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Scrolling with Purpose: A Serious Game for Adolescents about Social Media Use and Mental Health

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Mestrado em Engenharia Informática e Computação

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Abstract

The growing use of social media among adolescents has raised serious concerns regarding its potential negative effects on mental health, self-image, privacy, and online behaviour. Problematic use has been associated with anxiety, depression, social comparison, and addictive patterns that often go unrecognised by adolescents themselves. Serious games have emerged as promising tools to promote awareness and foster critical thinking in digital environments, offering experiential and reflective learning in ways that traditional educational approaches cannot.

This dissertation presents two interconnected contributions. First, a systematic literature review following the PRISMA methodology examines serious games designed to address online safety, privacy, and media literacy among adolescents. Five databases were searched, yielding 271 identified records, of which 15 studies met the inclusion criteria and were retained for full analysis. The review analyses design approaches, mechanics, platforms, evaluation methodologies, and reported outcomes. Findings indicate that simulation-based and narrative-driven designs are the most adopted approaches, promoting self-reflection and experiential learning. While most studies report positive short-term effects on awareness and attitudes, limitations include a lack of longitudinal evaluation and limited adoption of participatory design methodologies.

Second, informed by the literature review, by a survey of expert psychologists, and by contextual research drawing on adolescents' real-world accounts of social media use, a serious game is designed and developed targeting adolescents aged 10 to 19. The game, built in the Godot engine, follows a narrative-driven structure across five scenes representing a week in the life of a fictional adolescent. Each scene presents realistic social media dilemmas, requiring the player to make meaningful choices with visible consequences reflected through a dynamic stat system tracking mental health, sleep, self-image, and real connections. Notification popups deliver educational content and narrative reflection after each decision, grounding the experience in evidence-based information about the psychological effects of social media use.

The resulting prototype contributes a structured, accessible, and engaging intervention that addresses a gap identified in the literature: the absence of serious games specifically targeting social media use and its psychological impact on adolescents. Future work will focus on formal evaluation with adolescent participants using validated instruments including the SMAS, SUS, IMI, and GEQ, alongside follow-up interviews to assess usability, engagement, and impact on awareness and behaviour.

Resumo

O uso crescente das redes sociais entre os adolescentes tem suscitado sérias preocupações relativamente aos seus potenciais efeitos negativos na saúde mental, na autoimagem, na privacidade e no comportamento online. O uso problemático tem sido associado a ansiedade, depressão, comparação social e padrões aditivos que, frequentemente, não são reconhecidos pelos próprios adolescentes. Os jogos sérios têm surgido como ferramentas promissoras para promover a consciencialização e fomentar o pensamento crítico em ambientes digitais, proporcionando uma aprendizagem experiencial e reflexiva de formas que as abordagens educativas tradicionais não conseguem.

Esta dissertação apresenta dois contributos interligados. Em primeiro lugar, uma revisão sistemática da literatura, seguindo a metodologia PRISMA, examina jogos sérios concebidos para abordar a segurança online, a privacidade e a literacia mediática entre adolescentes. Foram pesquisadas cinco bases de dados, das quais resultaram 271 registos identificados, sendo que 15 estudos cumpriram os critérios de inclusão e foram mantidos para análise completa. A revisão analisa as abordagens de design, as mecânicas, as plataformas, as metodologias de avaliação e os resultados reportados. As conclusões indicam que os designs baseados em simulação e em narrativa são as abordagens mais adotadas, promovendo a autorreflexão e a aprendizagem experiencial. Embora a maioria dos estudos reporte efeitos positivos a curto prazo na consciencialização e nas atitudes, as limitações incluem a ausência de avaliação longitudinal e a reduzida adoção de metodologias de design participativo.

Em segundo lugar, com base na revisão da literatura, num inquérito a psicólogos especialistas e em investigação contextual a partir de relatos reais de adolescentes sobre o uso das redes sociais, foi concebido e desenvolvido um jogo sério dirigido a adolescentes dos 10 aos 19 anos. O jogo, desenvolvido no motor Godot, segue uma estrutura narrativa ao longo de cinco cenas que representam uma semana na vida de um adolescente fictício. Cada cena apresenta dilemas realistas relacionados com as redes sociais, exigindo que o jogador tome decisões significativas com consequências visíveis, refletidas através de um sistema dinâmico de estatísticas que acompanha a saúde mental, o sono, a autoimagem e as ligações reais. Notificações emergentes fornecem conteúdo educativo e reflexão narrativa após cada decisão, fundamentando a experiência em informação baseada em evidência sobre os efeitos psicológicos do uso das redes sociais.

O protótipo resultante constitui uma intervenção estruturada, acessível e cativante que aborda uma lacuna identificada na literatura: a ausência de jogos sérios especificamente dirigidos ao uso das redes sociais e ao seu impacto psicológico nos adolescentes. O trabalho futuro centrar-se-á na avaliação formal com participantes adolescentes, recorrendo a instrumentos validados, incluindo a SMAS, a SUS, o IMI e o GEQ, em conjunto com entrevistas de seguimento, para avaliar a usabilidade, o envolvimento e o impacto na consciencialização e no comportamento.

UN Sustainable Development Goals

This dissertation contributes to the United Nations 2030 Agenda for Sustainable Development by designing and developing a serious game aimed at raising awareness among adolescents about the risks of problematic social media use. The table below identifies the relevant SDGs, their specific targets, the project's contributions, and associated performance indicators.

SDG	Goal	Contribution	Performance Indicators and Metrics
3	3.4 - Promote mental health and well-being	The serious game acts as a preventive digital intervention targeting adolescent mental health. Problematic social media use is associated with anxiety, depression, and stress. By simulating realistic social media scenarios and prompting self-reflection, the game raises awareness of these risks before they escalate into clinical conditions.	Proportion of players reporting intention to change social media habits after gameplay.
4	4.7 - Ensure learners acquire knowledge and skills needed for sustainable development, including digital literacy and global citizenship	The game provides an interactive, experiential learning environment that promotes digital literacy and critical thinking about online behaviour. It is designed for deployment in school settings, broadening access to digital education.	Proportion of players reporting increased understanding of the negative consequences of online actions.

Table 1: Sustainable Development Goals addressed by this dissertation

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Henrique Manuel Cordeiro Rodrigues Gardé

Declaration of Honour

I declare that this dissertation is my own work and has not previously been submitted or assessed at this or any other institution.

References to other authors (statements, ideas, thoughts), as well as the use of published works, strictly comply with the rules of attribution and are duly identified in the text and in the bibliographic references, in accordance with the applicable referencing standards.

I am aware that the practice of plagiarism or self-plagiarism constitutes an academic offence, as established in the U.Porto Code of Ethics.

I also declare that I have used Artificial Intelligence tools to complete part(s) of this dissertation, including assistance in writing and refining the text of the document and support in the development of the serious game, and that this use and its results are duly noted and have been carefully checked for errors, inaccuracies, unfounded attributions or other forms of bias in content and arguments, as well as for the determination of authorship.

Henrique Manuel Cordeiro Rodrigues Gardé

“We shape our tools and then our tools shape us.”

John Culkin, *A Schoolman's Guide to Marshall McLuhan*, 1967

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List of Acronyms

GEQ	Game Experience Questionnaire
IMI	Intrinsic Motivation Inventory
LIACC	Laboratório de Inteligência Artificial e Ciência de Computadores
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSMU	Problematic Social Media Use
PSSUQ	Post-Study System Usability Questionnaire
SG	Serious Game
SMAS	Social Media Addiction Scale
SUS	System Usability Scale
FOMO	Fear of Missing Out

Chapter 1

Introduction

1.1 Context

This dissertation is part of a larger research project conducted at LIACC (Laboratório de Inteligência Artificial e Ciência de Computadores), focusing on developing serious games designed to promote mental health. In this specific case, the serious game targets adolescents that are unaware of the risks of the unhealthy use of social media. To the best of our knowledge, no serious game that specifically tackles this area exists. In addition, this work combines technology, psychology, and digital education to create an interactive and immersive platform that encourages reflection among adolescents. Using a serious game, this project aims to study how useful and efficient it can be to raise awareness about the potential dangers and psychological effects of unrestrained use of social media, while promoting reflection and encouraging healthier digital habits.

This project originated from increased use of social media in the everyday lives of adolescents, as they increasingly use online platforms to communicate, consume information, and maintain social connections. While there are clear benefits such as ease of communication and easy access to information, newer research has increasingly highlighted downsides when its usage is excessive or problematic. Systematic reviews have found significant associations between high levels of social media use and increased symptoms of anxiety, depression, and psychological distress among adolescents [1, 2]. These relationships are not straightforward, however; they are complex and shaped by multiple factors, including the type of use and individual differences [3]. It is precisely this complexity — the fact that the same platforms can be benign or harmful depending on how they are used — that makes raising adolescents' awareness of their own digital habits both difficult and necessary.

Other symptoms that a bad use of social media can amplify are loneliness and reduced self-esteem [4] and body dissatisfaction. Body dissatisfaction, for example, comes from peer comparison of adolescents to idealised images or from engaging in passive scrolling behaviour [5]. These effects are especially concerning during youth, a developmental stage that is marked by physical, social, cognitive, and emotional growth.

These are some examples of why research in this area is urgently needed. The ever growing

social media use among adolescents is faster than our understanding of its long-term effects on their mental and physical health. Therefore, increasing the research efforts in this field is necessary to create more effective educational tools and interventions based on evidence. This dissertation aims to contribute to that need by exploring how serious games can promote awareness and self-reflection, and healthier online behaviours among adolescents.

The tool proposed in this dissertation is a serious game designed and developed specifically for adolescents' use of social media. Serious games are games focused on education rather than entertainment [6]. By simulating scenarios similar to real-life events, providing in-game feedback, and prompting self-reflection, serious games can raise awareness of risks, in this case the unhealthy use of social media.

The core problem addressed in this research is the significant gap in risk awareness among adolescents regarding their own digital habits. While social media is omnipresent, many teenagers lack the meta-cognitive tools to distinguish between functional use and the onset of problematic, addictive patterns. Current educational strategies often fail because they are overly theoretical and detached from the "lived experience" of scrolling; research indicates that even high levels of technical digital literacy do not necessarily translate into an equivalent awareness of psychological risks, and that the relationship between social media use and its psychological impact is often complex and not easily perceived by users [3, 7].

Crucially, these risks do not affect all age groups equally. Adolescence is a developmental stage marked by heightened sensitivity to social evaluation [8] and an imbalance between reward-seeking behaviour and the still-maturing capacity for self-regulation [9]. This developmental vulnerability, combined with intense and continuous exposure to digital environments, creates a context in which maladaptive behaviours can emerge and become entrenched. For this reason, adolescence represents a critical window for interventions aimed at promoting awareness, self-regulation, and healthier interaction with digital technologies — a window this dissertation seeks to address.

Consequently, there is an urgent need for interactive interventions that can simulate real-world digital scenarios, allowing adolescents to observe the immediate and cumulative consequences of unhealthy use in a safe, controlled environment. Preventive and educational interventions, particularly those that are interactive or behaviour-focused, have been shown to reduce problematic digital behaviours and improve awareness compared to passive approaches [10].

1.2 Motivation and Objectives

Social media is embedded in the lives of most adolescents, making up a large portion of their time. Social media is always present, whether to learn new information, keep in contact with many people, or share parts of their lives. Adolescence is a period of self-exploration and identity formation, and having access to social media can complicate this process. However, using platforms like Instagram, X or TikTok for long periods of time or in a problematic manner can lead to side

effects such as addiction, depression, anxiety and stress [11]. These are harmful effects and, if not addressed, can lead to larger problems as the person ages.

In this context, the project aims to answer the central question: "Is it possible to create a serious game pertinent to raising awareness among adolescents about the potential risks and negative impacts of social media use?"

Additionally, two complementary research questions are proposed:

- "What characteristics should this serious game include to effectively engage adolescents?"
- "What are the perceptions of adolescents and healthcare professionals regarding the game's usability and its potential effects on awareness and behaviour?"

The main objective is to design and develop a serious game focused on facilitating adolescents' learning and self-reflection regarding the risks and adverse effects that problematic use of social media can cause. This project does not aim to solve the problem, but to draw attention to it so that more people become aware of it.

To support this main objective, the design of the serious game will have direct impact from the opinions and insights of adolescents and healthcare and judicial professionals.

Chapter 2

Conceptual Background

This chapter presents an overview of the main concepts that support this dissertation, focusing on three core dimensions: adolescents, social media, and serious games. These dimensions form the theoretical foundation for the development of a serious game aimed at raising awareness about the risks associated with social media use.

The first section introduces adolescence as a developmental stage, highlighting its psychological and behavioural characteristics. The second section focuses on social media, exploring its widespread use among adolescents and the potential risks associated with excessive or problematic usage. Finally, the third section presents the concept of serious games, their applications in awareness and behaviour change, and the technological tools used in their development.

2.1 Adolescents

Adolescence is a developmental stage typically defined as the transition between childhood and adulthood, generally occurring between the ages of 10 and 19 [12]. This period is characterized by significant cognitive, emotional, and social changes that influence how individuals perceive themselves and interact with the world around them [13].

2.1.1 Developmental Characteristics of Adolescence

One of the defining features of adolescence is the process of identity formation, during which individuals explore different roles, beliefs, and behaviours [8]. During this stage, peer relationships become increasingly important, and adolescents tend to show heightened sensitivity to social evaluation and feedback. This increased sensitivity makes them more susceptible to external influences, particularly those that provide immediate social validation.

From a neurodevelopmental perspective, adolescence is marked by an imbalance between reward-seeking behaviours and self-regulation capabilities [9]. Brain regions associated with reward processing and emotional responses, such as the limbic system, develop earlier than the prefrontal cortex, which is responsible for impulse control and decision-making. As illustrated in Figure 2.1, the prefrontal cortex governs a wide range of executive functions, including impulse

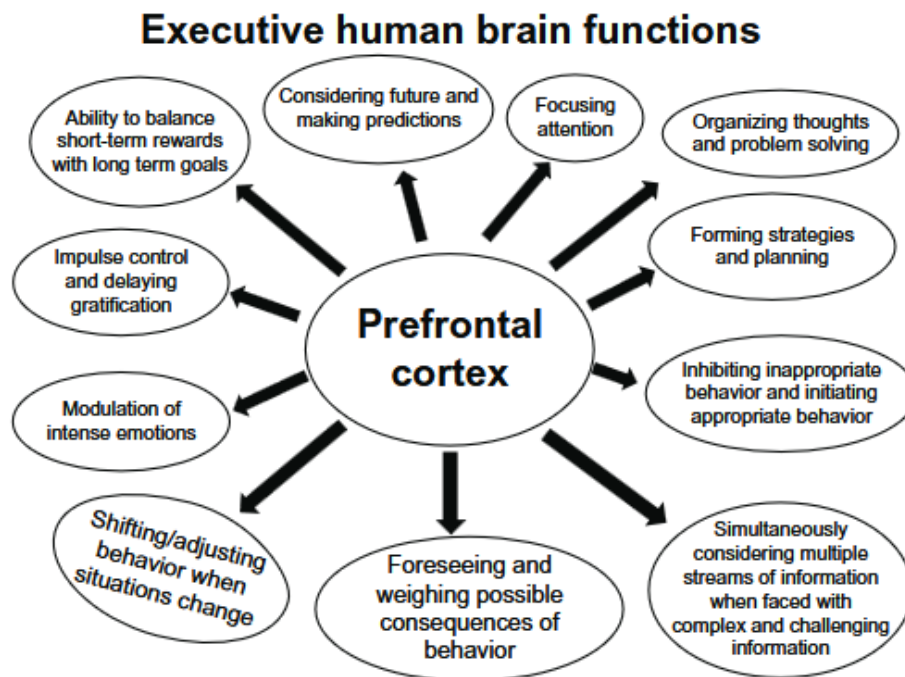


Figure 2.1: Executive functions associated with the prefrontal cortex during adolescence. The prefrontal cortex matures later than subcortical regions involved in reward processing, contributing to increased risk-taking behaviour (Adapted from [14]).

control, planning, and weighing the consequences of behaviour. This region continues to mature throughout adolescence, whereas subcortical regions involved in reward processing develop earlier [14].

Empirical studies support this perspective. For example, adolescents are significantly more likely than adults to engage in risk-related behaviours when peers are present, highlighting the strong influence of social context on decision-making [15]. Additionally, behavioural patterns established during adolescence often persist into adulthood, reinforcing the importance of this stage for early intervention.

2.1.2 Adolescents in Digital Contexts

In recent years, the developmental characteristics of adolescence have increasingly interacted with digital environments. Adolescents are now growing up in a context where online interaction plays a central role in their social lives. According to recent reports, over 90% of adolescents in developed countries use social media regularly, with many reporting daily usage exceeding 2 to 3 hours [16].

This high level of engagement is particularly relevant when considering adolescents' sensitivity to social feedback. Digital platforms amplify social evaluation through features such as likes, comments, and follower counts, providing continuous and quantifiable feedback [17]. For

adolescents, this can reinforce reward-seeking behaviours and increase dependence on external validation.

Moreover, studies indicate that adolescents often struggle to accurately assess the impact of their own digital behaviour. Despite being highly familiar with technology, they may lack the meta-cognitive skills required to reflect critically on their usage patterns and recognize potential risks [7]. For example, research has shown that self-reported digital media use often diverges substantially from objectively logged use, with adolescents tending to misjudge the extent of their own engagement, even when it is associated with negative outcomes such as sleep disruption or reduced well-being [18].

This combination of developmental vulnerability and high exposure to digital environments creates a context in which maladaptive behaviours can emerge and persist. As a result, adolescence represents a critical window for interventions aimed at promoting awareness, self-regulation, and healthier interaction with digital technologies.

Given these factors, approaches that go beyond traditional education and actively engage adolescents in reflective and experiential learning processes may be particularly effective in addressing these challenges.

2.2 Social Media

Social media platforms are digital environments that allow users to create, share, and interact with content and with other users. Over the past decade, these platforms have become deeply embedded in daily life, particularly among younger populations [19]. Their rapid growth has been driven by the widespread adoption of smartphones and constant internet connectivity, making access to these platforms immediate and continuous.

2.2.1 Characteristics of Social Media Platforms

Modern social media platforms are designed to maximize user engagement through a variety of persuasive design features [20]. These include personalized content feeds, push notifications, and infinite scrolling mechanisms, which encourage users to remain active for extended periods of time. Algorithms curate content based on user behaviour, increasing the likelihood of continued interaction and reinforcing usage patterns.

These design strategies are not neutral. Research suggests that features such as variable reward schedules - similar to those used in gambling contexts - can increase compulsive checking behaviours and prolong usage sessions [17]. For example, notifications and “likes” act as intermittent rewards, reinforcing repeated engagement and contributing to habit formation.

2.2.2 Social Media Use by Adolescents

Adolescents are among the most active users of social media. According to recent data, approximately 95% of teenagers report having access to a smartphone, and around 90-95% use social

media platforms regularly [16]. Furthermore, nearly half of adolescents report being online “almost constantly”, highlighting the extent to which digital interaction has become integrated into their daily routines.

On average, adolescents spend between 2 to 4 hours per day on social media platforms, with some studies reporting even higher usage levels [16]. This high level of engagement is facilitated not only by accessibility but also by the social relevance of these platforms.

Social media serves several important developmental functions during adolescence [21]. It provides a space for communication, allowing users to maintain and strengthen peer relationships. It also supports identity exploration, as adolescents experiment with self-presentation and receive feedback from others [22]. Additionally, these platforms offer access to information and communities that may not be available in offline contexts [21].

Despite these benefits, the intensity and frequency of use raise concerns about overexposure and dependency [2]. The constant availability of social media can blur the boundaries between online and offline life, making disengagement difficult and reducing opportunities for other activities, such as sleep, physical activity, and face-to-face interaction [23].

2.2.3 Problematic Social Media Use in Adolescents

While social media offers multiple benefits, its excessive or maladaptive use has been associated with several negative outcomes. Systematic reviews have found significant associations between high levels of social media use and increased symptoms of anxiety, depression, and psychological distress among adolescents [1]. However, these relationships are complex and influenced by multiple factors, including the type of use and individual differences [3].

One of the main mechanisms underlying these effects is social comparison. Social media platforms often present idealized versions of others’ lives, leading adolescents to compare themselves with unrealistic standards [5]. Features such as likes, comments, and follower counts quantify social approval, reinforcing validation-seeking behaviours and potentially impacting self-esteem [17].

Additionally, algorithm-driven content can create repetitive exposure to similar types of content, reinforcing certain behaviours and beliefs [24]. This can contribute to the normalization of excessive use and make it more difficult for users to recognize problematic patterns.

Problematic social media use can also manifest as addictive-like behaviour. Studies estimate that between 5% and 10% of adolescents exhibit symptoms consistent with problematic or addictive social media use, including loss of control, preoccupation, and continued use despite negative consequences [23]. These behaviours often develop gradually and may not be immediately recognized by users.

Another critical issue is the lack of awareness regarding these risks. Despite high levels of digital literacy, adolescents often struggle to accurately evaluate their own behaviour and its consequences [18]. For example, a significant proportion of individuals misreport their screen time, failing to perceive their usage as problematic even when it is associated with negative outcomes such as sleep disturbances, reduced academic performance, or decreased well-being.

This gap between usage and awareness highlights the limitations of traditional educational approaches — such as lectures, informational campaigns, and written materials — which tend to focus on transmitting knowledge rather than changing behaviour. Because adolescents frequently underestimate their own usage and fail to perceive its consequences [18], purely informational approaches rarely translate into genuine awareness or behavioural change. This reinforces the need for more engaging and experiential interventions that allow adolescents to actively reflect on their habits and observe the consequences of their digital behaviour — a need echoed by the expert psychologists consulted in this work (Section 5.1).

2.3 Serious Games

Serious games are digital games designed with purposes beyond entertainment, such as education, training, or behaviour change [6]. By integrating gameplay mechanics with instructional content, serious games aim to create engaging and meaningful learning experiences that can influence users' knowledge, attitudes, and behaviours [25].

The effectiveness of serious games can be understood through established learning theories. Constructivist approaches suggest that knowledge is actively constructed through experience, making interactive environments particularly suitable for learning complex behaviours. In this context, serious games support experiential learning, where understanding emerges through exploration, experimentation, and reflection. Additionally, self-determination theory emphasizes the importance of autonomy, competence, and relatedness in sustaining motivation, elements that are commonly embedded in well-designed game systems [26].

Unlike traditional educational approaches, serious games rely on interactivity, simulation, and continuous feedback to support learning processes. Players are actively involved in decision-making, enabling them to explore different strategies and observe the consequences of their actions in dynamic environments. This active participation has been associated with greater engagement and improved learning outcomes when compared to passive learning methods [25].

Empirical evidence supports the effectiveness of serious games across multiple domains. A broad systematic review by Boyle et al. found that computer games and serious games can produce significant improvements in learning outcomes, engagement, and behaviour change across diverse subject areas [25]. In the specific context of health, a meta-analysis by DeSmet et al. demonstrated that serious digital games can produce significant positive effects on health-related behaviours and their determinants, particularly when grounded in behavioural theory and incorporating engaging design features such as feedback and interactivity [27]. These effects extend to adolescent populations specifically: systematic reviews indicate that game-based interventions are a promising approach for promoting positive development and addressing problematic behaviours among young people [28], and pilot studies suggest that serious games can favourably influence cognitive and psychological processes associated with adolescent mental health [29]. Taken together, this evidence indicates that serious games are not merely engaging but can produce measurable

learning and behavioural outcomes, particularly when their design is theoretically informed and tailored to the target audience.

2.3.1 Serious Games in Social Media Awareness

Serious games have been increasingly applied as tools for promoting awareness and behavioural change in areas related to digital well-being [10]. In the context of social media use, these games can simulate realistic online environments, allowing users to engage with scenarios that reflect common interactions, such as posting content, receiving feedback, or managing notifications [30].

By placing adolescents in situations that mirror real-life digital experiences, serious games provide opportunities for experiential and reflective learning. Players can experiment with different behavioural choices and immediately observe their consequences in a safe and controlled environment. This approach may be particularly valuable for addressing implicit behaviours, such as habitual checking or validation-seeking, that are difficult to change through traditional instruction alone [27].

Research indicates that game-based interventions can be especially effective for adolescents due to their alignment with intrinsic motivational factors and familiarity with interactive media. Systematic reviews show that digital game-based interventions represent a promising approach for promoting attitudinal and behavioural change in adolescent populations [28].

Meta-analytic evidence further demonstrates that serious games can produce significant positive effects on behaviour and its determinants, particularly when they are grounded in behavioural theory and incorporate engaging design features such as feedback and interactivity [27]. These elements contribute to sustained engagement and enhance learning outcomes.

In addition, research highlights that serious games are particularly appealing to adolescents and can influence cognitive and psychological processes associated with behaviour change [29]. Their interactive nature supports self-reflection and active engagement, both of which are critical for fostering meaningful and lasting behavioural change.

Overall, serious games represent a promising approach for social media awareness, as they combine engagement, interactivity, and behavioural insight in a format that resonates with adolescent users.

2.3.2 Game Engines in Serious Games

The development of serious games relies on game engines, which are software frameworks that provide the necessary tools for creating interactive digital environments. These engines support core functionalities such as rendering, physics simulation, asset management, and scripting, enabling developers to focus on game design and user experience rather than low-level implementation details.

Popular game engines include Unity, Unreal Engine, and Godot, each offering different advantages in terms of performance, usability, and flexibility. Unity and Unreal Engine are widely

used in both industry and academia due to their advanced graphical capabilities and extensive ecosystems, although they may present a steeper learning curve and higher resource requirements.

In contrast, open-source engines such as Godot have gained increasing attention in research and educational contexts. Godot offers a lightweight architecture, an intuitive interface, and a dedicated scripting language (GDScript), which facilitates rapid prototyping and iterative development. These characteristics are particularly important in user-centred design processes, where frequent testing and refinement are required.

These considerations of functionality, accessibility, and openness inform the selection of an appropriate engine for serious game development, a decision discussed in the context of this project's implementation in Chapter 6.

Chapter 3

Systematic Literature Review

This chapter presents a systematic review of the literature that assesses the usability and effectiveness of serious games in raising awareness and educating adolescents about the risks associated with the unhealthy use of social media. The objective is to collect information and existing evidence from previous studies on how game-based learning, digital interventions, and gamification strategies can influence adolescents' awareness and behaviours regarding social media use.

The review addresses the complementary research question concerning which design characteristics a serious game should include to effectively engage adolescents and enhance its impact on awareness and behaviour.

Ultimately, this review aims to answer the central research question by identifying effective approaches to serious game design that can inform the development of a solution capable of promoting self-reflection and encouraging healthier digital habits among adolescents.

3.1 Methodology

The systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [31]. The following subsections describe each step of the process and explain how the PRISMA framework was applied throughout this literature review.

3.1.1 Search Strategy

The following search queries were created sequentially to address the research question: "What characteristics should a serious game include to effectively raise awareness among adolescents about the potential risks and negative impacts of social media use?"

QS1: "serious game" AND "social media" AND "adolescents"

QS2: ("serious game*" OR "educational game*") AND ("social media" OR "social network*") AND (adolescent* OR teen* OR youth)

QS3: (“serious game*” OR “educational game*”) AND (“social media” OR “social network*”) AND (adolescent* OR teen* OR youth) AND (“awareness” OR “risk perception”)

These search queries encompass all the key dimensions of the research scope: the technology involved — serious games; the target demographic — adolescents; the thematic context — social media use; and the desired outcome — raising awareness among players.

The final search query, **QS4**, was designed to capture literature intersecting all these areas with greater precision. To enhance coverage and ensure comprehensiveness, synonyms and terms in the same field for some of these words were added. Some examples include adding expressions such as "game-based intervention", "game-based education", and "gamification" to the "serious game" field, or adding "behaviour change" and "media literacy" to the objective field of the search query. It also contains wildcards (*) for some nouns that have variations in their grammatical number.

QS4:

(“serious game*” OR “educational game*” OR “digital game-based learning” OR “gamified learning” OR “game-based intervention” OR “game-based education” OR “gamification”)

AND

(“social media” OR “social network*” OR “internet safety” OR “cyberbullying” OR “digital literacy” OR “online risk*” OR “social media addiction” OR “problematic social media use” OR “online platform*” OR “online behavior*”)

AND

(adolescent* OR teen* OR youth OR “young people” OR student* OR “secondary school*” OR “high school*”)

AND

(“awareness” OR “risk perception” OR “attitude change” OR “behavior change” OR “behaviour change” OR “media literacy” OR “digital citizenship” OR “mental health literacy” OR “self-reflection”)

The databases selected for the search were IEEE Xplore (IEEE), PubMed, Scopus, Web of Science (WoS), and the Association for Computing Machinery Digital Library (ACM DL). These sources were selected to ensure a comprehensive reach across both technical engineering disciplines and health-related research, providing a multidisciplinary foundation for the study.

Each query was executed in two configurations across all five databases: first searching across all available fields, and then restricting the search to the Title, Abstract, and Keywords fields. Table 3.1 reports both counts for every database. For IEEE Xplore, PubMed, and Web of Science, the two configurations returned similar or identical counts, as the number of results was already manageable even when searching across all fields. For Scopus and the ACM Digital Library, where searching across all fields returned a number of entries far larger than could feasibly be screened, the restriction to Title, Abstract, and Keywords substantially reduced the results, retaining those most directly aligned with the intended intersection of topics.

No restrictions were applied to publication date, language, document type, or subject area in any database. Table 3.1 contains two entries for each query: the first indicates the number of articles retrieved when searching across all fields, and the second the number of results when limiting the search to Title, Abstract, and Keywords. Although the first three queries include terms representing the intersection of this dissertation's main research areas, their effectiveness is limited by the specificity of the combined concepts. The search query QS4 incorporates the necessary fields and expressions to achieve a precise and inclusive coverage of the literature.

Table 3.1: Number of Results per Database for Each Query

	IEEE	PubMed	Scopus	WoS	ACM DL	Total
QS1 - Full search	5	6	2,441	8	162	2,622
QS1 - Filtered search	5	6	18	8	0	37
QS2 - Full search	16	14	6,522	34	291	6,877
QS2 - Filtered search	16	14	45	34	0	109
QS3 - Full search	3	2	1,871	8	254	2,138
QS3 - Filtered search	3	2	10	8	0	23
QS4 - Full search	37	18	9,757	87	1,909	11,808
QS4 - Filtered search	37	18	119	87	10	271

3.1.2 Selection Process

The literature selection process aims to reduce the retrieved articles to those specifically containing serious games designed to educate adolescents about the risks associated with unhealthy social media use. This process is illustrated in Table 3.1.

The selected studies were required to meet specific inclusion criteria. Only publications written in English and classified as journal articles, conference papers or book chapters were considered. Studies had to target adolescents as their population and address social media use or closely related topics within the context of a serious or educational game. Publications that were not accessible in full text, identified as duplicates, retracted, summaries, or literature reviews were excluded from the review. Studies that targeted adults, involved interventions that were not gamified, or presented games not focused on social media were also ruled out.

The inclusion and exclusion criteria can be summarised as:

Inclusion Criteria

- Written in English
- Classified as journal articles, conference papers, or book chapters
- Focused on adolescents as the target population
- Addressed social media use or related topics in the context of serious or educational games¹

¹ e.g., online safety, digital literacy, cyberbullying

Exclusion Criteria

- Not available in full text
- Duplicate records
- Retracted publications
- Targeted adults
- Literature reviews and summaries
- Interventions that were not gamified
- Games designed for adolescents but not focused on social media

3.1.3 PRISMA Methodology

The Figure 3.1 illustrates the methodology used in the literature selection process. Following the PRISMA framework, the duplicated records identified during the execution of the **QS4** were first removed. In total, 141 studies were excluded from the review. The remaining records were screened according to the previously mentioned inclusion and exclusion criteria, yielding 34 eligible records. Of these, six could not be retrieved, and 13 were excluded because they were not written in English, did not focus on adolescents, did not address social media use, or did not examine gamified interventions. The final number of studies included in the review was 15.

3.2 Results

After selecting the studies using the PRISMA methodology, a data extraction process was conducted. Every study included in the final set was analysed to address the research questions. The information gathered from the studies was organised according to the following aspects: study design, target population and sample size, targeted skills, game features, evaluation setting, and outcome measures. A table was constructed based on these categories, as presented in Table 3.2.

It is important to note that, although the dataset includes 15 studies, they cover 14 unique gamified approaches, as two studies focus on the same game [32, 33]. Some studies present multiple games within a single gamified approach, each featuring some difference in mechanics or features [34, 35]. For consistency, all data extracted from a study is presented in a single row, even when multiple games are included, since the approaches generally share many similarities.

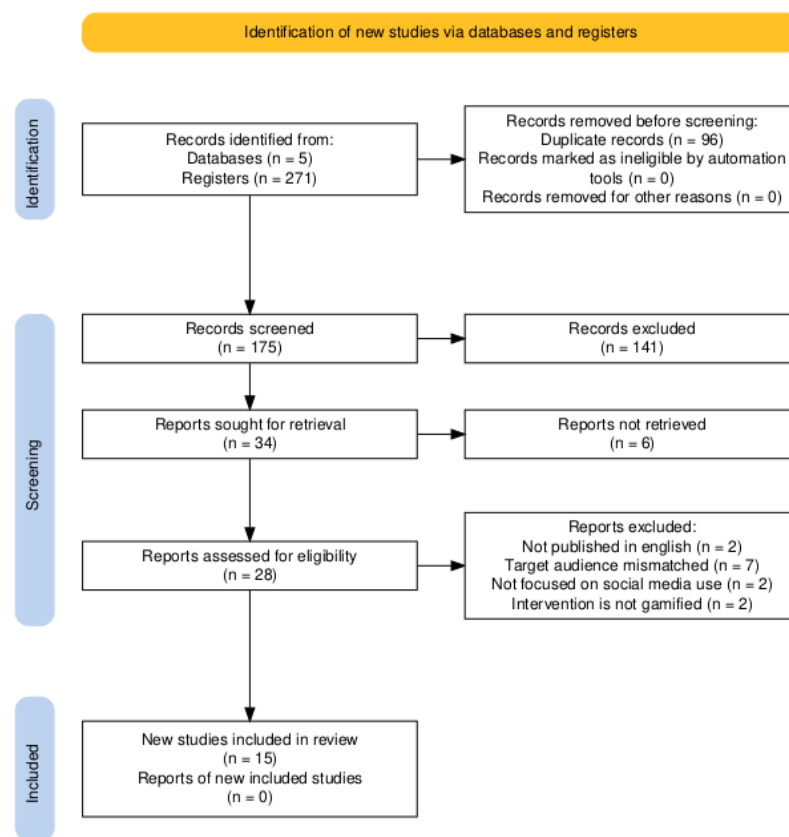


Figure 3.1: PRISMA flow diagram illustrating the study selection process.

3.2.1 Study Trends

Fig. 3.2 presents the number of studies published per year, categorised by publication quartile. First, there is a gradual increase in the number of studies, starting in 2018 and peaking in 2024. This growth may be associated with the increased use of social media among teenagers and the consequent need to inform and prepare them for potential risks and dangers. However, no studies were identified for the years 2022 and 2023. This gap may be explained by the applied inclusion criteria or by a temporary consolidation of research efforts.

Another relevant observation concerns the evolution of publication venues over time. In 2018 and 2019, all identified studies were published in conference proceedings. From 2020 onwards, conference publications remained present, with a notable increase in 2024, while journal articles began to emerge and gradually increased in number. No studies were published in Q3 or Q4 journals, and most journal articles appeared in Q1 venues. This distribution shows that research in this area has gained academic recognition and is increasingly characterised by higher methodological rigour.

The studies come from a diverse set of countries, mainly the United States and several European nations (e.g., Spain, Germany, and Portugal), with limited representation from Asia (Malaysia). This indicates a stronger research focus in Western regions.

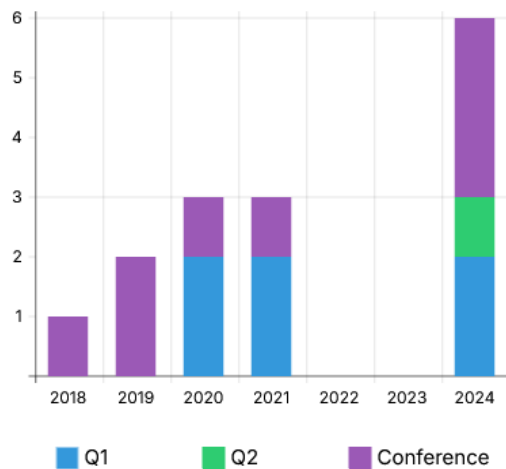


Figure 3.2: Publications by year and quartile

3.2.2 Population

Based on the studies reviewed, the target population is exclusively centred on adolescents and young teenagers, primarily within the 11 to 19 age range. The participants are almost entirely identified as middle and high school students, with sample sizes varying significantly across the literature, ranging from small-scale pilot groups of 21 to 22 participants to large-scale interventions involving over 1,300 students. These populations were reached through educational contexts, such as regular school classrooms, specialized cybersecurity summer camps, and university-led workshops, reflecting a research focus on integrating serious games into formal and informal learning environments. Notably, the collective population observed across these studies strictly adheres to all predefined inclusion and exclusion criteria for this review. Furthermore, this demographic accurately represents the specific target population of the current study, ensuring that the synthesized evidence is highly relevant and directly applicable to the intended research context.

3.2.3 Game Design

The analysed studies show consistent game design choices that support self-reflection and awareness of social media-related issues, including privacy, online safety, and cyberbullying. The majority of serious games adopt a *single-player* approach, allowing participants to engage privately and interact with socially complex scenarios without social pressure, encouraging self-reflection.

The most prevalent design approach across the reviewed studies is the use of narrative, [36], [32], [33], [37], and [38]. Most games present realistic, everyday digital scenarios, such as social media interactions or messaging, using consequential narratives to illustrate the outcomes of users' choices in an educational, ethical, and safe manner. These narratives are designed to promote awareness, emphasising users' reflection on the consequences of their actions rather than mastery, performance, or competition with others.

Another commonly adopted design approach is simulation. Games that follow this approach replicate familiar digital environments such as social networking platforms to facilitate user identification with the game context. By mirroring real-world social media interfaces, such as Instagram, these designs support the transfer of learning from the game context to everyday social media use. [39], [30], [40], and [41] exemplify this simulation-based approach.

Only a small number of studies explore *multiplayer* designs, [42] and [43]. The implemented multiplayer mechanics leverage social interaction enhancing cognitive and emotional engagement. This design approach appears less frequently in the literature, likely due to the increased technical and structural complexity of simulating live social environments [43], as well as ethical concerns regarding the potential for negative social pressure or the psychological burden of navigating peer-to-peer empathy in real-time [42].

The reviewed literature favours game designs that prioritise accessibility, realism, and ethical sensitivity. The analysed serious games focus on creating safe, structured environments that foster awareness, self-reflection, and discussion in formal educational settings; for example, PESEDIA [30] and PrivaCity [36].

3.2.4 Participatory and Co-Design Approaches

An important observation across the reviewed studies is the limited adoption of participatory and co-design methodologies. Only a small number of works explicitly involve stakeholders - such as educators or students - during the design process. A notable example is the design-based research by [44], which incorporates educators as domain experts throughout the development cycle.

In most studies, the design process is not described as participatory, and games appear to be primarily researcher- or developer-driven [30, 32–34, 36, 39–41, 45]. While these approaches still yield positive learning outcomes, the absence of direct input from the target audience may limit how well the game scenarios reflect adolescents' real-world digital experiences.

Table 3.2: Summary of Serious Games Addressing Online Safety, Privacy, and Media Literacy

Article	Authors & Year	Game Name	Design	Sample & Population	Skills	Features	Setting	Measures	Main Result
[34]	Jin, Ge and Tu, Manghui and Kim, Tae-Hoon and Heffron, Justin and White, Jonathan, 2018	<i>GenCyber</i>	Experimental	$N=181$ High school students	Safe online behaviour Threat recognition Social engineering detection	Four single-player games 3D VR decision paths Themed assets	Four 1-week camps	5-point Likert satisfaction survey	High school students learn cybersecurity skills effectively through a serious game
[36]	Berger, Erlend and Saethre, Torjus H. and Divitini, Monica, 2019	<i>PrivaCity</i>	Experimental	$N=104$, aged 13–19	Privacy awareness	Single-player narrative Conversational chatbot Consequential narrative Quizzes	Regular school activities	Student questionnaire and teacher feedback	Chatbot games can effectively raise teenagers' privacy awareness.
[39]	Ghazinour, Kambiz and Messner, Ken and Scarnecchia, Sean and Selinger, David, 2019	<i>Digital-Pass</i>	Experimental	$N=83$, High school students	Online privacy risk recognition	Single-player social media simulation Reward system	University visits, schools and summer camps	Likert questionnaires and gameplay logs	Simulation-based gamified education effectively raises social media privacy awareness.
[30]	Alemany, Jose and Val, Elena Del and Garcia-Fornes, Ana, 2020	<i>Pesedia</i>	Experimental	$N=405$, aged 12–14	Privacy risk recognition Privacy setting adjustment	Gamified vs. non-gamified social network Leader-boards, badges and points	University labs, classroom and home use	System log data and behavioural indices	Gamified social networks improve teenagers' privacy behaviour and engagement.
[32]	Calvo-Morata, Antonio and Rotaru, Dan Cristian and Alonso-Fernández, Cristina and Freire-Morán, Manuel and Martínez-Ortiz, Iván and Fernández-Manjón, Baltasar, 2020	<i>Conectado</i>	Experimental	$N=257$, aged 12–17	Cyberbullying awareness	First-person immersive game Consequential narrative Frustration based mini-games	One-hour school sessions	Pre/post questionnaires and free-text responses	Conectado increases student awareness and empathy about cyberbullying.
[33]	Calvo-Morata, Antonio and Alonso-Fernández, Cristina and Freire, Manuel and Martínez-Ortiz, Iván and Fernández-Manjón, Baltasar, 2021	<i>Conectado</i>	Experimental	$N=1301$, aged 12–17	Cyberbullying prevention strategies	First-person immersive game Consequential narrative	In-school sessions	Pre/post awareness questionnaires	Conectado effectively increases awareness of bullying and cyberbullying.
[35]	Kriglstein, Simone and Hengstberger, Fabian and Friert, Florian and Stiehl, Katharina and Schrank, Beate and Pfeiffer, Alexander and Wernbacher, Thomas and Wallner, Günter, 2020	N/A	Experimental	$N=29$, aged 11–15	Bullying awareness Bystander mediation	Single-player explorative Consequential narrative	Two-hour classroom lesson	Gameplay feedback and awareness assessment	Serious games raise adolescents' awareness of bullying consequences.

Article	Authors & Year	Game Name	Design	Sample & Population	Skills	Features	Setting	Measures	Main Result
[42]	Ferreira, Paula C. and Veiga-Simão, Ana Margarida and Paiva, Ana and Martinho, Carlos and Prada, Rui and Ferreira, Aristides and Santos, Francisco, 2021	<i>Com@Viver</i>	Quasi-experimental	$N=221$, 7th–8th graders	Empathy Perspective taking	Multiplayer social network simulation Narrative-driven	Classroom	IRI Perspective Taking Scale and reflections	Multiplayer game increases adolescents' empathy toward cyberbullying.
[45]	Shen, Low Wan and Mammi, Hazinah Kutty and Din, Mat Mazura, 2021	<i>CSAG</i>	Quasi-experimental	$N=21$, aged 13–17	Cybersecurity awareness	Web-based third-person shooter Badges, quizzes and leader-boards	Controlled sessions	Post usability survey	Game-based learning improves students' cybersecurity awareness.
[40]	Aprin, Farbod and Peters, Pascal and Hoppe, H. Ulrich, 2024	<i>InstaCour</i>	Experimental	$N=22$, aged 13–15	Media literacy Misinformation detection	Instagram-like simulation AI chatbot Badges	Classroom	Interaction logs and feedback	Virtual companion improves students' critical thinking on social media.
[37]	Brečko, Barbara Neža and Plaskan, Jure and Davidovi, Giorgi, 2024	<i>CyberSafe Tool</i>	Quasi-experimental	$N=959$, aged 13–16	Cyber-violence awareness	Narrative web-based game Scenario-based role-play	School work-shops	Impact questionnaires	Serious game improves teens' attitudes on cyberviolence.
[41]	Capecchi, Sara and Lieto, Antonio and Patti, Federica and Pensa, Ruggero G. and Rapp, Amon and Venero, Fabiana and Zingaro, Sandra, 2024	<i>Social4School</i>	Experimental	$N=217$, aged 12–14	Fake news detection	Social media simulation Sandbox	Classroom	SUS, eGameFlow and GUESS, logs	Serious game improves students' critical thinking on fake news.
[43]	Chattopadhyay, Dr. Ankur and Sharma, Saumya and Mbaya, Elisee and Rice, James, 2024	<i>VPET</i>	Quasi-experimental	$N=46$, High school students	Visual privacy awareness	Multiplayer adversarial game Competitive gameplay	Cybersecurity camps	Pre/post Likert surveys	VPET game effectively teaches K–12 students privacy and security concepts.
[38]	Doria, Jan and Grimm, Petra and Hohendanner, Michel and Kuhnert, Susanne, 2024	<i>Privat-o-Mat</i>	Qualitative	$N=54$, aged 14–18	Privacy literacy	Web-based Scenario-based	Classroom	Qualitative surveys	Privat-o-Mat promotes students' reflection on online privacy.
[44]	Kahila, Juho and Vartiainen, Henriikka and Arkko, Eetu and Lin, Anssi and Pope, Nicolas and Tedre, Matti, 2024	N/A	Design-based research	$N=163$, aged 11–14	Understanding data profiling	Narrative and pair-based Reflection tasks	Classroom	Written justifications	Gamified activity improves students' understanding of online data profiling.

Note. IRI: Interpersonal Reactivity Index; SUS: System Usability Scale; GUESS: Game User Experience Satisfaction Scale

3.2.5 Game Mechanics

Most reviewed games incorporate features to foster self-reflection, change attitudes, and raise awareness, rather than being competitive or focused on skill mastery. These features include decision-making with consequences, scenario-based role-play, social media simulation, and feedback and reinforcement mechanics. A small subset of games incorporated multiplayer and social interaction mechanics or competitive gameplay [30, 43, 45].

Most games include mechanics such as *decision-making with consequences*, and *scenario-based role-play*. Those games feature realistic scenarios in which players must choose how to respond. In some games, such as [42] and [35], players assume roles exploring different perspectives to observe the outcomes of their actions. These decisions lead to immediate consequences within the narrative, allowing players to see the various results of their actions in a safe environment. Games like *PrivaCity*, [36], *Conectado*, [32, 33], *CyberSafe Tool*, [37], and *Privat-o-Mat*, [38], incorporate these mechanics within a narrative, allowing the users to self-reflect and learn more from their actions.

Another common mechanic is the *social media simulation*. This mechanic introduces a familiar setting to the users, facilitating the transfer of learning to real-life digital contexts. It focuses on interactions with content feeds, profiles, messages, and privacy settings that closely resemble those of real-world social platforms. Incorporated into games such as *Digital-Pass*, *Pesedia*, *InstaCour*, and *Social4School*, this mechanic can be an excellent way for players to experiment with safe behaviours and recognise risks in a secure environment.

Feedback and reinforcement mechanisms, including quizzes, points, badges, and progress indicators, were also included in some games. These elements are used to reinforce learning outcomes rather than to foster competition. For example, quizzes and reflective questions are often presented after key scenarios to consolidate understanding, and badges or points serve as motivational indices. Competitive mechanics such as leader-boards appear less frequently and are used cautiously [30, 45], to avoid introducing social pressure or discouragement among adolescents.

A smaller subset of games includes *multiplayer and social interaction mechanics* [42, 43]. These mechanics were implemented to enable collaboration, discussion, or competition among players. Their limited adoption suggests a preference for individual approaches, likely due to ethical considerations.

3.2.6 Platform

A few different platforms were explored in the reviewed studies, with a clear preference for solutions that ensure accessibility and ease of deployment in educational settings. Most serious games were implemented as *web-based* applications, as seen in studies such as [37, 38, 45]. The games are played in standard browsers, without the need for installation, supporting scalability and straightforward integration. Many games were designed for *desktop or laptop computers*, as reported in studies such as [30, 32–34, 36, 39, 41]. These platforms enable more complex interfaces and immersive experiences.

GenCyber stands out for incorporating an immersive platform, such as virtual reality [34].

Finally, platform selection in the reviewed literature prioritises practicality and accessibility, favouring web-based and desktop solutions suitable for formal educational contexts.

3.2.7 Evaluation Methodologies

In the reviewed studies, experimental and quasi-experimental designs were the most common, typically implemented in classroom, workshop, or camp settings [30, 32–37, 39–43, 45]. The evaluations usually include pre- and post-intervention assessments to evaluate the effect of the gamified intervention and to measure observed changes in players' awareness, knowledge, and attitudes [32, 33, 43].

The primary evaluation methods are custom questionnaires, often using Likert-scale items [34, 36, 37, 39, 45]. Several studies employ validated tools, such as the System Usability Scale (SUS) and the Game User Experience Satisfaction Scale (GUESS) [41], or the Interpersonal Reactivity Index (IRI) [42]. Some studies incorporate gameplay logs and behavioural data to complement the questionnaire-based results [30, 39, 40].

Other approaches reported using open-ended survey responses, written reflections, or interviews with players [32, 38, 42, 44]. The primary focus of these evaluations is on short-term changes and immediate learning effects.

3.2.8 Expected Outcomes and Observed Effects

Across the reviewed studies, serious games are primarily designed to improve adolescents' awareness, knowledge, attitudes, and behaviours related to online safety, privacy, and media literacy. Expected outcomes commonly include enhanced risk recognition, better decision-making in online environments, increased empathy in social situations (e.g., cyberbullying), and improved critical thinking when interacting with digital content.

The reported results consistently indicate positive effects. Several studies show that serious games effectively improve cybersecurity knowledge and safe online behaviour [34, 45]. Similarly, privacy awareness and risk recognition are significantly enhanced through simulation-based and narrative-driven approaches [30, 36, 38, 39].

In the context of social interactions, games addressing cyberbullying demonstrate increased awareness, empathy, and perspective-taking among participants [32, 33, 35, 37, 42]. Furthermore, media literacy and critical thinking skills are also positively impacted [40, 41].

Some studies additionally report improvements in students' understanding of complex concepts such as data profiling and online tracking [44]. Overall, the findings suggest that serious games are effective tools for producing short-term learning gains and positively influencing attitudes and behaviours in digital contexts.

3.2.9 Discussion and Conclusions

This review synthesised current research on serious games designed to raise adolescents' awareness of the risks and potential negative impacts of social media use. The findings show trends regarding the use of narrative-driven mechanics, scenario-based role-play, and decision-making with consequences to foster self-reflection and critical evaluation of online behaviours. These mechanics, when used with simulated realistic scenarios or social media simulations, appear effective in supporting adolescents' understanding of privacy, cyberbullying, misinformation, and digital well-being safely and ethically.

There was a strong focus on web-based and desktop platforms, suggesting that accessibility and integration into formal education systems are top priorities. These platforms enable scalable deployment in classrooms and supervised settings, making it easy to structure interventions for adolescent users. While some games adopt interfaces similar to those of mobile social media applications, no study has reported a full-fledged application using a native mobile platform, indicating a cautious approach toward that platform.

Although the reviewed studies demonstrate positive short-term effects on awareness and attitudes, several limitations must be acknowledged. First, the number of eligible studies is minimal, constraining the generalizability of the findings and indicating that this research area is still new and still emerging. Second, most evaluations rely on short-term, self-reported measures collected immediately after gameplay, which restricts conclusions about long-term behavioural change and knowledge retention. Additionally, the use of virtual reality can increase engagement, realism, and impressiveness. However, their cost, technical complexity, and classroom feasibility explain why this approach was only incorporated in one single study.

An important observation is the limited adoption of participatory and co-design methodologies. The lack of user participation may contribute to a disconnect between game content and the evolving nature of social media practices, potentially affecting both engagement and the transfer of learning. Incorporating participatory or co-design strategies could therefore enhance the relevance, authenticity, and educational effectiveness of future serious games in this domain.

The reviewed studies indicate that serious games are well-suited to support reflection and learning in this domain, particularly by leveraging adolescents' familiarity with social media environments. Design strategies such as realistic simulations, narrative-driven scenarios, and consequence-based decision-making are relevant for engaging adolescents during a critical period of identity formation and self-exploration. These insights provide direct, helpful guidance on the characteristics a serious game in this area should include to foster engagement and meaningful reflection.

A tendency toward mechanics that prioritise reflection, ethical reasoning, and experiential learning can be observed. Competitive and multiplayer approaches were not as common, suggesting that existing serious games targeting social media awareness rely on individual, realistic simulations with structured feedback to encourage adolescents to evaluate their online behaviour and develop healthier digital habits critically.

In this context, this project addresses the central research question of whether it is possible to design a serious game that effectively raises awareness among adolescents about the potential risks and negative impacts of social media use. Rather than aiming to solve issues such as addiction, anxiety, or depression, the objective is to draw attention to these risks and encourage critical thinking about social media practices. The review highlights the importance of incorporating real-life scenarios, simulations of common social media platforms, and feedback on users' choices to support their learning and knowledge transfer. It also left an unexplored gap, co-design with adolescents, educators, and domain experts. Their insights can contribute to the game's usability, perceived impact on awareness, and alignment with real-world concerns, thereby supporting the development of a serious game that effectively promotes self-reflection and healthier digital habits among adolescents.

Chapter 4

Approach and Methodology

4.1 Research Design

To achieve the objectives of this research, it is proposed that the SG will be developed using a Participatory Design approach. The study will involve adolescents (defined by UNICEF and the World Health Organisation as individuals aged 10-19, [12] and [46]), their parents or legal guardians, and healthcare and justice professionals (e.g., psychologists, psychiatrists, jurists, therapists, educators, and social workers). The perspectives of these participants are essential to ensure that the SG design and content are relevant, engaging, and aligned with the target audience's needs and experiences.

Adolescents' contributions are essential to the design process, as they are the game's primary users. Likewise, professionals' insights will help guarantee that the game's contents and objectives are developmentally appropriate and psychologically meaningful. This collaborative approach will allow the SG to integrate educational, psychological, and technological perspectives in an evidence-based manner.

4.2 Participants

Participants will include adolescents and professionals from health and justice-related fields. All participants must be fluent in Portuguese and have access to a computer or mobile device with an Internet connection.

4.3 Study Structure

The research will be conducted online and divided into three main phases. Two major contact points with participants will occur: the first during the co-design phase (to inform the development of the SG) and the second after the game's development (to evaluate its usability and user experience).

4.4 Phase 1: Recruitment and Initial Assessment

4.4.1 Recruitment Procedures

In the 1st phase, schools (2nd and 3rd Cycles and Secondary Education), clinics, and professionals in the health and justice sectors will be contacted for recruitment. After obtaining authorisation from the respective Ethics Committees and administrative boards, the study will be disseminated through email invitations. Participants will receive detailed information about the study's objectives, procedures, and voluntary nature, and will have the opportunity to ask questions before participating. All adult participants will be required to provide informed, free, and clear consent, while adolescents will provide written informed assent along with parental consent.

4.4.2 Pre-questionnaire

After consent, participants will complete a brief pre-questionnaire including information such as age, education level, school year, and habitual use of social media and digital games.

4.5 Phase 2: Co-design and Game Development

4.5.1 Needs Assessment Through Interviews

In the 2nd phase, before game development, semi-structured interviews will be conducted to gather insights from adolescents and professionals on preferences, expectations, and motivational factors for the SG. These interviews will follow a predefined script and will include both closed and open-ended questions. Examples of custom questions include:

- "What aspect of social media do you find most positive or negative in your daily life?"
- "Would you enjoy playing a game that helps you reflect on your social media habits?"
- "What topics or scenarios should the game include to feel realistic or engaging?"
- "What type of challenges, feedback, or characters would make the game interesting?"
- "How could a game help you or your peers use social media in healthier ways?"
- Social Media Addiction Scale (SMAS) [47]

Interviews will be conducted online or in person, depending on the participant's preference. For online sessions, only audio recordings will be made (no video), and all interviews will be transcribed verbatim and anonymised. The information collected during this stage will guide the design and narrative elements of the SG, ensuring it aligns with adolescents' lived experiences and professionals' recommendations.

4.5.2 Iterative Game Development

The development of the SG will follow an iterative design process. Each prototype version will be tested and evaluated through short feedback interviews with participants from the previous stages. These sessions will focus on collecting impressions on usability, clarity, content relevance, and engagement. The feedback gathered in each iteration will inform subsequent design decisions, ensuring that the evolving prototypes integrate participants' ideas, expectations, and suggestions.

Examples of custom questions used during these feedback interviews include:

- "Was anything in the game confusing or difficult to understand?"
- "Do the situations presented in the game feel realistic or relatable?"
- "Did the game make you reflect on your own online habits?"
- "Did any challenge, activity, or message stand out as meaningful?"
- "Is there anything that should be removed or changed to improve the experience?"

4.6 Phase 3: Game Evaluation

4.6.1 Gameplay Period

Once the SG has been developed, participants will engage in a one-week play period during which adolescents will be asked to play the game freely and complete its activities and reflections.

4.6.2 Post-questionnaire Assessment

After gameplay, participants will be invited to complete a post-questionnaire battery to assess usability, experience, and satisfaction. Health professionals will also be asked to take part in a focused usability evaluation of the SG. These professionals will complete only the usability questionnaires (e.g., SUS/PSSUQ) to provide expert feedback.

The following standardised measures will be used in their Portuguese version:

- Social Media Addiction Scale (SMAS) [47]
- System Usability Scale (SUS) or Post-Study System Usability Questionnaire (PSSUQ) [48]
- Intrinsic Motivation Inventory (IMI) [49]
- The Game Experience Questionnaire (GEQ) [50]

Additionally, a custom-made game experience questionnaire will be developed including Likert-scale items (1-5) and open-ended questions addressing satisfaction, enjoyment, perceived learning, and behavioural impact, such as:

- "Were you able to complete the game?"
- "What did you like the most and the least about the game?"
- "Do you think the game helped you reflect on your social media use?"
- "Would you recommend this game to others your age?"
- "What would you change or improve in the game?"
- "The game increased my awareness of the risks associated with social media use." (Likert-scale)
- "After playing the game, I intend to make changes to my social media habits." (Likert-scale)
- "The game helped me better understand the potential negative consequences of certain on-line actions." (Likert-scale)

4.6.3 Follow-up Interviews and Focus Groups

Participants (adolescents and professionals) will be invited for follow-up semi-structured interviews or focus groups to explore in more depth their perceptions of the SG's usability, design, and potential impact on awareness and behaviour.

4.7 Data Management and Ethical Considerations

4.7.1 Data Collection and Storage

All data will be collected and stored anonymously using an online questionnaire platform that ensures access control, data encryption, and confidentiality. Each participant will be assigned a unique identification code (a combination of letters and numbers) that will be used throughout all phases of the study to maintain anonymity. Data will be stored on password-protected institutional servers, accessible only to the research team. Identifiable information (e.g., socio-demographic data, email addresses) will be stored separately from research data.

4.7.2 Ethical Compliance

The study will follow the ethical standards of the Helsinki Declaration (1964) and its subsequent amendments, as well as the Portuguese Data Protection Law (Lei n.º 58/2019). No financial compensation will be provided for participation.

Upon completion of the study, all identifiable data will be permanently deleted, and anonymised data will be retained only for scientific purposes - such as comparative analyses with future samples - with a maximum retention period of six years.

All required documentation for this study, including the research protocol, informed consent and assent forms, data protection procedures, and data collection instruments, was submitted to

and approved by the Ethics Committee of the Faculty of Engineering of the University of Porto (FEUP), under Report No. 53/CE-FEUP/2026.

4.7.3 Research Timeline

A Gantt diagram was created to illustrate an approximation of the planned study timeline. The timeline covers the entire research period, from September to June, and outlines the main phases, tasks, and expected durations.

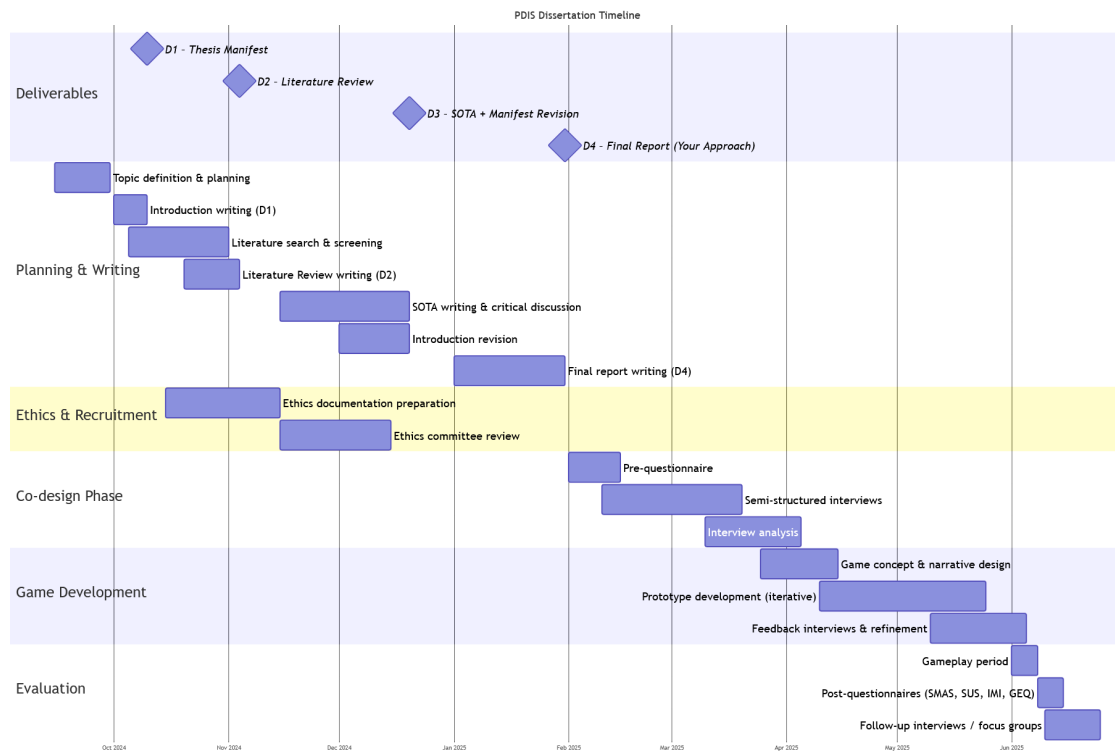


Figure 4.1: Gantt diagram showing the research timeline and key activities.

The Gantt diagram includes the following main tasks:

- **Co-design Phase:** Participant recruitment, pre-questionnaire, semi-structured interviews, and analysis of collected data.

- **Game Development:** Conceptualisation, game design, iterative prototype development, and refinement based on participant feedback.
- **Evaluation Phase:** Gameplay period, post-questionnaire, and follow-up interviews.

The Gantt diagram in Figure 4.1 presents the methodology as originally planned, organised around three main phases: a co-design phase (participant recruitment, pre-questionnaire, semi-structured interviews, and analysis of the collected data), a game development phase (conceptualisation, game design, iterative prototype development, and refinement based on participant feedback), and an evaluation phase (gameplay period, post-questionnaire, and follow-up interviews).

In practice, however, this plan could not be fully realised within the timeframe of this dissertation. The activities involving the direct participation of adolescents — namely the co-design interviews, the gameplay period, and the post-gameplay evaluation — could not begin before formal ethical approval was obtained. The approval from the Ethics Committee of FEUP (Report No. 53/CE-FEUP/2026) was granted on 28 May 2026, late in the project timeline, leaving insufficient time to carry out these participant-facing activities. Consequently, the co-design interviews with adolescents, the gameplay period, and the post-questionnaire battery and follow-up interviews could not be conducted within the scope of this work, and are instead carried forward as future work (see Chapter 7).

To ensure that the design of the serious game nonetheless remained grounded in evidence, the methodology was adapted to rely on sources of input that did not require the same participant recruitment and clearance. The first was a consultation with a panel of three expert psychologists, conducted through an interview, which provided professional, clinically informed guidance on the risks most relevant to adolescents and on the design principles most likely to engage them. The second was a phase of contextual research drawing on public online communities, particularly discussion forums in which adolescents and adults describe their own experiences with social media. Together, these sources allowed the game's scenarios and mechanics to be anchored in authentic, recognisable experiences and in expert knowledge, preserving the evidence-based spirit of the original plan while remaining within the ethical and temporal limits of the project. These two sources of input are described in detail in Chapter 5.

Chapter 5

Game Design: Insights from Healthcare Professionals and Target Audience

5.1 Interviews

Prior to the design and development of the serious game, an interview was administered to a panel of experts with the aim of grounding the project in professional knowledge and experience. This step served a dual purpose: to validate the relevance of the proposed themes and to gather evidence-based insights regarding the needs of the target audience, adolescents aged 10 to 19, and the most effective strategies for engaging them through digital educational tools.

5.1.1 Objectives

The interview was designed to achieve the following objectives:

- Understand expert perceptions of the main risks associated with the excessive use of social media among adolescents;
- Evaluate the limitations of traditional educational methods and the potential of interactive approaches;
- Identify the themes, scenarios, and mechanics considered most relevant and effective for a serious game on this topic;
- Gather recommendations regarding interface design, visual style, feedback strategies, and accessibility;
- Assess the importance of including safeguarding elements, such as external support resources, within the game experience.

5.1.2 Participants

The questionnaire was completed by three experts, all female psychologists with between 13 and 20 years of professional experience. Two of the three participants reported working directly with adolescents (aged 10 to 19). Regarding prior use of digital tools in their practice, one expert had already used or recommended digital tools (games or applications) in a therapeutic or educational context, while the remaining participant had not. Concerning familiarity with the concept of social media addiction, both respondents who answered this question confirmed being familiar with it. The frequency with which experts encountered cases related to problematic social media use varied: one reported dealing with such cases rarely, while the other encountered them sometimes.

Table 5.1 summarises the demographic and professional profile of the participants.

Table 5.1: Expert participants' profile

Expert	Age	Field	Experience (years)	Works with Adolescents
E1	44	Psychology	20	Yes
E2	36	Psychology	13	Yes
E3	40	Psychology	17	N/A

5.1.3 Structure and Content

The questionnaire was structured around three main areas: (1) expert characterisation and professional context; (2) perception of social media risks among adolescents and limitations of existing approaches; and (3) recommendations for the design of the serious game, covering themes, mechanics, visual style, feedback, interface, and safety considerations.

Questions were presented in a mixed format, combining closed-ended items (e.g., yes/no, frequency scales) with open-ended questions designed to elicit in-depth qualitative responses. The questionnaire was administered in Portuguese, as all participants were Portuguese-speaking professionals.

5.1.4 Results and Analysis

5.1.4.1 Main Risks of Social Media Use Among Adolescents

The experts identified a consistent set of risks associated with excessive social media use. Both respondents highlighted emotional and psychological difficulties: one pointed to problems with emotional regulation and social skill development, as well as attentional difficulties stemming from the constant attention-capturing mechanisms built into social media platforms. The other expert emphasised the harm caused by constant social comparison with idealised portrayals of others' lives, leading to increased anxiety and depressive symptoms, as well as addictive patterns that reduce time devoted to more meaningful activities such as studying and family interaction.

5.1.4.2 Limitations of Traditional Methods and the Role of Interactive Approaches

When asked to evaluate the efficacy of traditional educational methods, such as lectures and written materials, both experts expressed scepticism about their effectiveness with adolescents. One noted that, precisely because of the attentional difficulties associated with social media use, traditional formats tend to be poorly received and must be made highly interactive and experiential to meaningfully engage young people. The other expert observed that a common limitation of lectures is adolescents' tendency to underestimate the time they spend on social media and to fail to recognise the consequences of that behaviour. She suggested several interactive strategies as alternatives, including simulation-based games presenting real-life scenarios with decision-making tasks followed by small-group discussions, games involving the identification of authentic versus fabricated social profiles, and role-playing exercises in game format.

5.1.4.3 Contribution of Gameplay Simulation to Learning

Regarding the potential of everyday scenario simulation within a game environment, one expert acknowledged a certain conceptual tension in using a digital format to raise awareness about the risks of digital tools, while recognising it may be the most effective way to reach this age group. She emphasised that the success of this approach would depend heavily on how the game is implemented, so that it is not perceived as just another game with no real-world relevance. The other expert agreed on the value of simulation, particularly when followed by structured reflection time, and warned of the risk that, without such debriefing, adolescents may respond in socially expected ways rather than genuinely engaging with the content.

5.1.4.4 Essential Themes and Scenarios

Both experts converged on a set of core themes for the game. These included social comparison and its link to anxiety and depression, excessive use and its impact on daily life, the contrast between digital and real life, body image and lifestyle portrayals, and the addictive potential of social media. One expert also highlighted the importance of addressing the fear of negative evaluation stemming from biased social comparison. The other specifically mentioned the value of including scenarios related to personal data disclosure, interactions with strangers, cyberbullying and harmful language, and the emotional impact of online criticism. Both justified these choices based on the prevalence and clinical relevance of these issues in their professional practice.

5.1.4.5 Decision-Making and Multiple Narrative Paths

Both experts underscored the importance of allowing players to make meaningful choices with visible consequences and multiple narrative branches. One described this as essential for making the experience more immersive and personalised, and thus more impactful. The other emphasised that players should come to understand that all decisions carry consequences, a lesson that is particularly pertinent given that this lack of awareness is itself a central part of the problem.

5.1.4.6 Visual Style

One expert recommended a 2D visual style. The other suggested adopting an aesthetic similar to the games adolescents already play, as a means of increasing motivation and identification with the game world. Both responses pointed toward prioritising familiarity and appeal over technical sophistication.

5.1.4.7 Feedback Strategies

The experts differed somewhat in their preferences for feedback modalities, though with overlapping principles. One recommended a multimodal approach combining visual and auditory feedback, designed to be as immersive as possible. She advocated for immediate feedback following each decision complemented by more reflective feedback at the end of each chapter, addressing beliefs, thoughts, and self-efficacy expectations. The other expert preferred reflective feedback, mainly in textual format, acknowledging that visual elements could be incorporated when appropriate. Both agreed that feedback should serve awareness-raising functions while maintaining engagement.

5.1.4.8 Moments of Explicit Reflection

One expert expressed a preference for feedback over frequent pause moments, recommending that structured reflection be reserved for the end of chapters and kept brief and direct so as not to fatigue the player. The other, in contrast, emphasised the importance of the game functioning as more than an entertainment tool — serving as a space that encourages players to connect the scenarios to their own real-life contexts.

5.1.4.9 Balance Between Entertainment and Education

One expert described the ideal balance as an even split between entertainment and educational content. The other elaborated on this, suggesting that the game should incorporate entertainment elements, such as scoring systems for correct responses, while simultaneously enabling reflection and deliberation. Both agreed that neither dimension should be sacrificed at the expense of the other.

5.1.4.10 Interface Design

Regarding interface simplicity, one expert recommended focusing on a single main character and avoiding complex multi-perspective narratives. The other highlighted the importance of simple instructions, minimal visual stimuli, and short text passages. Both recommendations converge on the need for a clean, uncluttered interface suited to the target age group.

5.1.4.11 Mobile Accessibility

One expert described mobile accessibility as essential, while the other highlighted its practical value in allowing the game to be used across a variety of contexts. Both responses supported the prioritisation of a mobile-compatible design.

5.1.4.12 Sensitive Content and Safeguarding

The experts recommended handling sensitive topics with care but without necessarily avoiding them, provided that relevant support information is made available. One suggested that the game should present support resources dynamically: either when risk patterns are detected through in-game choices, or consistently when sensitive topics are addressed. The other recommended including a mechanism for players to report their emotional state after gameplay, and suggested that support resources be triggered if responses indicate elevated psychological risk. Both experts agreed on the importance of ensuring that support information is contextually appropriate and presented in a way that does not disrupt the game experience.

5.1.4.13 Challenges and Critical Success Factors

When reflecting on the broader challenges of using serious games to promote behaviour change, one expert expressed a preference for a distributed experience over time but acknowledged concerns about adherence, suggesting that gamification elements could help maintain engagement. She also emphasised the value of testing the game with potential users prior to deployment. The other expert highlighted the importance of creating a game that truly motivates players, closely resembling the games adolescents already enjoy.

5.1.5 Summary and Design Implications

The interview results provided a rich foundation for informing the design of the serious game. The convergent and complementary perspectives of the expert panel allowed for the identification of a coherent set of design principles:

- The game should address themes of social comparison, body image, excessive use, digital versus real-life balance, and personal data safety;
- Scenario-based gameplay with branching narratives and visible decision consequences is both pedagogically sound and engaging;
- Feedback should be multimodal, combining immediate post-decision responses with reflective end-of-chapter summaries;
- The visual style should be 2D and familiar in aesthetic, tailored to the target age group;
- The interface must be simple, focused, and accessible on mobile devices;

- Sensitive content should be handled carefully but not avoided, and external support resources should be integrated contextually and non-intrusively;
- The game should strike a balance between entertainment and education, with gamification elements to support sustained engagement.

These findings directly informed the subsequent design decisions documented in the following sections.

5.2 Forum-Based Inspiration: Real Voices on Social Media Use

Beyond the formal expert consultation, an important source of inspiration for the game's design came from a more informal but equally revealing channel: online discussion forums where ordinary people — including adolescents — speak candidly about their relationship with social media. Communities such as Reddit host thousands of threads in which users share personal experiences, frustrations, realisations, and confessions about their digital habits. These accounts, unfiltered and unsolicited, offered a perspective that academic questionnaires and clinical interviews rarely capture: the texture of everyday life shaped by social media.

Two threads in particular stood out as especially illustrative. In a post on r/teenagers titled “*26th hour of not using social media*”, a teenager described the experience of voluntarily stepping away from social platforms and tracking the hours that followed. What made this account striking was not the act of quitting itself, but the granular emotional detail: the recurring urge to check a phone, the unfamiliar discomfort of unoccupied time, and the gradual sense of calm that began to emerge. This kind of testimony reveals something that is difficult to convey through statistics — the almost involuntary, compulsive quality of social media use and the way its absence is felt as a mild but persistent withdrawal. For game design, this translated into a core insight: the game should not simply inform players that social media use is excessive; it should make them *feel* the pull, the boredom, and the relief in ways that mirror real experience.

The second thread, found in r/Futurology under the title “*Social media is harming adolescents at a scale we've never seen before*”, offered a different but complementary perspective. Here, the comments did not come from teenagers themselves but from adults reflecting on what they observed in younger generations — teachers, parents, psychologists, and former adolescents who had experienced or witnessed the effects firsthand. The thread was characterised by a tone of genuine concern, and many commenters spoke of social media's harms not as a future risk but as a present reality already playing out in classrooms, families, and mental health services. This reinforced the decision to ground the game in recognisable, present-tense scenarios rather than abstract warnings about future consequences.

More broadly, browsing these kinds of forum threads revealed several recurring themes that proved directly relevant to the game's narrative design. Users across multiple communities described the experience of comparing themselves unfavourably to the carefully curated content of others, feeling excluded when seeing friends socialise without them, struggling to put their phone

down even when consciously wanting to, and noticing a link between heavy social media use and feelings of emptiness or low mood. These themes are not new to the research literature, but encountering them in the first-person voice of real people — written informally, with frustration, humour, or quiet sadness — gave them a human weight that shaped how the game’s scenarios were constructed.

This phase of forum browsing served, in essence, as an informal form of user research. It complemented the expert knowledge gathered in the interviews by anchoring the game’s themes in lived experience, ensuring that the situations, emotions, and decisions portrayed in the game would feel authentic to the adolescents who play it.

Alongside the expert interviews, the design process was informed by a broader phase of contextual research, drawing on online communities, academic studies, and institutional reports. The aim of this phase was to complement the professional perspectives gathered from experts with the lived experiences of adolescents themselves, as well as with the most recent empirical evidence on the nature and scale of social media risks among young people. This triangulation of sources — expert knowledge, user testimony, and scientific literature — helped ensure that the game scenarios and mechanics were grounded in authentic, recognisable situations rather than abstract or clinically constructed problems.

5.2.1 Online Communities as a Window into Adolescent Experience

One of the most revealing sources of inspiration came from online forums, particularly Reddit communities where adolescents discuss their own experiences with social media use, detachment, and digital wellbeing. Threads on communities such as r/teenagers provided candid, first-person accounts of what it feels like to step away from social media — including the unexpected difficulty of doing so, the discomfort of silence and boredom in the absence of constant stimulation, and the gradual clarity that follows. These testimonies illustrated how deeply habitual social media use becomes, and how unfamiliar the absence of it can feel, even over a period of just a few hours or a single day. For game design purposes, these accounts offered a valuable blueprint for the emotional arc a player might experience throughout the game: the initial pull of checking one’s feed, the anxiety of disconnection, and the gradual realisation of what is being gained or lost.

Similarly, discussions in broader communities such as r/Futurology surfaced ongoing public debate about the systemic scale of social media harm among adolescents, including references to scientific findings and policy responses. These threads served as a reminder that awareness of the problem is not confined to clinical or academic settings — it is increasingly part of public discourse — and that a game designed for adolescents need not shy away from the seriousness of these issues, provided they are addressed with care and age-appropriate framing.

5.2.2 Synthesis and Implications for Design

Taken together, these sources served as a rich and diverse foundation for the game’s design. They reinforced many of the themes identified by the expert panel (social comparison, FOMO, excessive

use, body image) while also adding important nuances: the emotional ambivalence of adolescents toward social media, the systemic nature of the problem at population level, and the role of platform design in sustaining addictive behaviour.

This phase of contextual research will be returned to throughout the design chapter, as specific scenarios, dialogue choices, and feedback mechanisms are linked back to the real-world experiences and evidence that motivated them.

Chapter 6

Game Development

This chapter describes the design and development of the serious game produced in this dissertation. The development process was not conducted in isolation; rather, it represents the synthesis of three distinct streams of evidence gathered throughout this work. The first is the systematic literature review presented in Chapter 3, which identified the design approaches, mechanics, and platforms most consistently associated with effective serious games in this domain. The second is the expert interviews described in Section 5.1, which grounded the design in the clinical knowledge of practising psychologists. The third is the contextual research drawn from online communities and adolescent testimony presented in Section 5.2, which anchored the game’s scenarios in authentic, recognisable lived experience. Each design decision documented in this chapter is traced back to one or more of these sources, in keeping with the evidence-based methodology adopted throughout the project.

The game places the player in the role of a fictional adolescent over the course of a single week. Through five narrative scenarios, the player encounters a sequence of everyday social media dilemmas and must decide how to respond to each. The consequences of these decisions accumulate across the week and are ultimately reflected in a final outcome that characterises the kind of digital life the player has constructed. The following sections detail the technological foundation of the game, its genre and overarching design philosophy, its structure and intended deployment context, the individual scenarios, the feedback mechanisms, and the expected pedagogical outcomes.

6.1 Game Engine

The game was developed using Godot 4, an open-source game engine. As discussed in Section 2.3.2, the selection of a game engine has significant implications for the feasibility, scalability, and iterative refinement of a serious game project, particularly within a user-centred design process. Godot was chosen over the more graphically powerful Unity and Unreal Engine for several interrelated reasons that align directly with the requirements of this work.

First, Godot’s lightweight architecture and intuitive scene system facilitate rapid prototyping. The ability to construct, modify, and test discrete narrative scenarios quickly was essential to an

iterative development model in which each scene could be revised independently in response to expert input. Second, Godot employs GDScript, a high-level scripting language with a syntax similar to Python, which lowers the barrier to implementing the branching logic, stat tracking, and dynamic interface elements that the game's design demanded. Third, and importantly given the accessibility concerns raised by the expert panel, Godot's open-source nature imposes no licensing constraints and supports export to desktop, web, and mobile platforms. This directly addresses the recommendation, articulated by both consulted psychologists in Section 5.1, that the game should be accessible on mobile devices to allow its use across the varied contexts of adolescents' daily lives.

The technical structure of the game reflects Godot's scene-based paradigm. Each of the five narrative scenarios is implemented as an independent scene, and transitions between them are managed by a persistent autoloading node, referred to throughout development as the `GameManager`. This node retains the player's accumulated statistics as they move from one scenario to the next, thereby enabling the cumulative consequence mechanic that constitutes the pedagogical core of the game. Without this persistent state, each scenario would be experienced in isolation, and the central educational message — that the effects of social media use compound gradually over time — would be lost.

In its current form, the game was developed and built as a desktop application for the Windows platform, which served as the primary environment for development and testing. Nevertheless, one of the central reasons for selecting the Godot engine was its cross-platform export capability: the same project can be exported to other targets, including Android, with minimal modification. This is particularly relevant given that mobile accessibility was identified by the expert panel as an important factor for reaching adolescents in the varied contexts of their daily lives (Section 5.1). A native Android build therefore represents a straightforward and intended extension of the current prototype, allowing the game to be deployed on the devices through which adolescents most commonly access social media.

6.2 Game Genre and Design Philosophy

The game is best characterised as a narrative-driven serious game incorporating elements of simulation. This classification emerged directly from the convergent findings of the systematic literature review and the expert consultation. As established in Section 3.2.3, narrative and simulation were the two most prevalent design approaches across the reviewed studies, with narrative-driven games using consequential storytelling to illustrate the outcomes of user choices, and simulation-based games replicating familiar digital environments to facilitate the transfer of learning to real-world contexts. The game developed here deliberately combines both: it presents a continuous narrative across the week while simulating the interfaces — feeds, group chats, stories, and notifications — of the social media platforms adolescents use daily.

The decision to adopt a single-player format is likewise grounded in the literature. The review found that the majority of serious games in this domain favour individual engagement, allowing

players to interact with socially complex scenarios privately and without the social pressure that a multiplayer environment might introduce. This privacy was identified as conducive to genuine self-reflection, which is the primary aim of the game. Competitive and multiplayer mechanics, which appeared infrequently in the reviewed studies and raised ethical concerns regarding peer pressure, were therefore deliberately excluded.

The expert interviews provided further, more granular guidance that shaped the design philosophy. The psychologists consulted converged on the value of scenario-based gameplay featuring branching narratives and decisions with visible consequences. One expert explicitly recommended simulation-based games that present real-life scenarios with decision-making tasks, while also cautioning that such an approach carries an inherent conceptual tension: using a digital tool to raise awareness about the risks of digital tools. She noted that the success of the game would depend heavily on its implementation, so that it would not be perceived merely as another game disconnected from real-world relevance. This concern directly informed the central design principle of the game: rather than abstractly informing the player that social media use can be harmful, the game seeks to make the player *feel* the psychological pulls at work — the compulsion to keep scrolling, the sting of social comparison, the urgency of an escalating group conflict, and the ache of exclusion. This principle is the design embodiment of the insight drawn from the forum testimonies in Section 5.2, where adolescents described, in their own words, the almost involuntary quality of their social media use and the discomfort of its absence.

Finally, the experts emphasised that the game should strike a balance between entertainment and education, and that neither dimension should be sacrificed for the other. The game pursues this balance by embedding its educational content within an engaging, relatable narrative and a familiar interactive interface, reserving explicit instruction for brief reflective moments rather than allowing it to dominate the experience.

6.3 Game Structure and Deployment Context

The game is structured as five sequential narrative scenarios, each representing a single day in a fictional week of the player's life. The complete playthrough is estimated to take between fifteen and thirty minutes, with the variation depending largely on how much time the player devotes to reading the educational feedback and reflecting on each decision. This session length was a deliberate design choice, determined by the intended deployment context of the game and informed by both the literature review and expert recommendation.

The systematic literature review established, in Section 3.2.7, that the overwhelming majority of serious games in this domain are deployed within formal educational settings — classroom sessions, supervised workshops, and summer camps — typically occupying between one and two hours of structured time. A game requiring fifteen to thirty minutes of play fits comfortably within a single classroom session while leaving sufficient time for the structured group discussion that the expert panel considered essential. Indeed, one of the consulted psychologists stressed that the educational value of a simulation-based game depends substantially on a subsequent period of

structured reflection, warning that without such a debriefing, adolescents may respond in socially desirable ways rather than engaging authentically with the content. The chosen session length therefore reserves classroom time for precisely this kind of facilitated reflection, positioning the game as one component of a broader educational intervention rather than a self-contained experience.

The narrative is organised as a five-day progression, beginning on a Sunday night and concluding the following Friday. The scenarios are ordered to construct an escalating arc that moves from a private, internal dilemma toward increasingly social and interpersonal stakes. The first scenario, set on Sunday night, concerns the solitary act of late-night scrolling. The second, on Monday, introduces social comparison through a peer's idealised post. The third, on Wednesday, plunges the player into an interpersonal group conflict. The fourth, on Thursday, presents the diffuse social pressure of a viral challenge. The fifth and final scenario, on Friday night, confronts the player with the fear of missing out, returning the narrative to the private bedroom setting of the first scene but with markedly higher emotional stakes. This deliberate bookending of the week within the same physical space — the bedroom — was intended to underscore the contrast between how the player begins and ends the week, depending on the choices made throughout.

A distinctive feature of the game's structure is that each scenario opens with a dynamic introductory overlay whose text adapts according to the player's accumulated statistics. Rather than presenting an identical narrative framing to every player, the game tailors the introduction to reflect the consequences of prior decisions. A player whose choices have eroded their real connections, for instance, will encounter framing that conveys a weary familiarity with social conflict, whereas a player who has maintained their well-being will encounter a more neutral or hopeful tone. This adaptive mechanism reinforces the cumulative nature of the player's choices and was designed to make the consequences of earlier decisions felt even before the next decision is presented.

6.4 The Statistic System

Underlying the entire game is a system of four statistics that quantify the player's well-being across the dimensions most relevant to the psychological literature on social media and adolescent mental health. These four statistics are Mental Health, Sleep, Self-Image, and Real Connections. Their selection was guided by the conceptual background presented in Chapter 2 and corroborated by the themes the expert panel identified as clinically most prevalent: emotional and psychological distress, sleep disruption, body image and self-esteem, and the displacement of real relationships by digital interaction.

Each statistic begins at a value of seventy out of one hundred, situating the player in a state of moderate well-being at the outset of the week. As the player makes choices throughout each scenario — and as they engage in optional interactions, such as liking individual posts within a feed — these statistics are adjusted by predetermined amounts. The effects accumulate continuously across the five scenarios, so that the player's final state is the product of every decision made over the course of the week, not merely the last choice in each scene.

A crucial design decision, recommended explicitly by the expert panel, was to conceal these statistics from the player during gameplay. The psychologists cautioned that if players were able to see their scores while making decisions, they might begin to optimise their choices to maximise numerical outcomes rather than engaging genuinely with the moral and emotional substance of each scenario. By hiding the statistics until the conclusion of the game, the design preserves the authenticity of the player's decision-making. The cumulative effect of the player's choices is revealed only at two carefully chosen moments: partially, through the stat changes displayed in the notification popup at the end of each scene, and fully, on the final outcome screen. This approach allows the player to remain immersed in the narrative throughout, while still receiving the feedback necessary to recognise the consequences of their behaviour.

6.5 Narrative Scenarios

The five scenarios constitute the core of the game and are described in detail in the following subsections. For each, the narrative premise, the interactive elements, the available choices and their consequences, and the design rationale linking the scenario to the supporting evidence are presented in turn.

6.5.1 Scene One — Sunday Night

The first scenario takes place in the player's bedroom on a Sunday night, the evening before the first week of school after a holiday. The player is presented with a darkened room, lit chiefly by the glow of a phone, and is free to look around the environment before deciding how to proceed. The introductory overlay establishes the situation: it is late, school begins in a matter of hours, and the phone is already in hand, as it always is. The feed has loaded with a series of posts engineered to provoke comparison — a photograph from a beach party to which they were not invited, a peer's summer body transformation, and a fitness account proclaiming that a lack of results reflects nothing more than insufficient desire.

The player may open the phone and browse the simulated feed, which contains three posts. Each post can be liked, and doing so reveals a brief internal monologue articulating the psychological effect of that particular piece of content while applying a corresponding adjustment to the relevant statistic. This mechanic allows the player to experience, in microcosm, the accretive harm of passive consumption: each individual like seems inconsequential, yet each erodes the player's self-image or mental health by a small margin. Having browsed the feed, the player must make one of three primary choices. The first is to continue scrolling, which incurs a substantial penalty to both sleep and mental health. The second, triggered not through a menu but by physically directing the player to place the phone on the bedside table, is to put the phone down and attempt to sleep, which improves both sleep and mental health. The third is to post something of one's own in the hope of being noticed, which damages self-image and sleep most severely of all.

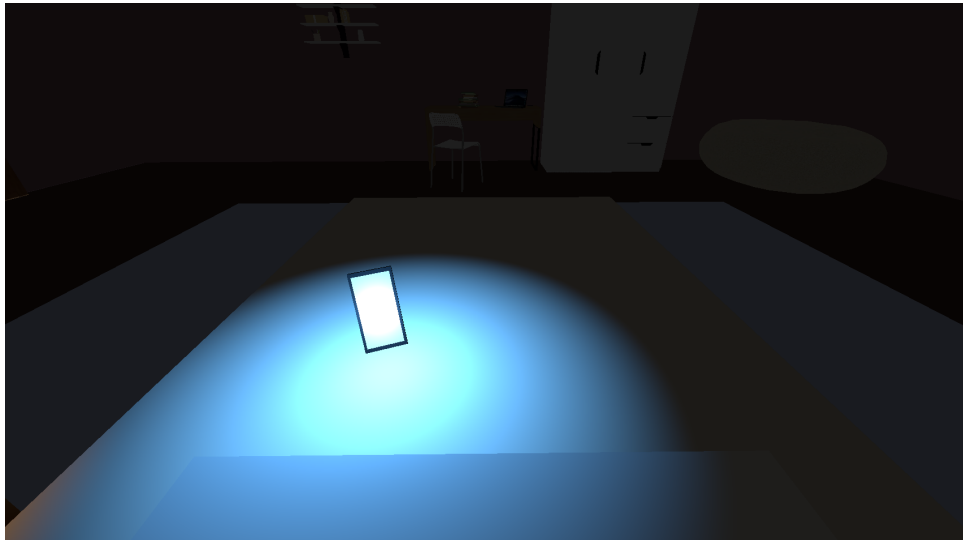


Figure 6.1: Scene One — Sunday Night. The bedroom environment at the start of the game, with the phone visible.

The design of this scenario draws on several strands of the supporting evidence. The content of the three posts — a body transformation, an exclusion from a social event, and a demotivating message — was chosen to embody the themes the expert panel identified as clinically most prevalent: social comparison, body image, and the fear of negative evaluation. The decision to implement the act of putting the phone down as a physical interaction with the bedside table, rather than as an abstract menu option, reflects the experts' recommendation that choices be embedded within the environment to heighten the player's sense of agency and presence. Most fundamentally, the scenario was designed to make tangible the experience documented in the forum testimony of Section 5.2, in which a teenager described the difficulty of stepping away from the phone and the gradual calm that followed; the choice to disengage is presented here not as a trivial default but as a deliberate act with a meaningful reward.

6.5.2 Scene Two — Monday: The Selfie

The second scenario relocates the player to a school corridor during the Monday lunch break. Unlike the static bedroom of the first scene, this environment permits free movement, and the player may choose to approach either the phone or a group of friends positioned within the space. The narrative premise concerns a selfie posted by a peer named Mia, which, though technically an ordinary photograph, possesses the polished quality of a magazine cover and has accumulated hundreds of likes within minutes. The in game player has also posted a photograph that day; it has received twelve likes, two of which come from a cousin and a parent.

When the player opens the phone, the feed displays the two posts. A particularly significant mechanic is implemented here: Mia's like counter increments in real time for as long as the phone remains open, simulating the psychological pressure of watching another person's social validation accumulate while one's own remains static. The player may also tap to leave a comment on Mia's

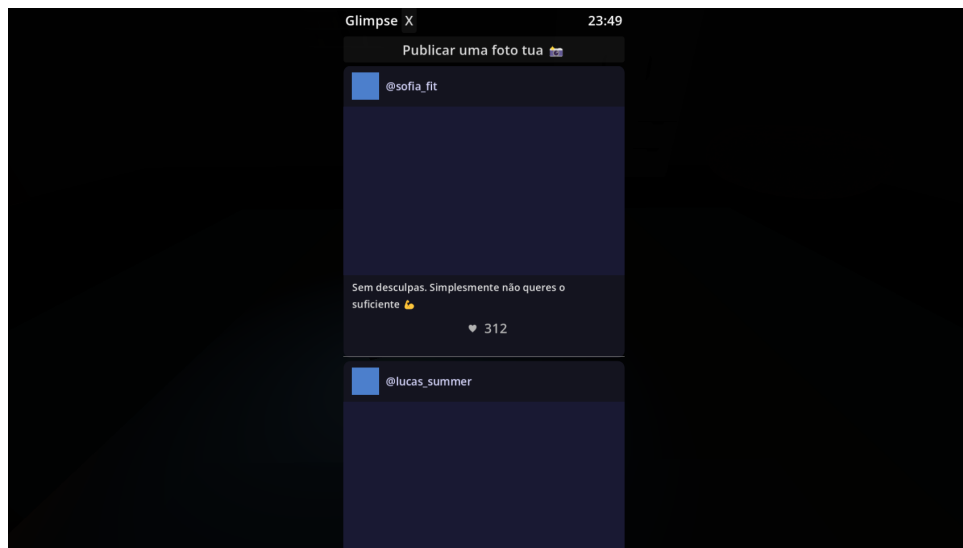


Figure 6.2: Scene One — The simulated social media feed, showing a post and the internal monologue revealed upon interaction.

post, which reveals a set of sub-options. Three primary choices are available. The player may edit and repost their own photograph with filters, which damages self-image and mental health; this choice is triggered through the phone's publish button. Alternatively, the player may abandon the comparison and instead approach the group of friends to engage in conversation, an action that improves both self-image and real connections and is triggered by walking to the friends within the environment. The third choice is to leave a passive-aggressive comment on Mia's post, which inflicts the heaviest damage to real connections and also harms mental health.

The real-time like counter was designed as a direct operationalisation of the research, discussed in Section 2.2, concerning variable reward schedules and their role in fostering compulsive checking behaviour. By rendering the relentless climb of another's validation visible and continuous, the mechanic reproduces the comparative anxiety that the expert panel identified as a central harm of social media use. Equally deliberate was the decision to represent the prosocial alternative — conversation with friends — as a tangible, navigable object within the three-dimensional environment, equally accessible as the phone. This spatial design choice was intended to avoid framing disconnection from the phone as mere absence or deprivation; instead, the alternative to digital comparison is presented as a present and inviting possibility, reflecting the expert emphasis on the value of real connection.

6.5.3 Scene Three — Wednesday: The Drama

The third scenario confronts the player with an interpersonal conflict that has erupted within the player's friend group. The premise is that a voice message, which someone deemed rude, has set the group chat ablaze; screenshots are circulating, and a private message that a friend named Carla sent about the player three weeks earlier has been forwarded to the entire group. The phone has not stopped buzzing for forty minutes. The environment is a path through a park, flanked by two



Figure 6.3: Scene Two — Monday: The Selfie. The school corridor, with the phone and the group of friends as the two principal points of interaction.

rows of trees, through which the player may walk freely while retaining the option to open the phone.

This scenario is distinguished by its buzz mechanic. Every two seconds, the phone vibrates, a new message is appended to the group chat feed, and a notification counter increments. The intended effect is to produce a mounting sense of urgency that mirrors the lived experience of being caught in an escalating online conflict, as described in the forum accounts of Section 5.2. Within the phone, the player may take several actions, and notably, more than one action may be taken before the scene concludes, distinguishing this scenario from the others. The player may screenshot the conversation and forward it to others, which inflicts severe damage on both real connections and mental health. They may write a message intended to de-escalate the conflict, which yields a modest improvement to real connections. They may take a side in the dispute, which damages real connections and mental health. Or they may mute the group entirely, which improves mental health.

The design of this scenario was shaped by the expert observation that adolescents frequently act impulsively during online conflicts precisely because the rapid pace of such exchanges leaves no room for reflection. The persistent buzzing was conceived as a means of reproducing this pressure within the game, transforming the act of muting or disengaging from a passive non-action into a deliberate and effortful decision. In this way, the scenario does not merely tell the player that disengagement is wise; it requires the player to resist the simulated urgency in order to choose it, thereby allowing the player to experience, rather than simply be told, the discipline that healthy disengagement demands.

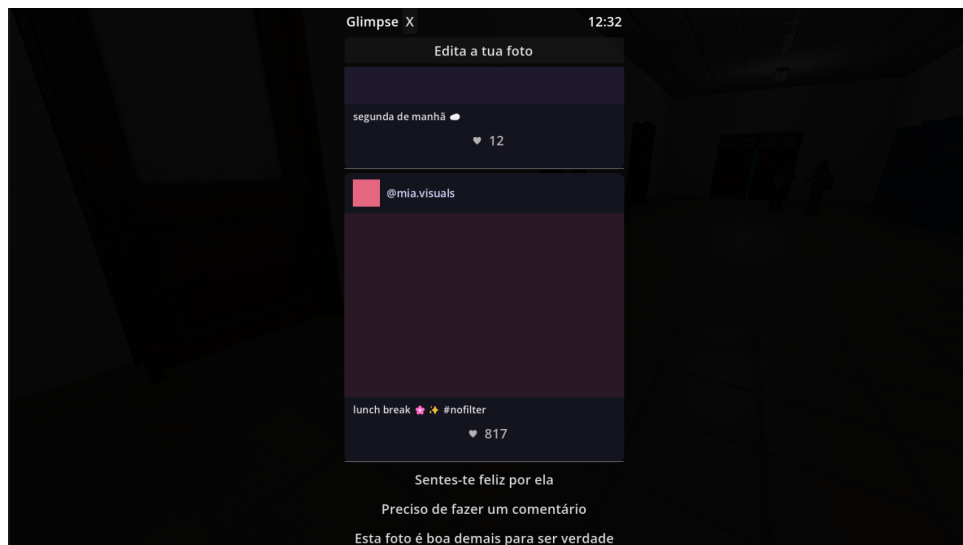


Figure 6.4: Scene Two — The phone feed displaying the player’s and Mia’s posts side by side, with Mia’s like counter incrementing in real time.

6.5.4 Scene Four — Thursday: The Challenge

The fourth scenario presents a viral social media challenge as its central dilemma. The premise is that a trend has taken hold whereby participants film themselves performing an action to a particular sound and tag three friends to continue the chain. The player has been tagged twice, once by someone who barely knows them. The environment is again the school corridor through which the player may walk freely while retaining the option to open the phone.

The phone’s feed contains three posts relating to the challenge, each of which may be liked to reveal an accompanying internal monologue. The player must then select one of three responses, presented as buttons within the phone interface. The first is to participate in the challenge, posting a video and tagging friends, which yields a small improvement to real connections. The second is to ignore the challenge entirely, which improves both self-image and mental health. The third is to post a video explaining why one is declining to participate, framing the refusal as a public statement, which results in a small loss to real connections.

This scenario was designed to introduce moral ambiguity, in deliberate contrast to the more clearly harmful situations of the first and third scenarios. Participation in the challenge is not portrayed as inherently damaging; indeed, the outcome associated with participation is mildly positive. This design reflects the expert panel’s insistence that the game should convey a balanced message, acknowledging that not all social media use is harmful and that connection, play, and shared humour are legitimate human needs. The critical distinction the scenario seeks to surface is not between participation and abstention, but between acting from genuine desire and acting from social pressure. This distinction is made explicit in the educational feedback delivered after the scenario, which invites the player to interrogate their own motivation, asking whether their choice arose from authentic enjoyment or from the felt obligation to conform.

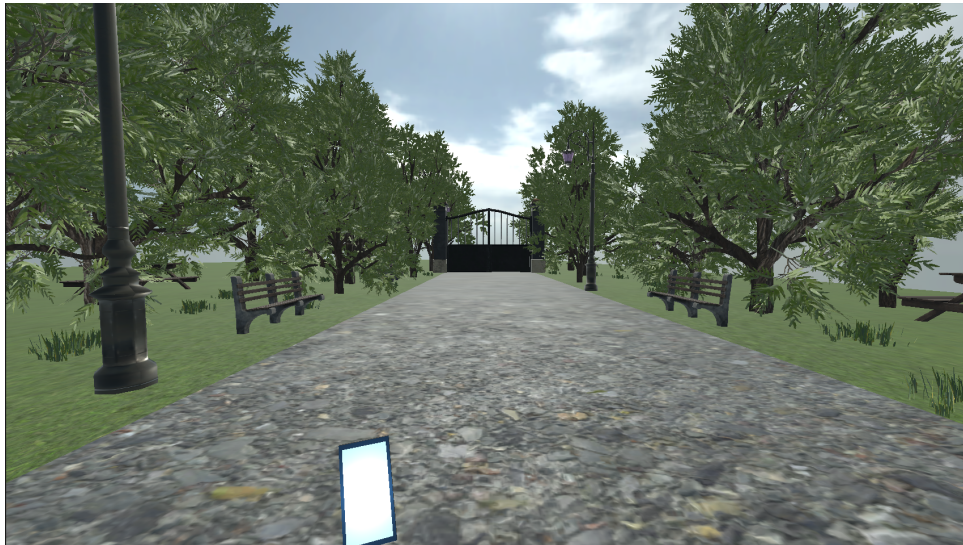


Figure 6.5: Scene Three — Wednesday: The Drama. The park environment, with the phone's persistent buzzing mechanic conveying the urgency of the escalating conflict.

6.5.5 Scene Five — Friday Night: The Fear of Missing Out

The fifth and final scenario returns the player to their bedroom, mirroring the setting of the first scene but with substantially heightened emotional stakes. The premise is that the player has not been invited to a party and learned of its existence only through social media, having now watched it unfold through six separate stories from six different vantage points over the preceding two hours. The weekend ahead presents itself as something to be endured. As in the first scenario, the player may survey the room and choose to interact with the phone or to place it on the bedside table.

A mechanic analogous to the buzz of the third scenario operates here: new stories appear on the feed every three seconds, each incrementing a counter that conveys the relentless continuation of the event from which the player is excluded. The player may select one of three responses, or may place the phone on the bedside table to disengage. The first response is to post a fabricated story implying that the player is busy and enjoying themselves, which inflicts severe damage on self-image and mental health. The second is to send a direct message to Carla, proposing that they spend the evening together, which substantially improves both real connections and mental health. The third is to continue watching the stories, which damages mental health, self-image, and sleep. Should the player place the phone on the bedside table without having made another choice, the scene resolves to the positive outcome associated with reaching out to a friend.

This concluding scenario operationalises the concept of the fear of missing out, or FOMO, which was identified in the conceptual background and reinforced by the forum research of Section 5.2 as a defining feature of adolescents' relationship with social media. The scenario reproduces the precise experience that adolescents described in those accounts: the sensation of being stationary while others appear to be living, and the consequent temptation either to perform a happiness one does not feel or to descend further into passive consumption. The reappearance of the

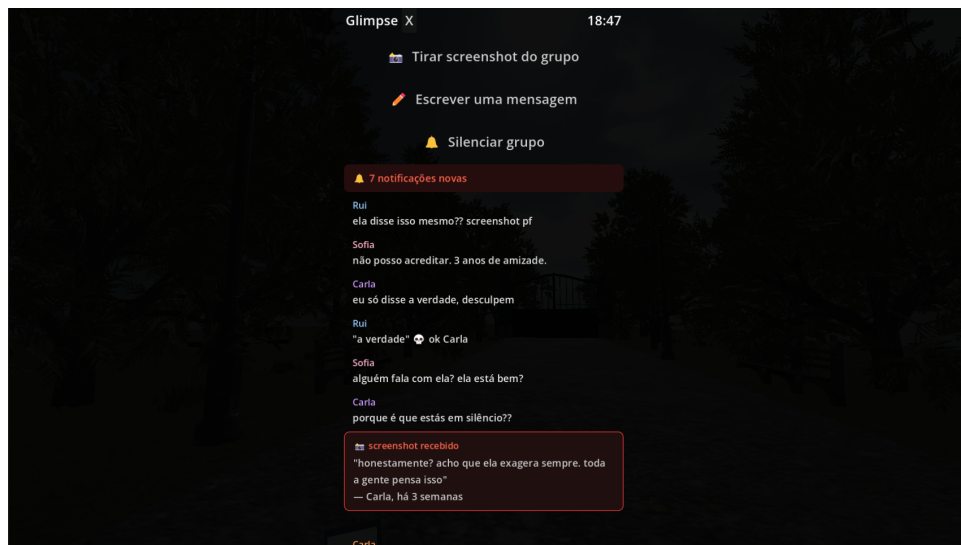


Figure 6.6: Scene Three — The group chat interface, showing the accumulating messages and the action options available to the player.

bedside table as a means of escape, echoing the first scenario, was a deliberate structural decision intended to bookend the week with a consistent spatial metaphor, in which setting the phone aside represents the restoration of presence.

6.6 Notification Popups as Reflective Feedback

Following the conclusion of each scenario, the player is presented with a notification popup that slides into view from the top of the screen. This popup serves as the principal vehicle for the game's explicit educational content and was designed in direct response to the expert recommendation that feedback should combine immediate responses to individual decisions with more reflective commentary, and that it should perform an awareness-raising function without becoming so frequent or lengthy as to fatigue the player.

Each popup comprises three distinct components, each serving a different rhetorical purpose. The first is a header, framed as a social media notification, which summarises the immediate result of the player's choice. The second is a body of text containing evidence-based educational information that explains the psychological mechanism underlying the scenario just experienced; this is the component through which the game delivers the factual content drawn from the research literature surveyed in Chapter 2. The third is a narrator's line that describes the downstream consequences of the choice within the ongoing fiction of player's life, thereby connecting the abstract psychological principle back to the concrete narrative. Together, these three components move the player from event, to explanation, to consequence, integrating instruction within the narrative rather than interrupting it.

Two design decisions govern the behaviour of the popup. First, the popup does not dismiss itself automatically after a fixed interval; instead, it requires the player to press a continue button



Figure 6.7: Scene Four — Thursday: The Challenge. The school corridor path environment in which the scenario unfolds.

in order to proceed. This decision was made to ensure that the educational content is actively read rather than passively allowed to elapse. Second, while the popup is displayed, all other input to the game is suspended, so that the player can neither move nor interact with the environment until they have chosen to continue. This enforced pause creates a deliberate moment of stillness in which the player's attention is directed wholly toward the reflective content, consistent with the expert recommendation that the game incorporate brief and direct moments of structured reflection. The popup also displays the net change in the player's statistics since the previous scene, rendering the cumulative consequences of the player's choices visible at each narrative juncture without requiring the player to monitor these values throughout play.

The complete text of the notification popups, for every possible outcome across the five scenarios, is presented in Table 6.1. The content of these popups was composed to translate the findings of the academic literature into language accessible and relevant to an adolescent audience, addressing in turn the phenomena of social comparison, validation-seeking, online conflict escalation, peer pressure, and the fear of missing out.

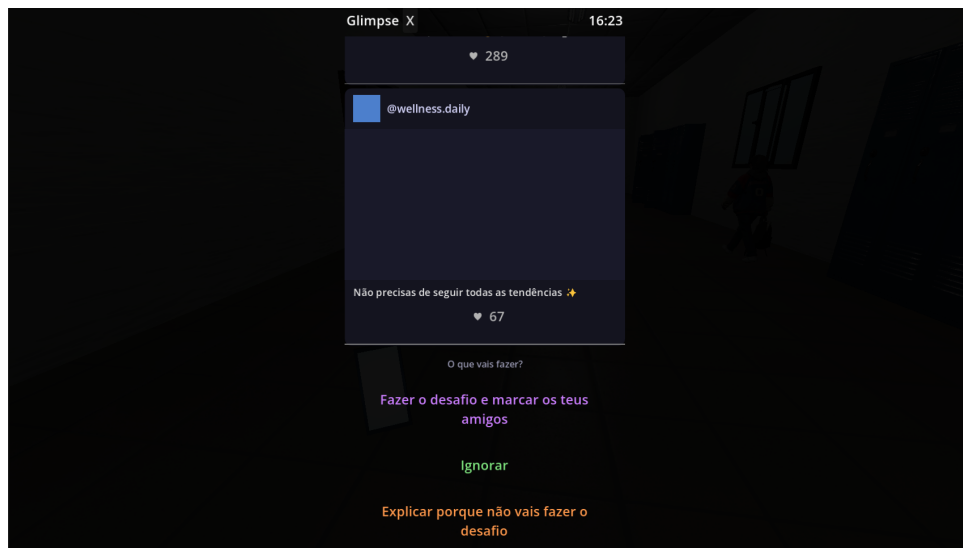


Figure 6.8: Scene Four — The phone feed showing the posts associated with the viral challenge and the available responses.

Table 6.1: Complete notification popup content for each scenario outcome.

Scene / Choice	Header	Educational Body	Narrator
1. Keep scrolling	Ficaste mais 47 minutos a fazer scroll.	A luz azul antes de dormir atrasa a melatonina até 90 minutos. A espiral de comparação tem nome: Teoria da Comparação Social.	A segunda-feira chega antes de estares pronto. Acordas atordoado e passas a viagem de autocarro a recuperar tudo o que perdeste.
1. Put phone down	Modo descanso ativado.	O adolescente verifica o telemóvel, em média, 150 vezes por dia. Pousá-lo uma única vez quebra o ciclo de compulsão.	Dormes melhor do que esperavas. A segunda-feira ainda chega, mas tu chegas pronto para ela.

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Table 6.1 – Continued from previous page

Scene / Choice	Header	Educational Body	Narrator
1. Post at midnight	Publicado às 23:52 · 3 gostos · 0 comentários	Publicar à procura de validação é uma aposta na dopamina. À meia-noite, o público para quem atuas não está a ver.	Verificas a publicação seis vezes antes de adormecer à 1h. Acoradas com 7 gostos. Ainda dói um pouco.
2. Filter and repost	Partilhado · 31 gostos · 2 comentários	67% dos adolescentes sentem-se pior com a sua aparência depois de usar as redes sociais. Editar-se torna-se cada vez mais difícil de parar.	Os 31 gostos fazem-te sentir bem durante 20 minutos. Depois vês a foto da Mia ainda a subir.
2. Talk to friends	Aplicação fechada · 12 gostos · tu com uma pessoa real	A comparação é a ladra da alegria. Cada vez que decides que a tua experiência é suficiente, desenvolves uma capacidade que a maioria dos adultos demora anos a aprender.	Sentas-te com o Javi ao almoço. Riem até doer a barriga. A foto ainda tem 12 gostos. Está bem na mesma.
2. Passive-aggressive comment	Comentário publicado · a Mia viu	Um comentário passivo-agressivo raramente te faz sentir melhor. Ao contrário de uma conversa real, fica para sempre e pode ser visto por toda a gente.	A Mia não responde. Mas três pessoas fizeram screenshot. Vais ouvir falar disso por alguém que nem estava envolvido.
3. Forward screenshots	Screenshot enviado para 4 pessoas	Os conflitos online escalam 3 a 4 vezes mais depressa do que os presenciais. Cada screenshot partilhado é combustível.	Até quinta-feira, o grupo fragmentou-se. Já não tens a certeza de quem são os teus amigos.

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Table 6.1 – Continued from previous page

Scene / Choice	Header	Educational Body	Narrator
3. De-escalate	Mensagem enviada · o caos continua	Tentar desescalar uma discussão online raramente resulta de imediato, mas importa. Uma voz calma muda a temperatura da sala.	Nem toda a gente ouve. Mas a Carla escreve em privado: “Obrigada por teres dito algo.”
3. Mute group	Saíste do grupo · a respirar melhor	Afastares-te do que te prejudica é uma forma de autoconsciência. No entanto, sair não resolve nada; o conflito continua sem ti.	As notificações param. Senteste-te mais leve. Mas percebes que perdeste coisas — incluindo alguém a defender-te.
4. Do the challenge	Publicado · 14 gostos · marcaste 3 pessoas	Nem todo o uso das redes sociais é prejudicial. A questão é: fizeste isto porque foi divertido, ou porque sentiste que tinhas de o fazer?	Foi até divertido. Tu e o Javi riem enquanto filmam. Os 14 gostos parecem um bónus, não o objetivo.
4. Ignore	0 publicações · tarde a fazer outra coisa	A pessoa média passa 2h27 por dia nas redes sociais. Dizer não a algo que não escolheste valorizar é como recuperas essas horas.	—
4. Anti-challenge video	Publicado · uma discussão nos comentários	Há uma versão disto que é reflexiva e uma que procura atenção. É algo em que acreditas, ou outra forma de te exibires para o mesmo público?	—
5. Fake story	Story falso publicado · sabes que é falso	Fingir uma felicidade que não sentes para te sentires menos excluído é a armadilha das redes sociais na sua forma mais completa.	Ninguém responde. Vês a festa onde não estás enquanto finges estar noutra que não existe. O domingo chega pesado.

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Table 6.1 – Continued from previous page

Scene / Choice	Header	Educational Body	Narrator
5. Text Carla	Mensagem enviada · Carla: “SIM vem cá”	O FOMO está integrado nas plataformas. O antídoto não é mais scroll, mas contactar diretamente alguém real. Uma mensagem vale mais que 40 minutos de stories.	A casa da Carla cheira a pipocas. Não publicas nada sobre isso. Não precisas.
5. Keep watching	47 stories vistos · a festa continua	O FOMO piora quanto mais o alimentas. Cada story confirma a narrativa: “Toda a gente vive. Tu não.” É uma mentira, mas muito eficaz.	—

6.7 The Ending Screen and Expected Outcomes

Upon the completion of the fifth scenario, the player is presented with a final screen that reveals, for the first time, the accumulated values of all four statistics. These are displayed as progress bars that fill sequentially to their final values, accompanied by an animation that allows the player to absorb each figure before the next is revealed. This deliberate pacing was intended to lend weight to the moment of revelation, encouraging the player to register the consequences of their week rather than apprehending all four outcomes at a single glance.

The arithmetic mean of the four statistics determines which of three endings the player receives. Should the average fall below forty-five, the player receives the ending designated *The Filtered Version*, in which the player concludes the week exhausted, anxious, and uncertain of who their genuine friends are, having found nothing online truly satisfying yet having found it impossible to stop. Should the average fall between forty-five and sixty-five, the player receives the ending designated *Somewhere in the Middle*, in which they are described as having had a complicated week of mixed experiences, with the crucial observation that the choices made with intention felt better than those made out of habit or fear. Should the average exceed sixty-five, the player receives the ending designated *The Unfiltered Version*, in which the player is described as having navigated a difficult week with greater awareness than most, retaining real friendships, real sleep, and a real sense of self alongside continued, but moderated, use of social media.

Each ending is accompanied by a paragraph of educational reflection that situates the player’s outcome within the broader research on social media and adolescent mental health, and, crucially, by a concrete behavioural challenge that the player is invited to attempt in their own life. These challenges — for example, setting a thirty-minute daily limit on the application one uses most, or telling someone offline something one would ordinarily only post — were designed to extend

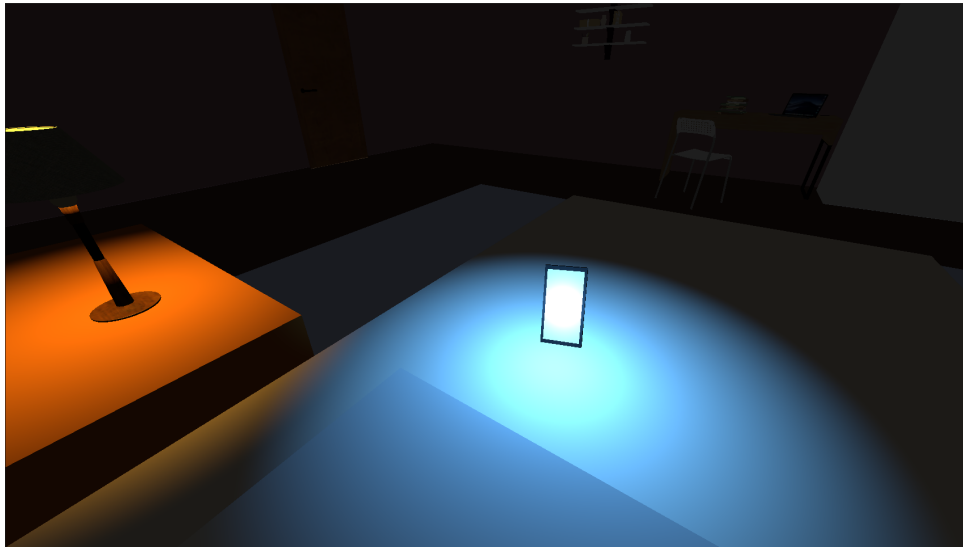


Figure 6.9: Scene Five — Friday Night: FOMO. The bedroom environment, deliberately echoing the setting of the first scenario.

the game's influence beyond the boundary of the play session itself, inviting the transfer of the in-game experience to the player's actual digital behaviour.

The pedagogical design of the game rests upon two complementary feedback mechanisms operating at distinct timescales, and it is the interplay between them that constitutes the game's principal educational strategy. The notification popups furnish immediate and local feedback, binding each individual choice to the specific psychological mechanism it engages in the moment immediately following the decision. The ending screen, by contrast, furnishes delayed and global feedback, binding the entirety of the week's choices to a single holistic outcome that reflects their cumulative weight. The deliberate combination of these two mechanisms was intended to reproduce, within the safe and compressed timeframe of the game, the actual relationship between social media use and mental health: a relationship in which the consequences of any single action are seldom dramatic, yet in which those consequences compound substantially over time.

This dual structure responds directly to one of the central problems identified in the conceptual background of this dissertation. As established in Section 2.1.2, adolescents frequently struggle to recognise the consequences of their own digital behaviour, in part because those consequences are neither immediate nor readily perceptible in the moment of action. By rendering the consequences both immediate, through the popups, and cumulative, through the ending, the game endeavours to construct the metacognitive bridge whose absence the experts identified as a defining feature of adolescents' relationship with their own screen time. In doing so, the game aspires not merely to inform the player that social media use carries risks, but to cultivate in the player the capacity to perceive, in their own lives, the gradual accumulation of consequences that ordinarily escapes notice.

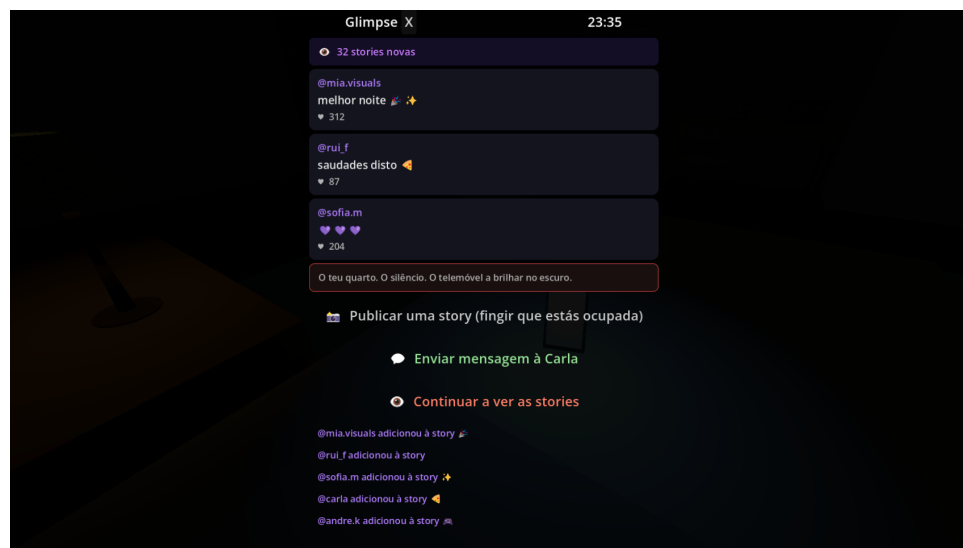


Figure 6.10: Scene Five — The phone feed showing the incoming stories from the party and the responses available to the player.



Figure 6.11: The ending screen, showing the animated revelation of the four statistics and the personalised outcome text.

Chapter 7

Conclusion and Future Work

This dissertation set out to investigate whether serious games can serve as effective instruments for raising awareness among adolescents about the risks and negative impacts of social media use. Motivated by the growing body of evidence linking problematic social media use to depression, anxiety, diminished self-esteem, body dissatisfaction, and sleep disruption among young people, and by the recognition that adolescents frequently lack the metacognitive tools to perceive the consequences of their own digital behaviour, the work pursued this question through two complementary contributions: a systematic review of the existing literature and the design and development of a serious game grounded in that evidence. This concluding chapter revisits the research questions that guided the work, summarises the extent to which they were addressed, reflects on the principal contributions of the dissertation, and outlines the directions that remain open for future work.

7.1 Conclusions

The central research question that framed this dissertation asked whether it is possible to create a serious game pertinent to raising awareness among adolescents about the potential risks and negative impacts of social media use. The work conducted here provides a substantive, if still provisional, affirmative answer. Through the systematic literature review presented in Chapter 3, it was established that serious games constitute a promising and increasingly validated approach for promoting awareness and behavioural reflection in adolescent populations, particularly when they are grounded in behavioural theory and incorporate engaging, interactive design. Building upon this foundation, the design and development of the serious game described in Chapter 6 demonstrated that such a game can indeed be constructed, translating the abstract risks documented in the research literature into concrete, experiential scenarios that adolescents can recognise from their own lives. The game addresses a gap identified at the outset of this work: to the best of our knowledge, no serious game previously existed that specifically targets the unhealthy use of social media and its psychological impact on adolescents.

The first complementary research question concerned the characteristics that such a serious game should include in order to engage adolescents effectively. This question was addressed primarily through the systematic literature review and the expert interviews. The review revealed that simulation-based and narrative-driven designs are the most widely adopted and effective approaches in this domain, that single-player formats are favoured for the privacy they afford to self-reflection, and that mechanics centred on decision-making with consequences, scenario-based role-play, and feedback are consistently associated with positive outcomes. The expert interviews refined these findings into actionable design principles, emphasising the value of branching narratives with visible consequences, multimodal and reflective feedback, a balance between entertainment and education, a simple and accessible interface, and the careful handling of sensitive content. These principles were directly operationalised in the design of the game, whose narrative structure, hidden statistic system, environmental interactions, and dual-feedback mechanism each trace back to specific findings from the literature or recommendations from the consulted professionals.

The second complementary research question concerned the perceptions of adolescents and healthcare professionals regarding the game's usability and its potential effects on awareness and behaviour. This question has been partially addressed through the participatory foundations of the design process, which incorporated the insights of expert psychologists and drew upon authentic adolescent testimony gathered from online communities. The full evaluation of the game's usability and impact, however, remains to be conducted, and constitutes the principal avenue of future work outlined below.

The principal contribution of this dissertation is therefore twofold. First, it provides a structured synthesis of the current landscape of serious games addressing online safety, privacy, and media literacy among adolescents, identifying the prevailing design approaches and the gaps that persist in the field, most notably the limited adoption of participatory design methodologies, the scarcity of longitudinal evaluation, and the absence of mobile-based interventions. Second, it presents the design and implementation of a novel serious game that responds directly to these gaps: a narrative-driven, evidence-based, and participatory-designed intervention that simulates the everyday digital dilemmas of adolescent life and seeks to cultivate, through experiential learning, the metacognitive awareness that adolescents so often lack. In doing so, the work contributes both to the academic understanding of serious games in this domain and to the practical toolkit available to educators, clinicians, and researchers concerned with adolescent digital well-being.

7.2 Future Work

Although this dissertation has established the feasibility of the proposed serious game and grounded its design in robust evidence, several important avenues remain open for future investigation. The most immediate and significant of these is the empirical evaluation of the game with its intended audience. As detailed in the methodology presented in Chapter 4, the game is intended to be tested with adolescents aged ten to nineteen through a structured evaluation involving a one-week

gameplay period followed by a battery of validated instruments, including the Social Media Addiction Scale, the System Usability Scale or Post-Study System Usability Questionnaire, the Intrinsic Motivation Inventory, and the Game Experience Questionnaire, complemented by follow-up semi-structured interviews and focus groups. This evaluation will be essential to answering the second complementary research question fully, allowing the perceptions of both adolescents and healthcare professionals regarding the game's usability, engagement, and impact on awareness and behaviour to be assessed in a rigorous and systematic manner. Healthcare professionals will additionally be invited to participate in a focused usability evaluation, providing expert validation of the game's design and content.

Beyond this immediate evaluation, the iterative and participatory nature of the development process invites further refinement of the game in response to adolescent feedback. The prototype described in this dissertation represents an initial realisation of the design principles distilled from the literature and the expert consultation; subsequent cycles of testing with adolescent users are expected to surface opportunities for improvement in clarity, realism, engagement, and educational effectiveness. This direct involvement of the target audience in the refinement of the game would also help to address one of the central limitations identified in the systematic literature review, namely the limited adoption of participatory and co-design methodologies in this field.

A further and particularly important direction for future work concerns the longitudinal assessment of the game's effects. The literature review found that the overwhelming majority of existing evaluations rely on short-term, self-reported measures collected immediately after gameplay, which constrains any conclusions about lasting behavioural change or knowledge retention. The behavioural challenges embedded in the game's endings, which invite players to transfer their in-game experience to their actual digital lives, are designed with this concern in mind; however, only a longitudinal study tracking participants over an extended period would be able to determine whether the awareness cultivated by the game translates into durable changes in adolescents' relationship with social media. Such a study would represent a valuable contribution not only to the evaluation of this particular game but to the broader field, which the review identified as lacking longitudinal evidence.

Finally, the development of fully mobile-based versions of the intervention represents a promising direction consistent with both the expert recommendations and the gaps identified in the literature. While the game was developed with cross-platform deployment in mind, a native mobile experience would more faithfully reflect the actual context in which adolescents engage with social media, potentially enhancing the realism, accessibility, and transfer of learning. The review noted that no existing study had reported a full-fledged native mobile intervention in this domain, and the pursuit of such an implementation would therefore address a clear and acknowledged gap.

In conclusion, this dissertation has demonstrated that a serious game addressing the unhealthy use of social media among adolescents is both feasible and well-founded, and it has produced a concrete prototype grounded in evidence and informed by professional expertise. The work does not claim to solve the complex problems of adolescent mental health and digital well-being; rather, in keeping with its stated objective, it seeks to draw attention to these problems and to encourage

critical reflection upon them. The evaluation of the game with adolescents, and the longitudinal investigation of its effects, remain the essential next steps in determining the extent to which this aspiration is realised in practice.

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