

IMPACT OF GAMIFICATION ON CHILDREN'S PHYSICAL AND MENTAL HEALTH: BENEFITS AND RISKS

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Abstract

The rapid digitization of the media has integrated gamification into various aspects of children's lives, significantly influencing their physical and mental health in significant ways. This research paper explores the multifaceted impact of gamification in digital media, outlining its benefits and risks. Gamification can promote physical activity through digital fitness apps and active video games; however it also poses risks such as increased sedentary behavior and health issues from prolonged screen time. Regarding mental health, gamified digital media can enhance cognitive skills, emotional well-being, and social interaction, but it also brings potential downsides, including addiction, exposure to cyberbullying, and heightened anxiety in competitive environments. This comprehensive analysis aims to provide insights into optimizing the positive impacts of gamification while mitigating its adverse effects on children's health.

Keywords: *Children, Gamification, Digital Media, Screen time, Physical Health, Mental Health.*

INTRODUCTION:

The integration of gamification into digital media has become a prominent aspect of modern childhood, significantly impacting physical and mental health. Gamification, defined as the use of game design elements in non-game contexts to engage and motivate users (Deterding et al., 2011), has become integral to educational apps, fitness programs, and interactive

entertainment, influencing children's daily activities. This development holds the potential to promote physical activity through engaging digital fitness apps and active video games, thus enhancing motor skills and encouraging healthier lifestyles (Staiano & Calvert, 2011). However, the increased screen time associated with these activities can lead to sedentary behavior, contributing to health issues such as obesity and poor posture (Tremblay et al., 2011). On the mental health front, gamified digital media can enhance cognitive skills, such as problem-solving and memory, while also providing emotional benefits by reducing stress and improving mood (Granic et al., 2014). Additionally, it facilitates social interaction through multiplayer and community-based platforms. Nevertheless, the risks cannot be overlooked; potential downsides include addiction, exposure to cyberbullying, and heightened anxiety from competitive environments (Kuss & Griffiths, 2012). This paper provides insights to optimize benefits and risks, offering insights into optimizing the positive impacts of gamification while mitigating its adverse effects on children's health.

PROBLEM STATEMENT

The widespread adoption of gamification in digital media has profoundly affected children's physical and mental health. While gamified apps and video games promote physical activity and cognitive development, they also increase sedentary behavior and screen time, leading to health issues such as obesity and poor posture (Tremblay et al., 2011). Additionally, while enhancing emotional well-being and social interaction, gamification poses risks of addiction, cyberbullying, and anxiety (Kuss & Griffiths, 2012). This study aims to evaluate the dual impacts of gamification on children's health, providing insights to optimize its benefits and mitigate adverse effects.

RESEARCH OBJECTIVES

The research objectives of this study are as follows:

To investigate how gamified digital media influences cognitive skills, emotional well-being, and social interactions among children.

To develop strategies for parents, educators, and developers to maximize the benefits and minimize the risks of gamification in children's digital media consumption.

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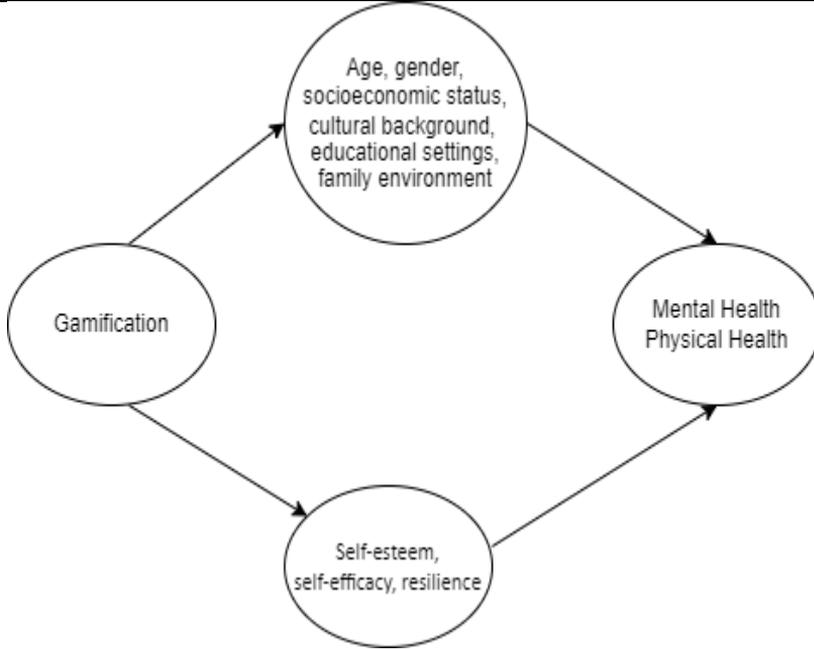


Figure 1. Effects of Gamification on mental and physical health

RESEARCH QUESTIONS

1. How does gamification in digital media promote physical activity among children?
2. What are the negative impacts of increased screen time and sedentary behavior linked to gamified content?
3. How does gamified digital media enhance children's cognitive skills and emotional well-being?
4. How does the engaging in gamified digital environments impact children's social interactions?
5. What strategies can parents and educators use to balance screen time and physical activity in children's gamified digital media use?

LITERATURE REVIEW

The Gaming My Way to Recovery scoping review project aimed to evaluate evidence on the digital game interventions for youth mental health services (aged 11 to 29 years) using the stepped care model as a conceptual framework. The review gave recommendations for the safe and effective incorporation of video games in mental health services (Ferrari et al., 2020). Additionally, Duketayev et al. (2021) found out that traditional Kazakhstan physical games had positive effects in keeping children physically fit. The positive impact of PFGs on children's physical abilities during physical

education classes is evident. In contrast, Guerada (2021) studied the effects of online games on children's health, stating that a psychologist or psychiatrist can diagnose game addiction when dysfunctional gaming patterns negatively impact life areas such as family, education, or work. Symptoms include difficulty concentrating and obsessive thoughts about games. The results showed that the points-based reward system increased Short-term PA engagement but did not significantly impact overall PA over time. It can also promote perceptions of relatedness with the virtual agent featured in the gamified intervention, though neither experimental condition nor participants' gender significantly affected psychological needs (Ahn et al., 2019). Lambe et al. (2022) applied a measure over the 7-week duration of the Beat the Street (BTS) intervention for Irish school-children, who found that the more often children reported being able to remember the game without being prompted and also played the game more than once a week, generally met the physical activity guidelines compared with their less frequent peers.

Self-image and mood are positively affected by exergames on boys and girls just as basic physical education has long-lasting effects on physical and psychological well-being. School physical education has benefits that run positively to physical and psychological health (Andrade et al., 2020). Guerrero-Puerta and Guerrero (2021) studied the effects of gamification on well-being among students at risk of early school leaving (ESL) and suggested that it sometimes induces positive engagement in school due to higher levels of well-being but also inversely could foster a rebound effect and thus act as a risk factor to ESL. Arihata et al. (2022) summarize and review current knowledge in gamified treatment and use it in mental health treatment alternatives-how it affects mental health. They found that co-occurring mental health disorder was significantly related with increased higher resource utilization for the much-needed care treatment cost incurred for the patients.

The results of the past studies indicate that games may produce effects similar to those gained from traditional training methods; nevertheless, the researchers suggest that physical education alone may not be able to bring about worthwhile gains in cardiorespiratory fitness, regardless of the nature of the task involved. More specifically, both the experimental group (games as their training) and control group (traditional exercise training activities) made progress in improving their physical fitness; however, little significant change occurred in cardiorespiratory fitness (Cocca et al., 2020).

On the other hand, Sotos-Martínez et al. (2024) analyzed how the

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gamified motivation affected Compulsory Secondary Education and Secondary Education students in Spain within an 8-session Physical Education Didactic Unit and found that gamified intervention actually satisfies those basic psychological needs, increases intrinsic motivation, while decreases amotivation in secondary education students. The students have been actively participating in serious game development to encourage physical activity. Gamification provides opportunities for enhanced learning as well as health education in schools (Sotos-Martinez et al., 2024).

Authors have explored how a participatory approach strengthens schoolchildren's understanding of gamification as a tool for promoting physical activities and learning (Kostenius et al., 2018).

Padman et al. (2018) discovered not only a huge prospective positive level of actual food choices by the mobile game direct after 40 minutes of exposure to the intervention but it is also adding into historical growing evidence of healthy learning about healthy eating in a fun and simple way via mobile games, acting as Digital Vaccines, which have positive effects on children's actual Food choices.

Children use a variety of tools and games to interact with others within the hospital, testing different gaming mechanisms and strategies to determine which positively affect participant interactions (Montaner-Marco, 2019). The Triumph mobile game improved the psychological well-being of pediatric cancer patients. The Triumph intervention seemed to be associated with better health-related quality of life for participants. The analysis indicates that the delivery of the Triumph digital intervention in the form of a mobile health game could be beneficial for psychological well-being in the pediatric cancer patient population (Tark, 2019).

Udara and De Alwis (2019) wrote the article on the use of gamification in health and well-being. It discusses gamified solutions for different health issues and their feasibility. Current and historical developments and trends in gamified health solutions would be explored by this research. Semartiana et al., (2022) presented a systematic literature review on gamification to identify the types of goals, game components, and trends in gamification technology for the younger generation. To motivate and engage children, the main purpose of gamification is to do so. Points, levels, and leaderboards are some of the game elements that are commonly employed.

Serious games are very interesting and meaningfully effective in

psychiatric treatment for children and adolescents suffering from mental health problems. Gamified interventions have been useful and feasible for mental health concerns (Silva et al., 2021). A systematic review and meta-analysis were carried out in CINAHL, EMBASE, LILACS, MEDLINE, SciELO and Scopus databases, following PRISMA recommendations. The intervention led to increased fruit and vegetable consumption and higher nutritional knowledge scores in the intervention group compared to the control group, with improved understanding of healthy food groups (Suleiman-Martos et al., 2021).

The impact of gamification within diverse contexts has been thoroughly investigated. Nevertheless, there are still enormous gaps with respect to how these would impact children's physical and mental health. For instance, current literature like Ferrari et al. (2020) and Arihta et al. (2022) cites several benefits through this approach, especially in terms of the mental health services, though no longitudinal studies could be found that measured the sustainability in terms of long-term outcomes. Similarly, while Duketayev et al. (2021) and Lambe et al. (2022) broaden understanding regarding physical activity promotion through gamification, not much evidence is available regarding the investigation on optimization of these interventions to different populations and contexts. Moreover, even the downside of gamification, such as dangerous addiction and cyberbullying, as discussed by Guerada (2021) and Guerrero-Puerta and Guerrero (2021), need further researching. Studies on preventive aspects and intervention strategies need to be conducted for the additive effects of these drawbacks or the overall effects of gamification on their own.

The potential benefits of gamification-enhanced cognitive skills and emotional well-being have been relatively under-investigated regarding their precise game mechanics and psychological effects, as noted Andrade et al. (2020) and Silva et al. (2021). The joint usage of gamification in educational and health environments is calling for additional research on scaling and implementation strategies like the findings of Sotos-Martinez et al. (2024) and Kostenius et al. (2018). Finally, just when studies such as those of Padman et al. (2018) or Tark (2019) collect promising results, researchers are at a loss in regard to established measures and methodologies for determining the success and effectiveness of gamified interventions along a variety of health outcomes and demographic groups. A unified framework is needed to guide future research and practice.

Cognitive Theory of Multimedia Learning (Mayer, 2005), according to which gamification can be a key factor in the development of cognitive skills,

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may argue that multimedia environments by their very nature - including such gamified content - can contribute to learning by presenting information in a variety of sensory modalities (visual-auditory) and engaging their interactive elements (e.g., quizzes, puzzles). By a developmental perspective to be drawn out here, however, the second significant with respect to thinking about the effects of gamification is Vygotsky's Sociocultural Theory (Vygotsky & Cole, 1978), which emphasizes all forms of social interaction and tools of culture-which includes digital media-in cognitive development. In other words, it can scaffold the learning and problem-solving skills by providing interactive tools and collaborative opportunities. Thus, these theoretical perspectives will form an intellectual framework in terms of which the study would be able to comprehend the nature of the healthcare effect of gamification in children. This attention to the motivational, cognitive, social, and developmental context aspects will add muscle to the interpretation of any physiological or psychological differences in health outcomes for children.

METHOD

IN-DEPTH INTERVIEWS

For the present study, six in-depth interviews were conducted. In-depth interviews are structured conversations aimed at eliciting detailed information, opinions, and insights from participants (experts in this case) about their experiences, perspectives, and knowledge related to the research topic (Marshall & Rossman, 2014). Experts were selected based on their expertise in gamification, child health, psychology, education, or related fields, ensuring a diverse range of perspectives. A semi-structured interview protocol was developed, consisting of open-ended questions that allowed flexibility to explore new topics as they arose during the interview (Seidman, 2006). Interviews were conducted one-on-one. The focus was on creating a comfortable environment for participants to share their insights. The technique of thematic analysis was applied while using Atlas 24. Thematic analysis is commonly used to analyze qualitative data from interviews. It involves identifying patterns, themes, and categories within the data to generate meaningful interpretations and insights (Braun & Clarke, 2006).

TABLE 1
INTERVIEWEES' BRIEF DESCRIPTION

<i>Identification</i>	<i>Designation</i>	<i>Focused</i>
<i>Interviewee 1</i>	<i>Medical Doctor</i>	<i>Gamification with Health Care</i>
<i>Interviewee 2</i>	<i>Media Expert</i>	<i>Negative Effects of Gamification</i>
<i>Interviewee 3</i>	<i>VideoGame Designer</i>	<i>Gamification</i>
<i>Interviewee 4</i>	<i>Teacher</i>	<i>Gamification in Education/Classroom</i>
<i>Interviewee 5</i>	<i>Psychologist</i>	<i>Gamification for emotional fitness</i>
<i>Interviewee 6</i>	<i>Entrepreneur</i>	<i>Gamification pioneer</i>

DATA COLLECTION

Interviews were conducted in person, via video conferencing, or over the phone, depending on the availability and preference of the experts. Interviews were audio-recorded with the consent of the participants to ensure accuracy in data collection and subsequent analysis. Each interview was lasted between 45 minutes to an hour, allowing sufficient time for detailed discussion.

DATA ANALYSIS

Recorded interviews are transcribed verbatim to facilitate thorough analysis. A systematic approach was employed to identify, analyze, and report patterns (themes) within the data. This involves coding the data, identifying key themes, and interpreting the findings in the context of the research questions (Braun & Clarke, 2006). For the purpose of analysis Atlas.ti 24 was used.

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RESULTS

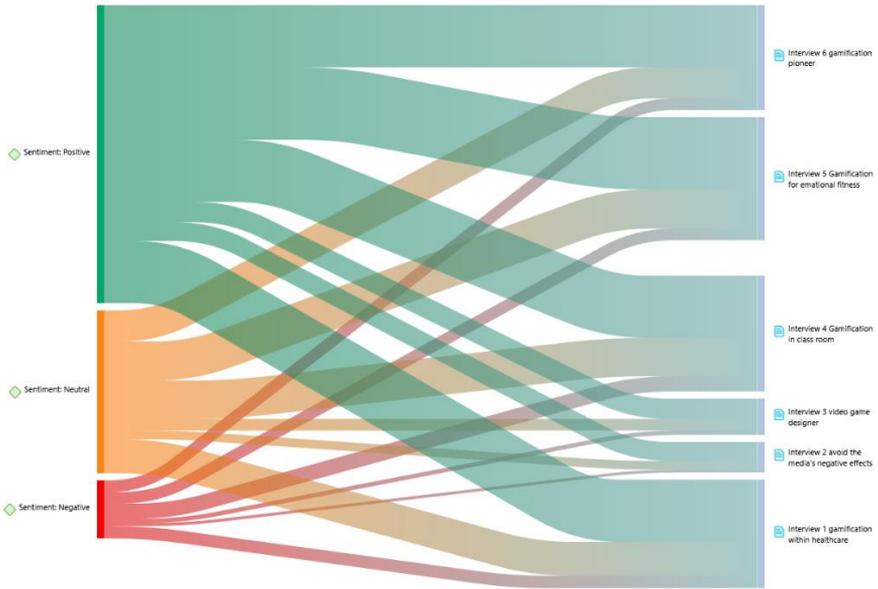


Figure 2. Sentiment Analysis

The sentiment analysis of the interviews reveals that the majority of experts expressed positive views regarding the impact of gamification on children's physical and mental health. While some negative sentiments were identified, they were less prevalent compared to the positive ones (figure 2). This indicates a general consensus among experts that gamification has more beneficial effects on children's health.

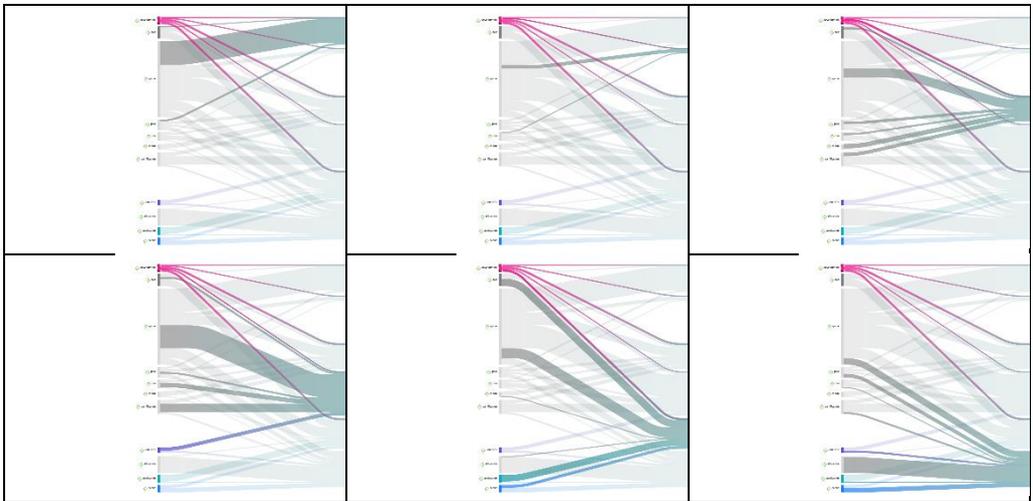
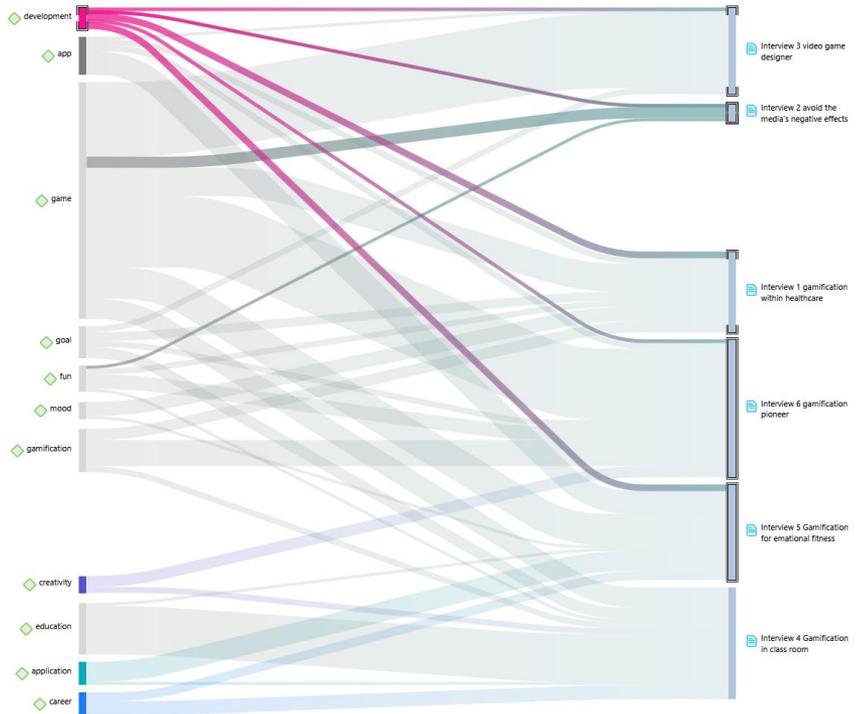
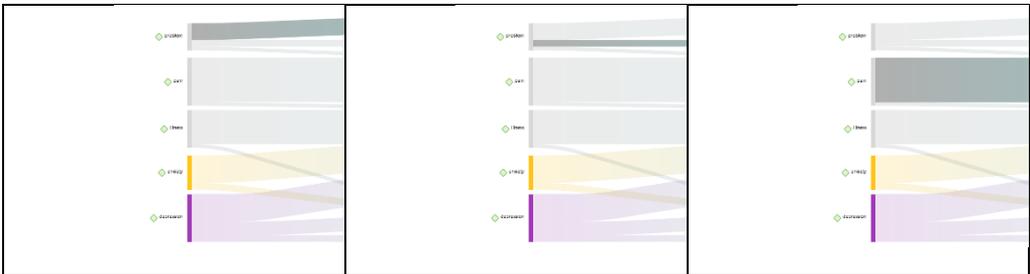
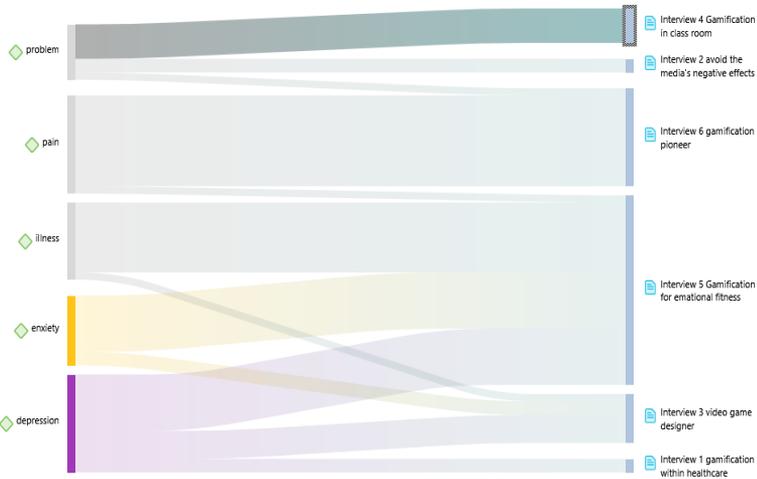


Figure 3. Positive Coding

The interviews with various experts revealed several positive aspects of gamification in digital media concerning children's physical and mental health. Medical Doctor emphasized the development of apps and games that have clear goals and are fun, contributing positively to children's mood and overall gamification experience (Interviewee 1). Media Expert highlighted the

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importance of development, games, and the fun aspect, underlining how these elements engage children effectively (Interviewee 2). Video Game Designer discussed the development process of apps and games, focusing on setting achievable goals, which are integral to creating a rewarding gamified experience (Interviewee 3). Educationist stressed the importance of games and goals, fun, mood enhancement, and the broader concept of gamification. Additionally, they highlighted creativity, education, application, and career development as significant benefits (Interviewee 4). Psychologist focused on apps and games that improve mood and contribute to educational goals, supporting children's application of knowledge and career readiness (Interviewee 5). Entrepreneur discussed the development of apps and games, the importance of setting goals, and the fun and creative aspects of gamification, which enhance children's engagement and learning (Interviewee 6). Each expert provided insights into how gamification can positively affect children's health by integrating fun, goal-oriented, and creative elements into their learning and development experiences (Figure 3).



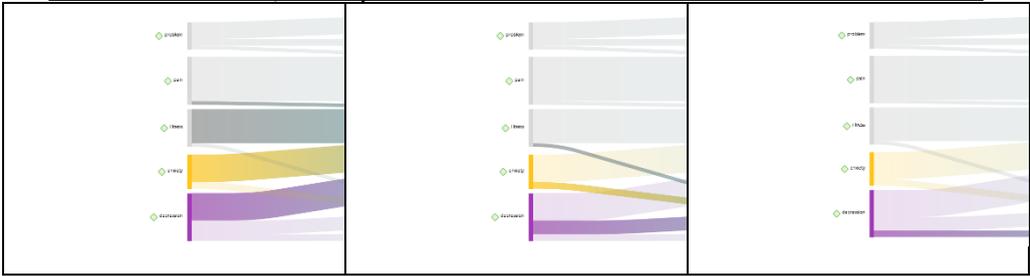


Figure 4. Negative Sentiments

The expert interviews also highlighted several negative aspects associated with gamification in digital media regarding children's physical and mental health. Medical Doctor discussed the issue of depression as a potential negative outcome of gamification (Interviewee 1). Media Expert focused on the problems associated with gamification, emphasizing the potential risks and challenges (Interviewee 2). Video Game Designer mentioned various problems, including anxiety and illness that can arise from excessive or improper use of gamified content (Interviewee 3). Educationist highlighted the problems associated with gamification, pointing out that while there are benefits, there are also significant risks to be managed (Interviewee 4). Psychologist focused on depression, anxiety, illness, and pain, detailing how gamification can negatively impact mental health if not carefully monitored and balanced (Interviewee 5). Entrepreneur highlighted the problems and pains related to gamification, acknowledging the potential downsides alongside the benefits (Interviewee 6). These insights underscore the importance of addressing and mitigating the negative impacts of gamification to ensure it serves as a beneficial tool for children's health (Figure 4).



Figure 5. Relational coding

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The expert interviews also revealed the importance of relational aspects in the context of gamification in digital media and its impact on children's health. Medical Doctor emphasized the role of friends in the gamification experience, highlighting how social interactions can enhance the benefits of gamified activities (Interviewee 1). Media Expert focused on the involvement of teachers and parents, underscoring their role in guiding and supporting children's engagement with gamified content (Interviewee 2). Video Game Designer discussed the influence of friends, pointing out that peer interactions are a significant part of the gamification experience (Interviewee 3). Educationist highlighted the roles of teachers, parents, and friends, noting that a supportive environment involving all these relationships can maximize the positive impacts of gamification (Interviewee 4). Psychologist did not focus on any specific relational connotations, indicating a primary focus on individual psychological impacts (Interviewee 5). Entrepreneur highlighted the importance of parents and friends, recognizing their influence on how children interact with and benefit from gamified activities (Interviewee 6). These insights emphasize that relational factors such as the involvement of friends, parents, and teachers play a crucial role in enhancing the effectiveness and experience of gamification for children (Figure 5).

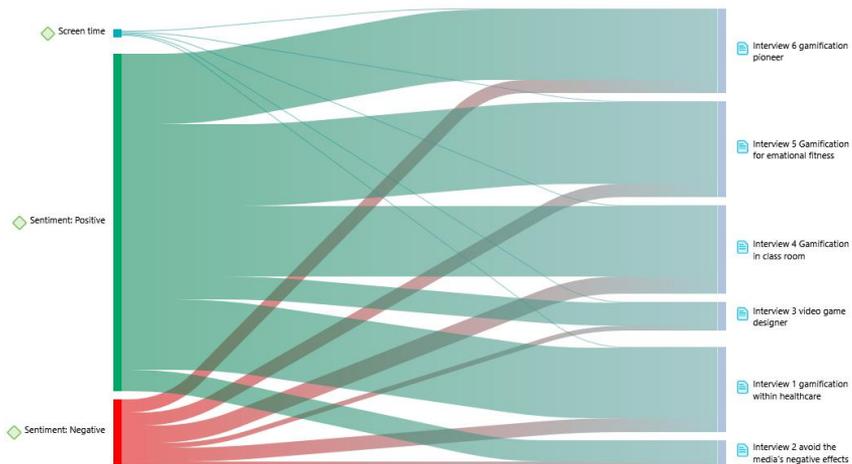


Figure 6. Presentation of screen time coding with positive and negative connotations.

The expert interviews provided insights into the impact of screen time related to gamification, with both negative and positive connotations. Medical Doctor discussed screen time, highlighting both its potential benefits in

promoting physical activity through interactive games and its risks, such as contributing to sedentary behavior and associated health issues (Interviewee 1). Video Game Designer focused on screen time, noting how well-designed gamified content can enhance learning and engagement, but also cautioning against excessive use that can lead to physical and mental health problems (Interviewee 3). Educationist highlighted the importance of balanced screen time, recognizing its educational potential while also warning about the dangers of overuse, which can lead to negative health outcomes (Interviewee 4). Psychologist emphasized screen time concerns, particularly the mental health risks associated with prolonged use, such as anxiety, depression, and reduced social interactions (Interviewee 5). Entrepreneur discussed screen time, acknowledging its role in driving engagement and creativity but also noting the need for moderation to prevent negative health impacts (Interviewee 6). Media Expert did not focus on screen time, instead addressing other aspects of gamification (Interviewee 2). These varied perspectives underscore the dual nature of screen time in the context of gamification, highlighting the need for balanced and mindful use to maximize benefits while minimizing risks (Figure 6).

DISCUSSION

The sentiment analysis of the interviews reveals that the majority of experts expressed positive views regarding the impact of gamification on children's physical and mental health. This finding aligns with several past studies that have highlighted the benefits of gamified approaches in various aspects of children's development. Several experts noted that gamified digital media can effectively promote physical activity among children. This is supported by studies like those of Lambe et al. (2022), who found that gamified interventions like Beat the Street (BTS) increased physical activity and active travel among schoolchildren. Similarly, Ahn et al. (2019) reported that points-based reward systems in gamified interventions could briefly increase physical activity engagement.

The positive impact of gamification on cognitive skills such as problem-solving, memory, and critical thinking was emphasized by the experts, which is in line with findings from Guerrero- Guerrero-Puerta and Guerrero (2021). They noted that gamified learning can enhance engagement and cognitive skills, especially for students at risk of early school leaving. Emotional well-being and stress relief are also significant benefits mentioned by the experts. Tark (2019) found that gamified interventions like the Triumph mobile game improved

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psychological well-being in pediatric cancer patients, suggesting that gamification can be a powerful tool for emotional health.

Experts highlighted how multiplayer and community-based gamified environments can enhance social skills and interactions among children. This is corroborated by Kostenius et al. (2018), who found that schoolchildren's participation in serious game development promoted physical activity and improved social interactions. Despite the positive sentiments, some experts did express concerns about the potential negative impacts of increased screen time, such as sedentary behavior and associated health issues. This concern is consistent with findings from Duketayev et al. (2021), who noted that while physical folk games have positive physical benefits, excessive screen time in digital gamification can lead to obesity and other health problems.

The issue of screen time and its negative health implications, such as eye strain and sleep disturbances, is a recurrent theme in studies like those by Guerrero-Puerta and Guerrero (2021).

Addiction and anxiety were among the negative sentiments expressed by some experts. Guerada (2021) highlighted the risk of game addiction, which can lead to various negative outcomes, including lack of focus and attention issues. The competitive nature of some gamified environments can lead to heightened anxiety, as noted by the experts and supported by findings from Silva et al. (2021) who discussed the potential for gamified interventions to cause stress if not properly managed.

The interviews with various experts revealed several positive aspects of gamification in digital media concerning children's physical and mental health. These insights align closely with past studies, further validating the beneficial impacts of gamification when applied thoughtfully and strategically. Medical Doctor (Interviewee 1) and Video Game Designer (Interviewee 3) both emphasized the importance of developing apps and games with clear, achievable goals that are fun for children. This mirrors findings from Lambe et al. (2022), where structured gamified interventions were found to increase physical activity among children, promoting health and fitness.

Entrepreneur (Interviewee 6) discussed the creative aspects and goal-setting in game development, which is consistent with research by Kostenius et al. (2018), who found that engaging children in the development of serious games not only promotes physical activity but also fosters creativity and problem-solving skills. Media Expert (Interviewee 2) and Educationist

(Interviewee 4) highlighted the engagement and fun elements of games, which are crucial for maintaining children's interest and motivation. This is supported by Guerrero-Puerta and Guerrero (2021), who noted that gamification can significantly enhance student engagement and well-being, particularly among those at risk of early school leaving. Psychologist (Interviewee 5) focused on how fun and engaging apps and games can improve children's mood and support their educational goals. This aligns with findings from Tark (2019), where gamified health interventions were shown to improve psychological well-being in pediatric patients.

Experts across disciplines (Interviewees 1, 4, 5) consistently highlighted how gamified apps and games can enhance children's mood and contribute to their educational development. This is corroborated by Ahn et al. (2019), who found that gamification could enhance emotional well-being and cognitive skills such as problem-solving and critical thinking. Educationist (Interviewee 4) stressed the broader benefits of gamification, including creativity, application, and career development. These insights resonate with the findings of Silva et al. (2021), who suggested that serious games can be an engaging and effective approach to educational and psychological treatment for children. The importance of social interaction and career readiness was underscored by the Educationist (Interviewee 4) and Psychologist (Interviewee 5). They noted that gamification can foster valuable social skills and prepare children for future career challenges. This is supported by findings from studies like those of Montaner-Marco (2019), who found that gamified interventions in educational settings can promote social interaction and collaboration among students.

The expert interviews also highlighted several negative aspects associated with gamification in digital media regarding children's physical and mental health. These concerns align with various past studies, which have identified potential risks linked to excessive or improper use of gamified content. Medical Doctor (Interviewee 1) and Psychologist (Interviewee 5) discussed depression and anxiety as potential negative outcomes of gamification. This is consistent with the findings of Guerada (2021), who noted that excessive gaming can lead to addiction, resulting in severe negative impacts on mental health, including depression and anxiety. Video Game Designer (Interviewee 3) mentioned the risk of anxiety and illness from improper use of gamified content. This aligns with Silva et al. (2021), who highlighted that while gamified interventions can be beneficial, they can also induce stress and anxiety if not properly designed and monitored.

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Media Expert (Interviewee 2) and Educationist (Interviewee 4) emphasized the broader problems associated with gamification, such as the potential for increased sedentary behavior and the risks of addiction. These concerns are supported by Duketayev et al. (2021), who found that while gamified physical activities have benefits, the digital nature of gamification can contribute to sedentary lifestyles if not balanced with physical activity. Entrepreneur (Interviewee 6) highlighted the general pains related to gamification, acknowledging both the potential downsides and benefits. This dual perspective is necessary, as discussed by Suleiman-Martos et al. (2021).

, who noted that gamified interventions need to be carefully designed to avoid reinforcing negative behaviors or outcomes.

Psychologist (Interviewee 5) detailed the negative impacts on mental health, including pain and illness, which can result from overuse of gamified content. This echoes findings from Arihta et al. (2022), who reported that gamified treatments for mental health need to be carefully tailored to avoid exacerbating conditions. Video Game Designer (Interviewee 3) also discussed illness as a consequence of improper gamification. The study by Cocca et al. (2020) supports this, showing that while gamified physical activities can improve fitness, they may not sufficiently address all health needs, such as cardiorespiratory fitness, if not integrated into a broader health strategy.

Entrepreneur (Interviewee 6) and Psychologist (Interviewee 5) both emphasized the risks of addiction and the physical and mental health issues stemming from excessive screen time. This is corroborated by the work of Guerrero-Puerta and Guerrero (2021), who found that while gamification can enhance engagement, it can also lead to addictive behaviors if not properly managed. The expert interviews underscored the importance of relational aspects in gamification within digital media and their significant impact on children's health. These insights align with existing research, which has consistently highlighted the influential role of social interactions and support systems in shaping children's experiences with gamified activities.

Medical Doctor (Interviewee 1) and Video Game Designer (Interviewee 3) emphasized the positive influence of friends on the gamification experience, suggesting that peer interactions can enhance engagement and enjoyment. This is supported by studies such as those by Montaner-Marco (2019), which found that peer interactions in gamified settings can foster collaboration and social skills among children. Media Expert (Interviewee 2) and Educationist

(Interviewee 4) highlighted the crucial roles of teachers and parents in guiding and supporting children's engagement with gamified content. Research by Guerrero-Puerta and Guerrero (2021) supports this, indicating that parental and educational involvement can enhance the educational outcomes and overall well-being of children participating in gamified activities. Educationist (Interviewee 4) and Entrepreneur (Interviewee 6) stressed the importance of creating a supportive environment involving teachers, parents, and friends to maximize the positive impacts of gamification. This aligns with findings from Kostenius et al. (2018), which suggest that collaborative efforts among stakeholders can promote sustained engagement and holistic development in children through gamification.

CONCLUSION

While gamification shows promise in enhancing various aspects of children's well-being, including physical activity, cognitive skills, and social interactions, it also poses risks such as addiction, increased screen time, and potential negative impacts on mental health. To harness the benefits of gamification effectively while mitigating these risks, stakeholders must adopt a balanced approach. This involves carefully monitoring children's engagement, designing gamified content that promotes healthy behaviors and learning, and integrating physical activity to counteract sedentary behavior. Insights from experts underscore the importance of involving parents, educators, and peers in supporting children's engagement with gamified activities, thereby fostering a supportive environment that enhances their overall development.

RECOMMENDATIONS

Moving forward, it is crucial for developers, educators, and policymakers to collaborate on creating guidelines and best practices for the responsible implementation of gamification in children's lives. This approach ensures that gamified experiences are not only engaging but also contribute positively to children's health and well-being. By addressing these considerations, stakeholders can optimize the potential of gamification as a beneficial tool in promoting holistic development among children in the digital age..



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