. Likes were provided by others, contingent that an individual completed his or her assigned task.^{38,39}
7. Animated feedback. Animated feedback was provided during a test to describe how well the tester was doing. The feedback could be in the form of sounds or animations.²⁹
8. Kudos. Kudos were virtual gifts that could be shared on social media outlets via HealthSeeker.³⁷

Intervention efficacy

No studies evaluated the direct effects of the reward type on changes in the desired outcomes. Without direct evaluation of rewards' impact on motivation or behavior, we were unable to synthesize how rewards directly affect the intervention outcomes. However, rewards are a central component of gamified interventions. Therefore, rewards may be a contributing factor to interventions' efficaciousness. There is some evidence of the efficacy of gamified interventions from 2 of the 18 studies reviewed.^{28,33} Using a randomized controlled trial design, Allam et al.²⁸ found a significant increase in physical activity and decreased utilization of healthcare services among participants who received all intervention components (gaming and social support) compared with those who did not have access to the intervention Web site. The authors also found that the gaming group, with no social support, had an increase in empowerment compared with the control group.²⁸ Dovis et al.³³ also found a gamified intervention efficacious. Full activation in "BrianGame Brian" resulted in improved response inhibition among children with attention deficit/hyperactivity disorder, but the effect of external rewards in combination with the game could not be determined because both intervention and control participants received the external rewards.³³

Preliminary results from four quasi-experimental studies also show promise of gamified interventions.^{30,35,36,41} A study that evaluated the use of mobile app found a 50 percent increase in blood glucose measurements among children with type 1 diabetes.³⁰ A gamified intervention implemented through the school also found a significant increase in consumption of target fruits and vegetables.^{35,36} The use of a Web-based tool showed a significant increase in knowledge retention over time among medical residents, as well as higher likelihood of completing the "weekly"/"daily" assignments, when they were given badges during the second phase of the study.⁴¹ More research is needed to evaluate if these reported efficacy results are the product of the rewards implemented in the intervention.

Discussion

This review summarized how rewards, in particular points, are operationalized and the efficacy of gamified interventions. This is an initial step prior to evaluating rewards' impact on gamified interventions and motivation.

Through our review, we found that gamified interventions have been used to target a wide range of clinical outcomes. Of the 21 articles retrieved, 18 were included because they described a reward structure. This suggests that rewards are a common feature among gamified interventions. The types and the number of rewards used within these interventions vary, but it is evident that points are prominent.

The rewards found in these studies conform loosely to reward taxonomies previously published.¹¹ Points, achievements/badges/medals, and animated rewards appeared to mostly serve as rewards of glory.⁴⁴ Kudos and likes provided verbal intangible and social rewards.²² In some contexts, currency provided rewards of facility by serving as power-ups,³⁷ whereas in others, currency served as a means for game progression.^{35,36} The rewards grouped as tangible in this review did not appear to adhere to SDT-based principles of gamification. These differences in reward types and contexts may underlie differences in intervention effects and controversies over the efficacy of external rewards. As suggested by Rigby,²² it is possible that some rewards can maintain or even increase intrinsic motivation, whereas others may be perceived as too controlling and decrease intrinsic motivation. We hypothesize that reward type influences the effect of gamified interventions on intrinsic and extrinsic motivation.

To increase the likelihood that intrinsic motivation is maintained or enhanced, we recommend that specific types of rewards should be explored in future gamified interventions. Verbal rewards and task-noncontingent rewards may promote autonomy,²² whereas rewards of glory (reputational rewards, such as achievements or medals) may enhance perceptions of competence and relatedness. Verbal rewards are intangible and provided by individuals within the game or intervention,²² task-noncontingent rewards are unexpected and provided at random,²² and rewards of glory provide bragging rights and feedback.⁴⁴ As described above, these include points, achievements, badges, medals, animated feedback, kudos, and likes. These rewards can be made task-noncontingent if their delivery is unpredictable,²² which may contribute to reducing perceptions of being controlled. Therefore we recommend prioritization of these types of rewards in gamified interventions. We also recommend modification of tangible or task-contingent rewards to enhance SDT principles. Specifically, tangible rewards may be detrimental to intrinsic motivation among children⁶ but appeared primarily among children and adolescent populations.^{30,33,35,36,40,43}

With the proliferation of gamified randomized controlled trials, it would be possible to determine the effect of gamified rewards on clinical outcomes in the future. To reach this aim, there are several areas for future research. Researchers should (1) assess intrinsic and extrinsic motivations, (2) distinguish between intrinsic motivators to play the game or change behaviors, (3) analyze the effect of the reward system as well as the gamified intervention on motivation, (4) evaluate their effects across population ages, and (5) evaluate their effects across several research outcomes.⁴⁵ As researchers and interventionists are developing and reporting gamified interventions, they need to also consider describing, in detail, within the text or in a supplemental documents the reward system being implemented.

Strengths and limitations

This review has its limitations. The search was narrowed to gamified interventions. Gamification has expanded to other areas of research, such as business¹³ and education,²⁵ and their studies may not have been captured by the term “intervention.” Furthermore, interventions that used game features but did not categorize themselves as gamified were not captured by the term “gamfi*.” Despite this limitation, 18 articles were identified to provide evidence for initial evaluation of how rewards are being operationalized in gamified interventions. The full operationalization of rewards could not be determined because authors seldom described noncontingent rewards or how the rewards interacted with other game features. These characteristics may play an important role in the overall success of rewards.¹¹ This review is also limited in that it could not evaluate the efficacy of gamified rewards because of the novelty of gamification interventions and lack of direct evaluation of the relation of rewards on gamified interventions’ outcomes of interest and motivation among participants.

The strength of this review is that it describes what and how rewards are used with gamification. This is a primary step in understanding how external rewards through gamification may have affected motivation and promote long-term behavior change.

Conclusions

Gamification is a novel intervention strategy that has gained popularity in recent years and has the potential to target intrinsic motivation. Gamified interventions target a myriad of clinical outcomes and commonly use a reward system. Points are the most prevalent type of reward in these interventions. Points, along with achievements, badges, medals, animated feedback, kudos, and likes, should be the preferred types of rewards within gamified interventions, whereas reward systems such as tangible rewards and currency should be modified to enhance perceptions of autonomy, competence, and relatedness. Future research needs to explicitly describe how rewards were operationalized in the intervention and evaluate the effects of gamified rewards on motivation, across populations and research outcomes.

Note Added in Proof

In the original manuscript authored by Lewis et al., the authors misinterpreted the works of Jones et al.^{35,36} The manuscript has been corrected to reflect that the currency used in both studies were for progression in the game. This correction was made in the section *Reward types* (on page 96) and in the Discussion (on page 97).

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