



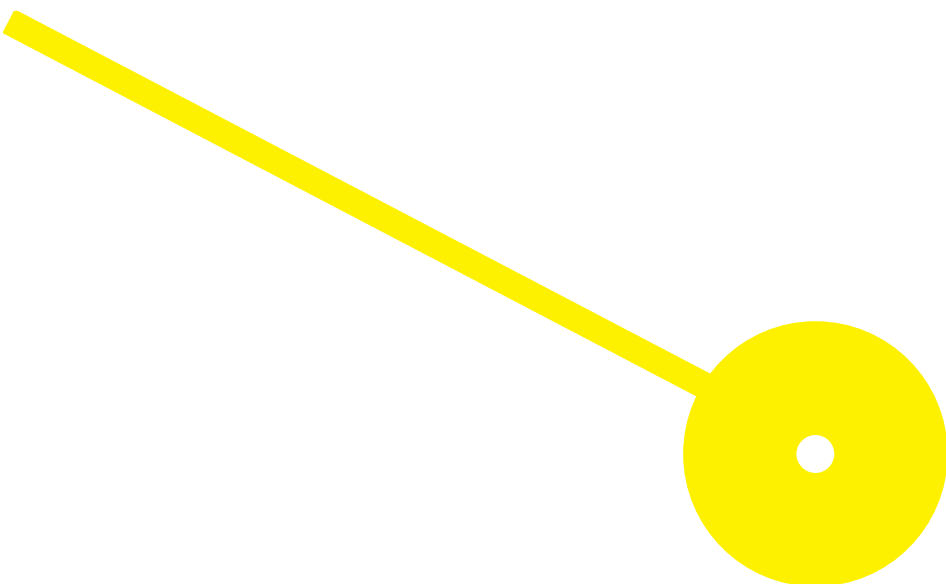
MESTRADO

TERAPIA OCUPACIONAL – ESPECIALIZAÇÃO EM SAÚDE MENTAL

Effectiveness of games to promote mental health literacy – A systematic review

Patrícia Alexandre Oliveira

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**ESCOLA
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Effectiveness of games to promote mental health literacy – A systematic review

Autor

Patrícia Alexandre Oliveira

Orientador

Prof. Doutor Tiago Coelho, ESS-IPP

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Resumo

A prevalência de doença mental é uma preocupação crescente a nível mundial, com cerca de uma em cada oito pessoas afetadas, segundo a Organização Mundial de Saúde. A literacia em saúde mental surgiu como uma estratégia importante para combater o estigma associado a estas patologias e para aumentar o reconhecimento, a gestão e a procura de ajuda. Estudos recentes mostram o potencial da aprendizagem baseada em jogos para promover a literacia em saúde mental. Esta revisão sistemática teve como objetivo mapear a literatura existente sobre a eficácia dos jogos – tanto de vídeo como analógicos – na promoção da literacia em saúde mental. Dos estudos incluídos, apenas cinco avaliaram diretamente a eficácia dos jogos na promoção de literacia na saúde mental. Para além disto, maioria dos jogos utilizados eram jogos de vídeo (n=14; 93.3%), para um único jogador (n=14; 93.3%) e o tipo de jogo predominante era o *role-playing* (n=9;60.0%). Maioria destas intervenções não faziam parte dos programas com outras abordagens (n=10; 66.7%) e foram implementados em contextos educacionais, tendo como população predominante alunos do ensino básico e secundário (n=10;66.7%).

Finalmente, foi possível verificar um aumento da literacia após a utilização do jogo.

A predominância de jogos de vídeo de *role-playing* para um único jogador, deve-se ao seu carácter imersivo, envolvente e personalizado, fornecendo um ambiente seguro para o jogador refletir e explorar tópicos relacionados com a saúde mental. Estas intervenções foram essencialmente aplicadas em contextos educacionais com alunos do ensino básico e secundário, devido à sua vulnerabilidade para desenvolver perturbações do foro mental. Apesar de maioria das intervenções ser composta apenas pelo jogo em si, a literatura recomenda que estes sejam parte de uma intervenção com várias componentes, de forma a potencializar a sua eficácia.

Posto isto e apesar do evidente potencial destas intervenções, é necessária mais investigação para explorar o impacto das intervenções baseadas em jogos em diferentes populações e contextos e utilizando vários tipos de jogos.

Palavras-chave: Aprendizagem baseada em jogos; jogos sérios; literacia em saúde mental; doença mental; estigma

Abstract

The prevalence of mental illness is a growing concern worldwide, with around one in eight people affected, according to the World Health Organization. Mental health literacy has emerged as an important strategy to combat the stigma associated with these pathologies and to increase recognition, management and help-seeking. Recent studies show the potential of game-based learning to promote mental health literacy. This systematic review aimed to map the existing literature on the effectiveness of games – both video and analog – in promoting mental health literacy.

Of the studies included, only five directly evaluated the effectiveness of games in promoting mental health literacy. In addition, most of the games used were single player (n=14;93.3%), role-playing (n=9;60.0%) video games (n=14; 93.3%). Most of these interventions were not part of programs with other approaches (n=10; 66.7%) and were implemented in educational contexts, with primary and secondary school students as the predominant population (n=10; 66.7%). Finally, it was noticeable an increase of mental health literacy after the gameplay.

The predominance of single player role-playing video games is due to their immersive, engaging and personalized nature, providing a safe environment for the player to reflect on and explore topics related to mental health. These interventions were essentially applied in educational contexts with primary and secondary school students, due to their vulnerability to developing mental disorders. Although most interventions consist only of the game itself, the literature recommends that they should be part of a multi-component intervention in order to maximize their effectiveness.

That said, and despite the obvious potential of these interventions, more research is needed to explore the impact of game-based interventions in different populations and contexts and using various types of games.

Keywords: Game-based learning; serious games; mental health literacy; mental illness

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1. Introduction

According to World Health Organization, in 2019 an estimated one in eight people globally were living with a mental disorder⁽¹⁾. A mental disorder is defined, by Diagnostic and Statistical Manual of Mental Disorders, Fifth-Edition (DSM-V), as a “syndrome characterized by clinically significant disturbance in an individual’s cognition, emotion regulation, or behavior that reflects a dysfunction in the psychological, biological, or development process underlying mental functioning”⁽²⁾.

Mental disorder stigma is still a significantly barrier to seeking and engaging in mental health care, despite the advancements in treatments, as people may be reluctant to be associated with mental health professionals⁽³⁻⁵⁾. One of the strategies to reduce stigma associated with mental health disorders is related to improving mental health literacy of the population⁽⁶⁾.

Mental health literacy was defined as the knowledge and beliefs about mental disorders which helps their recognition, prevention or management⁽⁷⁾. Despite the increasing awareness of mental health issues, research indicates that there is a generally low level of understanding of mental disorders and their evidence-based treatments⁽⁸⁾. Plus, it is also proven that the population in general has difficulties to recognize the symptoms of mental health disorders and, normally, prefer self-help over the traditional medical treatments⁽⁹⁾. Therefore, addressing mental health literacy has become a focus for mental health interventions globally. Mental health literacy interventions have the purpose of improve knowledge, reduce stigma, and promote help-seeking behaviors.

Based on Piaget’s statement that play is integral to and evolving with the stages of cognitive development, recent research has also shown that games can capitalize on brain plasticity to improve learning outcomes, leading the way for game-based learning (GBL)^(10,11).

The term GBL can be defined as an educational approach that promotes the acquisition of knowledge and the development of skills through engaging game activities⁽¹²⁾. GBL has three essential theories to be developed, they are the narrative-centered learning theory, the problem-solving theory and the engagement theory⁽¹³⁾. This type of learning approach aims to reduce the gap between traditional learning and digital culture by making learning more accurate and appealing by using games to motivate learner in the acquisition of knowledge⁽¹⁴⁾. It can be implemented using various types of games, such as video games or analog games⁽¹⁵⁾. Although GBL has a high potential for learning, its successful implementation depends on various factors such as the user’s expectations, type of game and game design elements, plus it also requires

being careful with some aspects, such as the age appropriateness and the varied game types⁽¹⁶⁻¹⁹⁾.

One specific type of game that can be used in GBL interventions are serious games. Differently from other types of games where entertainment is a primary goal, these games have as a primary goal promote knowledge⁽²⁰⁾. They are created to engage the user and include education into the game experience⁽²¹⁾. Examples such as “Super Better”, a game created to help people build resilience and improve their ability to cope with stress, anxiety, and depression and it is based on gamified activities that encourage positive behaviors and help users achieve their personal goals⁽²²⁾. Another example of serious games used in the mental health field is “SPARX”, a fantasy games designed to deliver cognitive behavior therapy for clinically significant depression⁽²³⁾. As it is possible to verify, these games are gaining recognition as effective tools to promote mental health literacy, increase confidence in mental health first aid, reduce symptoms and address help seeking barriers⁽²⁴⁾.

Given the engaging aspects of GBL and serious games, they have the potential to tackle gaps in mental health literacy by making the information about mental health disorders more accessible and relatable. However, more research is needed. Therefore, the aim of this systematic review is to map the existing literature on the potential of games – both video games and analogue games – in promoting literacy in mental health.

2. Methods

2.1. Information Sources and Eligibility Criteria

The search strategy of the present systematic review was developed in accordance with the PRISMA 2020 statement guidelines for the reporting of systematic reviews⁽²⁵⁾.

The research for this systematic review was conducted in the scientific databases defined by the research team. This included PubMed and ISI Web of Science, and the search terms included combinations of keywords related to games and mental health literacy. The concept “games” includes all video games and analogue games such as “tabletop games”, “dice games”, “board games” “card games” or any type of game that does not imply the exclusive use of digital technology.

The inclusion criteria included being empirical research studies, published up to May 2024, available in English or Portuguese, and studies that refer to games that convey information regarding mental health, characteristics of mental illness and/or mental health treatments and resources, regardless of the outcome assessed in the study. Thus, all the studies that did not meet these criteria were excluded from this systematic review.

2.2. Search Strategy

Regarding the search strategy, the search equation was composed as follows: (video game) OR (analog OR analogue OR board OR card OR dice OR tabletop) AND (game OR gaming OR games) AND (health education OR health literacy) AND (mental health). Used filters were “Portuguese or English only”.

2.3. Selection Process

The selection process included three phases, the identification phase, the screening phase and the eligibility phase. Through this process we refined our search to arrive at the final sample of studies that will comprise this systematic review.

The identification phase involved applying the search strategy to the selected information sources, and gather all the obtained data. All retrieved records were imported to the software Rayyan, a web-based tool designed to facilitate systematic reviews. Duplicates were then identified and removed within Rayyan to ensure each study was unique.

The screening phase was developed by applying the inclusion and exclusion criteria to the initial sample of studies (N=639), only by analyzing the title and the abstract. Studies that met the criteria at this stage were included for full-text review.

During the eligibility phase, the selected studies (N=94) were submitted to a full-text review using the same inclusion and exclusion criteria. By this procedure was reached the final sample of 15 studies.

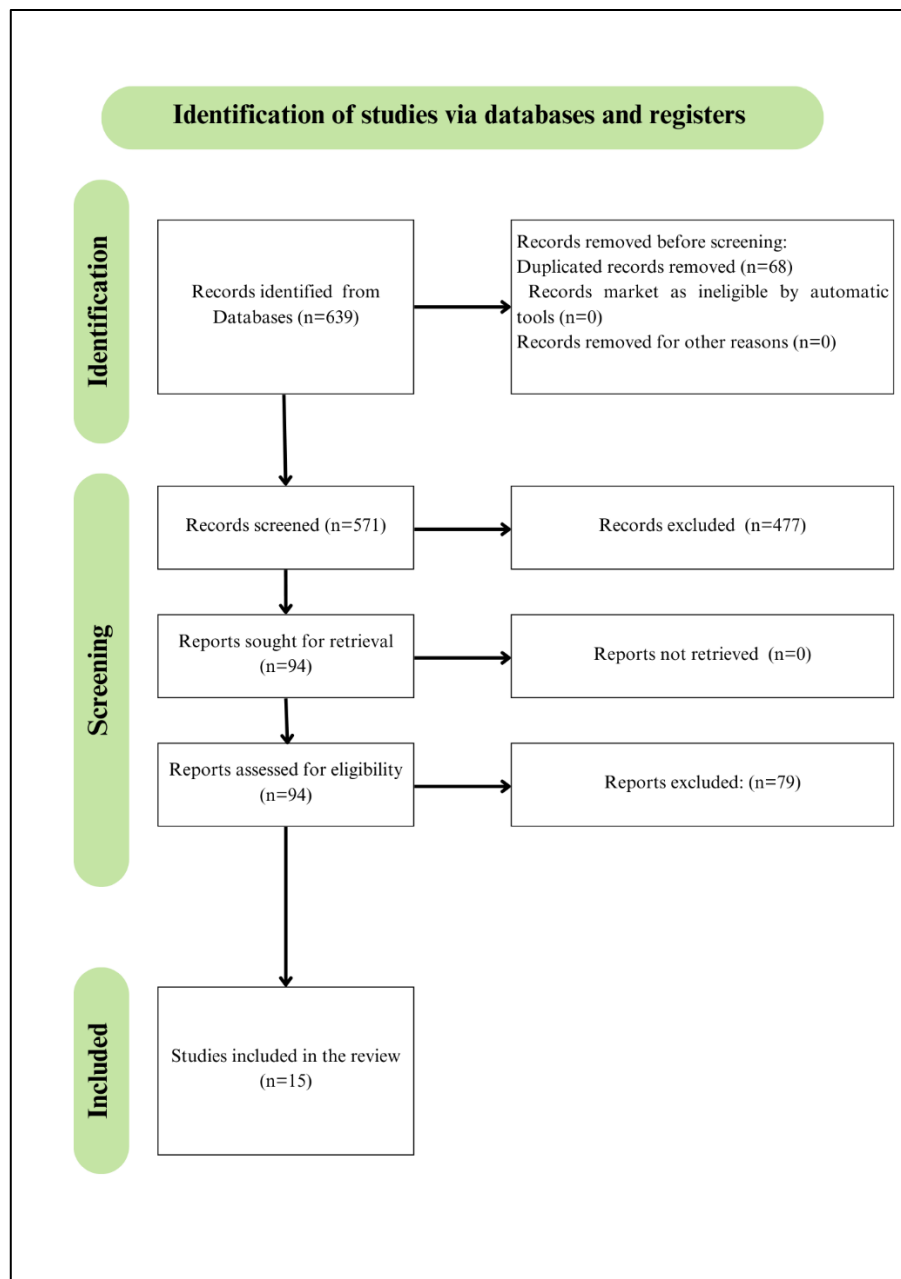


Figure 1 - Flowchart of the selection process

3. Results

To analyze the final sample of studies (n=15), information was systematically coded and organized in a comprehensive table. The following characteristics were extracted and included in the table: author(s) and publication year; purpose of the study; sample and characteristics of the sample; game characteristics; game implementation/intervention; measurements and outcomes (Table 1).

Table 1 – Studies' characteristics

Author(s) and Year	Purpose of the study	Sample and characteristics of the sample	Game characteristics	Game implementation / Intervention	Measurements	Outcomes
(Khazaal et al., 2010) (26)	Assess the feasibility and impact of the board game "Pick-Klop" in 61 smokers.	Recruited in a university of Lausanne in Switzerland. 61 employees and students. Current smokers. Aged between 18 and 65.	Board Game Multiplayer Game Trivia Game 291 cards with questions The game board represents a curved cigarette containing boxes of different colors. Players move their pawns by throwing the dice, according to the score obtained, the players place their pawns on a box to indicate the color of the card to be drawn. Topics addressed in the game (according to cards color): • White – general questions about tobacco • Blue – behavioral aspects of the nicotine addiction • Green – process of change and motivational stage • Pink – methods of change	4 consecutive weeks with 4 sessions of 1,50 hours each The game was played in groups (2 to 6 players) Sessions were directed by a psychologist	Anonymous self-reports Nicotine Dependence (Fagerstrom Test for Nicotine Dependence) Attitude Towards Smoking (Attitude Toward Smoking Scale – ATS 18) Confidence and ability to refrain from smoking when facing internal stimuli (Smoking Self-Efficacy Questionnaire – SEQ) Perceptions of the advantages and drawback of NRT (Attitude Towards Nicotine Replacement Therapy) Number of cigarettes smoked per day and intention to quit smoking (Analogic Scale) No follow-up	Reduction of the number of cigarettes smoked per day Increase intention to quit smoking and perception of the adverse effect of smoking Increase in the ability to refrain from smoking when facing internal stimuli
(Li et al., 2013)(27)	Assess the effectiveness of "Ching Ching Story" electronic game on enhancing mental health and problem-solving skills for young people.	Recruited in a university in Hong Kong, China 73 undergraduates (42 females and 31 males) Aged between 17 and 25	Video Game Accessible through Facebook Single Player Game Role-playing game Players assume the role of the game character Ching Ching and move around different areas of the game to complete all missions by talking to nonplayer characters, exploring various places and objects and playing minigames that taught instrumental skills. The game was composed by 10 missions that incorporate different mental health topics. Some of these missions were expected to be either more challenging or require prior knowledge learned in other missions. Topics addressed: – Identifying Stressors and how to handle stress – Understanding the relationship between stress and coping, and the consequence of depression – Understanding what goal directed thinking is – Affirming existing strengths and acknowledging the concept of "self" – Cognitive restructuring – Advanced cognitive restructuring – Understanding others' feelings – Communication skills – Conflict resolution based on a problem-solving approach – Anger management	3-week period to complete the game on Facebook Playing anytime and anywhere with a computer connected to the internet	Mental health literacy (31 questions constructed by the researchers to address the 10 topics of the game) Learning motivation (modified questions from the Motivated Strategies for Learning Questionnaire) No follow-up	Mental health literacy: increased between the pre and post test Learning motivation: Intrinsic goal orientation was stronger when compared with extrinsic goal orientation. Expectancy subscales: participants demonstrated confidence in acquisition of mental health knowledge Affect: scores of anxiety were the lowest among the 6 subscales.
(Epstein et al., 2016) (28)	Assess the effectiveness of the game "Bacon Brains" in teaching students how alcohol and drug affect the brain	Recruited from a charter school in St. Louis, Missouri 244 participants (132 boys and 112 girls) Aged between 11 to 15	Video Game Accessible through Browser Single and Multi-Player Game Arcade Types of games: racing, arcade and maze: Racing games- users guide their character through a track with brain parts. There are missions that involve a lap around the track. Once they're back in lab, they must install the brain part they collected on the track to complete the objective of the mission.	6 session of game play (1 module per session) 40 minutes interacting with an individual module To address the outcomes, students played individually, collaboratively or competitively	Knowledge (10 multiple-choice questions per module that covered the basic concepts address in that module) Follow-up: 8 weeks after	Knowledge: increased compared to other video games The responses to games were influenced by pre-existing factors such as grade, gender and attitude toward science.

			<p>Arcade-style games– occurs in an arena, the users firstly had to use a ray to release the objects from a grid. Then they must catch them in the pig's bucket before falling on the ground. In the brain they must collect reinforcers, such as veggies, sundaes, etc. In the Genetics of Addiction, they had to use the ray to burst open cells to reveal the nucleus, chromosomes and genes. The mission consists in collecting the requisite genes for the pig.</p> <p>Maze– the users guided their pig through the basement of a movie studio in search of movie clips. The clips are stored on discs that are littered throughout the basement. Once they collected each clip, they learn a small bit about the underlying curriculum. Then is punctuated with a mini matching game to further reinforce the content. Once all the clips are collected, they proceed to the editing room where they apply various audio and visual effects before viewing an animation of the entire content of the module.</p> <p>6 minigames</p> <p>Modules:</p> <ul style="list-style-type: none"> - Brain structure and function - Process of neurotransmission - Brain reward system - Disease model of addiction - Genetics of addiction - Treatment for addiction 			
(Huen et al., 2016)(29)	Describe and assess the internet-based DGBL program 'Professor Gooley and the Flame of Mind' in promoting mental health in adolescents	33 high schools in Hong Kong, China 498 students Mean age of 12.6	<p>Videogame</p> <p>Mobile app</p> <p>Single player game</p> <p>Role-playing game</p> <p>Users played the role of space intern in a fictional setting of the prevalence of cognitive distortions on earth. Under the instruction of Professor Gooley, they undertook a space journey to 8 planets to search for the Flame of Mind to solve world health crisis. During the space journey, the users undertook quests that prompted them to learn the psychological constructs and apply the knowledge and skills learned to complete the quests to obtain various components to activate the Flame of Mind.</p> <p>8 modules</p> <p>Topic addressed:</p> <ul style="list-style-type: none"> - Relationship between activating event, belief, and consequences - Basis of self-esteem and the association between self-esteem and several psychological variables - Goal setting and procrastination on goal attainment - Hope theory (consisting of goal, pathways thinking, and agency thinking) - Basis of interpersonal communication, common communication barriers, empathy, and effective communication skills - The concept of gratitude - 6-step problem solving model - Recap key concepts of mental health and common mental health problems in adolescents 	12-week intervention 45 minutes per week	<p>Mental Health (Scales of Psychological Well-being)</p> <p>Automatic Thoughts (Children's Automatic Thought Scale)</p> <p>Self-Esteem (Rosenberg Self-Esteem Scale)</p> <p>Procrastination (Procrastination Scale)</p> <p>Hope (Children's Hope Scale)</p> <p>Communication Skills (Communication Competence Scale)</p> <p>Gratitude (Gratitude Questionnaire-6)</p> <p>Problem-Solving Skills (Social Problem-Solving Inventory)</p> <p>Engagement (Self Constructed Items)</p> <p>No follow-up</p>	Effective in enhancing mental health in the participants
(A.J. Cangas et al., 2017) (30)	Assess the effectiveness of "Stigma-Stop" among a group of high school students in reducing stigma toward mental illness	Recruited from 24 classes from 12 secondary schools in Spain 522 students Aged between 14 and 18	<p>Videogame</p> <p>Mobile app</p> <p>Single player game</p> <p>Role-playing game</p> <p>The user must interact with 4 individuals (depression, agoraphobia, schizophrenia and bipolar disorder) to gain their collaboration and together perform a group task – participate in a videodesign contest.</p> <p>Includes 4 minigames</p> <ul style="list-style-type: none"> - Memory: match two identical pictures to make a pair. Images of famous people that have some type of mental illness - Trivia: answer a series of questions related to certain aspects about mental illness - Dali's Runner: collect paints from Salvador Dali, while avoiding obstacles, followed by a biography of this painter 	3 months Sessions once a week 1-hour sessions Control Group played another video game not related to mental health	<p>Stigma (Questionnaire on student attitudes toward schizophrenia)</p> <p>No follow-up</p>	Significant decrease in levels of stigma toward schizophrenia after playing Stigma-Stop.

			- Stigma Shooter: trap the positive concepts and destroy the negative concepts			
(Stapinski et al., 2018) (31)	Develop and assess the effectiveness of a video game called "Pure Rush" in drug education	Recruited from 4 schools in Sydney, Australia 281 students Aged between 14 and 17	Video Game Mobile app or accessible through browser Single Player Game Platform game The aim of the game was to arrive at a musical festival before tickets sell out. Players selected from a male or female teenager avatar, and race across four Australian backdrops, jumping over obstacles and collecting skill upgrades. Along the way, they encounter drugs obstacles representing cannabis, ecstasy, methamphetamine and hallucinogens which should be avoided, as collisions result in impaired performance effects and loss of health points. Brief messages related to drug effects associated with each drug were incorporated in the form of visually appealing infographics that aligned with the impaired performance effects of colliding with each drug type. To win the game it's necessary to avoid the drug obstacles by jumping over them and when an avatar does so, reinforcing messages appear on screen.	1 session 10 min game play 15 booklet information	Knowledge (26-item quiz of knowledge on drugs effects, prevalence, risks and harm-minimization information) Intentions to use (Adapted items from Life Skills Training Questionnaire) Lesson engagement (Adapted version of Keller's Model of Motivation) No follow-up	Knowledge increased after the intervention but there was no significant change in the intentions to use Lesson engagement was higher in males
(Shum et al., 2019)(32)	Assess the effectiveness of "The Adventures of DoReMiFa" to magnify the social and emotional health and well-being of school children between 9 and 11 in Hong Kong	Recruited from 4 primary schools in Hong Kong, China 459 students Aged between 8 to 12	Video Game Accessible through browser Single player game Role-playing game Adventurous story that combines the elements of a storyline, dialogues, problem-solving, challenges, mini-games, teamwork and so on. The story is about 4 monsters, Do, Re, Mi and Fa who came from another planet to look for a book hidden, that would help to improve the mental health of their fellow citizens, in a primary school. They would encounter 2 students Lily and Max after they landed on Earth to help them look for the book and solve different challenges and tasks. 8 modules Topics addressed: - Emotional competence - Cognitive model - ABC Theory - Problem-solving skills - Social Skills - Communication Skills - Empathy - Gratitude	11 digital game lessons (20 min each) Classroom lesson with approximately 25 to 60 minutes, after the digital lesson	Anxiety disorder symptoms (The Screen for Children Anxiety-Related Emotional Disorders) Mental health knowledge (Mental Health Knowledge Checklist) Negative Self statements about internalizing and externalizing problems (Children's Automatic Thoughts Scale-Negative or Positive) Perspective taking behaviors (Interpersonal Reactivity Index) Self-esteem (Rosenberg Self-Esteem Scale) 6-month follow-up	Effective in promoting, the student's mental health knowledge, positive automatic thoughts and perspective taking behaviors.
(A. J. Cangas et al., 2019) (33)	Analyze the usefulness of Stigma-Stop and analyze whether its usefulness can be influenced by type of video games or time spent playing entertainment games.	Recruited from different schools in Almería (Spain) 530 students 412 experimental group 118 control group 291 secondary schools' students 239 university students Aged between 14 and 59 326 women 204 men	As described above(30)	1 session 10 minutes to prequestionnaire Playing Stigma-Stop Post questionnaire	Stigma (Questionnaire on Students Attitudes toward Schizophrenia) Familiarity and Use of Video Games (Specifically designed questionnaire)	The levels of stigma decreased among the participants exposed to Stigma-Stop Stigma reduction was more marked in social distance subscale than in stereotypes subscale
(Ong et al., 2019)(34)	Development and evaluation of RegnaTales to help children and adolescents manage anger.	Recruited from Singapore 72 children Aged between 6 and 12 35 children had clinical diagnosis of disruptive behavior disorders 37 were typically development children	Video game Mobile App Single Player game Role-playing game The game happens in Arcadia, a village where there is balance between flame (good) and shadow (bad). Abaddon, a villain that tries to take control of the energy in Arcadia, kidnaps the user's parents in order to have them manipulate the machine they invented to keep both forces balanced, for his own benefit. He hopes to dominate the villagers and have them to do his evil bidding. To stop Abaddon and rescue his parents, the user must go through a series of missions that addresses various social problem-solving skills. Composed by 6 minigames 1: identification of feelings	Each children played 1 of the 6 RegnaTales apps for approximately 50 min	Game experience - fun, game experience, willingness to continue playing and curiosity (Playability and Usability Questionnaire) Reactive and proactive aggression (The Reactive-Proactive Aggression Questionnaire)	Typically Developed children showed significantly lower reactive aggression after Disruptive Behavior Disorders children showed significant lower reactive and overall aggression after playing the game

			<p>2: awareness of anger signals; cognitive restructuring targeting angry thoughts; deep breathing to keep calm</p> <p>3: guided imagery for a peaceful mind; muscle tension and relaxation; leisure activities as a way to cope with anger; perspective taking and empathy in dealing with conflicts</p> <p>4: assertiveness and "fighting fair" in dealing with conflicts</p> <p>5: problem-solving skills</p>			
(David et al., 2019)(35)	Investigate the effectiveness of RETHink in helping children and adolescents to develop psychological resilience	<p>142 children</p> <p>91 girls and 51 boys</p> <p>71.8% secondary school (grades 5-8) students</p> <p>28% high school (grades 9 and 10) students</p> <p>Aged between 10 and 16 years old</p>	<p>Video game</p> <p>Accessible through browser</p> <p>Single player game</p> <p>Role-playing game</p> <p>The game takes place in different territories on Earth that are under the power of Irrationalizer and need to be conquer back from the bad mind and at the end of each level, the player must win the key to go into the next area. Composed by 7 levels</p> <p>1: Identifying the emotional reactions, and differentiating between basic emotions, complex emotions and functional emotions - Players are tasked with differentiating between an emotion and a neutral state, basic emotions, and functional and dysfunctional emotions</p> <p>2: Identifying cognitive processes - Players learn and practice a breathing exercise and develop their skills to stay present by observing the environment and identifying elements within it</p> <p>3: Identifying the relationship between cognitive processes, emotions and behavioral reactions - Players are tasked with helping a tree grow by removing birds that represent irrational beliefs. As the sub-levels progress, the game's difficulty increases, and at the end of this level, players' frustration tolerance is evaluated through an experimental task</p> <p>4: Changing irrational cognitions into rational cognitions - Players must identify irrational thoughts and provide rational alternatives, with the game progressing in difficulty with each sub-level.</p> <p>5: Building problem-solving skills</p> <p>6: Building relaxation skills</p> <p>7: Building happiness skills</p>	Complete the seven modules of the game 50 minutes per session	<p>Emotion Symptoms (Strengths and Difficulties Questionnaire - child version)</p> <p>Key aspects of emotion regulation in children and adolescents (The Emotion- Regulation index for Children and Adolescents)</p> <p>Temperamental effortful control, affiliativeness, surgency and negative affectivity (The Early Adolescent Temperament Questionnaire- Revised)</p> <p>Intensity of emotions felt by children and adolescents (Functional and Dysfunctional Child Mood Scale)</p> <p>Participants' level of satisfaction with the intervention (The Treatment Satisfaction Visual Analogue Scales)</p> <p>6 months follow-up</p>	<p>Significant impact on children's emotional symptoms and depressive mood</p> <p>Significant impact on children's ability to regulate their emotions and ability for emotion control</p>
(Gijzen et al., 2021)(36)	Assess inhibiting and promoting factors for scaling up Moving Stories	<p>Recruited from 7 schools in the Southeast of the province North-Brabant, Netherlands</p> <p>982 high school students</p> <p>11- 13% of the children were screen positive for depressive symptoms</p> <p>5-6% were screen positive on suicidal thoughts or behaviors</p> <p>Aged between 11 and 15</p>	<p>Video Game</p> <p>Mobile app</p> <p>Single Player game</p> <p>SimulationGame</p> <p>Interact with Lisa, a virtual girl suffering from depressive symptoms and completing tasks that are beneficial or not</p>	<p>Combination of a serious game and contact-based learning:</p> <ul style="list-style-type: none"> - Introductory face-to-face lesson led by a researcher. - Single-player game-app (10-15 minutes in the morning between 7 and 11 am for 5 days) <p>Debriefing session led by a Lived Experience Worker (LEW) with experience of depression (40 to 50 minutes)</p>	<p>Since this study was to assess the coverage, costs of preparing and offering the Moving Stories intervention to the mentioned sample, there were no measures related to mental health literacy.</p>	<p>Even though the primary outcome was not to assess the effectiveness of the game, the students showed big interest in the LEW stories and shared their own, which may suggest that mental health was enhanced, and stigma reduced among students.</p>
(Tuijnman et al., 2022)(37)	Assess the effectiveness of Moving Stories in promoting mental health literacy and reduce stigma	<p>Recruited from 10 classes from 4 schools in Netherlands</p> <p>185 adolescents</p> <p>Aged between 12 to 15</p>	As described above(36)	<p>Program that comprised 3 parts:</p> <ul style="list-style-type: none"> - Introductory lesson - Single player, mobile and 3D game - A contact session with someone who has a lived experience with a depressive disorder 	<p>Symptom recognition (3 vignettes with a gender matched description of adolescents aged 15 with depression, social anxiety and psychosis)</p> <p>First Aid Confidence (asking how confident the participant would be to help the person in the vignette if they were a friend)</p> <p>First Aid Intentions (asking how much the participants agreed with the statement "If (name of the person on the vignette) was I friend, I would help him/her")</p> <p>Specific First Aid Skills (asking whether the participant would perform each action from a list of 12 helpful and harmful first aid actions)</p>	<p>It showed no effects on symptom recognition, first aid confidence, first aid intentions, beliefs about help, help seeking intentions, first aid behavior and help seeking behavior, after intervention. Personal stigma decreased significantly in the</p>

				Play the game individually but at the same period as their classmates, for 5 days in the morning	Beliefs About Help (asking whether a specific person would make the person's situation in the vignette "better"; "not better"; "not worse" or "worse") Help Seeking Intentions (General Help-Seeking Questionnaire) Questionnaire Perceived Stigma (Dutch Depression Stigma Scale) Social Distance (Items from the Social Distance Scale for youths) First Aid Behavior (asking whether the participant has had contact with someone who has experienced a problem similar to the one seen in the vignette ever) Help Seeking Behavior (asking whether the participants themselves had experienced a problem similar to the situation in the vignette) Depressive symptoms (Children's Depression Inventory) 3-month follow up – mental health literacy 6-month follow-up: mental health literacy and first aid and help seeking behaviors	experimental group after intervention.
(Jani et al., 2022) (38)	Assess the effectiveness of a KT program (tutorial sessions and gameplay) in educating Black youth about Cannabis and Psychosis	Recruited from community in Ontario, Canada 9 participants 77% were male and attending or recently completed high school Aged between 16 and 19	Video game Online through zoom call shared screen Single Player game Role-playing game 3 video games (Harry's Journey, Harry's Journal and Harry's Pathways ToCare map)	Program consisted in 2 parts: tutorial sessions facilitated by undergraduate students and Back to Reality Series video games Tutorials lasted 60 min each and were conducted over Zoom 3 sessions in total	Knowledge about the relationship between cannabis and psychosis (Psychosis and Cannabis Teste (PCT) quiz)	7 participants showed improvement in knowledge about the relationship between cannabis and psychosis and 2 didn't show significant change after the intervention
(Gacia-Soriano et al., 2024) (39)	Asses the effectiveness of using app esTOCma in a community sample	Recruited from a community in Spain 208 community participants Aged between 18 and 73 years old	Video game Mobile App Single Payer game Triviagame 10 missions across a mountain path to free the prisoners, to do so, user must complete different activities such as answering questions or destroying erroneous beliefs about obsessive-compulsive disorder (OCD).	Playing esTOCma vis smartphone until completion – recommended one mission per day, but the participants were free to advance in their own pace	Social Stigma Associated with Mental Disorders (Attribution Questionnaire – Spanish Version) Individual's desire to interact with an individual with mental disorder (Social Distance Scale) Intention to seek help from different sources (General Help-Seeking Questionnaire) Knowledge regarding OCD specifically (Mental Health Literacy Questionnaire) 3-month follow-up	After intervention individual showed a decrease of stigmatizing attitudes, desire to social distance and increase of the knowledge regarding OCD specifically and intentions to seek help.
(Gordon et al., 2024) (40)	Determine the feasibility and acceptability of ACTing Minds on acceptance and community therapy	Recruited from Wales (advertisement were posted on Swansea University and social media pages) 29 participants Over 18 years old Self-reporting experience ongoing of depression, anxiety or stress	Video game Mobile App Single Player Game Role-playing game 5 chapters The game starts with a depressed individual who has recently lost his wife in an accident, and he's feeling depressed, lonely and isolated. Each chapter will reward ACT (Acceptance and Commitment Therapy) consistent behavior with point on a "psychoflexameter". The user will be confronted with two choices that determine the course of the game. They will learn that destroying or suppressing thoughts creates barriers in his mind which prevents him from continuing the game. If the player chooses acceptance-based strategies, they will be able to continue the game. – Acceptance and openness to pain – Mindfulness – Values identification and commitment – Defusion – Self as context	1-hour single session playing ACTing Minds	Acceptability and efficacy (thematic analysis of semistructured interviews) Stress, Depression and Anxiety (Depression Anxiety Stress Scale) Psychological Inflexibility (Acceptance and Action Questionnaire – second version) Social Connectedness (Social Connectedness Scale) 3-week follow up (structured interview) 3-month follow-up (questionnaires)	Decreases in depression, anxiety and stress Increases in psychological flexibility, social connectedness, well-being and participation in usual activities.

The studies included in this systematic review were published between 2010 and 2024, being most of studies published in 2019 and after (n=10; 66.7%) (32–40).

The most common design of the studies included in this review were randomized controlled trials, $n=7$, which reported 46.7% of the included studies. The remaining of the studies were quasi-experimental studies ($n=6$; 40.0%) and mixed-method studies ($n=2$; 13.3%).

Some of these designs were used to assess the effectiveness of serious games to promote mental health literacy or reduction of the stigma towards mental health disorders ($n=5$; 33.3%)^(30,33,37-39), although not all the studies assessed this specific outcome.

The interventions were conducted mostly in educational settings, such as schools and universities, even though some studies allowed the participants to play the game remotely by accessing a link provided by the investigators. They had a duration ranged from single session with the duration of 25 minutes to multiweek programs with a duration of 12 weeks of intervention. Follow-up periods varied, with some studies assessing outcomes after the intervention, and studies including follow-ups to 6 months post interventions.

The participants of the included studies varied from children to adults, with ages ranging between 6 to 73 years old. The studies targeted primary school students ($n=2$; 13.3%), high school students ($n=10$; 66.7%), university students ($n=2$; 13.3%) and general population ($n=2$; 13.3%). Four of the studies targeted clinical population. The gender distribution across studies was in general balanced, although some studies had a predominance of male or female participants.

The games used in the studies were mostly video games ($n=14$, 93.3%)⁽²⁷⁻⁴⁰⁾, with only one (6.7%) being focused on an analogue game⁽²⁶⁾. Most of the games address in the studies were single player games ($N=14$; 93.3%)⁽²⁷⁻⁴⁰⁾, only one was a multiplayer game (6.7%)⁽²⁶⁾. Despite this, in one of the studies, to address the study question, the game was played individually, collaboratively or competitively. Despite working on their own laptops, depending on the group they were assigned to, students were encouraged to provide assistance to their partner or do their best to outperform them⁽²⁸⁾. Regarding type of games, they were role-playing ($n=9$; 60.0%)^(27,29,30,32-35,38,40), trivia games ($n=2$; 13.3%)^(26,39), simulation games ($n=2$; 13.3%)^(36,37), arcade games ($n=1$; 6.7%)⁽²⁸⁾ and platform games ($n=1$; 6.7%)⁽³¹⁾.

Regarding the way to access the game, ten studies used a game accessed through an app (62.50%), and five through a website (31.25%), one of the games could be accessed both ways.

Regarding the mental health topic addressed, four of the included studies addressed general mental health disorders (26.7%), the remaining of the studies addressed specific mental health disorders ($n=11$; 73.3%), such as depression ($n=5$; 33.3%), addiction ($n=3$; 20.0%), bipolarity ($n=2$; 13.3%), schizophrenia ($n=2$; 13.3%), agoraphobia ($n=2$; 13.3%), obsessive-compulsive disorders

(n=1;6.7%), anxiety (n=1; 6.7%), stress (n=1;6.7%), anger management (n=1;6.7%) and psychosis due to drug use (n=1;6.7%), as shown in table 2.

Table 2 – Mental health related topic adressed in each game

Game	Mental health related topic
"Pick-Klop" (26)	Addiction
"Ching Ching Story" (28)	General Mental Health
"Bacon Brains" (28)	Addiction
"Professor Gooley and The Flame of Mind" (29)	General Mental Health
"Stigma-Stop" (30,33)	Depression, Bipolarity, Schizophrenia, Agoraphobia
"Pure Rush" (31)	Addiction
"The Adventures of DoReMiFa" (32)	General Mental Health
"Regna Tales" (34)	Anger Management
"REThink" (35)	General Mental Health
"Moving Stories" (36,37)	Depression
"Back to Reality"(38)	Psychosis due to drug use
"esTOCma" (39)	Obsessive-compulsive disorders
"ACTing minds" (40)	Depression, Anxiety and Stress

Finally, some of these games (N=5; 33.3%) were part of multicomponent intervention. This was the case of "Pure Rush" ⁽³¹⁾, the gameplay was followed by the reading of a booklet information. The participants played the game and after that they must read a booklet that contained all info-graph messages that were presented in the game, assertiveness skills, short- and long-term effects and common misperceptions related to the drugs presented in the game. The game "The Adventures of DoReMiFa" ⁽³²⁾, was also followed by a classroom lesson after every digital game-based lesson. The classroom lesson functionated to consolidate the participants' learning and were led by graduates or students of a Psychology master's degree. The structure of the lesson involved different activities such as role-play and card games, addressing the same topics that were addressed in the previous digital game-based lesson. "Moving Stories" ^(36,37) was also part of a multicomponent program, being the gameplay followed by a debriefing session with a person that experienced depression. This was a contact session for the whole class, led by trainers with lived experience with depression. In this session the trainers told their own life stories about depression and associating that with the experience of the participants with the game, were

discussed five first aid skills (1. Look for warning signs; 2. Ask how they are; 3. Listen without judgement; 4. Help them connect with an adult; 5. Be a friend) that the participants could use when one of their friends would experience depressive feelings. The game "Back to Reality"⁽³⁸⁾ was also part of a multicomponent program composed by the game itself and two tutorial lessons. This tutorial lessons were led by three or four college students and lasted sixty minutes each. The learning objectives were to increase the participants' awareness of the benefits and harms of cannabis, understand the psychosis disorder and cannabis use disorder, appreciate factors mediating the risks associated with underage cannabis use and psychosis such as age of first use, potency of marijuana, genetic vulnerability, choice of products and pathways to care for marijuana use disorder and psychosis.

To assess the outcomes, data were collected via pre/post intervention questionnaires and knowledge tests/quizzes.

In ten studies (66.7%) the outcomes assessed were the ability of increasing the mental health literacy, including knowledge (n=6;40.0%)^(27,28,31,32,38,39) and reduction of stigma (n=5;33.3%)^(30,33,36,37,39). To measure these outcomes, were used knowledge tests created by the researchers of the study. Were also used standard instruments such as the "Questionnaire on Student Attitudes toward Schizophrenia", the Spanish Version^(30,33), the "Mental Health Literacy Questionnaire"⁽³⁹⁾, the "Dutch Depression Scale"⁽³⁷⁾ and the "Mental Health Knowledge Checklist"⁽³²⁾. Some studies assessed general mental health or mental health symptoms before and after the intervention^(26,29,32,34,35,40), and the usability and playability of the games.

4. Discussion

The present review aimed to map the existing literature on the effectiveness of games to promote mental health literacy. Most of the studies in this area were published in 2019 and after and it was also possible to verify that the most games used to promote mental health literacy are single player role-playing (RPG) video games in the form of a mobile app. The interventions were mostly composed only by the game and were performed in educational settings and were mostly focused on high school and university students. Only a few studies assessed the mental health literacy directly.

Most of the studies about promoting mental health literacy through games were published in 2019 and after, this can be due to several factors. Firstly, it can be related to the impact of COVID-19 pandemic in the mental health of the population in general. With this pandemic emerged the need to find responses to address the rising mental health issues, besides this with the necessity of keeping social distancing, digital interventions like video games gained a big power, since games offered a way to engage people in mental health education during periods of lockdown and were able to reach diverse populations^(41,42). This aligns with the fact that there has been a growing focus on mental health and mental health literacy globally, since it has been recognized the importance of early interventions and preventive approaches to mental health⁽⁴³⁾. Therefore, more studies have focused on the effectiveness of games to promote mental health literacy. Finally, the advancements in GBL research have been showing the effectiveness of this approach, leading to more interest in applying this method in mental health education and consequently increasing the research in the effectiveness of games to promote mental health literacy^(32,39).

Most of the studies included in this systematic review used video games to promote mental health literacy. Video games have the ability to engage and motivate the players by using reward systems, progression paths and personalized narratives to increase intrinsic and extrinsic motivation⁽⁴⁴⁻⁴⁶⁾. This characteristic may make effective in promoting mental health literacy since people are more likely to retain information if they are actively engaged. Besides that, video games can simulate real-world situations and create immersive settings where the players experience different scenarios related to mental health. This immersive nature of this type of games stimulates emotional responses, which is essential for learning⁽⁴⁷⁾. Video games also allow users to explore mental health disorders in a safe environment, without the real-world consequences, it offers a controlled environment where players can learn about mental health⁽⁴⁸⁾.

Finally, video games, provide an accessible platform to reach diverse populations, even the ones who may not engage with the traditional mental health education.

Nonetheless, analogue games, such as board games, tabletop games or card games can also be an effective tool to promote mental health literacy. Many analogue games promote face-to-face interactions that encourage the players to communicate, cooperate and work through challenges together ⁽⁴⁹⁾. This characteristic allows players in fostering discussions about the addressed topics and learn more about it and allows the players to build trust and relationships where they are more open to talk about sensitive topics and seek-help if needed⁽⁵⁰⁾. Analogue games also can make learning more engaging by provide sensory engagement that can be useful for players who benefit from multisensory inputs⁽⁵¹⁾. Aligned with that there's the fact the board game offers an alternative to digital game and consequently allow to reduce the screen time that is known for having some consequences, such increasing anxiety, difficult to deal with the frustration, lack of sleep quality and others⁽⁵²⁾. Finally analogue games are excellent to play in groups due to creating a structure yet informal atmosphere where the players feel comfortable to discuss mental health topics openly. They can also be played by different generations and cultures promoting inclusivity of mental health literacy independently of age or culture of the players.

Therefore, the predominance of video games in promoting mental health literacy can be attributed to their accessibility and capacity to reach bigger audiences quickly and effectively compared to analogue games that require material sources and being present which limits their reach. Video games also can create immersive worlds which helps to capture attention for long periods and engage users to learn and acquire mental health literacy. Finally, video games are more convenient and easier to use anywhere and anytime than analogue games.

Single player games were the most common approach. They allow the players to advance in their own pace and reflect on their strategies, since their confronted with the consequences of their own decisions ⁽⁴⁶⁾. Players can take their time to reflect on their actions without the pressure of competing or keeping up with others, which can lead to a deeper engagement. This allied with the safe environment component of video games, can be particularly beneficial for players who are dealing with mental health challenges themselves. Finally, users are more likely to develop insights about their own mental health state and behaviors when they are allowed to reflect without the distraction of others.

On the other hand, being learning a social process, multiplayer games are also suitable for this kind of interventions, since it allows the players to play collaboratively and promotes peer support

by exchanging ideas and strategies with each other and promoting social interaction and teamwork, which can enhance collective knowledge in a way that an individual might not be able to achieve alone ⁽⁵³⁾. These social interactions permit reinforce the importance of teamwork, empathy and understanding in managing mental health challenges.

Thus, single player games offer personalized, reflexive and safe environments for players to learn. They allow users to engage deeply and explore mental health topics at their own pace, without the pressure or competitiveness of multiplayer approaches. These characteristics can justify the fact that single player games more common for promoting mental health literacy than multiplayer approaches.

Additionally, RPG were found to be the most used approach for promoting mental health literacy, since they offer various benefits in education. RPG games are a genre of games in which players assume the roles of characters in a fictional setting. This genre emphasizes storytelling, character development and player decision-making, which makes them a flexible tool to explore different themes such as mental health, in this case. The benefits referred are related to the fact RPG allows the player to engage in the simulated scenarios by assume the character skin and make decisions that affect his well-being or the game outcome, promoting critical thinking and problem-solving skills, which can help them better understand how to deal with mental health challenges in real life. By embodying the character, players also develop empathy, an important characteristic considering that it encourages awareness and compassion for various mental health disorders. Besides this, RPG allows participants to engage in a safe environment where they can explore and learn more about mental health disorders. By increasing self-esteem, engagement and motivation, this type of game is a powerful tool for promoting mental health literacy ⁽⁵⁴⁾.

The remaining games were trivia games, a genre that tests player's knowledge about a certain topic by asking them questions, arcade games, designed for quick, short sessions of play and usually feature simple controls and gameplay which makes them more accessible to a larger range of players, platform games, a genre where the primary challenge involves navigating a character though the environment, normally by jumping over platforms and avoiding obstacles. The last genre of game included in this systematic review was the simulation, this type of games are designed to replicate real-life situations and allow users to control, manage and experience different environments and situations. Contrary of RPGs, in simulations games the character development is not important.

For the reasons mentioned above, the RPG are the most commonly used games to promote mental health literacy due to their immersive and personalized setting combined with the ability to create a safe environment where the players can interact with certain topics and be emotionally engaged which can increase the learning motivation. Otherwise, trivia games are less immersive limiting their ability to engage emotionally the players, simulation games, although realistic prioritize skills over emotional and psychological experiences, finally platform and arcade games are, normally, more action-oriented and don't have the narrative depth or the decision-making opportunities that are important for the discussion of mental health related topics.

These game-based interventions were particularly used among children and adolescents, since all games were educational games and therefore, were typically implemented in specific contexts such as schools and universities, and the population that often frequents these places are children and adolescents. Associated with this, children and adolescents are in a stage where it's essential to promote mental health literacy and reduce stigma around it, since they are forming their identities, developing emotional regulation skills and learning how to deal with complex social situations, which makes them a vulnerable population for mental health disorders⁽⁵⁵⁾. Improving literacy and reducing stigma allows children and adolescents to seek help related to mental health, when needed.

Some of these games were part of a multicomponent intervention which is justified by literature that refers that even though these kinds of interventions are promising, they may be most effective when combined in a multicomponent approach^(54,56,57). Despite this, most of the studies included in this review had as intervention only the game itself, probably due to the high investment in resources that multicomponent approaches require.

Finally, only five of the studies included in this review addressed the promotion of mental health literacy as a primary outcome, although the evaluation measures used are not overlapping, and some authors have even created their own instruments to evaluate knowledge before and after interventions. The lack of standard methods to evaluate mental health literacy difficult the comparison across different studies.

This study had several limitations including the majority use of single player role-playing video games to promote mental health literacy. Its effectiveness was mostly evaluated in younger populations and in individual interventions. The other limitation was the lack of standard evaluation methods to evaluate mental health literacy which complicated the comparison between studies.

Finally, although the results of this study show an increase of mental health literacy after the intervention, which allow to conclude that games are effective in promoting mental health literacy, a deeper investigation is essential to establish their impact and effectiveness across diverse population and settings.

5. Conclusion

The present systematic review aimed to map the existing literature on the effectiveness of games—both video and analogue—to promote mental health literacy. The results show a growing amount of research, especially after 2019, exploring the potential of games to foster mental health literacy. The predominance of studies that involved single player role-playing video games highlights its effectiveness in providing immersive, personalized and safe learning environments where users can individually, without the judgment of other reflect and explore complex mental health topics. RPGs were specifically successful due to their ability to engage players emotionally, foster empathy and encourage decision-making skills essential to face mental health challenges. It was possible to verify that there were benefits in using games to promote mental health literacy, since the results show that there was improvement after the intervention.

Besides this, the review also showed gaps in the literature, including a limited number of studies assessing mental health literacy as a primary outcome and a lack of standardized measure to evaluate these interventions. Additionally, while video games were the most used tools, the potential of analogue games, which encourage face-to-face interactions and deeper reflections, remains unexplored.

Given the increased focus on mental health, games offer a promising way to engage various populations in mental health literacy, especially in educational settings targeting adolescents and young adults due to their vulnerability in these ages.

Nonetheless, further investigation is needed to assess the effectiveness of these interventions by expanding the scope to other type of games such as multiplayer or analogue games, which can provide more opportunities for social learning and teamwork.

Overall, to conclude, while game-based interventions are a great promise to improve mental health literacy, future studies should aim to use standard methods to measure the outcomes and facilitate the comparison between studies and explore multicomponent interventions that combine games with another educational tool, as this way they are more effective to foster learning. This research should include diverse population and settings in order to better understand the impact of games to promote mental health literacy.

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