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Yama's Liberation: Co-designing a ludic educational system to support teens' group therapy

Viviane Peçaibes[1], Pedro Cardoso[2], Bruno Giesteira[3], Liliana Castro[5] Luciana Lima[1]

[1] Interactive Technologies Institute – ITI/LARSyS, Lisboa, Portugal
[2] i2ADS/Faculty of Fine Arts, University of Porto, Porto, Portugal
[3] ID+/ Faculty of Fine Arts, University of Porto, Porto, Portugal
[4] RISE-Health/ICBAS, University of Porto, Porto, Portugal
vivianepeçaibes@gmail.com

Abstract. Digital media can contribute to emergence of eating disorders by reinforcing idealised body standards, generating dissatisfaction with body image and encouraging conditions such as anorexia nervosa. Excessive use of the internet intensifies self-control difficulties, such as impulsivity, hyperactivity and behavioural problems, aggravating the situation. In this context, games can act as effective tools for prevention and treatment, stimulating self-knowledge, communication, behavioural change, and understanding of the disease. In anorexia, wellbeing is impaired by the demands of the disorder, which affects various life's dimensions. This article presents the co-design process to the creation and playtesting of a board game called *Yama's Liberation*, developed with patients and health professionals. The game was useful in promoting self-control, empathy, collective reflection, and flexibility of thought, contributing to mental, social, and digital wellbeing. While the game does not directly address the pathology itself, it has the potential to encourage adoption of positive behaviours among players.

Keywords: co-design, game design, mental health, digital wellbeing, anorexia nervosa.

1 Introduction

According to Vanden Abeele "Digital wellbeing is a subjective individual experience of optimal balance between the benefits and drawbacks obtained from mobile connectivity." [1]. This state of experience is the result of emotional and

rational interpretations of how digital connectivity fits into daily life. Meanwhile, different studies show the media, especially digital media (such as television, online magazines and social media), as potential risk factors for the development of eating disorders. This is because the content conveyed by these media recurrently favours an appearance that idealises thin bodies. Practices such as taking selfies and visualising and/or comparing oneself to images of celebrities, colleagues or family members can intensify body dissatisfaction, contributing to triggering eating disorders in both women and men [2, 3, 4]. Dissatisfaction with body self-image is one of the main factors contributing to the onset of illnesses such as anorexia nervosa [5, 6].

In addition, excessive internet use has been associated with externalising problems, characterised by high levels of impulsivity, hyperactivity and other behavioural difficulties [7]. In adolescents with anorexia nervosa, these effects can be aggravated by deficient self-control mechanisms and a greater propensity for impulsive behaviour or the pursuit of intense sensory experiences. In this way, anorexia nervosa is directly linked to the individual's gradual isolation. This illness usually causes mood and personality changes that can damage close personal relationships and family ties. This can happen because the person with anorexia nervosa is intensely focused on the illness, channelling their efforts into food control, excessive physical exercise and sometimes school performance [8]. It is therefore a serious mental disorder characterised by excessive fear of gaining weight, distortion of body image and weight-based self-evaluation [9, 10]. Although it predominantly affects girls (adolescents), an increase in incidence has been observed among young people in general, including boys [11]. Refusal to recognise the seriousness of the condition compromises involvement in the therapeutic process, which generally requires a multidisciplinary approach combining nutritional recovery and psychotherapeutic follow-up; in many cases, this may involve hospitalisation [12].

The illness affects individuals' physical, emotional and social health. Interpersonal relationships tend to deteriorate, largely due to social withdrawal and communication difficulties, which are aggravated by alexithymia, making it difficult to recognise and express emotions [13, 14]. Depression and anxiety are frequent comorbidities [15, 16], and the lack of insight, i.e. the inability to recognise and understand the seriousness of their health condition, is another obstacle to treatment, requiring specialised strategies from multidisciplinary teams [17, 18]. In this context, family support and empathy from health professionals are fundamental to building a relationship of trust that favours the treatment of the disease [19].

Recent literature has highlighted the potential of games, both analogue and digital, as complementary resources in the treatment of mental disorders, including anorexia nervosa [20, 21, 22]. Studies show that these ludic tools can: (a) complement and enhance conventional medical and psychological treatments; (b)

act as promoters in the patient's recognition of the disease; (c) facilitate communication between doctor-patient and family; (d) improve emotional management; (e) offer ludic experiences that teach about the disease; and (f) promote behavioural changes. Because they appeal to young digital natives [23], games can also help to involve patients in their treatment, and promote self-management, empowerment and socialisation, transforming ludic behaviour into positive actions [24, 25, 26]. Furthermore, as Huizinga [27] has already argued, games can also be instruments capable of facilitating learning, helping to improve mental health, promoting personal and cultural improvement and facilitating socialisation, expression and the construction of knowledge. Thus, by integrating games into clinical contexts, we start from the assumption that it is possible to create experiences that not only facilitate understanding of the illness but also promote the active involvement of patients, encouraging the adoption of healthier behaviours and sustaining the path to recovery and mental, physical, social and digital wellbeing.

This perspective on the potential of games as resources to support the treatment of anorexia nervosa was further developed in a PhD research project in Design [28], which focused on the creation of analogue, digital and hybrid games that would meet the needs of the disease's prevention and treatment contexts [29]. This research adopted an approach based on design practice, anchored in co-design methodologies [30, 31, 32, 33], which are part of the User-Centred Design paradigm [34], thus valuing the active participation of users. Within this interactive process, the focus is on deeply understanding user needs. According to Sanders and Stappers [35], co-design is an evolution of the user-centred approach by redefining the roles traditionally attributed to researchers and users. Instead of mere participants or informants, users become active co-creators in the development process, contributing their experience to all phases of the project, from generating knowledge and formulating ideas to designing and implementing the solution, which can be a product or artefact. This approach values collaboration between designers and individuals without specific design training, recognising shared creativity as an essential resource for developing more relevant, inclusive and effective artefacts. Thus, the participant (or the person who has the need to be met by the design process) is given the position of expert (because of their experience), and plays a role in knowledge development, idea generation, concept and development.

Based on the above contextualisation and supported by the clinical experience of one of the authors with this audience, as well as research centred on co-design and participatory design methodologies, we set out to explore interactive and complementary approaches that would promote more active participation by patients in the therapeutic process. Thus, we focused on games, recognising their potential as a support resource in the treatment of anorexia nervosa. In 2019, we

immersed ourselves in clinical contexts (defined as study settings) for one year to collect data from patients, family members, and health professionals, aiming to understand the complexity of anorexia nervosa and the dynamics between the various actors involved. The study settings were the University Hospital Centre São João (CHUSJ), specifically the Psychiatry Service, in the eating disorders sector (Porto, Portugal) and the Elysio de Moura Residence (Valongo, Portugal)[1].

In this article, we will address the following research question: *How can a co-created analogue game serve as a tool to help teenagers with anorexia nervosa manage self-control and other issues arising from digital technology, such as high levels of impulsivity, hyperactivity, and other behavioural difficulties?*

To answer this question, we present the co-design process that resulted in the creation and playtesting of an board game called *Yama's Liberation* together with patients and health professionals. This article is structured in six sections, including this introduction. In Section 1, we present some examples of games developed and accompanied by multidisciplinary teams with a focus on anorexia nervosa. Section 2 describes the methodological approach adopted for the co-design process. In Section 3, we detail the game development and the different prototypes co-created. Section 4 is dedicated to playtesting with patients and health professionals, as well as the data collection instruments created. The results and respective discussion are presented in Section 5. Finally, in Section 6, we summarise the main points of the collaborative process and reflect on the game's performance as a therapeutic instrument. This article contributes to research and practice at the intersection of design, mental health and participatory methodologies by demonstrating, in an applied way, how an analogue game co-created with patients and health professionals can function as a complementary therapeutic tool in the treatment of anorexia nervosa, as well as tool to promote wellbeing.

2 Related work: Games for Anorexia Nervosa

A search was carried out in specialised databases[2] and websites[3], resulting in the identification of seven games focusing on anorexia nervosa. Of these, two have academic articles, four are experimental prototypes, and one is a mobile application. Only three were developed with the support of a multidisciplinary team, while the others are personal creations based on individual experiences with the illness. This

[1] This research was evaluated and unanimously accepted by CHUSJ's Ethics Committee.

[2] Databases consulted: Psycinfo, Web of Science and Pubmed on 08/06/20 and 09/06/20.

[3] Websites consulted:<https://itch.io/>; <https://www.gamesforchange.org/>; <https://www.kickstarter.com/>; <https://play.google.com/store/games?hl=pt-PT>; <http://gamestudies.org/2202> - accessed on 09/06/2020.

section deals with the three games with professional support: *Perfection* (2015), *Amigo* (2015) and *High School Story* (2013), as they are aligned with the objectives of the project presented.

Perfection (2015) is an interactive game about anorexia nervosa, part of the online project *For the Records*[4], which addresses various mental disorders. It uses the metaphor of a garden as a representation of the body, where the quest for perfection involves eliminating slugs and weeds. Created with people suffering from the illness, the game aims to sensitise the public and promote insight into patients. The simulation of the challenges in maintaining the garden reflects the obsession with perfection, a central characteristic of anorexia, making the experience educational and emotionally engaging [36, 37, 38].

Amigo (2015) is a narrative game (affective visual novel) aimed at preventing anorexia nervosa in young schoolchildren. It mixes romance and fantasy, allowing the player to interact with four main characters, anorexia patients who protect the world at night. The player helps them recover through mini-games and advice. The game also features secondary characters such as experts, friends, family and opponents. Based on Cognitive Behavioural Theory, it uses a system of rewards called *Love Coins*, which encourages changes in behaviour and makes it easier for players to apply their learning to their daily lives [39].

High School Story (2013) is a mobile role-playing game that explores themes of adolescence[5]. The player builds their ideal school and interacts with various characters. Due to its popularity among young people, the developers included more diverse characters, such as Mia, a teenager with anorexia nervosa, created based on suggestions from the players themselves. Her story deals with bullying, criticising her appearance and distorting her body image through photo manipulation. Developed in partnership with the *National Eating Disorder Association*[6], the character seeks to raise awareness and promote prevention and insight into anorexia.

The data collected shows that there are only a small number of games focusing exclusively on anorexia nervosa, which reveals that this is still a largely unexplored area of design research. There is also a lack of initiatives based on multidisciplinary approaches, which reinforces the relevance and need for this study. The complexity inherent in anorexia nervosa, as well as its multiple dimensions, must be carefully considered when developing games with therapeutic potential. In this sense, it is recognised that games can be promising tools, capable of helping to externalise emotions, foster cooperation, and promote communication between patients and health professionals.

[4] URL:<http://fortherecords.org/> - accessed on 03/08/2022.
[5] URL: <https://www.highschoolstory.com/> - accessed on 03/08/2022.
[6] URL: <https://www.nationaleatingdisorders.org/> - accessed on 03/08/2022.

3 Co-design for game creation

Burkett [30] states that co-design is a design-led process that uses creative and participatory methods in which co-designers make decisions, not just suggestions. Co-design happens over time and through different structures – it requires a different kind of relationship between people, involving trust, open and active communication and mutual learning. In this way, co-design is a process, not an event.

Co-design was fundamental to the co-creation of the *Yama's Liberation* game, as anorexia nervosa is complex and involves a wide range of stakeholders. All these people affected by the illness have different needs, and co-design allowed them to participate in some way in game development. According to Ku and Lupton [40], involving patients and other stakeholders in the design process makes these people active participants and not just objects of study or empathy, as they have their own experience of living with the disease, which makes them experts on their condition. These authors also note that patient involvement is not yet routine in biomedical research and health care. The co-design process consisted of five stages that ensured the involvement of co-designers in design decisions throughout the project:

1. *Game Concept Ideation:* refers to the generation of ideas and sketches of the game concept. This stage aims to generate different ideas that respond to the needs identified in the research context. To do this, we held two co-design workshops with patients and health professionals on the premises of the Elysio de Moura Residence.
2. *Game Concept Development:* creating the overall game concept, defining the main objectives and elements, and creating the content. This stage involves identifying, formulating and developing the concept and basic structure. This stage aims to structure the game, give a preliminary shape to the elements, organise the basic rules and create the content.
3. *Verification (content):* game concept and content created are reviewed and pre-validated. This stage aims to verify the relevance, alignment and suitability of the game concept to clinical practice in the treatment of anorexia nervosa.
4. *Verification (playability):* testing the game concept's playability. This stage aims to observe the players' experience of the game. Gather players' perceptions and suggestions as to whether the game meets the premises set out in the concept development phase. To do this, we returned to the Elysio de Moura Residence and tested the game concept with the same group of patients and health professionals as in stage 1.
5. *Test Prototype Development:* game review following therapeutic and playability verification to create the prototype test. In this stage, the input

from the verification stages is reviewed to adjust and refine the game concept to turn it into a prototype test.

4 The Game: Yama's Liberation

Immersion in the study setting, which included gathering information from patients recovering from anorexia nervosa, health professionals and passive observation of the care provided at the Elysio de Moura Hospital and Residence, allowed us to identify a significant gap in the use of games as a support tool in clinical-therapeutic contexts [29]. It was found that there are no games aimed at both the treatment environment and preventive actions aimed at individuals who have not yet been formally diagnosed with the disease. It was also found that most of the patients show the characteristics indicated by Šablatúrová et al. [41] such as shyness, withdrawal, difficulties in identifying and expressing emotions, self-control problems, as well as resistance to recognising their pathological condition, which translates into a posture of distrust towards health professionals.

Given this scenario, the need arose to design an analogue game that could function as an instrument of therapeutic mediation, contributing to the externalisation of feelings and emotions, stimulating communication, social and behavioural skills training and strengthening the relationship between patients and professionals. Observation of the group therapies revealed the recurrent use of psychodrama[7] as an effective resource for mobilising patients' emotions and dealing with sensitive content. Based on this observation, the RPG (Role-Playing Game) format was identified as having significant potential for the creation of a game capable of supporting the clinical work of health professionals in a playful, engaging way that is sensitive to the specificities of the treatment of anorexia nervosa.

To illustrate and explain the outcome of the co-design application in this study, we present the process of creating and developing the game *Yama's Liberation*, which is divided into:

- *Serious goal*: therapeutic game purpose.
- *Theme*: ludic game goal and related thematic.
- *Components and Gameplay*: game composition and elements as well as player's game experience.
- *Rules*: general rules and how the game works.
- *Gift Challenges*: Challenges created especially for the game.

[7] This intervention focuses on dramatization as a method of developing roles and their bonds, expanding patients' spontaneity and creativity. The aim is to provide dramatic action by the patient to help the individual get in touch with themselves and their interrelationships [42].

This game was developed together with 5 patients and 2 health professionals from the Elysio de Moura Residence (Table 1), 1 product designer and 2 prototyping specialists, 1 game designer and 1 illustrator.

Table 1. Co-Design sessions: Profiles of participating patients and health professionals.

Category	Participant	Age (y.o.)	Level of Education	Occupation
Patients	Pa	20	High School	-
	Pb	18	Higher Education	-
	Pc	19	High School	-
	Pd	21	High School	-
	Pe	18	Higher Education	-
Health professionals	Maria	45	-	Psychologist
	Inês	40	-	Psychologist

Exclusion criteria were a) Patients already diagnosed with intellectual retardation and/or comorbid schizophrenia, patients showing signs or symptoms of intoxication due to the use of a substance that influences their cognition and patients diagnosed with bulimia nervosa or an eating disorder other than anorexia nervosa; b) Health professionals working in other hospitals.

In the *Game Concept Ideation* phase, we defined the environment, the game's main story and the characters through co-design workshops with patients diagnosed with anorexia nervosa and undergoing treatment. These game components were produced in 2 workshops (90 minutes each) supervised by 2 health professionals at the Elysio de Moura Residence.

Fig. 1. Workshop 1 materials before the session (left - top), Workshop materials after the session (left - bottom) and the co-created story mind map (right).

In the first workshop, participants were invited to work together to create the atmosphere and introduction to the game's story based on a selection of images provided. They were given a series of thematic *moodboards* (medieval, 1920s, space, post-apocalyptic, fantasy and present-day) and other materials (Fig. 1).

In the second workshop, each patient created and filled in a character sheet freely, building the story, defining the character's attributes and abilities and explaining the reasons for each choice (Fig. 2).

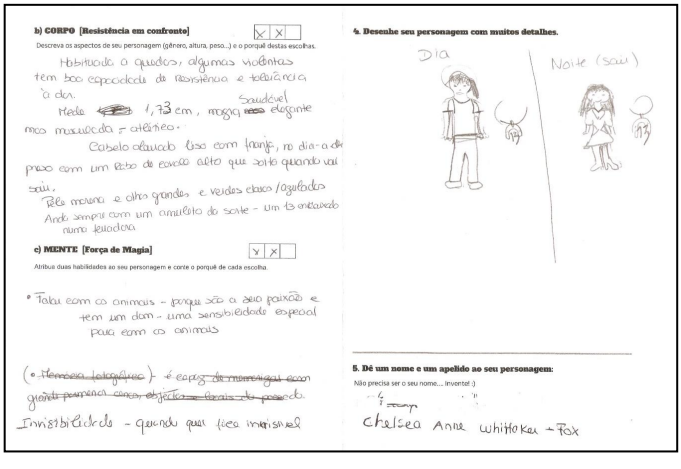

Fig. 2. Character sheet filled in by a patient (anonymised) - Front.

In the *Game Concept Development* phase, we created the game mechanics, defined the components, improved the story, created the game's name, designed the challenges, refined the content co-created by the patients and built the first study prototype. In the *Content Verification* phase, the challenges and other content were verified by the supervisor team (experts in design, game design and anorexia nervosa). The *Playability Verification* phase took place initially in-house (with game designers) to adapt the prototype. This verification was fundamental for tuning the challenges, creating the component aesthetics and structure, and adjusting the game mechanics. Based on the improvements from the internal playability verification, we made the second prototype.

The second prototype was used in the *External Playability Verification*, with the participation of the same patients and health professionals who co-created the game, in two group therapy sessions at the Elysio de Moura Residence (Figure 3). In this verification, the patients played the game together with the health professionals, and then everyone made suggestions in an informal conversation.

Fig. 3. Playability verification session with patients during group therapy at the Elysio de Moura Residence. All the players show the tattoos they got at the end of the game.

In this verification, we realised that the characters, story and challenges were balanced and that the game design made sense for the patient's age group. We also realised that some of the challenges could have been more difficult, as the cognition of these patients was less affected due to the pathology stage and treatment. Based on the input from the verifications, we moved on to the development stage of the test prototype. We redesigned all the components, adjusted the challenges, created the character illustrations based on the character sheets created by the patients and created the illustrations of the Hindu Gods who are part of the story.

3.1 Serious Goal

This analogue board game has an RPG[8] (*role-playing game*) style. Its purpose is to help patients externalise feelings and emotions, stimulate communication, social and behavioural skills training and strengthening the relationship between patients and professionals in group therapy sessions.

3.2 Theme

Throughout the adventure, which takes place in India (New Delhi), players must work as a group to overcome challenges spread throughout the game world to meet the final challenge and liberate Yama (the Hindu god who was imprisoned by the Hindu god Shiva). Through role-playing, players are compelled to act to take care of themselves and the group in the game world, communicate with each other and

[8] Role-playing game where players take on the roles of characters and collaboratively create narratives.

make decisions to deal with complex and spontaneous situations [20]. By promoting player engagement, discourse and action, this game acts as a tool for health professionals to obtain information about their patients that would otherwise be difficult to obtain.

The game's name was based on a fairy tale about Indian gods: Yama is the Hindu representation of balanced and natural death. With Yama's disappearance, the earth became overpopulated. The god Brahma, concerned about the imbalance on earth, sends Shiva to help with the immense population. Shiva disobeys Brahma and influences humans to self-destruct. Only with Yama's liberation can Shiva be removed from the earth and balance be restored.

3.3 Components and Gameplay – Test Prototype

The minimum number of players is 5 (4 players and 1 health professional), and the maximum is 9 (8 players and 1 health professional). The complete game can be seen in Figure 4:

Fig. 4. Game board with the components.

The complete game has different items that act not only as components for the players' action in the game, but also as facilitators for group therapy (Table 2).

Table 2: Game components and their facilitating factors for group therapy.

COMPONENT	DESCRIPTION	FACILITATING FACTOR FOR GROUP THERAPY
1 Board *(DIN A3 format)*	It has a real map of a section of the city of New Delhi on which the elements and gods of the game's theme have been added.	The decision to use a map as the basis of the board was inspired by an exercise in Cognitive Remediation Therapy for Anorexia Nervosa that aims to help make perfectionism more flexible[9].
12 × Character Sheets (*6 predefined characters and 6 blank sheets*)	Players interact with the game through the characters. The predefined characters are those that have been co-created with the patients[10].	The projective dimension implicit in the characters that players create to play can open a window onto subjective information about themselves, such as personal characteristics, past experiences, knowledge and integration of the world [20].
1 × Game Master's Book	Book to support the health professional (Game Master), it contains the game instructions, the Gift Challenges and the Mandatory Stop 1 and 2 challenges, as well as the correct answers to all the challenges.	The health professional is the moderator of the session to ensure that the game runs and to guide the players in their group decision-making, and he/she also has an active role in the game (in the additional challenge of the Gift Card – *role play*). These 2 roles alternate each round to promote proximity between patients and health professionals.
8 × Gift Card *(1 card for each location on the board)*	When the group wins a challenge, they choose a player to become that god's favourite, gaining benefits and resources to be shared among the participants.	The group must decide who gets the god's protection and distribute the resources (as there aren't enough for everyone). In addition, in each Gift Card, there is an additional challenge that the players must solve as a group through role-play together with the health professional.
1 × Stamp (tattoo) *(3D-printed stamp and 1 stamp pad)*	When the team wins a Gift Challenge, one of the players is chosen to receive a tattoo (stamp) on his/her skin.	

[9] Cognitive Remediation Therapy aims to improve basic cognitive functions using a range of exercises designed to strengthen the cognitive and metacognitive flexibility and information processing of patients with Anorexia Nervosa [43].

[10] The drawings created by the patients were redrawn by an independent illustrator. URL: <https://pablitoaguiar.com.br/> - accessed on 17/08/2022.

360 × Coloured Chips (*120 × blue, 120 × yellow and 120 × red*)	The character sheet contains the character's history and spaces for managing resources (strength, body and mind).	Resource management is individual, but during the game, there is a need to share resources or even lose them. The players' decisions in this administration provide a range of information for the health professional.
2 × Common dice (*1 × blue and 1 × red*)	The blue die is used to receive chips (body, mind or strength) during the journey, and the red die takes chips.	The dice adds the factor of randomness, which gives patients the experience of losing out and lacking control (perfectionism - anorexia characteristic).
1 × Pawn *(Unique pawn – 3D printing in resin)*	Players move around the game world together.	This encourages joint decision-making, organisation and negotiation between the players.
1 × 3D Spectacles	Items to help with some specific challenges.	These items favour discovery and surprise, as the Game Master doesn't tell you when and how to use them.
1 × black light pen		

3.4 Rules

The *Yama's Liberation* game has a set of rules that are given by the game master. The rules are as follows:

1. *Preparation:* Each player starts with a character and a predetermined number of coloured chips. At the start of the game, everyone must decide where they want to go in the game world. The group must always start and return from the centre square on the board.
2. *Mandatory Stop 1:* The player rolls a die and receives a reward based on the result.
3. *Gift Challenge:* Place the pawn in the chosen city and read the challenge for that location. The group has the time shown on the hourglass. If the group completes the challenge, everyone must decide which player will receive the gift card and tattoo (stamp).
4. *Mandatory Stop 2:* A player must roll to find out his opponent's Strength. To defeat the opponent, the player can roll or choose to use Strength or Magic. If the player wins, they get coloured chips. If they lose, everyone loses coloured chips.

5. When players return to the town square after completing a challenge, they will always find people in need of help. At this point, they need to discuss how to solve the problem.
6. Players must then choose a new location in the town to explore.
7. *Game over:* The game ends when all 8 Gift Challenges have been solved, each player has at least 1 tattoo, and Yama's Liberation is complete.

3.5 Gift Challenges

Some of the game's challenges were based on *Cognitive Remediation Therapy* for anorexia nervosa. Cognitive rigidity and very detail-oriented thinking are key disease characteristics [44] and of people who overuse the internet [7]. This has a significant negative impact on any therapeutic involvement. In this sense, this is a useful approach for minimising the high drop-out rates. Players are often at different levels of the disease, so we decided to create challenges based on *Cognitive Remediation Therapy*[11] and others not, so that the health professional would have differentiated resources to cater for all specificities (Table 3).

Table 3: Yama's Liberation - Game's Challenges.

LOCATION	STATEMENT	ACTIVITY DESCRIPTION
Hospital*	*How many people are in the picture?*	An image with an optical illusion, which helps people with anorexia nervosa with cognitive flexibility.
Supermarket	*Decode the message in Morse code.*	Phrase with Morse code symbols only. The players receive a sheet with all the symbols and the corresponding letters of the alphabet.
Mysterious Village*	*Divide into groups. One group describes the image and the other draws it.*	A picture with a geometric figure is given to the group that describes it. Pencil and paper are given to the group that draws.
Old Garden	*Deciphering the sculpture's message.*	Image with a message hidden by red symbols. The only way to read the message is to use the 3D paper glasses.

[11] Marked in Table 3 with an asterisk (*)

Sacred River*	*Mark the centre of each line with an X.*	Image with a group of lines at different angles and sizes.
Abandoned Temple	*Unravel 4 messages from the gods on the board.*	An image of a pen is presented to the players, who need to find the light pen to read the messages.
Devastated Field	*Find 7 differences.*	Manipulated images of a field with 7 differences to find.
Ancestral Park*	*Look at the arrows and define where they point (north, south, east...)*	Image with 15 arrows pointing to different points. Players receive a compass rose to help them.
Yama's Liberation*	*Gather in the main square to receive Shiva's message.*	The health professional brings the group together for a joint reflection on the experience of the game.

4 Playtests

The playtests took place after the COVID-19 pandemic (November and December 2021) at the Elysio de Moura Residence (Valongo, Portugal) under the supervision of the medical team. Below we present the instruments created for data collection, the procedures applied in the playtest session and the sample participants' characterisation.

4.1 Instruments

The main type of evaluation used was an observational evaluation, which helps to verify the behaviour of the product in a real environment [45], accompanied by in-depth interviews with health professionals. It should be highlighted that although the patients are the game users, our focus was on the evaluation by the health professionals using the game. To record the playtest sessions, the following information collection tools were developed:

- *Diary Studies:* a written journal of our activities, thoughts and feelings throughout the research process [46]. We only used this instrument to play tests in the hospital setting, as the CHUSJ Ethics Committee did not allow video recording or image capture (photos) during the sessions.

- *Observation grid:* designed to be used during all playtesting sessions. We created this grid based on the contributions of ethnographic observation [47], the manual for observation of collective serious games [48] and the game's basic elements [49].
- *Unstructured interview script:* used in the interviews with the health professionals who conducted the tests. The interview script is based on the Quality Evaluation Criteria for Serious Games [50], the Interactive Digital Narrative Game Experience instrument [51], the Questionnaire for Game Evaluation created by Daré et al. [48] and the objectives of this research.
- *PANAS (Positive and Negative Affect Scale):* applied to patients after the game tests. This scale [52] is widely used in the health field to measure well-being. We used the version validated for Portuguese [53, 54].

4.2 Procedures

We created the test protocol aligned with the contributions of Macklin and Sharp [49]:

- *Before the session,* we help the health professionals present the game to the patients.
- *During the session,* the patients play with the health professional while we take notes on the observation grid and diary.
- *After the session,* the health professional gives the patients the PANAS instrument to fill in, and then we interview the health professionals about the experience using the unstructured script.

All material collected in the in-depth interviews with health professionals was transcribed and, together with the information from the observation grid and the diary, underwent content analysis [55]. The data collected by the PANAS instrument were organised in a table that supports the presentation of the results, to perceive the details of the information obtained through the qualitative collection.

4.3 Sample

The playtests took place in 3 group therapy sessions with 6 patients[12] (who didn't know the game) and 2 health professionals (Table 4).

[12] The exclusion criteria were the same abovementioned in Section 2.

Table 4. Participant profiles.

Patient	Age (y.o)	Educational Level
P1	55	High School
P2	31	Master
P4	19	Higher Education
P5	18	Higher Education
P6	25	High School
P8	30	College

After the game tests, interviews were held only with the health professionals identified in Table 5.

Table 5. Health professionals interviewed.

Name	Function
Maria	Psychologist
Oriana	Psychology trainee

5 Results

Based on the interview content analysis, we created categories and analysis subcategories a posteriori, based on the verbalisations, while remaining open to the diversity of content expressed by the interviewees:

- Category 1: PERCEPTION OF GAME ELEMENTS AND EXPERIENCE - This category covers the material and immaterial game components. It seeks to understand how the design applied in the game's construction is perceived by the interviewees and participants who have tested the game. Subcategories: *Game components, Content relevance, Game experience.*
- Category 2: GAME THERAPEUTIC POTENTIAL - This category is aligned with the game's properties and capabilities as an active instrument within the disease prevention and treatment process. Subcategories: *Positive or Negative Experience and Learning, Externalisation of Emotions and Memories, Encouraging communication between health professional and patient and between patients, Promoting behaviour change, Potential for treatment and Equating game and reality.*

The following subsections present the results of the game's playtests, divided into the two analysis categories. Each result is followed by an excerpt from the interview with the health professionals to illustrate the data presented.

5.1 Perception of game elements and experience

Game objects (namely the character sheet and the tattoo stamp) were crucial to the players' engagement, closeness and immersion in the game space, culminating in the players' complete appropriation of all elements, thus enhancing creativity and focus on problem-solving, something that is usually difficult for this type of patient due to perfectionism (Figure 5): '*For problem-solving, it seemed to me that the patients brought out the best in themselves (their skills). Like a better version of themselves.*[13]' (Maria).

Fig. 5. Patient during the test showing the tattoo received.

The visual and graphic elements were perceived by the health professionals as attractive and demonstrating quality. According to the psychologist interviewed: *'It's all very nice! It delights to see.*[14]*'* (Oriana).

The objectives and rules were understood by the players, which was reflected in the patients' pride in their performance and effort within the game, creating an opportunity to reflect on their treatment in a light and welcoming atmosphere. The players had some difficulties at the start of the game, but it brought satisfaction and fulfilment to both the players and the health professionals because they managed to

[13] Translation of the original in PT: *"Para a resolução de problemas me pareceu que os pacientes trouxeram o melhor de si (suas habilidades). Como uma melhor versão de si próprios."*

[14] Translation of the original in PT: *"Tudo muito giro! Realmente encanta ao ver."*

overcome challenges through teamwork: *'I hope you enjoyed it as much as we did (patients)!*[15]*'* (Patient 6 at the end of game session 3).

The content was perceived as appropriate and technically coherent, conveying security and credibility. The psychologist interviewed said: *'It's an interesting game for those who come from the field of psychodrama because role-playing here is fundamental. In this case, it fits like a glove for those with this background.*[16]*'* (Maria).

The narrative connected to fantasy brought the players closer and made them identify with the game, strengthening their confidence and motivation to continue playing. According to the professional interviewed: *'The characters' content was very rich and allowed quick identification... regardless of whether the character was a child or older... or a man.*[17]*'* (Maria).

As for the players' agency, they felt free to make group decisions, to have discussions about the distribution of resources and quickly self-organise strategies within the game. This experience of freedom that the players felt when choosing the tasks to carry out and the challenges to achieve was reflected in their enthusiasm, proactivity and responsibility for their own decisions. The health professional interviewed mentions that: *'I found it very interesting that they had to the places to go as a group, everything was a group decision (distributing chips, who gets the Gift), and we (the professionals) get to observe the more active players, which is really interesting.*[18]*'* (Maria).

5.2 Game Therapeutic Potential

To evaluate the positive or negative experience aroused after using the game, we used the aforementioned PANAS instrument, which was completed by 5 of the 6 patients who played the game.[19] Patient responses (Figure 6) were identified (P5,

[15] Translation of the original in PT: "*Espero que tenham gostado tanto quanto nós (pacientes)!*"

[16] Translation of the original in PT: "*É um jogo interessante para quem vem da área do psicodrama, pois a interpretação de papéis aqui é fundamental. Neste caso, assenta como uma luva para quem tem este background.*"

[17] Translation of the original in PT: "*O conteúdo dos personagens estava muito rico e deu a oportunidade de uma rápida identificação… independentemente do personagem ser criança ou mais velho… ou homem.*"

[18] Translation of the original in PT: *"Achei muito interessante a coisa deles terem que escolher os sítios para onde ir em grupo, tudo era uma decisão do grupo (distribuir fichas, para quem vai o Dom) e nós (profissionais) vamos observando os jogadores mais ativos e é mesmo muito interessante.*"

[19] Patient 7 was present at one of the three game sessions, but as she left the residence quickly, we didn't have enough time for her to fill in the instrument.

P4, P1, P2 and P8) in which we had higher values for positive affect (213) than negative affect (60). P8 had the highest total score for positive affect (48), followed by P2 (46), almost reaching the total score of 50 (when the maximum score of 5 is given for all affect), showing that the experience was perceived as very positive by these participants.

POSITIVE AFFECT	P5	P4	P1	P2	P8	TOTAL
Interested	4	5	4	5	5	23
Excited	5	4	3	5	5	22
Enchanted	3	4	4	4	5	20
Alert	4	4	4	5	5	22
Proud	5	1	4	4	5	19
Strong	5	2	4	4	3	18
Inspired	4	1	3	4	5	17
Determined	5	5	4	5	5	24
Attentive	5	5	5	5	5	25
Active	4	5	4	5	5	23
TOTAL	**44**	**36**	**39**	**46**	**48**	**213**

NEGATIVE AFFECT	P5	P4	P1	P2	P8	TOTAL
Hostile	1	1	1	2	1	6
Irritable	1	1	1	1	1	5
Guilty	1	1	1	1	1	5
Afraid	2	1	1	1	1	6
Scared	1	1	1	1	1	5
Angry	2	4	1	1	2	10
Ashamed	1	1	1	1	1	5
Nervous	2	2	1	2	1	8
Distressed	1	1	1	1	1	5
Jittery	1	1	1	1	1	5
TOTAL	**13**	**14**	**10**	**12**	**11**	**60**

Fig. 6. Results obtained using the PANAS instrument.

The high scores for the positive affections of *interested* (23), *determined* (24), *attentive* (25) and *active* (23) are consistent with the respondent's indication that the game provided positive reinforcement and that the players found the experience rewarding.

In terms of negative affect, the highest scores are for *angry* (10) and *nervous* (8), which is consistent with the interviewee's comment about the *'positive experience and group cohesion even with different profiles*[20]*'* (Maria), as this game requires players to make decisions as a group, which can cause irritation and nervousness for some profiles.

Regarding learning, the respondents mentioned that role-playing was perceived as something very relevant within the game to modify the standards imposed by perfectionism: *'Yes... but mainly in role-playing. (...) The fact that you lose in the challenge is also important because normally patients always want to distinguish themselves and win.*[21]*'* (Maria).

The game also acts as an instrument that gives health professionals access to the relevant emotional material that the game evokes in patients. The psychologist interviewed emphasises this: *'The game relates more to spontaneity. The great merit*

[20] Translation of the original in PT: "*experiência positiva e a coesão grupal mesmo com perfis diferentes*".

[21] Translation of the original in PT: *"Sim..., mas essencialmente no treino de papel. (...) O facto de perder no desafio também é importante, pois normalmente os pacientes querem sempre destacar-se e vencer."*

of the game is to develop spontaneity because in the game patients can be whoever they want to be, without being trapped by previous definitions of themselves.[22]*'* (Maria)

The health professionals interviewed highlighted the perceived benefits in terms of communication and interaction between the team and the patient, but also between patients themselves. As an instrument to facilitate positive interaction with patients, to encourage curiosity and reduce patient resistance, and to provide moments of fun, relaxation and closeness with health professionals: *'The great merit of this game is that they (patients) can stop seeing us as therapists and see us as old people, pregnant women or tourists.*[23]*'* (Oriana).

The game encouraged players to express themselves physically and verbally, which was highlighted as important for communication between patients, as negotiation and group decision-making are important factors to work on during treatment: *'This game involves a lot of negotiation and therefore a lot of communication… Of course, there are moments of tension, but that's part of it.*[24]*'* (Maria).

The game was found to have the potential to change behaviour, mainly because of the action it encourages and the way it affects players in a way that empowers them: *'Especially the response to the big challenges, I think patients can see other facets of themselves, which has a lot of impact. They see their characteristics, what makes them impatient... what makes them nervous... and that is very rich. The game empowers them. There's an empowerment that continues after the game is over.*[25]*'* (Maria).

The game's potential to improve patients' adherence to treatment was also recognised. The health professional referred to the case of Patient 6 who performed well in the game, which was reflected in her reduced resistance to treatment and greater integration into the group: *'In the case of Patient 6, the game was very important... because she has such a sick role (she uses crutches and falls on the floor*

[22] Translation of the original in PT: "*O jogo remete mais para a espontaneidade. O grande mérito do jogo é desenvolver a espontaneidade, pois dentro do jogo os doentes podem ser quem quiserem sem estarem presos às anteriores definições de si".*

[23] Translation of the original in PT: *"O grande mérito deste jogo é esta possibilidade de elas deixarem de nos ver como terapeutas e nos verem como velhinhos, grávidas ou turistas."*

[24] Translation of the original in PT: *"Este jogo tem muita negociação e com isso muita comunicação…. é claro que tem momentos de tensão, mas isto faz parte."*

[25] Translation of the original in PT: *"Principalmente a resposta aos grandes desafios, acho que os pacientes têm a possibilidade de ver outras facetas deles, o que tem muito impacto. Eles percebem seus próprios traços, o que causa impaciência… o que os deixa nervosos… e isto é muito rico. O jogo os empodera. Acontece um empoderamento que continua depois que o jogo termina."*

all the time) and she performed so well and integrated so well into the group that this is undoubtedly an important factor in treatment adherence.[26]*'* (Maria).

The interviewee said that the potential for insight gained from the game was made possible by the game's final challenge, which encourages free dialogue and reflection between the patients and the health professional on the behaviours and roles they have played in the game: *'The last activity of the game (Shiva talking to the participants - reflection) is undoubtedly a great promoter of insight. They are forced to see the best in themselves and that is fundamental. Everyone needs to realise their evolution.*[27]* (Oriana).

The game surprised the professional interviewed because the action it encourages puts patients in situations that require an immediate reaction, thus allowing them to practice their ability to express, understand and then evaluate their emotions: *'It's spectacular because the most common emotional strategies in them (patients), which are rumination and avoidance, become impossible in the game (...) because the action is imposed and for me, this is the best part of the game.*[28]*'* (Maria).

The interviewee emphasised that this game has relevant therapeutic capabilities that can help not only patients with anorexia nervosa but also patients with borderline personality disorder in their treatment: *'It's a great group instrument that reflects individual aspects. I can see this game being used by anorexia patients and borderline personality disorder patients together, but the therapist couldn't be alone because you must be attentive to ensure control of the session.*[29]*'* (Maria).

The perceived advantages of using the game as a tool to be integrated into group therapy are the call to action for the patients, as the game requires quick decisions in which the players become active in the process and the warm-up. These factors were cited as something that had never been encouraged in these patients' regular treatment practice: *'What we never achieve in normal group activities, and what is very important here with the game, are two things: this game forces a continuous*

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[26] Translation of the original in PT: *"No caso da Paciente 6 o jogo foi muito importante… pois ela tem tanto este papel de doente (usa canadianas e vive a cair ao chão) e ela teve uma performance e uma integração tão boa no grupo que sem dúvida isto é um fator importante para a adesão terapêutica."*

[27] Translation of the original in PT: *"A última atividade do jogo (Shiva conversa com os participantes – reflexão) é sem dúvida um grande promotor de insight. Pois são obrigadas a ver o melhor deles e isto é fundamental. É muito importante todos perceberem a própria evolução."*

[28] Translation of the original in PT: *"É espetacular, porque as estratégias emocionais mais frequentes nelas (pacientes) que é a ruminação e o evitamento, no jogo torna-se impossível (...) porque ação impõe-se e isto para mim é a melhor parte do jogo".*

[29] Translation of the original in PT: *"É uma ferramenta ótima de grupo que reflete aspetos individuais. Vejo este jogo a ser utilizado por pacientes com anorexia e perturbação de personalidade borderline em conjunto, mas o terapeuta não poderia estar sozinho, pois é necessário estar atento para assegurar o controlo da sessão."*

decision-making process, which I don't think I ever wanted to do and never managed to do in groups. The fact that they must manage is one of the advantages of this game. And then the fact that they want to win the challenge, none of them are passive in the process... often in group activity without the game they need a lot of warming up to get involved, but here the game itself is the warming up.[30]' (Maria).

The health professionals interviewed saw their expectations exceeded, considering that games are not normally used in these contexts: *'It exceeded my expectations, even though I was already co-creating this game with the previous group.*[31]*'* (Maria).

The interviewees mentioned that they were motivated to use the game in their daily work, and this was even reflected in other activities with patients: *'It was very motivating! And this was reflected in the following residency activities.*[32]*'* (Oriana).

5.3 Discussion

Based on the results, it is possible to say that bringing different patients closer to games has played an important role, since games have been gaining ground in society, including in health-related contexts. However, specifically in the treatment of anorexia nervosa, there are still few alternatives capable of dealing with the complexity of this condition. Studies [2, 3, 4] point out that digital media can represent risk factors for the emergence of eating disorders, and, in this sense, the analogue game offered patients a different opportunity to exercise their self-control skills. Thus, by encouraging players to interact with the activity through attractive aesthetic physical resources, the game facilitated the creation of bonds, encouraged positive behaviour and reduced possible initial barriers of resistance.

People with anorexia nervosa have low self-esteem and a negative perspective on themselves [8]. However, the players easily interacted with the game environment through the objects intuitively and naturally and thus felt motivated because they saw themselves as capable and skilled enough. Patients can also display behaviours linked to perfectionism, anxiety, obsessive disorders, impulsivity, competitiveness

[30] Translation of the original in PT: *"O que nunca conseguimos nas atividades do grupo normal e que aqui com o jogo é muito importante são duas coisas: este jogo obriga a um processo de decisão contínua, eu acho que nunca tive intenção e nunca consegui fazer isso nos grupos. Elas terem que gerir é uma das vantagens deste jogo. E depois, o facto que elas querem vencer o desafio, nenhuma fica passiva no processo... muitas vezes na atividade de grupo sem o jogo elas precisam de muito aquecimento para se envolverem, mas aqui o próprio jogo é o aquecimento".*

[31] Translation of the original in PT: "*Superou minhas expectativas, mesmo estando já na criação deste jogo com o grupo anterior.*"

[32] Translation of the original in PT: "*Foi muito motivador! E isto refletiu-se nas atividades seguintes da residência".*

and aggression [56]. The simplicity of the analogue format of the game generated less anxiety for the players, as they were already familiar with this type of game, favouring greater concentration and tranquillity for the participants. This was also reflected in greater spontaneity and, consequently, greater interest and involvement.

According to Ioannidis et al. [7], excessive use of the internet has been associated with externalisation problems. Aesthetics such as illustrations and graphics applied to the game encourage free personalisation, which favours a sense of belonging and the expression of subjectivity. Using illustrations and creating spaces for oral and written expression on the character sheets and during the game allowed the players to express what they think and feel.

Yama's Liberation game encouraged other forms of externalisation and emotional expression, with action and role-playing, favouring spontaneity and the experimentation of a better version of the players. For this audience, which has greater access to digital technologies, the analogue game provided a new dynamic and, as a result, greater interaction between players and between players and health professionals. Squire [57] states that games are perceived as motivating and social learning environments where players work and learn together. The interaction between the players encouraged open dialogue so that they could express what they were thinking and feeling.

Co-created characters fostered identification, thus contributing to greater immersion in the game, as Lebowitz and Klug [58] affirm, characters help players become emotionally involved with the game. Patients have severe self-criticism that can lead to negative thoughts about feeling useless and worthless, which can trigger depressive symptoms [59]. In this sense, the co-created characters and role-playing action enhanced experimentation, promoting reactions in the players that favour the exploration of emotional content, but also helped to mitigate behavioural difficulties and bring patients closer to health professionals when they also play and perform characters.

The results also showed that the game stimulated the sharing of experiences and thoughts on subjects that are not addressed spontaneously or are avoided by the players. It is known that in the mental health environment, verbal communication is usually the only means of providing information about patients' conditions. Thus, the game brought new perspectives and subjects to the conversations, allowed open and revealing communication between the players in a relaxed and stimulating environment, providing the professional with a friendly and in-depth exploration resource.

Shepphird [8] and Ioannidis et al. [7] mention that people with excessive internet use and anorexia nervosa have mood swings and behavioural difficulties that can damage close personal relationships and family ties. In this way, the game's objectives, which must be achieved as a group, made it possible to come together

and overcome problems collectively, where decisions had to be negotiated and action had to be collaborative. As a result, the players felt empowered, happy and invigorated. The *call to action* of the game's objectives and challenges fostered an immediate reaction from the players, which favoured the externalisation and evaluation of emotions. It also favoured proactivity and free expression, which are difficult for patients to express due to their profile, and could be observed by the health professionals.

By using a fantastic but not childish narrative, players were able to disconnect from reality and be transported into the game's universe, getting involved in unexpected situations that aroused interest and, at the same time, offered protection. This protective nature was since in the ludic environment the participants were able to deal more easily with abstract issues than with concrete real-life problems. For the health professionals, this aspect was considered very positive, as it favoured players' reflection on sensitive issues. The ludic dimension created by the game made it possible to tackle difficult topics, which often act as barriers to adherence to treatment. This favoured a subjective individual experience that fostered emotional and rational interpretations of how behaviour (in real life and/or digitally) is perceived by the players themselves and by others.

In addition, the game stimulated the exchange of experiences and promoted behavioural changes, since participants were able to openly discuss sensitive issues in a relaxed and fun atmosphere, which made them want to return to their consultations to play again. This process is directly related to the concept of the *Magic Circle*, in which, within the game, the rules of the system itself are the ones that apply, and not those of real life [27]. After this moment, players return to everyday life stronger to face their challenges [60].

According to Grace [61], games contribute greatly to the coping process, providing the player with a mental and physical state favourable to experiencing different emotions and positive experiences. In this sense, the dynamics of action, negotiation and group decision-making promoted by the *Yama's Liberation* proved to be an important element in the development of coping strategies. As well as encouraging the substitution of less effective emotional strategies such as rumination and avoidance, the game also made it possible for players to exercise self-control in a light, natural and autonomous way.

Finally, we realised that developing the content in co-creation with mental health experts and patients not only represented an enriching experience for the game designer but also considered the complexity of the disease and acted as a way of preventing possible misunderstandings that could affect the players. Another relevant point was that the materials produced from this multidisciplinary approach transmitted greater security and confidence to the health professionals responsible for applying the game.

6 Conclusions

In this article, we seek to answer our research question, which centres on the co-design of an analogue game designed to help teenagers with anorexia nervosa develop self-control and deal with other challenges associated with the use of digital technologies, such as high levels of impulsivity, hyperactivity and behavioural difficulties. Anorexia nervosa mainly affects young people, who are often exposed to digital social networks that place excessive value on appearance and reinforce the idealisation of thin bodies, which intensifies body dissatisfaction and increases the risk of developing eating disorders in both boys and girls.

We concluded that the co-design approach was essential to the creation of the game. The active participation of patients and health professionals in this process was decisive in developing a proposal that considered the complexity of anorexia nervosa and the needs of the different people involved. The results of the playtest and the interviews with health professionals showed that the game *Yama's Liberation*:

- Created a more open and relaxed environment for dealing with difficult subjects:
- It aroused curiosity, motivation and self-confidence in the patients.
- It fostered behaviour change that led to empowerment.
- It enabled role-playing, generating satisfaction and identification.
- It stimulated dialogue and reflection that led to a perception of one's behaviour, leading to self-control.
- It promoted the integration of the patients with each other and with the medical team.
- It reinforced autonomy and proactivity in patients who usually show resistance to treatment.
- It facilitated communication between the participants, since free dialogue and group negotiation enabled joint decision-making.
- Negotiation with the other players provided the opportunity to exercise coping skills, control impulsivity and hyperactivity.

We also realise that awareness of the illness is linked to the individual's reflection on their wellbeing (in real life and digital). However, in the case of anorexia nervosa, this process is particularly difficult, since the patient is usually absorbed by the demands of the condition, compromising not only physical wellbeing, but also mental, social and digital wellbeing. In this scenario, the game proved to be effective in stimulating self-awareness and self-knowledge through various analogue strategies that can be employed in the digital environment, as it offered experiences of overcoming, created a safe space to address sensitive issues in a welcoming way, encouraged collective reflection on one's attitudes and those of others, and helped to make rigid thinking linked to the demands of the disease more flexible. The

game's ludic process also expanded the ability to adopt the other person's perspective, strengthening empathy and promoting a more open and balanced view of oneself, contributing to the digital wellbeing of these patients.

In this way, the game was perceived by the interviewees as a useful and valuable tool for helping patients with their treatment. Through this study, we realised that the field of mental health and psychiatry has different clinical procedures that can be supported and complemented by games. This field of health is very promising for Game Design, and we can affirm that patients feel valued and more involved in their treatment when they experience ludic approaches.

As future work, we intend to review some issues involving the content applied to the game and its production, such as:

- Incorporating interviewee suggestions and creating a challenge that involves patients having to deal with people with anorexia nervosa.
- Create different levels of difficulty for each challenge, so that the health professional has the resources to work with patients with different cognitive conditions.
- Create an additional instruction manual for health professionals who are not trained in psychodrama and who do not carry out group therapy, to help all profiles of health professionals.
- After these modifications, we intend to create an MVP (Minimum Viable Product).
- Create partnerships with the industry to edit and produce this game.

It is also important to emphasise that, despite the conclusive results of this study, we would like to highlight the limitations of the region in which the research was carried out (a central hospital in the north of Portugal), limiting access to a broader sociodemographic profile. Although the hospital is a reference institution, we believe that the universe studied was restricted, considering cultural differences and the scale of the problem of eating disorders in Portugal and Europe, making it difficult to generalise the results. However, the results obtained are a way forward for the future development of new games for mental health, eating disorders and the well-being and mental health of individuals. It is important to note that the game has no direct impact on diseases, but it does have the ability to influence players' behaviour.

Finally, we can say that Game Design has promoted people's involvement, so that they can see themselves as active participants in changing their health condition. In this way, we understand that Design can design instruments with the potential to change people's lives, so that they feel safer and more valued to the point of changing their view of the world, through simple actions that are easy to assimilate and have the power to change behaviour.

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CRediT author statement.
Viviane Peçaibes: Conceptualization, Methodology, Content Analysis, Validation, Investigation, Visualization, Writing- Original draft preparation, Writing- Reviewing and Editing. **Pedro Cardoso:** Conceptualization, Methodology, Validation, Resources, Investigation, Writing- Reviewing and Editing and Supervision. **Bruno Giesteira:** Methodology, Validation, Resources and Supervision. **Liliana Castro:** Conceptualization, Methodology, Validation, Resources and Supervision. **Luciana Lima:** Writing- Original draft preparation, Writing- Reviewing and Editing.

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