

Gamification and the Impact of Gamified Health Apps: Opportunities, Evidence and Public Health Implications

Dr. Amit Sachdeva^{1*}, Mr Nasim Ahmed², Mrs. Tamanna Rahman³, Dr. Anju Sachdeva⁴

¹Assistant Professor, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh

²Independent Researcher, Guwahati Assam, India Email: nasim@iarcon.org

³MSc in Herbal Science and Technology, Anandaram Dhekial Phookan College under Guwahati University, Assam

⁴Physiotherapist, Shimla, Himachal Pradesh

Received: Jul. 03, 2025; Revised: Aug. 09, 2025; Accepted: Aug. 26, 2025; Published: Sep. 30, 2025

Under a Creative Commons license Doi: 10.47310/medlet.2025.v02i02.014

Abstract: Gamification—the use of game-design elements in non-game settings—has become a prominent strategy for improving engagement with mobile health applications. Points, challenges, progress indicators, badges, rewards, narratives and social comparisons are increasingly embedded in apps addressing physical activity, nutrition, medication adherence, chronic disease self-management and mental wellbeing. This narrative review critically examines the effectiveness and public health implications of gamified health apps, with emphasis on evidence published during the past five years. Current findings suggest that gamification can produce small-to-moderate improvements in physical activity, app engagement and selected self-management behaviours, particularly when interventions provide personalized goals, meaningful feedback and progressive challenges. However, evidence for sustained clinical benefit remains inconsistent. Many studies are short, heterogeneous and dependent on self-selected, digitally connected populations. Engagement frequently declines after initial novelty subsides, while competitive features may motivate some users but discourage others. Additional concerns include privacy, commercialization, inequitable access, behavioural manipulation, inaccurate health claims and weak regulatory oversight. In India, gamification could complement population-level initiatives for physical activity and noncommunicable disease prevention, but culturally adapted content, multilingual interfaces, low-bandwidth functionality and integration with established health services are essential. Gamification should therefore be regarded as a behavioural design component rather than a stand-alone therapeutic intervention. Future research should identify which game elements work, for whom, under what conditions and for how long, using pragmatic trials, objective outcomes, equity analyses and transparent safety standards.

Keywords: gamification; mobile health; digital health; health behaviour; physical activity; public health.

INTRODUCTION

Smartphones have transformed health information, behavioural support and disease self-management into activities that can occur continuously rather than only during clinical encounters. Yet downloading a health app does not ensure meaningful or sustained use. Attrition is one of the central weaknesses of digital health interventions: users may initially engage with enthusiasm but discontinue once novelty diminishes, goals become difficult or perceived benefits remain unclear. Gamification has emerged as a response to this engagement problem.

Gamification refers to making a non-game activity more game-like through selected design elements, rather than creating a complete entertainment or “serious” game.[1] In health apps, these elements include points, badges, achievement levels, streaks, quests, progress bars, avatars, challenges, virtual rewards, leaderboards and social teams. They are intended to convert distant health benefits into immediate, visible and emotionally meaningful experiences. For example,

walking today may yield no perceptible reduction in cardiovascular risk, but an app can immediately display progress, award points or unlock a new level.

The distinction between engagement and effectiveness is nevertheless critical. An app may be enjoyable and frequently opened without producing a clinically important change. Conversely, a simple, minimally gamified application may improve health if it supports an effective intervention such as medication adherence, structured rehabilitation or evidence-based behaviour-change counselling. The relevant public health question is therefore not whether gamification attracts attention, but whether it produces sustained, equitable and safe improvements in health.

How Gamification May Influence Health Behaviour

Gamification draws upon several behavioural and motivational mechanisms. Goal-setting converts broad intentions, such as “exercise more,” into measurable tasks. Immediate feedback reduces the delay between behaviour and reinforcement. Progress indicators make improvement visible, while badges and virtual rewards recognize achievement. Increasing difficulty can maintain challenge as competence develops. Social elements may create accountability, companionship or competition.

Self-determination theory offers a useful framework. Gamification may strengthen autonomy when users select personally relevant goals, competence when they observe progress, and relatedness when they participate with supportive peers. However, poorly designed systems can undermine the same needs. Rigid targets may reduce autonomy; repeated failure can diminish perceived competence; and public leaderboards may embarrass or alienate users who consistently rank near the bottom.

Extrinsic rewards also present a tension. Points, prizes or financial incentives can initiate behaviour, particularly when the natural benefit is delayed. Nevertheless, behaviour may regress when rewards stop if users have not developed intrinsic motivation, routines or supportive environments. Thus, successful gamification must move beyond superficial “pointsification” and gradually connect external rewards with self-efficacy, personal meaning and habit formation.

Evidence of Impact

Physical activity and weight-related behaviours

Physical activity is the most extensively evaluated application of health gamification because steps can be measured objectively through smartphones or wearable devices. Meta-analyses generally indicate that gamified interventions increase daily steps or moderate-to-vigorous physical activity, although effects are usually modest and heterogeneous.[2,3]

Mazéas and colleagues found that gamified interventions produced a significant improvement in physical activity across randomized trials, but the magnitude varied according to population, intervention duration and design.[2] A separate systematic review concluded that mHealth gamification could improve participation in physical activity, while emphasizing that results were mixed and often modest.[3] Commonly used components included goal-setting, feedback, rewards, points and progress visualization.

A 2024 meta-analysis comparing digital applications with and without gamification reported improvements in physical activity and weight-related outcomes, supporting the addition of carefully designed game elements to behavioural interventions.[4] However, changes in blood pressure, glucose regulation and other cardiometabolic outcomes were less consistent, partly because these outcomes require longer follow-up and are influenced by numerous factors beyond app engagement.

Real-world evidence also shows that the effect of competition is not uniform. An analysis of wearable-device leaderboards found an average increase of approximately 370 daily steps, but responses differed by baseline activity. Previously sedentary users increased their activity substantially, whereas some highly active users reduced their steps after joining smaller leaderboards.[5] This finding challenges the assumption that one competitive format will motivate all users equally.

Chronic disease self-management and medication adherence

Gamified apps are increasingly used in diabetes, hypertension, cardiovascular disease, obesity and rehabilitation. Typical features include medication streaks, symptom-tracking achievements, educational quizzes, self-monitoring goals and rewards for treatment-related tasks.

A scoping review of gamification and incentives for medication adherence found generally favourable or maintained adherence outcomes, but identified major heterogeneity in populations, adherence measures, theoretical frameworks and app-development methods.[6] Many studies combined gamification with reminders, education or financial incentives, making it difficult to isolate the independent contribution of individual game elements.

In diabetes management, gamified applications may encourage glucose monitoring, physical activity, healthier food selection and medication-taking. Some studies have reported small improvements in glycated haemoglobin, but evidence remains insufficient to conclude that gamification itself produces durable metabolic control. Clinical outcomes depend not only on engagement but also on treatment access, medication effectiveness, dietary environments, disease severity and continuity of professional care.

Gamification therefore appears most defensible as an adjunct to validated self-management programmes. It should reinforce clinically appropriate actions rather than replace medical assessment or create a false impression that complex disease can be managed solely through points and streaks.

Mental health and wellbeing

Mental health apps use gamification to support mood tracking, mindfulness, cognitive exercises, coping strategies and behavioural activation. Narrative progression and achievement systems may make repetitive therapeutic exercises more acceptable. However, evidence that gamification independently improves depression, anxiety or treatment adherence is less robust than evidence for physical activity.

The appropriateness of competition and rewards also requires caution. Users experiencing depression, anxiety, obsessive tendencies or low self-esteem may respond negatively to missed streaks, performance rankings or loss-framed messages. Mental health gamification should prioritize compassionate feedback, user control and recovery from lapses rather than punishment or continuous performance pressure.

Health education and preventive behaviours

Interactive quizzes, missions and rewards can improve attention and short-term knowledge in areas such as nutrition, sexual health, vaccination, hygiene and disease prevention. Gamification is particularly attractive for children and adolescents, but knowledge gains do not automatically translate into sustained behaviour. Educational interventions should therefore be evaluated using behavioural and health outcomes, not only quiz scores, app ratings or time spent on the platform.

Public Health Significance

Gamified apps offer scalability, automated personalization and frequent interaction at relatively low marginal cost. They may extend health promotion beyond clinics and create continuous support for behaviours that require repetition. Population challenges can also generate social visibility for walking, healthy eating or preventive actions.

The public health value of gamification is nevertheless conditional. Digital interventions often attract younger, wealthier and more health-conscious users. People with older devices, limited connectivity, low digital literacy, disabilities or restrictive data plans may be excluded. An intervention can therefore improve average outcomes while widening disparities.

Table 1. Public health applications, evidence and design considerations for gamified health apps

Application area	Common gamification components	Current evidence	Principal limitations	Recommended design approach
Physical activity	Step goals, challenges, progress bars, badges, leaderboards, team competitions	Most consistent evidence; generally small-to-moderate increases in steps and activity	Declining engagement, heterogeneous response, limited long-term clinical outcomes	Adaptive goals, objective measurement, cooperative options and maintenance phases
Weight management and nutrition	Food logging points, healthy-meal challenges, streaks, virtual rewards	May improve self-monitoring and selected dietary behaviours; weight effects are variable	Reporting bias, burden of food entry, risk of unhealthy restriction	Emphasize dietary quality, flexible goals and avoidance of weight stigma
Diabetes and other NCD self-management	Monitoring streaks, medication rewards, educational quizzes, goal achievement	Promising engagement and modest improvements in selected self-care outcomes	Gamification usually combined with multiple components; limited long-term trials	Integrate with clinical care, validated advice and clinician escalation pathways
Medication adherence	Reminders, adherence streaks, points, social support and incentives	Generally favourable but inconsistent findings	Self-reported adherence, short follow-up and diverse outcome definitions	Use objective adherence measures and non-punitive lapse recovery
Mental health	Mood-tracking progress, therapeutic journeys, mindfulness challenges	Potential improvement in engagement; clinical effectiveness remains uncertain	Safety concerns, crisis management and possible guilt after broken streaks	Compassionate design, user control and clear referral or crisis pathways
Health education	Quizzes, levels, narratives, badges and interactive missions	Often improves short-term knowledge and participation	Knowledge may not lead to behaviour change	Link learning with real-world tasks and measure behavioural outcomes
Population campaigns	Community challenges, team points and public recognition	Potential for wide reach and social mobilization	Digital exclusion, privacy concerns and unequal participation	Multilingual, low-data, community-supported and non-digital alternatives

Gamification should be incorporated within comprehensive programmes that address environmental and structural barriers. Awarding points for walking will have limited effect where neighbourhoods lack safe paths, air quality is poor, working hours are excessive or women face restrictions on outdoor mobility. Digital motivation cannot substitute for safe environments, affordable medicines, accessible services or supportive public policy.

Global and Indian Perspectives

Globally, gamification is increasingly linked with wearable devices, employer wellness programmes, insurance platforms, digital therapeutics and population health campaigns. WHO has acknowledged that well-designed gamification can support physical activity and noncommunicable disease prevention, while cautioning that positive effects may fade and that stronger research is required.[7]

India has favourable conditions for carefully designed gamified health promotion, including extensive smartphone use, a young population and expanding digital health infrastructure. Gamification could

support initiatives related to physical activity, obesity prevention, diabetes self-management, tobacco cessation, maternal health, adolescent health and treatment adherence. WHO's South-East Asia Regional Office has specifically identified India's Fit India Movement and regional walking challenges as examples of mobile and gamified approaches promoting healthier lifestyles.[8]

However, transferring commercially developed Western apps without adaptation is unlikely to produce equitable impact. Indian applications should support regional languages, low-cost devices, intermittent connectivity, culturally relevant foods and locally feasible activities. Audio-assisted and icon-based interfaces may improve accessibility among users with limited literacy. Gamification should also acknowledge collective and family-oriented motivations rather than relying exclusively on individual competition.

Integration with existing public health systems is more promising than stand-alone commercial deployment. Accredited social health activists, health and wellness centres, schools and local bodies could support community challenges and assist users who need non-digital guidance. At the same time, linking app-generated data with national digital health systems requires explicit consent, purpose limitation, secure storage and protection against commercial exploitation.

Recent Advances

Recent gamification is moving from fixed rewards toward adaptive, data-driven experiences. Wearables permit real-time feedback based on steps, sleep, heart rate or exercise intensity. Machine-learning systems can adjust goals according to previous performance, predicted adherence and user preference. "Just-in-time" interventions attempt to deliver encouragement when users are most receptive.

Social design is also evolving. Cooperative teams, peer encouragement and shared missions may be less discouraging than public leaderboards. Personalized avatars, narratives and culturally relevant challenges can strengthen emotional engagement. Some platforms now combine gamification with telecoaching, remote monitoring and clinical decision support.

These advances also introduce risks. Algorithms may reinforce narrow performance metrics, reward excessive exercise or create opaque recommendations. Personalization based on sensitive behavioural data raises questions about consent, profiling and secondary data use. Innovation therefore needs to be accompanied by explainability, safety testing and human oversight.

Challenges and Limitations

The evidence base is constrained by short intervention periods, small samples and inconsistent definitions of gamification. Many studies test bundles of features, preventing attribution of effects to specific mechanisms. Control groups may receive no app rather than an identical non-gamified app, making it difficult to distinguish gamification from reminders, monitoring or general digital engagement.

Novelty effects are substantial. Early enthusiasm may produce temporary behavioural improvement, followed by declining use. Publication bias may favour successful prototypes, while commercially unsuccessful or harmful interventions remain unpublished. Studies frequently report app use and satisfaction instead of sustained clinical outcomes, cost-effectiveness or quality of life.

Safety and regulation are emerging concerns. A 2024 assessment of 69 gamified health apps found that only seven had regulatory clearance or approval and that 31 were considered non-compliant or potentially non-compliant with applicable European requirements.[9] Only a small proportion publicly presented evidence supporting their effectiveness. The main concern is not that every wellness app requires medical-device regulation, but that apps making diagnostic or therapeutic claims should meet standards proportionate to their intended purpose and risk.

Privacy risks are amplified by continuous tracking, social sharing and behavioural profiling. Commercial rewards may encourage disclosure of sensitive information or permit insurers and employers to

influence health behaviour. Users should know what data are collected, who can access them and whether participation affects employment, insurance or service eligibility.

Gamification can also become coercive. Loss of points, broken streaks and repeated notifications may generate guilt rather than empowerment. Competitive systems can stigmatize users who are ill, disabled or unable to meet standardized targets. Ethical design must therefore include opt-out mechanisms, flexible goals, accessibility testing and non-punitive responses to lapses.

Future Directions

Future studies should use factorial or microrandomized designs to determine which components—feedback, rewards, narratives, competition or social support—produce benefit. Follow-up should continue after rewards are removed to assess maintenance. Objective outcomes, including wearable-recorded activity, pharmacy refill data and validated clinical indicators, should complement self-report.

Research must examine heterogeneity rather than relying only on average effects. Age, gender, disability, socioeconomic position, digital literacy, baseline motivation and cultural context may modify effectiveness. Equity impact assessments should be built into trials from the outset.

Publicly funded app evaluations should require prospective registration, transparent reporting of adverse effects, accessible intervention descriptions and publication of negative findings. Independent certification could distinguish general wellness apps from clinically validated digital interventions. For India, pragmatic evaluations conducted through schools, primary healthcare facilities and community programmes are needed, alongside economic analyses comparing gamification with simpler alternatives such as text messaging, peer support or counselling.

Co-design with users, clinicians, public health practitioners, behavioural scientists and software developers should become standard. Successful gamification is unlikely to arise from adding badges after an intervention has been designed; game elements must be matched to the health objective, target population and behavioural mechanism.

CONCLUSION

Gamified health apps can make health-related activities more visible, interactive and rewarding. The strongest evidence concerns short-term physical activity and engagement, while findings for medication adherence, chronic disease outcomes, nutrition and mental health remain promising but inconsistent. Benefits are generally modest and depend on thoughtful design, personalization, supportive contexts and integration with evidence-based care.

Gamification is neither a technological cure nor merely entertainment. It is a behavioural tool whose effects can be beneficial, neutral or harmful depending on how it is used. Public health adoption should therefore prioritize sustained outcomes, equity, privacy, clinical validity and user autonomy over downloads, screen time or commercial popularity. The next phase of research must move from asking whether gamification works to identifying which designs work, for whom, for how long and at what cost.

REFERENCES

1. Deterding S, Dixon D, Khaled R, Nacke L. From game design elements to gamefulness: defining “gamification.” In: *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*; 2011 Sep 28-30; Tampere, Finland. New York (NY): Association for Computing Machinery; 2011. p. 9-15. doi:10.1145/2181037.2181040.
2. Mazéas A, Duclos M, Pereira B, Chalabaev A. Evaluating the effectiveness of gamification on physical activity: systematic review and meta-analysis of randomized controlled trials. *J Med Internet Res*. 2022;24(1):e26779. doi:10.2196/26779.

3. Xu L, Shi H, Shen M, Ni Y, Zhang X, Pang Y, et al. The effects of mHealth-based gamification interventions on participation in physical activity: systematic review. *JMIR Mhealth Uhealth*. 2022;10(2):e27794. doi:10.2196/27794.
4. Nishi SK, Kavanagh ME, Ramboanga K, et al. Effect of digital health applications with or without gamification on physical activity and cardiometabolic risk factors: a systematic review and meta-analysis of randomized controlled trials. *EClinicalMedicine*. 2024;76:102798. doi:10.1016/j.eclinm.2024.102798.
5. Hydari MZ, Adjerid I, Striegel AD. Health wearables, gamification, and healthful activity. *Manage Sci*. 2023;69(7):3920-3938. doi:10.1287/mnsc.2022.4581.
6. Tran S, Smith L, El-Den S, Carter S. The use of gamification and incentives in mobile health apps to improve medication adherence: scoping review. *JMIR Mhealth Uhealth*. 2022;10(2):e30671. doi:10.2196/30671.
7. World Health Organization Regional Office for Europe. *Can video games make us healthier?* [Internet]. Copenhagen: WHO Regional Office for Europe; 2021 Dec 8 [cited 2026 Aug 6]. Available from: <https://www.who.int/europe/news-room/08-12-2021-can-video-games-make-us-healthier>
8. World Health Organization Regional Office for South-East Asia. *Regional Director's keynote address: Leveraging technological innovation for health promotion and disease prevention—insights from Asia-Pacific* [Internet]. New Delhi: WHO Regional Office for South-East Asia; 2025 Jan 28 [cited 2026 Aug 6]. Available from: <https://www.who.int/southeastasia/news/speeches/detail/regional-director-s-keynote-address---leveraging-technological-innovation-for-health-promotion-and-disease-prevention--insights-from-asia-pacific>
9. Freyer O, Wrona KJ, de Snoeck Q, Hofmann M, Melvin T, Stratton-Powell A, et al. The regulatory status of health apps that employ gamification. *Sci Rep*. 2024;14(1):21016. doi:10.1038/s41598-024-71808-2.