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Integrating Physical Activity into Traditional Video Gaming: Exploring New Ways to Connect Digital and Real-World Experiences

Amina Ayari

Berlin School Of Business and Innovation

Aminaayari408@gmail.Com

Abstract

The growing amount of time spent playing video games has raised questions about the relationship between digital gaming, physical activity, and everyday life. Previous attempts to connect gaming with physical activity, such as motion-controlled and virtual reality systems, have introduced physical movement directly into gameplay but have also revealed limitations related to fatigue, effort, interaction preferences, and long-term engagement. This research explores an alternative approach in which physical activity remains separate from gameplay while becoming meaningfully connected to the player's progression within the virtual environment.

The study investigates how gamers perceive the integration of real-world physical activity into traditional mobile and computer gaming, with particular attention to autonomy and the risk of perceived manipulation. Interviews conducted with gamers revealed a significant difference in perception: participants who were already physically active tended to perceive physical activity as a meaningful potential reward mechanism, whereas less active participants were more likely to perceive its integration into gaming as a form of pressure or manipulation. These findings suggest that the meaning attributed to physical activity plays an important role in determining its acceptance within a gaming experience.

Based on the literature review, theoretical framework, and user research, the project proposes a three-board game architecture that separates different gameplay experiences

while supporting a unified player journey. Physical activity is not mandatory but provides an alternative means of progressing and accessing game content through accumulated steps or activity recordings. Since no single tracking method currently offers a completely intuitive and reliable way to capture all forms of physical activity without additional user effort or opportunities for manipulation, the proposed system combines step tracking, as a low-friction and broadly inclusive measure, with live or uploaded video recordings for activities requiring more explicit verification. This approach aims to establish a complementary relationship between physical activity and digital gaming while preserving player autonomy and the core experience of traditional gaming.

Keywords: Physical activity in games, Game design Innovation, Real-world interaction, Gamer centered approach, Ethical game design

Introduction

Video games have become far more than simple applications to download or a way to fill a few free moments after a busy day. Over time, they have evolved into entire worlds, cultures, and sometimes even identities. For some individuals, gaming serves as a space for learning and growth, where players develop perseverance, resilience in the face of failure, strategic thinking, problem-solving abilities, and a competitive mindset. These skills may remain within the boundaries of the game, but they can also extend beyond the screen and become valuable assets in everyday life.

For others, however, video games can resemble a mousetrap. Once immersed in their worlds, the experience can become so engaging, rewarding, and meaningful that stepping away becomes increasingly difficult. Video games themselves are not inherently addictive. Nevertheless, they can become powerful stimulators for individuals with psychological vulnerabilities, especially when the virtual world begins to satisfy needs that remain unfulfilled in real life. It is within this context that the World Health Organization added “Gaming Disorder” to its International Classification of Diseases in 2018. At the same time, some psychotherapists have integrated video games into therapeutic practices, using them as tools to help patients address issues related to personality development, self-confidence, emotional regulation, and social interaction.

Previous research has identified a correlation between the amount of time individuals spend playing video games and their level of engagement in physical activity, with greater gaming time being associated with lower participation in sports and other physically active behaviors. This relationship does not necessarily imply a direct causal effect, but it highlights a potential tension between prolonged engagement with digital games and participation in physical activities in everyday life. As gaming increasingly occupies a significant place in people's leisure time, the question therefore becomes not only how much people play, but also how gaming may coexist with, or potentially support, activities taking place beyond the screen.

These two seemingly contradictory perspectives share a common foundation: whether we realize it or not, video games possess a remarkable influence on human behavior.

In response to growing concerns regarding sedentary lifestyles and increasing screen time, the gaming industry attempted to build a bridge between digital play and physical activity. Systems such as the Nintendo Wii and, later, virtual reality sought to preserve the appeal of gaming while incorporating bodily movement into the experience. The idea appeared straightforward: if people enjoy playing games, why not encourage them to move at the same time? However, the reality proved more complex. Research has shown that players tend to gradually reduce their movements and adopt shortcuts that allow them to achieve the same results with less physical effort. Other studies have identified physical fatigue as one of the main limitations of motion-based gaming systems. While interactive games are innovative, enjoyable, and particularly engaging in social and multiplayer contexts, they have not succeeded in replacing the experience offered by traditional gaming platforms such as consoles, computers, and mobile devices.

The limitations of these systems raise an important question. If physical activity alone is not sufficient to create a lasting balance between gaming and real life, then perhaps the challenge lies elsewhere. This raises the possibility that the issue is not how to make gamers move more, but how to create a meaningful connection between what happens in the virtual world and what happens outside of it. Rather than viewing gaming and real life as two competing realities, this project explores the possibility of transforming them into complementary parts of the same experience.

This project is dedicated to those who have successfully found a balance between their passion for gaming and their everyday lives, and who deserve recognition for achieving it. It is also dedicated to those who sometimes experience guilt after spending hours in front of a screen, to those searching for a way to reconnect their real lives with the worlds they enjoy exploring, and to those who are unfamiliar with gaming but wish to understand its appeal from a different perspective. Finally, it is dedicated to those who are perfectly content with their current relationship with gaming and have no desire to change it. The door remains open to them as well.

This project does not seek to impose a single solution or replace existing alternatives. Instead, it offers another possibility, another path, —one that may contribute to a more balanced and positive future for both players and the game industry.

1. Problem Definition

Despite the growing popularity of video games, concerns remain regarding sedentary behavior and the increasing amount of time spent in front of screens. While some games encourage physical activity, many of them either interrupt the gaming experience, rely on external fitness goals, or fail to create a meaningful connection between real-world actions and in-game progression. As a result, players often perceive physical activity and gaming as two separate activities rather than complementary experiences. This raises the challenge of designing a game that encourages real-world physical activity while preserving player autonomy, immersion, and enjoyment.

2. Research Questions

H1: How do gamers perceive mandatory physical activity as a condition for unlocking missions and progressing within a video game?

H2: Can a highly engaging and attractive game experience make players accept mandatory physical activity as an integral part of gameplay?

3. Research Methodology

The project followed a user-centered design approach. It began with a literature and theoretical review, followed by exploratory interviews with both physically active and inactive gamers.

The interview findings were analyzed and used to refine the initial concept. The process continued with benchmark analysis, concept development, low-fidelity wireframes, user testing, and finally the creation of high-fidelity prototypes.

4. Literature Review and Theoretical Framework

4.1. Introduction

This chapter is dedicated to exploring existing research and projects related to the proposed concept. The objective is to identify previously developed approaches, analyze their characteristics, strengths, and limitations, and compare them with the goals of this project.

The proposed project aims to design a video game that encourages physical activity by creating a connection between the real world and the game universe. Physical activities performed in real life are tracked and transformed into rewards, resources, or advantages within the virtual environment, without requiring the physical activity itself to be performed in real time during gameplay. This approach seeks to maintain a clear distinction between the two worlds while establishing a meaningful connection between them.

Due to the innovative nature of this concept, particularly its combination of real-world physical activity and virtual gameplay while preserving the separation between both environments, no existing research or implementation matching this approach exactly has been identified. Therefore, this literature review draws upon related studies and existing systems that help explain the concepts, theories, and mechanisms underlying the proposed project.

4.2. The Impact of Gaming Time on Physical Activity

The long time spent playing sedentary video games has been associated with lower engagement in physical activity across different age groups. In a randomized crossover trial, Straker, Abbott and Smith (2013) studied 56 children aged 10–12 years and found that removing traditional electronic games from the home increased moderate-to-vigorous physical activity by 3.8 minutes per day and reduced sedentary time by 4.7 minutes per day during the after-school period.

Chortatos et al. (2020) analysed data from 742 Norwegian adolescents collected in 2016 and found that adolescents who spent less time playing electronic games had significantly higher odds of participating in physical activity. In particular, 51.4% of adolescents who played electronic games for one hour or less per weekday reported more than 60 minutes of physical activity on at least five days per week, compared with 33.1% among those playing for at least 2.5 hours.

These findings should not be interpreted as evidence of a direct causal relationship between gaming and physical inactivity. Instead, they suggest that prolonged sedentary gaming may be associated with lower levels of physical activity, particularly when gaming occupies leisure time that could otherwise be devoted to physically active behaviours.

4.3. Addiction, Control, and Reality: From Virtual Escape to Integrated Experience

The powerful mechanisms that make video games engaging also raise important questions regarding their addictive potential. However, contrary to common assumptions, video game addiction is not generalized and rarely constitutes the primary problem. According to Serge Tisseron (2015), excessive gaming often reflects pre-existing psychological vulnerabilities such as anxiety, depression, or social difficulties. Gaming therefore does not create the disorder, but rather becomes a space in which underlying tensions are expressed.

The level of engagement depends on the interaction between two factors: the attractiveness of the game and the vulnerability of the player. Games become problematic when they function as a refuge from reality, particularly when the virtual self becomes more rewarding than the real self. The character, endowed with power, recognition, and status, may create an increasing gap between lived reality and the idealized digital identity. The problem therefore lies not only in the amount of time spent playing, but also in its consequences, such as social withdrawal, imbalance in daily life, and disengagement from real-world activities.

This phenomenon appears in both clinical cases and everyday gaming experiences. While the World Health Organization officially recognized Gaming Disorder in 2018, many players experience a different form of discomfort that does not necessarily involve addiction. In an online discussion entitled *I Feel Guilty Gaming* (2024), several players described feeling guilty after gaming sessions despite maintaining control over their habits. One participant explained, “Every time I sit down to play I just feel like I should be doing something more,” while another reported feeling “like a loser that is wasting his time” after only a short period of play. These testimonies suggest that distress does not always originate from excessive gaming itself, but from a perceived conflict between enjoyment and productivity, or between virtual achievement and socially valued activities.

In more severe cases, gaming can progressively occupy a central role in an individual's life. In an interview published by VICE, James Good (2020), a 24-year-old gamer, described spending up to 32 consecutive hours playing and later realizing that he had lost control over his gaming habits. Reflecting on this period, he stated, “I don't think I even enjoyed it,” and later admitted, “I still wake up thinking about games; go to sleep thinking about games.” Despite completing a 90-day gaming detox program, he reported returning to gaming for more than sixty hours per week, illustrating how difficult it can be to re-establish balance once gaming becomes the primary source of satisfaction and escape.

A similar tension can be observed in the testimony of professional Fortnite player Jaden Ashman, also known as Wolfiez. Despite achieving financial success through esports at a very young age, Ashman described a growing dissatisfaction with his lifestyle and the negative consequences of prolonged gaming on his physical and mental well-being. He explained, “When I was playing, I was on top of the world,” but simultaneously

acknowledged that “I wasn’t happy with where I was.” His experience highlights the possibility that success and achievement within virtual environments do not automatically translate into fulfillment outside them.

These observations support the argument that the issue may not be gaming itself, but rather the growing separation between virtual accomplishments and real-world experiences. The stronger the contrast becomes between these two worlds, the more likely players are to experience guilt, dissatisfaction, escapism, or a loss of balance. Whether expressed through Gaming Disorder, as described by the World Health Organization (2018), or through the more common phenomenon of gamer guilt discussed by MacDonald (2020), the underlying tension often revolves around the relationship between virtual rewards and real-life meaning.

4.4. The Power of Video Games and Their Therapeutic Potential

The attraction of video games lies in their unique ability to transform perception into experience and participation into meaning. Rather than being simple digital environments, video games create structured spaces where individuals can act, feel, and construct themselves through interaction. This power is rooted in deep psychological mechanisms linked to perception, identity, and emotional regulation.

One of the fundamental sources of this attraction is the relationship between human beings and images. As highlighted in the book “*Et si les écrans nous soignaient ?” : “What If Screens Could Heal Us?”* by Michaël Stora, images do not simply represent reality; they propose idealized versions of it. For individuals with fragile self-esteem, these images become powerful points of identification. What distinguishes video games from other visual media is that they allow individuals not only to observe these ideals, but also to enter them, embody them, and act within them. The transition from image to experience transforms the individual into an active participant capable of exploring possibilities that are sometimes inaccessible or limited in real life.

This immersive engagement is closely linked to early developmental processes. The human subject constructs identity through interaction, feedback, and recognition. The gaming environment recreates these conditions by providing immediate responses to the player’s actions, reinforcing a sense of presence and agency. The player is not simply engaged in a task, but involved in a process of becoming — testing abilities, making decisions, and experiencing their consequences within a controlled space.

Video games are particularly powerful because they allow individuals to experience forms of action, competence, and control that may be absent or difficult to achieve in everyday life. Through structured challenges and progressive systems, players develop a sense of mastery. This becomes especially significant in contexts where individuals lack self-confidence or experience social difficulties. The virtual environment then becomes a space for reclaiming competence and recognition.

This dynamic also explains the therapeutic potential of video games. Michaël Stora’s clinical observations show that gaming can function as a medium through which internal processes may be expressed and transformed. One of his patients, who had difficulties asserting himself in a professional environment, developed a stronger sense of control after managing a virtual city in SimCity, which later translated into more assertive behavior in real life. Similarly, Stora notes that changes in the types of games chosen by individuals

may sometimes reflect deeper psychological evolutions, revealing transformations in needs, motivations, emotional states, or identity construction.

Research has also shown that digital games can contribute to improvements in attention, problem-solving, emotional regulation, and social understanding (Granic, Lobel & Engels, 2014).

Another important aspect of video games is their capacity for narcissistic repair. Individuals confronted with failure, rejection, or lack of recognition may find within games a space where they feel competent, valued, and effective. The experience of success, even within a virtual environment, generates real emotional responses that contribute to rebuilding self-esteem.

Furthermore, video games function as narrative systems. According to Daniel Stern's (1985) concept of prenarrative structures, humans naturally seek to organize their experiences into coherent stories. Within games, the framework is provided, but the player actively constructs the narrative through actions and emotional involvement. This reinforces a sense of continuity, meaning, and identity, as the individual becomes both actor and author of their experience.

Players embody heroic characters through victories, defeats, and progression, and each individual experiences pleasure in taking on this role. This pleasure may be connected to the early experience of being recognized and valued through the caregiver's gaze. The game therefore reactivates a regressive yet structuring dynamic, in which the individual seeks to become a "hero" within a meaningful narrative space.

In contemporary contexts, this dynamic gains additional importance. Some individuals, particularly those confronted with difficulties of recognition or achievement in real life, may turn toward video games as spaces in which they can regain competence and power. The concept of the "king-child syndrome" illustrates how the gap between an elevated perception of the self and the limitations of reality may generate frustration. Through the embodiment of a heroic avatar, video games may temporarily restore a sense of agency and control — not as the cause of fragility, but as a response to it.

This therapeutic potential raises an important question: how can the same medium that provides a space for psychological repair, competence, recognition, and emotional regulation also become a source of psychological vulnerability? The answer may lie not in video games themselves, but in the psychological mechanisms through which they engage and retain players.

4.5. The Octalysis Framework, Yu-kai Chou

The Octalysis Framework, developed by Yu-kai Chou (2015), is a gamification theory that seeks to understand the different psychological drivers behind human engagement in games and digital experiences. According to this approach, certain experiences become engaging not only because they entertain, but because they activate deeper emotional and psychological needs within the individual, called Core Drives. These psychological drivers are divided between two main forms of engagement: White Hat Engagement and Black Hat Engagement.

White Hat Engagement is based on positive and durable motivations such as meaning, autonomy, creativity, personal progression, accomplishment, or even human connection. In contrast, Black Hat Engagement relies more on fear, pressure, artificial scarcity, the feeling of missing something (FOMO), or certain addictive mechanisms intended to keep the user active. Although this second form of engagement can be very effective in the short term, it can also generate fatigue, dependence, psychological exhaustion, or reinforce certain unhealthy behavioral dynamics.

4.6. Interactive Gaming: A Promising Solution That Never Fully Solved the Problem

When concerns about sedentary lifestyles, screen time, and gaming addiction began to emerge, the gaming industry responded with what appeared to be a simple and promising idea: what if players could move while playing? The Nintendo Wii, followed later by virtual reality systems, attempted to build a bridge between physical activity and digital entertainment. Instead of sitting in front of a screen pressing buttons, players could swing a tennis racket, throw punches, dodge obstacles, or move their entire bodies. For a moment, it seemed that the long-standing conflict between gaming and physical activity had finally found a solution.

However, reality proved more complex.

Nova and Crosnier (2009) observed that although gesture-based interfaces were initially perceived as more intuitive and attractive, players quickly adapted their behavior. Rather than reproducing realistic movements, they progressively discovered shortcuts that allowed them to achieve the same results with less effort. A full tennis swing was replaced by a simple wrist movement. Success was no longer determined by the quality of the real-world action but by understanding how the system interpreted the gesture. Ironically, even in games designed around physical activity, players naturally sought efficiency rather than exercise. The study further revealed that even participants with high physical competence did not necessarily prefer gesture-based systems. Being skilled in a sport did not automatically translate into better performance in motion-controlled games because the techniques required to succeed were often different from those used in real-life practice. Players still had to learn the specific logic of the interface and adapt to how the system interpreted their movements.

The study also revealed another interesting paradox. Casual players generally preferred the Wii because it was easier to understand and did not require the learning curve associated with traditional controllers. Yet this preference often changed over time. Once players acquired the skills necessary to use a PlayStation controller efficiently, many found traditional gaming more engaging and rewarding. Gesture-based games were frequently described as becoming repetitive, while controller-based games offered greater depth, precision, and long-term progression. This phenomenon was less visible in multiplayer settings, where social interaction itself became a source of enjoyment.

Another phenomenon observed in the findings of Nova and Crosnier (2009) is what the authors describe as the *inertia effect*. Players who had spent years using traditional controllers had developed habits, automatisms, and expertise that influenced their preferences.

Similar challenges were encountered in virtual reality. While VR increased immersion by making players physically participate in the game world, it also introduced a new limitation: fatigue. Wang (2016) demonstrated that larger and more realistic body movements increase physical effort and muscular fatigue, which can negatively affect the gaming experience over time. Interestingly, one of the innovations explored in his research was not how to make players move more, but how to reduce unnecessary movement while preserving immersion. In other words, even within virtual reality, the challenge was not encouraging maximum physical activity but finding the minimum amount of movement required to maintain engagement.

Similar observations were reported by Johnson et al. (2008), who compared novice and expert players using both traditional controllers and gesture-based interfaces in shooting and snowboarding games. Their results showed that novices generally preferred gesture-based interactions because conventional controllers appeared less intuitive. However, expert players favored traditional interfaces, partly because they required less physical effort. The authors also found that a physical gun controller was preferred over a snowboard controller by both novice and expert players because it was less fatiguing to use. Their findings suggest that direct correspondence between physical actions and digital interactions is not sufficient to guarantee user preference. Instead, expertise, effort, and fatigue play a significant role in shaping player experience and long-term engagement.

Taken together, these studies suggest that motion-based systems have successfully introduced new forms of interaction perceived as innovative and relatively intuitive. However, this intuitiveness appears to stem largely from their ease of use and reduced learning curve compared to traditional controllers, rather than from the physical activity itself. While these systems lowered the entry barrier for novice players, they did not necessarily maintain the same level of attractiveness over time once users acquired the skills required to master more traditional gaming interfaces.

Although this assumption is not directly supported by the studies presented, it is reasonable to question whether this advantage related to intuitiveness would still hold the same significance today when compared to computer and mobile games. Since the introduction of the Wii, touch interfaces, simplified controls, and familiar interaction patterns have become widely adopted, making many gaming experiences accessible without requiring complex learning processes. If ease of use is one of the primary drivers of preference, then gesture-based systems may no longer possess the same competitive advantage they once had when they were first introduced.

An even more striking observation emerges from this body of research. Technologies designed to encourage movement appear to have been more successful when the movements required from users were reduced rather than amplified. The reality is that systems originally created to promote physical activity seem to be more appreciated when they demand less physical effort. In other words, players are not necessarily seeking exercise itself, but rather an experience that is efficient, comfortable, enjoyable, and capable of sustaining engagement over time.

4.7. The Power of Passive Play: A Sensorimotor and Psychological Perspective

Passive engagement in screen-based activities, particularly video games, cannot be reduced to a simple absence of physical movement. A deeper analysis reveals that this

attraction is rooted in fundamental psychological and sensorimotor mechanisms present from early development.

From early childhood, the hand plays a central role in discovering the world. Through touch, grasping, and manipulation, the infant explores the environment, where even the simplest gestures produce meaningful feedback. This establishes a fundamental loop in which action leads to perception, and perception in turn guides action.

Video games reactivate and optimize this loop in an extremely effective way. A simple finger movement — pressing a button or slightly adjusting a joystick — produces immediate and often complex visual consequences. This minimal gesture, deeply rooted in sensorimotor experience, is perceived as natural and effortless, yet it is sufficient to trigger a continuous cycle of interaction. The player observes, reacts, anticipates, and adjusts, creating a dynamic relationship with the digital environment.

At a more fundamental level, the power of passive play lies in the fact that a very small physical action is enough to trigger a rich cognitive and perceptual experience. The movement of a single finger becomes a gateway into another world. Through visual feedback and continuous interaction, the brain interprets these micro-actions as meaningful participation, activating an "imaginary world" at the cognitive level. The user does not simply observe the screen: they project themselves into it, navigate it, and master an environment through perception rather than physical displacement.

This creates a unique form of engagement in which the body remains passive while the subject experiences a strong sense of agency. The player feels active, in control, and immersed despite the absence of full bodily involvement. In this sense, passive play does not eliminate action; it compresses it into minimal gestures while amplifying its perceptual and cognitive impact.

Moreover, passive play creates a particular balance between stimulation and comfort. Unlike physically active experiences, which require energy and total bodily engagement, screen-based games maintain the body in a resting state while continuously stimulating perception and cognition. This combination makes the experience particularly effective: it offers intensity, control, and immersion at a minimal physical cost. While active games may promote health and movement, they may also reduce the sense of relaxation and ease that many players seek.

This raises an important design consideration: even when physical activity is integrated into a video game, does it necessarily need to transform the game into a physically active experience? Instead, physical activity could remain a separate but connected component of the overall gaming experience, without necessarily occurring simultaneously with gameplay. This approach would allow the game to preserve the passive, immersive, and comfortable qualities that make conventional gaming attractive, while still creating a meaningful connection between gameplay and physical activity.

4.8. Player Autonomy and Engagement: Self-Determination Theory

According to Deci, E.L. and Ryan, R.M. (1985) Self-Determination literally means "to determine oneself," that is to say acting from oneself and being at the origin of one's own behavior. At that time, many psychological theories mainly considered motivation as a search for reward or an avoidance of punishment. It is in this context that one of the central

questions of this theory appeared: what makes a person feel internally free or, on the contrary, controlled?

This theory was built through several experimental researches, showed that external rewards could sometimes reduce natural motivation, because the activity was no longer experienced as coming from oneself, but as being controlled from the outside. One of the experiences is a study in which participants naturally enjoying puzzles were divided into two groups: a first group completed the puzzles without reward, while the second received a financial reward. After the experiment, the researchers observed that the unpaid participants continued spontaneously to play with the puzzles, whereas those who had received a reward lost more easily their spontaneous interest. These results showed that certain external rewards can reduce intrinsic motivation, particularly when they generate a feeling of control.

The self-determination theory therefore highlights the fundamental need of the human being to feel at the origin of one's actions. It is not limited to external freedom, because a person can be free in their choices while being internally motivated by fear of rejection, the need to please, or the avoidance of guilt. The deepest and most durable motivation is therefore the one that possesses a personal and integrated meaning. This allows understanding why certain activities provide durable energy and stable engagement, while others lead to exhaustion or dependence on external validation.

The objective of this theory is not to exclude extrinsic motivation, but rather to show that it can become healthier when the person understands the meaning of the action and integrates it into their identity. According to this approach, to function in a psychologically healthy and durable way, human beings need to satisfy three fundamental psychological needs: autonomy, competence, and the feeling of belonging or relationship to others.

Based on Self-Determination Theory, making physical activity a mandatory requirement for accessing missions or progressing within a game may create a perceived loss of autonomy, as players may no longer feel fully in control of how and when they engage with the game. This raises an important question in relation to the present research: could making physical activity mandatory undermine players' interest in the game by transforming an enjoyable activity into a conditional experience? Conversely, for players who are already physically active, could linking physical activity to mandatory game progression also reduce their interest in the activity itself by turning something they freely choose to do into a requirement imposed by the game? These questions are particularly relevant to the research hypotheses, as they examine whether the attractiveness and engagement of a game can compensate for the potential loss of autonomy created by mandatory physical activity.

4.9. From External Influence to Internalization: Kelman's Theory and Organismic Integration Theory

The works of Herbert Kelman(1958) seek to answer the following question: why does a person truly accept an idea, a norm, or a behavior? According to him, not all behaviors have the same psychological depth and can pass through three different processes. The first is compliance, where the person acts mainly to avoid a punishment, obtain a reward, or respond to an external demand, without necessarily internally adhering to the value of the behavior. The second is identification, where the behavior becomes more personal, because

the individual acts to belong to a group, maintain a relationship, preserve a self-image, or resemble certain people or values that they appreciate. Finally, the deepest level is internalization, where the behavior, the value, or the belief become truly integrated into the identity, convictions, and worldview of the person. At this stage, the behavior can continue even in the absence of reward or external pressure. These works thus show that a person can initially perform an action without real deep adherence, but that when the experience generates meaning, value, or a feeling of accomplishment, this action can progressively become integrated into the way the person defines themselves.

Within the framework of the Self-Determination Theory, Edward Deci and Richard Ryan developed the Organismic Integration Theory, which also shows that human motivation can progressively evolve through different levels. A person can first find themselves in a state of amotivation, where they see no interest in the action. The behavior can then be motivated by an external regulation linked to reward, punishment, or external pressure. With time, this pressure can become more internalized through introjected regulation, where the action is motivated by guilt, the need for recognition, or the desire to prove one's value. Progressively, the person can begin to recognize a personal meaning in the activity through identified regulation, before it becomes coherent with their identity and values in integrated regulation. Finally, certain activities can reach the stage of intrinsic motivation, where they are carried out simply for pleasure, curiosity, or the natural interest they provide.

These approaches therefore suggest that the "self" is not necessarily something totally defined from the beginning, but that it can also be constructed through lived experiences, felt emotions, repetitions, and the meaning progressively attributed to certain actions. An activity initiated for an external reason can thus, with time, acquire a more personal value and become integrated into the way the individual perceives themselves.

Within the framework of this game, this perspective highlights the importance of creating an engaging and attractive experience, but also raises the question of how the initial attraction created by the game can develop into a more personal relationship with physical activity. The game can first act as a form of external influence: its marketing, visual identity, narrative, and gameplay experience may attract players who are not initially interested in physical activity. At this stage, the player may engage with the concept primarily because of the appeal of the game itself, rather than because of an existing personal interest in movement. Through repeated experiences, however, the activity associated with the game may progressively acquire personal meaning. What initially begins as an externally introduced behavior could therefore move from compliance, through identification, toward greater internalization, or from external regulation toward more autonomous forms of motivation.

4.10. The Design Value of Integrating Physical Activity into the Game Environment

Even when physical activity does not occur simultaneously with gameplay, keeping it present within the game environment may have an important psychological function.

Repeated exposure to an element within a familiar and engaging environment can contribute to the formation and reinforcement of mental schemas, creating associations between concepts that may initially appear unrelated. Montoya et al. (2017), in a meta-

analysis of 81 articles, found a positive relationship between repeated exposure and measures such as familiarity and liking, although the effect was not unlimited and could follow a non-linear pattern.

More specifically, research on physical activity suggests that the context in which a behaviour repeatedly occurs can become associated with that behaviour. Zhu et al. (2026), in a systematic review and three-level meta-analysis of 14 independent studies involving 6,069 participants, found that greater consistency of contextual cues was associated with stronger physical-activity habits ($r = 0.20$) and, to a smaller extent, physical-activity behaviour ($r = 0.11$). These findings do not demonstrate that simply displaying physical activity will cause people to become more physically active. Rather, they support the broader idea that contextual consistency and repeated associations can contribute to the development of behavioural habits.

Repeated exposure to an element within a familiar and engaging environment can contribute to the formation and reinforcement of mental schemas, creating associations between concepts that may initially appear unrelated. Applied to the present case, when physical activity is repeatedly represented, referenced, or connected to the player's progression within the game, it becomes part of the player's gaming environment and becomes increasingly familiar through repeated exposure. Rather than remaining an external activity disconnected from their interest, it can therefore become associated with the player's universe and routines.

5. Interviews

5.1. Interview Method and Participants

All interviews were conducted with professional gamers aged between 19 and 30 years old. The participants had substantial gaming experience, with a minimum of eight years of gaming experience, while some had been playing video games since childhood.

Two complementary qualitative approaches were used: individual semi-structured interviews and a focus group. Three professional gamers participated in the individual interviews, while six professional gamers participated in the focus group. Thus, both methods involved participants with comparable levels of gaming experience, while encompassing different levels of engagement in physical activity and providing two complementary formats for exploring their perspectives.

The three individual interviews were conducted online via Google Meet. Participants were recruited through a written invitation shared via WhatsApp, which included a link to a calendar to select an interview date. Consent to participate was obtained when participants selected an interview date following the invitation and was confirmed again at the beginning of each interview. Participants were also informed that they could subsequently be contacted for the prototype testing phase.

The six-person focus group was conducted with students from the Bachelor’s programme in Game Design at Berlin School of Business and Innovation (BSBI), during a gaming-related class session. Before the session began, the instructor and participating students provided and obtained the necessary consent to take part in the discussion and for the collected responses to be used for the research.

The individual interviews first explored participants' gaming habits and healthy lifestyle habits before introducing the proposed concept and discussing their personal reactions to it. In contrast, the focus group began with a presentation of the concept, followed by questions and discussion about participants' reactions, both in relation to their own experiences and their general opinions.

5.2. Interview Findings and Analysis

5.2.1. *Perceptions of Physical Activity Integration*

A clear difference emerged between participants based on their existing relationship with physical activity. Physically active participants perceived the integration of physical activity into the game as motivating and meaningful, particularly as a way to visualize achievements and maintain motivation.

Among less active participants, two different attitudes emerged. Some expressed a sense of guilt or dissatisfaction about not being physically active enough. Despite being inactive, these participants showed a positive attitude toward the concept and perceived it similarly to the physically active participants, as a potential source of motivation and encouragement. In contrast, inactive participants with no desire or sense of guilt regarding physical activity questioned its relevance within a gaming experience and perceived mandatory physical activity as an external requirement that could interfere with the freedom traditionally associated with gaming.

These findings suggest that the perception of the concept is influenced not only by participants' level of physical activity, but also by their underlying attitude toward it. Less active participants were more receptive to the concept when they already experienced dissatisfaction with their level of activity or expressed a desire to achieve a better balance between gaming and physical activity. In contrast, those who were satisfied with their current level of activity and had no desire to change it were less likely to perceive physical activity as adding value to the gaming experience.

5.2.2. Physical Activity as a Positive Addition to Gaming, Not a Barrier to Social Play

Another recurring theme concerned the conditions under which physical activity could be successfully integrated into a game. Even among participants who supported the concept, there was a strong consensus that physical activity should never become a barrier to playing with others. Pro gamers emphasized that social interaction and cooperative gameplay are central motivations for gaming and should remain accessible regardless of a player's physical activity level and sport preferences.

5.2.3. Preference for Autonomy and Flexible Participation

The findings suggest that giving players control over how they engage with the game can increase acceptance and accessibility. Allowing multiple progression pathways accommodates diverse user profiles while preserving the voluntary nature of physical activity. Participants viewed this freedom of choice as essential for maintaining long-term engagement and preventing the experience from feeling restrictive or mandatory.

5.2.4. Preferred Gaming Devices Influence Platform Selection

The interviews revealed clear patterns regarding device preferences among participants. Most players reported playing games either on their smartphones or on computers, sometimes in combination with gaming consoles such as PlayStation.

6. Hypothesis Verification

The research initially explored how gamers would perceive mandatory physical activity as part of game progression and whether an engaging game experience could make such a requirement acceptable. The findings did not fully support the idea of making physical activity mandatory for all players.

The concept was perceived positively by participants who were already physically active, as well as by less active participants who expressed a desire to become more active or felt dissatisfied with their current level of physical activity. For these participants, integrating physical activity into the game could provide additional motivation. However, even participants who were favourable to the concept raised concerns about how a mandatory system could remain feasible and accessible for players with different levels of physical activity and different abilities or willingness to participate.

The social dimension of gaming was also an important consideration. Participants described both individual and collective gaming preferences, but playing with friends and peers remained an important part of the gaming experience. They were concerned that making physical activity a requirement could create situations in which players with different levels of engagement could no longer easily play together, particularly when some friends were unwilling to participate in physical activity. In this sense, the issue was not only whether an individual player accepted physical activity, but also whether the requirement could be compatible with different players participating in the same gaming experience.

The findings also suggest that the attractiveness of the game alone would not necessarily overcome this limitation. Even an engaging and interactive game may become less accessible when progression depends on an activity that some players are unwilling or unable to complete. Therefore, the value of the gaming experience could encourage interest in physical activity for some players, but it could not make a mandatory requirement equally suitable for all.

7. Design Decisions

The interview findings led to an important shift in the design direction: rather than making physical activity mandatory, it should be integrated as an optional component of the gaming experience, allowing players to engage with it according to their own pace and willingness.

Physical activity could remain connected to the game rewards while players would retain the choice of whether and how they engage with it.

This approach aimed not only to preserve the motivational potential identified in the research, but also to create opportunities for initially non-engaged players to become interested in physical activity through their exposure to it within the game. Rather than imposing participation, the design leaves the possibility open for players to explore

physical activity voluntarily, potentially motivated by their own curiosity, the appeal of the game, or continued exposure to the activity-related features.

Another important consideration emerged from the interviews: a significant proportion of gamers play on computers and consoles rather than exclusively on mobile devices. This raises a specific design challenge regarding how physical activity can be integrated and tracked for these players without disrupting the gaming experience.

The design therefore needs to explore how existing technologies and devices can enable seamless activity tracking, as well as how specific activities could be encouraged when required for progression. At the same time, the tracking system should limit opportunities for cheating and provide a reliable way of validating completed activities. The objective is to develop a flexible system that can accommodate players with different levels of physical activity while remaining accessible and engaging across different gaming platforms.

8. Design Implementation

Instead of embedding physical activity directly into missions, it is integrated through an Activity Synchronization System. Players can either record a live workout session or upload a video from their gallery. Once validated, the recorded activity is transformed and synchronized with the game universe, becoming part of the player's story experience. For example, the generated content may appear as a cinematic sequence or mission briefing before gameplay begins. To support this feature, an intelligent validation system would be implemented to detect cheating and to transform activity recordings into scenes that visually align with the game's aesthetic and narrative.

Physical activity is also encouraged through Step tracking. Players accumulate steps in real life, and reaching predefined milestones unlocks rewards equivalent to premium in-game items. This approach allows physical activity to remain rewarding while preserving equal access to the core gameplay experience.

Another challenge identified during the design process was balancing visibility and usability. If physical activity became too prominent within the interface, it could disrupt the gaming experience and make the purpose of the application overly explicit. Conversely, if activity-related features were too hidden, the concept could lose its purpose of encouraging physical activity.

To address this challenge, the mobile game interface was divided into three distinct sections:

- **Game Universe:** The primary gaming environment, where players explore the story, complete missions, interact with other players, and access rewards.



Figure 1. Figure 1. High-fidelity prototype of the Game Universe section in portrait and landscape modes for the mobile version of the game "SuperYou"

- **Activity Synchronization:** A dedicated space where players can record live activities, upload videos, synchronize physical achievements, and connect real-world activity to the game experience.

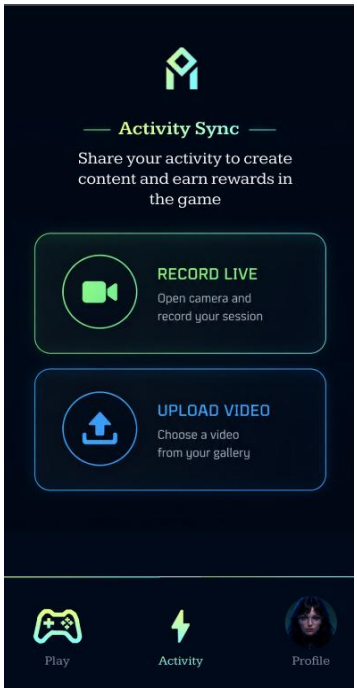


Figure 2. High-fidelity prototype of the Activity Synchronization page for the mobile version of the game "Super You"

- **Profile:** A personal space containing user information and a step-tracking graph. Gift icons appear at specific milestones to indicate unlockable rewards, which can

be accessed either directly from the graph or through the rewards section within the Game Universe.

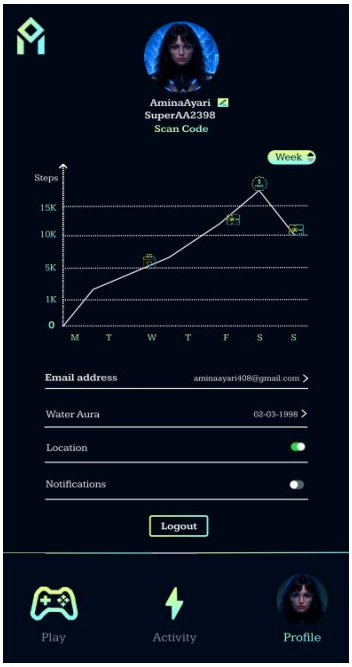


Figure 3. High-fidelity prototype of the profile page for the mobile version of the game "SuperYou"

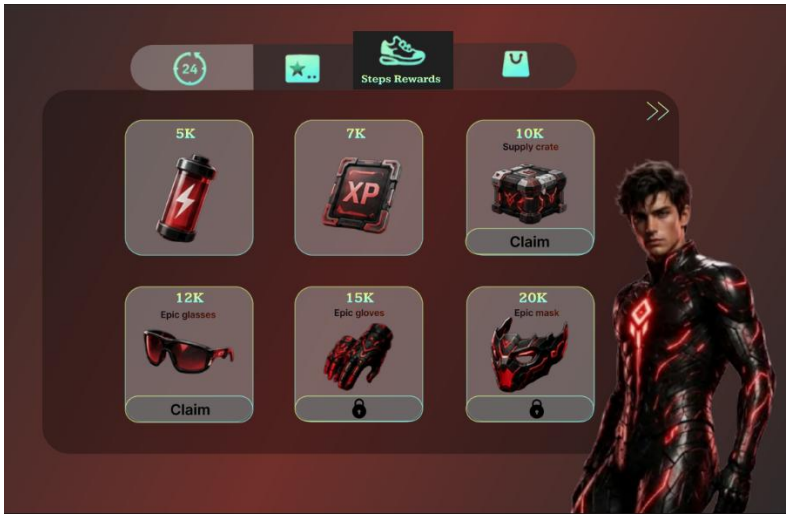


Figure 4. High-fidelity prototype of the Steps Rewards section within the game universe of "SuperYou"

A further design consideration concerns players who primarily use computers or consoles. Rather than requiring them to change their gaming device, the game can remain playable on these platforms while a mobile extension enables activity tracking. The mobile application could be connected to the main game through a QR code, email address, or login credentials, allowing players to track steps, record activities, or upload live and recorded videos from their mobile device while continuing to play on their computer or

console. This approach aims to maintain the gaming experience on the player's preferred platform while using mobile technology for physical activity tracking.

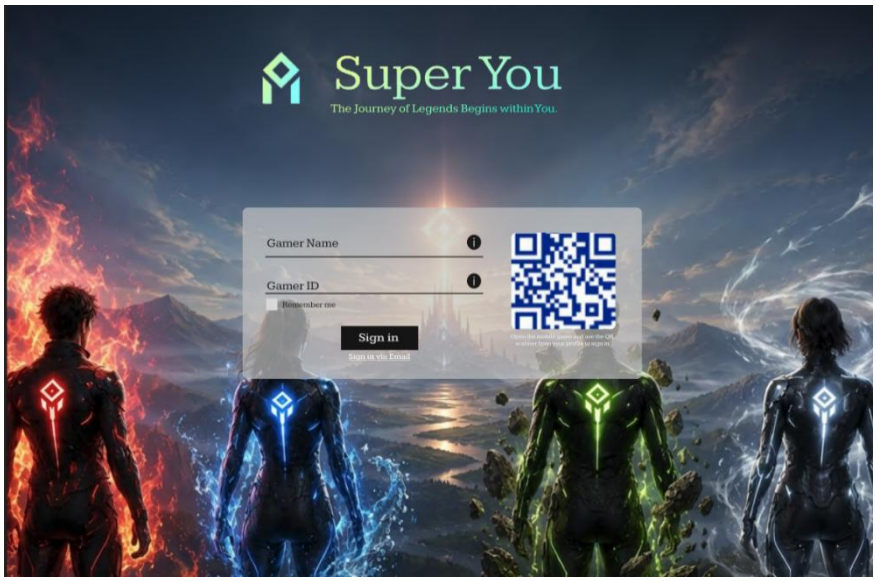


Figure 5 High-fidelity prototype of the welcome screen for the computer version of the game "SuperYou", with mobile application connection

9. Insights from Step Tracking Benchmark Analysis

Step tracking was identified as one of the most appropriate tools for monitoring physical activity, as it enables activity to be tracked continuously with relatively little user effort. However, step-counting systems are not completely reliable and may be subject to inaccuracies or manipulation. The benchmark analysis of existing step-tracking applications, particularly Sweatcoin, highlighted this limitation. Although the application automatically tracks users' steps, the recorded step count can be artificially increased through movements such as shaking the phone, without corresponding physical activity. This indicates that step count alone may not be sufficient to reliably validate physical activity.

The benchmark showed that activity tracking should not rely on phone movement alone, as shaking the device can increase the recorded number of steps without actual physical activity. Instead, activity validation should account for this limitation by distinguishing genuine walking or running from artificial movements, such as simply shaking the phone.

10. User testing

10.1. Participants

The concept was subsequently tested with three professional gamers, representing different levels of interest in physical activity: one highly interested, one moderately interested, and one with no interest. Two of the three participants had previously taken part in the individual interviews, allowing the testing phase to build on their earlier perspectives and feedback. The third participant was recruited specifically for the testing phase through

targeted recruitment and a recommendation, based on their alignment with the intended user profile.

10.2. Tested Features

As the design had not yet been implemented in a functional game, the testing consequently did not evaluate the effectiveness or long-term impact of the proposed design in practice.

Instead, the testing focused on three main aspects. First, the perceived relevance of the concept, particularly the integration of physical activity through step-based rewards and activity synchronization. Participants were asked to consider the idea of receiving in-game rewards after reaching predefined step thresholds, as well as the possibility of recording a physical activity live and transferring it into the game environment. Second, the three-part game architecture was explored, including how participants perceived the division of the mobile gaming experience into three distinct components rather than a single interface, and whether this organization was clear and appropriate. The proposed mobile extension was also examined for computer-based gaming, particularly the idea of using a mobile device to track steps, upload activities, or record activities live while the main game remains on the computer.

Finally, the testing addressed the design of these features and interfaces. The proposed concepts were progressively represented through low- and high-fidelity prototypes, allowing participants to provide feedback on the visual presentation, interface organization, feature placement, and overall clarity of the proposed interactions. At this stage, the focus was on participants' perceptions and preferences regarding the proposed design alternatives.

10.3. User Testing Results

10.3.1. Perceived Relevance of the Concept

The feedback suggested that making physical activity optional and dependent on the player's willingness could help include players with different preferences and levels of physical activity. Players could interact with friends regardless of whether they completed steps or engaged in the same level of physical activity, without this becoming a barrier to participation or excluding them from the game experience.

Step tracking was perceived as relevant because it can make everyday physical activity more visible to players who do not necessarily consider themselves physically active. One participant highlighted that activities such as shopping, travelling, or spending a day walking can result in a high number of steps without the person consciously perceiving them as exercise. Connecting these steps to meaningful in-game rewards could therefore help players recognize their everyday activity and provide an additional incentive, particularly for those who do not have a strong interest in sports.

The participants also expressed interest in recording their physical activity through video when this activity would have a meaningful connection to the game. In particular, they indicated that they would be willing to record and share an activity if doing so allowed them to become part of the game universe and see their real-life activity represented within the game. This suggests that the perceived value of the activity does not necessarily come

only from receiving an in-game reward, but also from the opportunity to contribute to and become part of the game world.

10.3.2. Three-part game architecture

The three-part architecture was tested, particularly in relation to whether mobile-focused players would perceive the concept as a complete game experience.

The participants found the separation between the different components useful for maintaining a clear and understandable interface. Rather than presenting all features within a single interface, the different functions could remain organized according to their purpose. This also preserved player autonomy: when players wanted to focus exclusively on gaming, they could simply select the game mode and begin playing without having to interact with physical activity features.

10.3.3. Mobile Extension

The participants considered the mobile application useful even when their main gaming experience took place on a computer or PlayStation. They identified several practical benefits, including using the phone as a step-tracking tool, checking the rewards already obtained through their physical activity without having to access the main game, and using the mobile device to record, import, or complete activity through live tracking. The mobile application was therefore perceived not as a separate game, but as a practical extension of the existing gaming experience.

11. Conclusion

This research explored how physical activity could be integrated into a gaming experience without compromising players' autonomy or their engagement with gaming.

The findings suggest that gamers can be broadly understood through three different relationships with physical activity. Some have already established a balance between their personal lives, physical activity, and gaming interests. Others have not yet achieved this balance but expressed an interest in developing it. For these players, a game that encourages physical activity through rewards and game-related experiences may provide an interesting opportunity. A third group did not initially perceive a strong interest in physical activity. For these players, maintaining autonomy and avoiding mandatory participation appeared particularly important.

An additional factor emerged from the social dimension of gaming: participants considered that physical activity requirements should not prevent them from playing with friends who may have different levels of physical activity or different willingness to engage in it. Thus, even when players themselves were open to integrating physical activity into gaming, they emphasized the importance of preserving access to shared gaming experiences regardless of individual activity levels.

This further supported the shift from mandatory to optional participation. Rather than forcing physical activity, gradual exposure within the gaming environment may make it more familiar and potentially support greater openness among players who are not yet willing to engage directly in physical activity. At the same time, the optional approach

provides players who are already motivated or willing to engage with physical activity with the opportunity to do so directly.

The synchronization between physical activity and the game universe was perceived positively during testing. Rather than making physical activity the central focus, synchronization was seen as a way to increase engagement with the game world, create a stronger sense of involvement, and allow players to see themselves and the effects of their real-life activity reflected within the game.

Step tracking emerged as a practical way to encompass different forms of everyday physical activity, despite its limitations and the possibility of manipulation. At present, however, there is no fully intuitive solution that can reliably detect and validate physical activity without relying on additional devices such as a smartwatch.

The resulting concept proposes a system in which physical activity can contribute to obtaining meaningful in-game rewards that are equivalent in value to rewards that could otherwise be purchased with money. At the same time, synchronization provides another form of value by connecting the player's real-life activity with their in-game experience, allowing them to become part of the game scene and universe. These two approaches therefore provide different forms of motivation and engagement. This approach emerged through the different design alternatives, iterations, and user testing conducted throughout the research.

The user testing conducted with a relatively small number of gamers provided an initial indication of how the concept could be perceived and offered valuable feedback for its development. However, a larger and more diverse group of participants would be necessary to obtain broader feedback and further examine the different relationships gamers may have with physical activity and gaming. The proposed system remains a concept that was tested to gather user feedback rather than a solution implemented and evaluated in real-life and long-term use. Further research and real-world testing would therefore be required to understand how gamers would interact with such an ecosystem over time and whether repeated exposure, autonomous participation, meaningful rewards, and synchronization could support the adoption of physical activity within gaming routines.

Ultimately, this research provides a foundation for exploring how physical activity and gaming could coexist within the same ecosystem while preserving the player's sense of choice and engagement. Rather than changing gaming into a form of active exercise or requiring players to abandon traditional gaming experiences, the proposed approach seeks to integrate physical activity as an additional layer that can coexist with the established way people play games. In this way, the game can remain a game in its traditional form while offering players the possibility of connecting their real-life activity with their virtual experience when they choose to do so.

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