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Empowerment and Well-Being Through Participatory Action Research and Accessible Gaming: A Case Study With Adults With Intellectual Disability

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Although the potential of games to foster learning, representation, empowerment, well-being, and social inclusion is already documented, some groups seem to remain underrepresented. In the field of disability, this potential is still immersed in a set of barriers and hindrances, arising from the lack of accessibility of this medium and the lack of representation of voices in research and development processes. This problem seems to be exponentiated in the field of Intellectual Disability (ID). The present study describes insights from a case study developed with 14 institutionalized adults with severe ID, with two complementary aims: (a) explore the effectiveness of a PAR gaming approach in the empowerment and well-being of adults with ID living in an institutional setting; and (b) explore the feasibility of promoting accessibility in games through PAR. The proposed intervention included the development of games by higher education students for these individuals, with their active participation in all phases – conceptual definition, game design, game development, and playtesting. A total of 38 playtesting sessions and 162 gaming sessions were conducted, where systematic observation grids were filled, and pre and post-process assessments were conducted, targeting variables related to empowerment and well-being. The obtained results sustain this type of action-research design as a feasible strategy to empower people with ID and foster their well-being, through games as a form of expression and not only therapy. It also reflects on accessibility improvement through the presence of underrepresented groups (people with ID particularly) in the media creation processes that can, *per se*, be considered a form of empowerment. These insights also open a discussion about a potential paradigm shift toward a social model of accessibility aligned with the current views on the field of disability studies. Future studies should replicate this methodology with larger samples and in a context not aligned with the pandemic isolation. Furthermore, PAR must also be explored from a more general perspective, as a strategy to promote accessibility and participation in other media and cultural products as a whole.

Keywords: intellectual disability, gaming, empowerment, well-being, accessibility, participatory action research

INTRODUCTION

When an individual plays a good, well-developed game, they move toward the most positive end of the emotional spectrum through intense engagement that fosters the physical and mental conditions required for all kinds of positive emotions and experiences. Gameplay potentially activates different cognitive systems – including attention and memory – and supports emotional induction and rewards systems (McGonigal, 2011). Moreover, play is the first cognitive strategy of human beings; therefore crucial to explain and understand the world, allowing exploration, experimentation, and learning. Games can be therefore seen as having inherent meaning-making processes, framing them as ways to convey values, and opening a wide range of possibilities for the individuals within the gameplay. Thus, games allow individuals to complement the linear visions provided by other forms of narrative by manipulating several simultaneous variables (Frasca, 2009).

Even though, as discussed above, games seem to be a space of cultural expression, meant to provide rich and positive experiences through interaction and meaning-making, for individuals with disabilities, this tends to be interpreted through a much more limited and categorical lens (Wästerfors and Hansson, 2017). For example, a Systematic Literature Review that intended to analyze the studies approaching games and disability, produced and published between 2010 and 2020, concluded that individuals with Intellectual Disability (ID) tend to have a passive role in games research, with gaming mainly seen through therapeutic frameworks, neglecting recreation and representation as crucial factors. More specifically, individuals with ID were generally requested to play a game chosen by the research team, with only 16.70% ($N = 9$) of the studies including them in the choice process, either through the collection of their interests and needs or through participatory design approaches (Sousa, 2020).

Intellectual Disability and Gaming

Intellectual disability is a disorder with onset in the developmental period characterized by transversal impacts in individuals' daily lives, including both intellectual and adaptive functioning, with impacts in conceptual, social, and practical domains. These aspects can include: deficits in intellectual functioning, impacting cognitive abilities, such as reasoning, problem-solving, planning, or abstract thinking; and deficits in adaptive functioning, impacting autonomy, social participation, communication, and daily life in general (American Psychiatric Association, 2013).

From the beginning, the social paradigms of approaching disability have gradually evolved through a four-phase path, characterized by an exclusion – segregation – integration – inclusion trajectory, from social charity to social citizenship (Emygdio da Silva, 2009; Fontes, 2009). To this extent, the previous medical model of disability, which emphasizes the individuals' impairments as causing the disability, has been progressively replaced by a social model of disability, where it is seen as emerging from the environment's inability to accommodate the individual's support needs (Barnes, 2019; Gilbert, 2019, p. 4). Considering this perspective and the games research field, if a person is not able to play a game because, for example, their motor planning abilities do not allow them to comply with the required reaction time, the problem is centered in the gameplay and interaction models, and not on this subject impairment. Considering this model, Cobigo et al. (2012) highlighted how the social inclusion of people with ID could be significantly enhanced by a pro-active and empowering perspective that includes the voices of the non-dominant groups, giving them opportunities to interact, and participate.

The unique characteristic of games includes a wide range of potentialities, such as interactivity, goal orientation (Costikyan, 2002), motivation through failure, immediate feedback (Boyle et al., 2016), systematic requirement of response to stimuli, demand for hand-eye coordination, reinforcement systems, opportunities for peer group attention, and approval through competition (Wood et al., 2004). Moreover, it is also relevant to emphasize the theoretically and empirically sustained role of games as spaces for performing and training decision making (Keith et al., 2013; Kaczmarczyk et al., 2015; Robles et al., 2020). Taking this into account, games are nowadays seen as having a relevant potential to foster empowerment and inclusion with different underrepresented populations, even if some knowledge gaps and policy opportunities can still be identified (Stewart et al., 2013).

Even though this potential is recognized, a significant gap for its operationalization in actual contexts seems to emerge. This is centered around the lack of representation of people with disability in gaming worlds, with research tending to see this subject through a utilitarian and categorical picture (Wästerfors and Hansson, 2017). As above explored, in the field of ID, this includes a subrepresentation of these individuals' voices and wills (Sousa, 2020) through research methodologies that contradict the premise of "nothing about us, without us" that originated the Convention on the Rights of Persons with Disabilities (CRPD; United Nations, 2006) and most activist movements in the field (Johnson et al., 2019). Furthermore, the lack of accessibility in media in general also creates unnecessary barriers to this population, with their support needs being tendentially considered in the later stages of the creative process through a more reactive lens (Fryer, 2021).

Empowerment and full participation are nowadays seen as central to promoting the well-being and the rights of people with disabilities (Martin, 2009; Shogren and Shaw, 2016). Although empowerment allows several different conceptualizations, in the present study, it is defined as a property that sustains the ability of an individual to control their life. Therefore, an increase in empowerment is registered if it represents "the person's ability (or opportunity) to control her own life" (Tengland, 2008, p. 82). The question of opportunity is also very relevant since it can be framed with the social model of disability, by acknowledging that the lack of empowerment is linked to an environment that does not provide individuals with opportunities to engage. This is the case for the lack of

accessibility in games and the lack of representation in both the games industry and games research.

Methodological Framing

As explored above, games research seems to tendentially marginalize the voice of people with disabilities (Wästerfors and Hansson, 2017), particularly ID (Terras et al., 2018; Sousa, 2020). To fill this gap, Participatory Action Research (PAR) appears as both a methodological option and a result that allows a more comprehensive and diverse-driven approach while promoting representation through the promoted process (Greenwood et al., 1993). PAR is defined as a specific branch of action research, driven to implement action, foster change, and generate empirical and scientific evidence through the systematic collection of data (MacDonald, 2012).

Historically, some of the founding and seminal approaches in the field of PAR can also be considered to justify this adoption. Hatton et al. (1946), based the emergence of action research and PAR, by justifying how the problems of minorities are also issues for the dominant groups. Thus, the author defined action research as an approach to studying a problem that inherently aims to change it or solve it. PAR would be a self-reflective cycle that guides research, action, and assessment, emphasizing collective action and society's marginalized groups (Zeller-Berkman, 2014). Later, the traditional connection between PAR and the study of underrepresented groups was reinforced by the Latin American school, with Paulo Freire as its primary contributor (Zeller-Berkman, 2014), and by contemporary critical PAR, based on feminist premises and the decolonization of research, with contributors like Gloria Anzaldúa or Linda Tuhiwai Smith (Ayala, 2009; Torre and Ayala, 2009). Considering this conceptual and historical framework, it is clear how PAR can represent a more inclusive research methodology to approach the lack of accessibility in games for pwID, through an extended epistemology that includes different "ways of knowing" and voices (Gayá, 2021). This is aimed at the co-development of meaningful, relevant, and appropriate communication to the life experiences of these individuals (Parker and Becker-Benton, 2016) while addressing the premises of inclusive research by fostering participants' collaboration and reflecting on different contextual factors (Schwartz et al., 2019).

Besides the premises of PAR, it is relevant to mention that mixed methods were incorporated into the present research, to assess participants before and after the process, with the same relevance being attributed to the process *per se*, and reinforcing the relevance attributed to methodological integration in media studies and educational research. This type of integration is particularly crucial in games research and is established by a dialogical perspective between different information tracks, systematically integrated (Lieberoth and Roepstorff, 2015). In this systematic integration, media ethnography, seen to this extent more as a researcher's attitude, is also essential, given its ability to approach the intersubjective experiences and contexts of interaction that arise from the empirical study of media, going beyond the qualitative and quantitative debate (Ardevól and Gómez-Cruz, 2014). The methodological premises from where the present study emerges are further explored in a conceptual article, developed by the same team (Sousa et al., in press).

Considering the explored framework, the present study proposes an exploratory approach to tackle two specific aims, namely:

(a) Explore the effectiveness of a PAR gaming approach in the empowerment and well-being of adults with ID living in an institutional setting;
(b) Explore the feasibility of promoting accessibility in games through PAR, having adults with ID as a case study.

The two specific aims can be seen as contributing to preliminary answers to a broader question, most specifically, "How can games empower adults with ID?".

MATERIALS AND METHODS

Participants

Fourteen adults with ID, living in a residential facility administered by a Non-Governmental Organization (NGO) in the field participated in this process. In the group 10 participants identified themselves as males (71.40%), while 4 participants identified as females (28.60%), with ages ranging from 30 to 64 (M = 46.21; SD = 9.62). Considering institutional information and the classification established by DSM-5 (American Psychiatric Association, 2013), all participants were considered as having severe ID (N = 14; 100.00%). Convenience non-probability sampling was adopted since subjects were recruited considering both institution suggestions and their willingness to participate.

Regarding motor function, seven participants (50.00%) were able to walk autonomously, while the rest used wheelchairs to move (N = 7; 50.00%), divided by electrical wheelchairs driven by the person (N = 6; 85.71%) and manual wheelchairs requiring support to move (N = 1; 14.29%). Six participants (42.90%) had control issues in the movement of both hands, three of them (21.40%) experienced such impairment one only one hand, and the other five (35.70%) were able to control both hands autonomously. Considering the observation and the institutional information, five participants (35.70%) were autonomous in tasks that required fine motor skills, while the remaining nine (64.30%) frequently required support. No specific vision or hearing-related support needs were registered. Regarding communication, 12 participants (85.70%) communicated verbally, while two participants communicated non-verbally (14.30%). Aligned with this, four participants used augmented communication systems (28.60%), and two participants used alternative communication systems (14.30%). Moreover, most participants did not have reading skills (N = 11; 78.60%), while the remaining could read simple sentences (N = 3; 21.40%).

From the initial focus group on media habits and interests, some relevant conclusions about the participants emerged. Their main hobbies and daily activities included: watching television; listening to music; simple analogical games frequently developed for children; doing exercise at the gym; playing boccia; rehabilitation activities in Snoezelen environments;

cognitive stimulation with therapists; and participating in parties at the institution. Some more specific interests included watching football and related news, playing domino, watching action movies, watching the news, drinking coffee outside, and going to the beach. From these specific interests, the two last ones were impossible to carry out at the time due to the pandemic.

Instruments

This study adopted a set of instruments to assess the research objectives defined above. In order to interfere as little as possible with the participants' daily lives, priority was given to the instruments already adopted by the partner institution, namely in adaptive behavior and well-being. Also, given the methodological framework established above, the standardized instruments were combined with instruments developed explicitly for this purpose, aimed at the process *continuum* through a more qualitative lens.

Adaptive Behavior Scale – Residential and Community – Short Form

The adaptive behavior scale – residential and community – short form (SABS) is a questionnaire composed of 24 items designed for pwID living in community-based support institutions. It is usually completed by or with the support of a caregiver, whether a family member or staff member. Answers to the scale are presented in two different formats, depending on the question: a rating of the highest level of adaptive behavior exhibited on an item; or a dichotomous yes/no response (Hatton et al., 2001). The items are organized into three factors or dimensions:

(a) personal self-sufficiency, composed by bathing, self-care at toilet, bathing, dressing, shoes, walking, and running;
(b) community self-sufficiency, composed by eating in public, care of clothing, miscellaneous independent functioning, safety at residential facility or home, money handling, purchasing, sentences, comprehension of spoken instructions, numbers, food preparation, and general domestic activity;
(c) personal-social responsibility, composed by passivity, persistence, leisure time activity, general responsibility, personal responsibility, consideration for others, and awareness of others (Hatton et al., 2001).

If the overall scale result provides insights regarding the daily life functioning of individuals, the personal-social responsibility factor can be seen as particularly relevant for the present research. The items that compose this factor are aimed to gather information about: how individuals need more or less stimulation to accomplish a task (passivity); their effort and motivation for its development (persistence), their active interest and autonomy in hobbies and leisure activities; their compliance with the responsibilities that are assigned to them (general responsibility); their personal responsibility; their consideration for the others needs and feelings; and their awareness and knowledge about the ones surrounding them (Hatton et al., 2001).

SABS shows good internal consistency and validity, with a Cronbach's Alpha higher than 0.90 in all factors and the full scale (Hatton et al., 2001). The scale scores are also highly correlated with the scores of the full version of the scale, developed by Nihira et al. (1993), and composed of 73 items.

Self-Assessment Well-Being

The Self-Assessment Well-Being (SEW) is a scale aimed at assessing the well-being of service users in the area of rehabilitation, in general terms. The 22 item scale is based on an objective rather than conceptual rationale, prioritizing the empowerment of respondents to reflect on their own well-being. The answers are provided through a seven-point Likert scale ranging from one (nothing) to seven (extremely) (Louvet and Rohmer, 2006). In the disseminated Portuguese version, visual support materials for the response Likert scale are provided to support pwID and individuals with other conditions affecting cognitive functioning (CRPG, 2010). The scores are organized into four dimensions, namely:

- communication skills, including items related to the ability to communicate problems, discuss them, and ask for help;
- socio-cognitive abilities, including attention, concentration, and interpersonal relationship skills;
- knowledge of the disability, including the knowledge about one's disability nature and intervention plan;
- emotional coping, including humor and stress management-related items.

For the overall well-being, full-scale results can be calculated. SEW presents good internal consistency and validity, with a Cronbach's Alpha higher than 0.90 in all factors (Louvet and Rohmer, 2006).

Systematic Observation Grids

To operationalize the methodological premises explored above, namely, regarding PAR and how the process is as relevant as the final outcomes, a systematic observation grid was developed to be filled both in the playtesting and gaming sessions. The observation grid was adapted from a study involving children and game creation processes (Sousa et al., 2018) to match the particular aims of this study, namely in terms of accessibility.

The grid was also developed to address two different types of observation categories. First, descriptive categories, including date of the session, place, and title(s) of the played game(s). Second, the orthogonal categories, with a specific emphasis on capturing the different aspects of the design activity (Ball and Ormerod, 2000) included: accessibility, separated into three subsections (cognitive, motor, and sensory accessibility); behavioral observation; game experience; main comments of the players; and a space for other observation aspects.

Procedure

In the present study, a PAR research design was implemented and operationalized by integrating pre and post-process assessments, process documentation, and participant observation. This methodological option is also justified by the need to study this form of media as a complex process of meaning-making, socially and contextually situated, through an ethnographic lens (Schrøder et al., 2003). For this purpose, a systematic observation grid was filled in each playtesting and gaming session.

The games were developed on the scope of a two semesters subject of the Bachelor's Degree in Videogames. A collaboration protocol was established between the university and an NGO that manages a residential home and occupational center for adults with severe ID. Based on this partnership, students were challenged to design and develop a game and a specific physical interface that could serve two purposes: be accessible to this population while being designed with their participation, to meet their interests and priorities. This challenge emerged from the critical problem discussed above as a way to tackle the lack of accessible games for this population, most specifically games that primarily focus on entertainment while empowering the voices and experiences of pwID (Sousa, 2020). Moreover, and during the process, the students were also challenged to develop games that can be interesting for everyone, even if they contain specific accessibility features that can accommodate pwID's support needs. This was based on the premise that user experience must be about improving the lives of all people, not only of the user who fit in the preconceived target audience, and that accessibility must be centered around the erasing of any barrier to use and enjoyment (Hodent, 2022, p. 87). Games were developed in UnityEngine, and physical interfaces were designed on Onshape, to be produced with 3D printing technology, and later integrated with Arduino boards and switches.

This process was developed over two university semesters. The first one was dedicated to the concept, prototyping, and preliminary playtesting of the game, while the second one was dedicated to refinements, production of physical interfaces, iterative playtesting, and the gaming sessions. Although students were never physically with pwID, due to the heavy lockdown imposed on institutions during the first pandemic wave, a researcher was always present in the NGO's venue to conduct the focus group, playtesting, and gaming sessions. This allowed the exploration of different contextual factors, besides the interaction with the games.

Prior to the first co-creation session with students, the participants were selected, as explained above, and assessed through institutional information, gathered with their consent, demographic data collection, SABS, and SEW. In addition, the focus group on interests and needs, which results are mentioned in the participants' section, was also conducted in advance so that students could access a systematized version of the feedback since the beginning of the creative process.

Playtesting was conducted in three rounds, and a systematic observation grid was filled on each session. Sessions were also recorded, with the participants' permission, to inform students about the measures and changes to be implemented. After each playtesting round, the games were changed according to the participants' feedback. The version obtained after the third playtesting round was used in the gaming sessions. Gaming sessions had approximately 1 h, and the games to be played were chosen by the players. Players were encouraged to think aloud while playing the games as much as possible, with most of their verbal and non-verbal expressions being registered in the systematic observation grids. Most participants (N = 11; 78.57%) were in three playtesting sessions, while two participants (14.29%) were only in two, and one participant (7.14%) was only in one. Also, most participants (N = 12; 85.71%) were in 12 gaming sessions, while one participant (7.14%) was only in 11, and the other participant (7.14%) in 10 gaming sessions. These discrepancies were due to the pandemic context and some pwID being outside of the institution with their families, making it impossible for them to participate in some sessions. In the end, each pwID participated in an average of 2.71 playtesting sessions (SD = 0.61) and 11.79 gaming sessions (SD = 0.59), with an average total of 14.50 sessions per participant (SD = 1.16). Moreover, gaming sessions were initially planned to be conducted in groups, to support a more profound understanding of the gaming meso-level and interpersonal relationship to that extent, as proposed in a model developed in a conceptual level of the present research (Sousa et al., in press). Unfortunately, due to COVID-19 restrictions, this was also not possible.

After the last gaming session, each participant was assessed, through the repetition of SEW and the personal-social responsibility items of SABS (Factor C), considering this study's aims and ensuring the assessments' cost-effectiveness. In the application of SEW, both in pre and post-assessment, an A3 printed version of the 7-point Likert scale was used, as provided by the scale manual, to support visualization and accurate response. After the whole process and the gaming sessions, final adjustments were made to the games by a senior programmer to allow their online dissemination as open educational resources.

In summary, one focus group about interests and media habits, nine co-creation sessions where students analyzed the feedback gathered from the target audience, 38 playtesting sessions, and 162 gaming sessions were conducted, between March 2020 and February 2021, under the scope of the present study. The research design of the present study is better schematized in a flowchart (**Figure 1**).

Informed consent was obtained in several formats to this extent, through a protocol with the NGO, with each participant's legal guardian, and with the participating individual, with the support of accessible formats. The study was conducted under the European Federation of Academies of Sciences and Humanities (ALLEA) Code of Conduct for Research Integrity and was approved by the leading research institution's ethics committee (please check the "Ethics Statement" section for more information).

Data Analysis

Concerning statistical analysis, demographic data and characterization data were analyzed through descriptive statistics. In addition, both the Personal-Social Responsibility Factor of SABS and SEW were also analyzed through hypothesis testing, most specifically Wilcoxon signed-rank test. This was adopted considering both the small sample size and the non-parametric distribution of the data. Statistical analysis was performed with the Statistical Package for the Social Sciences (SPSS), version 26.

Content analysis of observation grids was performed both through a top–down and bottom–up approach. Most specifically, the grids were thoroughly analyzed with the first approach to meet the previously defined sections and relevant aspects

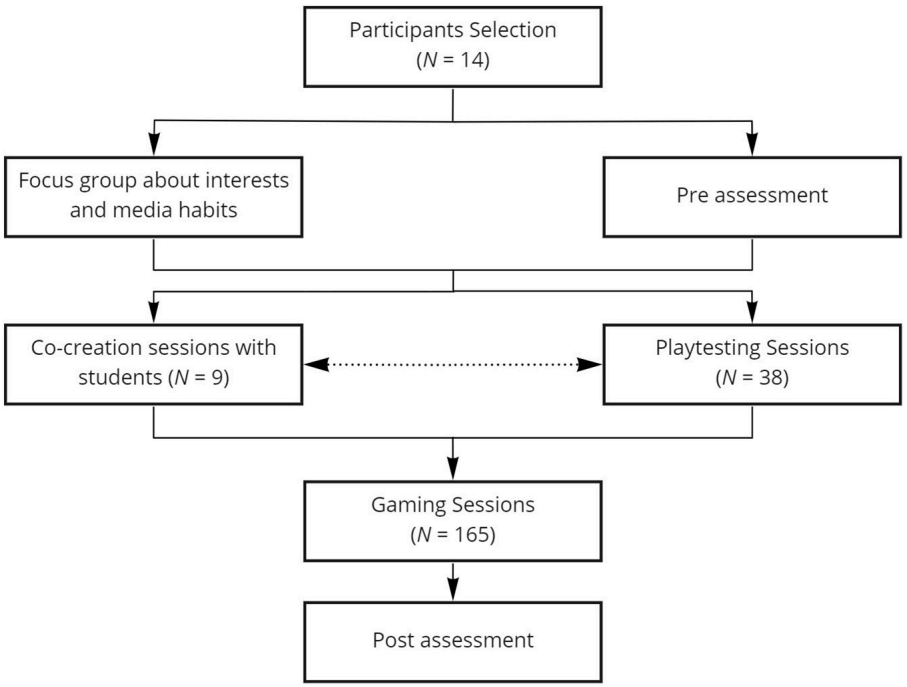

FIGURE 1 | Research design flowchart.

of the playtesting and session, classifying the content in each section as positive or negative. For example, all units of analysis expressing content related to well-being, autonomy, or enjoyment were classified as positive, while those expressing psychological distress, barriers to autonomy, or lack of interest were classified as negative. After this, the observations present in the behavioral observation section were recoded through a bottom–up and exploratory procedure.

The content analysis process was based on Boyatzis (1998) premises regarding coding and thematic organization of observations. In the first approach, the codebook was developed before the coding process, while in the second approach, it was developed simultaneously as the coding process. In both approaches, each sentence was considered as a unit of analysis. Frequencies and percentages for each coding were later calculated. Inter Coder Reliability (ICR) was calculated with the support of an independent researcher based on 20 randomly assigned observation grids (10.00% of the coded material). Divergences in coding were solved through a discussion session. The agreement rate was 83.31%, which is considered acceptable (Lombard et al., 2002).

To better explain the bottom-up coding of the behavioral observations, it is essential to clarify that the use of the category "engagement" intended to simplify the process, aimed at including a broad range of behavior and states. These behaviors are related to enjoyment, motivation to keep playing, emotionally rich gaming experiences, immersion, sense of presence, and, ultimately, fun. Although this might seem somewhat vague, this concept tends to be meaningful to more readers, than others like flow, as established by Hodent (2017, p. 106).

RESULTS

Developed Games

Through this process, ten games were developed based on the individuals' interests and support needs, including nine digital games and one hybrid game (analogical with an electronic interface). In terms of genre, the games presented great diversity, including: one party game (*Adivinhas?*); one first-person shooter (*Chicken Shooter*); two simulations (*Canoe and FlyYouBirds*); two arcade games (*Orbiter and Space Conqueror*); one endless runner (*Endless Runner*); one casual game (*Virtual Companion*); and two puzzle games (*Futebolástico!* – **Figure 2** and *SoundQuest*).

In terms of accessibility, most games were developed to be played through a small number of inputs, around two

FIGURE 2 | Screenshot of the game *Futebolástico!*

or three, and allow several in-game customizations, such as speed or number of opponents. As mentioned above, every game had a physical interface specifically developed for it. This allowed to enhance games' motor and cognitive accessibility, considering the audience's characteristics, and foster engagement by creating a tangible interactive product that is aligned with each game's aesthetic. The gameplay and the physical interface for *Chicken Shooter* are presented in **Figure 3**. The gameplay and the physical interface for *Space Conqueror* are presented in **Figure 4**.

The digital games' art frequently adopted classic games aesthetic trends, like pixel art, even if no specific indication regarding art was given to the students. As a result, it was highly relevant, as it can be seen as a strategy to make these aesthetic elements more accessible to populations whose play experiences are closely linked to interactive therapeutic resources, typically less rich in this field, tending to privilege realism-driven over fantasy-driven art.

Another interesting trend observed in some games is the desire to provide pw ID with sensory experiences that are not frequent in their daily lives (e.g., walking on the rain in *Endless Runner*) or that can provide a particular notion of freedom (e.g., driving a boat in *Canoe* or flying in *FlyYouBirds*). Screenshots from *Endless Runner* and *Canoe* are presented in **Figures 5**, **6**.

Regarding the most played games, and considering the gaming sessions only (N = 162) since in the playtesting everyone would play most games, *Futebolátisco* was the most played game (N = 82; 50.62%), followed by: *Orbiter* (N = 57; 35.19%); *Chicken Shooter* (N = 43; 26.54%); *Endless Runner* (N = 42; 25.93%); *Space Conqueror* (N = 39; 24.07%); *Adivinhas?* (N = 22; 13.58%); *Virtual Companion* (N = 22; 13.58%); and *Canoe* (N = 17; 10.49%). Playtesting sessions were not considered since players did not decide what they wanted to play to ensure all games were tested.

It is also relevant to mention that some games were not used during the gaming sessions, since they still presented some critical improvement points, after the playtesting phase. This was the case for *FlyYouBirds* and *Sound Quest*. While the first one was difficult to play on the institution's computer due to a scenario that required procedural generation in its final version, the second one still needed improvement in terms of gameplay, namely to foster cognitive accessibility.

Pre and Post Assessment

To support the participants' characterization full-scale results for SABS were calculated. For personal self-sufficiency (factor A), participants scored an average of 19.29 (SD = 16.30) points out of 38 possible points. For personal self-sufficiency (factor B), participants registered an average of 22.14 (SD = 8.73) points

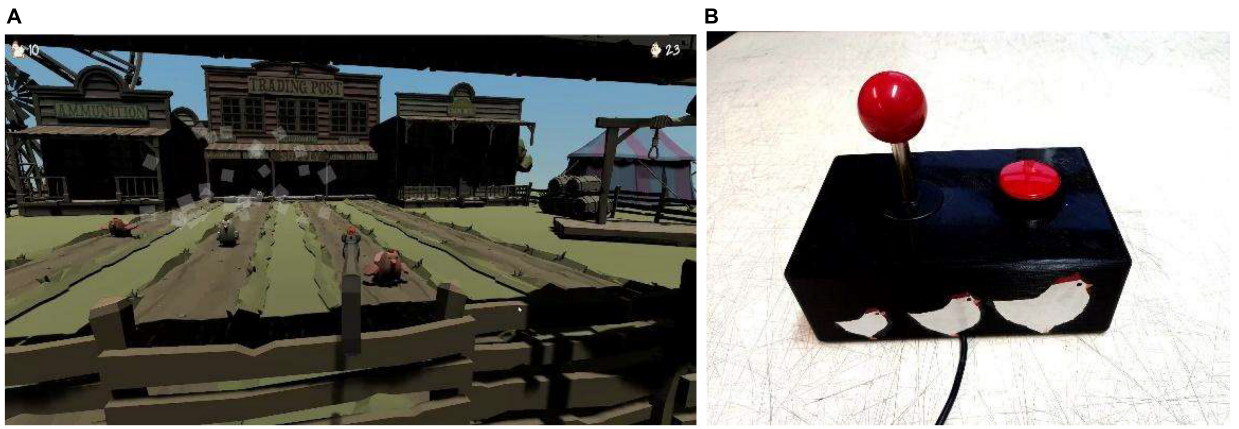

FIGURE 3 | (A) Screenshot of the game *Chicken Shooter*; and **(B)** Physical interface of the same game.

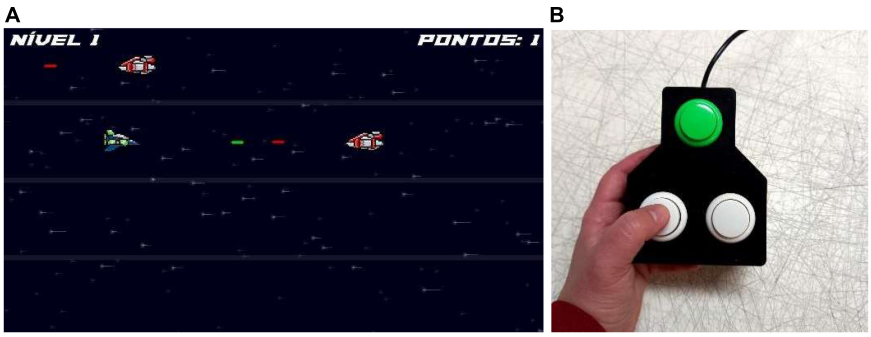

FIGURE 4 | (A) Screenshot of the game *Space Conqueror*; and **(B)** Physical interface of the same game.

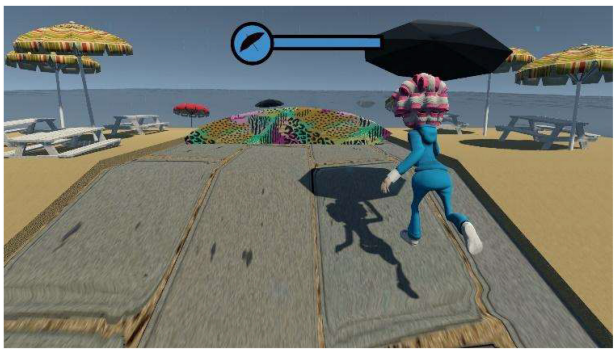

FIGURE 5 | Screenshot of the game *Endless Runner*.

FIGURE 6 | Screenshot of the game *Canoe*.

out of 55. More central for the present study, personal-social responsibility (factor C) registered an average of 15.43 (*SD* = 3.98) out of 32. Overall, when considering the full scale, participants ranked an average of 55.14 (*SD* = 25.73) points on SABS, with a total of 125 possible points.

Regarding the differences in adaptive behavior, most specifically the personal-social responsibility factor of SABS, it is possible to mention that the group showed significantly higher values, from the pre-intervention assessment (*Mdn* = 15.50) to the post-intervention assessment (*Mdn* = 20.00); $T = 101.50$, $Z = 3.09$, $p = 0.002$. When analyzing the differences between pre and post-intervention ranks of SABS per item, statistically significant differences were found for passivity ($T = 91$, $Z = 3.28$, $p = 0.001$), persistence ($T = 78$, $Z = 3.11$, $p = 0.002$), and leisure time activity ($T = 55$, $Z = 3.05$, $p = 0.002$), with higher values on post-assessment, as presented in **Table 1**. As expected, no statistically significant differences were found for general responsibility, personal responsibility, consideration for others, or awareness of others.

Regarding wellbeing, most specifically the total ranks of SEW, it is possible to mention that the group showed significantly higher values, from the pre intervention assessment (*Mdn* = 3.39) to the post intervention assessment (*Mdn* = 3.55); $T = 105$, $Z = 3.31$, $p = 0.001$. From the analysis of each dimension, statistically significant results were also found between the pre and post assessments in communication (pre *Mdn* = 3.00; post *Mdn* = 3.25; $T = 32$, $Z = 2.11$, $p = 0.035$); knowledge about impairments and disabilities (pre *Mdn* = 2.75; post *Mdn* = 3.13; $T = 91$, $Z = 3.20$, $p = 0.001$); and social and cognitive abilities (pre *Mdn* = 4.14; post *Mdn* = 4.14; $T = 41$, $Z = 2.31$, $p = 0.021$). No significant results were found for the coping with emotions dimension. Full results can be found in **Table 2**.

Through the detailed analysis of each SEW item, it is possible to highlight the existence of some statistically significant differences. In the item "I feel that I am able to talk about my disability with other people," participants register statistically significant higher ranks ($T = 45$, $Z = 2.81$, $p = 0.005$) on post assessment (*Mdn* = 3.00), than in the pre assessment (*Mdn* = 2.00). Similar results were obtained for the items: "During the day I feel satisfied" (pre *Mdn* = 3.50; post *Mdn* = 4.00; $T = 15$, $Z = 2.12$, $p = 0.034$); "I have enough information about my disability" (pre *Mdn* = 2.00; post *Mdn* = 3.00; $T = 66$, $Z = 3.02$, $p = 0.003$); and "I understand the nature of my disability" (pre *Mdn* = 1.50; post *Mdn* = 3.00; $T = 45$, $Z = 2.76$, $p = 0.006$). No statistically significant differences were found for the other SEW items, as shown in **Table 3**.

Observation Grids

A total of 1488 observations were coded from 200 grids, including both playtesting ($N = 38$) and gaming sessions ($N = 162$). Coded observations by participants ranged from 49 to 140 ($M = 106.29$; $SD = 28.60$). From these, a total of 1017 (68.35%) were coded as positive observations, while the remaining 471 (31.65%) were coded as negative observations. If we consider playtesting grids only ($N = 38$), a total of 545 observations were coded, while the remaining 943 were coded for gaming session grids only ($N = 162$).

Behavioral observations accounted for 32.79% of the total coded units, followed by observations related by other observations or notes ($N = 388$; 26.08%), cognitive accessibility ($N = 359$; 24.13%), and motor accessibility ($N = 253$; 17.01%).

TABLE 1 | Pre and post intervention results for the items of SABS personal-social responsibility factor ($N = 14$).

Item	Pre*Mdn*	Post*M*dn	*Z*	*p*
Passivity	2.00	3.00	3.28	0.001
Persistence	1.00	3.00	3.11	0.002
Leisure time activity	1.00	2.00	3.05	0.002
General responsibility	1.50	2.00	1.41	0.157
Personal responsibility	3.00	2.00	−0.58	0.564
Consideration for others	3.00	3.00	0.58	0.564
Awareness of others	5.00	4.00	−1.41	0.157

TABLE 2 | Pre and post intervention results for the dimensions of SEW ($N = 14$).

Item	Pre*Mdn*	Post*Mdn*	*Z*	*p*
Coping with emotions	3.33	3.50	1.10	0.271
Communication	3.00	3.25	2.11	0.035
Knowledge about impairments and disabilities	2.75	3.13	3.20	0.001
Social and cognitive abilities	4.14	4.14	2.31	0.021

Full results can be found in **Table 4**, including positive and negative aspects, analyzed by the different phases of the process.

If we consider **Table 4**, it is possible to highlight that in the playtesting phase, cognitive accessibility-related observations were the more coded (N = 174; 31.93%), followed by behavioral observations (N = 135; 24.78%), and motor accessibility (N = 126; 23.12%). Regarding cognitive accessibility, negative aspects were more prevalent (N = 94; 17.25%) than positive aspects (N = 80; 14.68%), similarly to what happened with motor accessibility, where negative aspects represented 15.05% (N = 82), while positive aspects represented 8.07% (N = 44). Opposed to this, the remaining categories presented a higher frequency of positive aspects than negative aspects during the playtesting sessions. Considering the results from the gaming sessions' grids, it is possible to highlight that behavioral observations were the most frequent (N = 353; 37.43%), followed by other observations or notes (N = 278; 29.48%), cognitive accessibility (N = 165; 19.62%), and motor accessibility related aspects (N = 127; 13.47%). Here, when analyzing cognitive accessibility related aspects, it is possible to highlight that positive observations (N = 124; 13.15%), were more frequent than negative (N = 61; 6.47%), similarly to what happened with motor accessibility, where positive aspects represented 6.89% (N = 65), while negative aspects represented 6.57% (N = 62). In both **Tables 3**, **4**, the bold categories aggregate the results of the below categories in the same cell. Therefore, to calculate the total percentage, only these should be considered.

The previously described bottom-up coding procedure was developed based on the behavioral observations presented in **Table 4**. Therefore, only the units in this section were included, and the results are fully presented in **Table 5**.

Considering the results from the playtesting sessions' grids, behaviors aligned with greater awareness about one's own support needs were the most frequent (N = 27; 20.00%), shown mainly by verbal expressions reflecting on individual's needs (e.g., "Yes, I really need this to be a bit slower." or "This game needs to be better, because I have difficulties with my hands."). This was followed by engagement related behavioral observations (N = 24; 17.78). Participants' perception that their suggestions were included in the game represented 14.07% (N = 19) of all the

TABLE 3 | Pre and post intervention results for the items of SEW (N = 14).

Item	Pre*Mdn*	Post*Mdn*	*Z*	*p*
(1) I feel able to plan my time.	5.00	5.00	1.00	0.317
(2) I am able to talk about my problems with other people.	4.00	4.00	−0.82	0.414
(3) I feel that I am able to talk about my disability with other people.	2.00	3.00	2.81	0.005
(4) I assume my responsibilities in society.	5.00	5.00	1.00	0.317
(5) I am able to support my friends and colleagues.	5.50	5.00	−1.73	0.083
(6) I have enough information about the medication I take.	2.50	2.00	−0.82	0.414
(7) I can manage/solve my emotional problems.	4.00	4.00	−0.038	0.705
(8) During the day I feel satisfied.	3.50	4.00	2.12	0.034
(9) I am able to cope with stressful situations.	3.00	3.00	−0.58	0.564
(10) I have enough information about my disability.	2.00	3.00	3.02	0.003
(11) I understand the nature of my disability.	1.50	3.00	2.76	0.006
(12) I feel satisfied with the support I receive from care professionals.	5.00	5.00	1.86	0.063
(13) I feel that I have control over my life.	3.00	3.00	1.41	0.157
(14) I am satisfied with the level of independence I have in my life.	2.00	2.00	−1.34	0.180
(15) I can concentrate and be alert.	3.00	3.00	1.73	0.083
(16) I can learn new things.	4.00	4.00	1.89	0.059
(17) I am satisfied with my memory.	3.00	3.00	1.73	0.083
(18) I am accountable for my everyday responsibilities.	5.00	4.50	−1.41	0.157
(19) I am self-confident.	3.50	4.00	0.378	0.705
(20) Over the past few months, my mood has been stable.	4.00	3.50	−1.00	0.317
(21) I can cope with/solve my problems.	3.50	4.00	1.63	0.102
(22) I can easily adapt to changes in my life.	4.00	3.50	0.378	0.705

TABLE 4 | Observation grids' results, coded by positive and negative aspects (N participants = 14; N grids = 200).

Category of coded observations	Playtesting *N* (%)	Gaming sessions *N* (%)	Total *N* (%)
Cognitive accessibility	**174 (31.93)**	**165 (19.62)**	**359 (24.13)**
Positive aspects	80 (14.68)	124 (13.15)	204 (13.71)
Negative aspects	94 (17.25)	61 (6.47)	155 (10.42)
Motor accessibility	**126 (23.12)**	**127 (13.47)**	**253 (17.01)**
Positive aspects	44 (8.07)	65 (6.89)	109 (7.33)
Negative aspects	82 (15.05)	62 (6.57)	144 (9.68)
Behavioral observations	**135 (24.78)**	**353 (37.43)**	**488 (32.79)**
Positive	108 (19.82)	295 (31.28)	403 (27.08)
Negative	27 (4.95)	58 (6.15)	85 (5.71)
Other observations/notes	**110 (20.18)**	**278 (29.48)**	**388 (26.08)**
Positive	83 (15.23)	218 (23.12)	301 (20.23)
Negative	27 (4.95)	60 (6.36)	87 (5.85)
Total	**545 (100.00)**	**943 (100.00)**	**1488 (100.00)**

Bold values are the sum of the respective below categories.

TABLE 5 | Coded behavioral observations (N participants = 14; N grids = 200).

Category of coded observations	Playtesting *N* (%)	Gaming sessions *N* (%)	Total *N* (%)
Engagement	24 (17.78)	91 (25.78)	115 (23.57)
Awareness about one's own support needs	27 (20.00)	27 (7.65)	54 (11.07)
Perception of competence	18 (13.33)	63 (17.85)	81 (16.60)
Perception that their suggestions were included in the game	19 (14.07)	9 (2.55)	28 (5.74)
Looking forward to the next sessions	11 (8.15)	58 (16.43)	69 (14.14)
Not wanting to end the session	9 (6.67)	47 (13.31)	56 (11.48)
Fear of failure	11 (8.15)	31 (8.78)	42 (8.61)
Avoid making decisions	9 (6.67)	11 (3.12)	20 (4.10)
Boredom	2 (1.48)	4 (1.13)	6 (1.23)
Challenging behavior	3 (2.22)	2 (0.57)	5 (1.02)
Psychomotor Agitation	2 (1.48)	10 (2.83)	12 (2.46)
Total	135 (100.00)	353 (100.00)	488 (100.00)

behavioral observations in the playtesting. This included mainly verbal expressions such as "Yes, I told you that this was very difficult and now it is much better." or "I know that this was made with my help." On the other hand, also in the playtesting sessions, boredom and psychomotor agitation were the least prevalent behavioral observations ($N = 2$; 1.48%). The avoidance of making decisions, characterized by behaviors where players tend to ask the researcher to decide by them, also emerged in the playtesting sessions ($N = 9$; 6.67%).

Regarding the analysis of the gaming sessions' grids, it is possible to highlight that engagement was the most frequent coded observation ($N = 91$; 25.78%), followed by: perception of competence ($N = 63$; 17.85%); looking forward to the next sessions ($N = 58$; 16.42%); and not wanting to end the session ($N = 47$; 13.31%). From a more negative point of view, fear of failure emerged as the fifth more relevant factor ($N = 31$; 8.78%), similarly to what happened in the playtesting sessions. The occurrence of challenging behaviors ($N = 2$; 0.57%) and boredom ($N = 4$; 1.13%) were the least frequent factors.

When comparing the two phases, it is possible to highlight that engagement, perception of competence, looking forward to the next sessions, and not wanting to end the session were more frequent in the gaming sessions. On the other hand, the perceived contribution to the games' creative process, expressed through acknowledging their suggestions' inclusion into the game, was more frequent during the playtesting sessions. The players' support needs awareness was proportionally similar in both phases. In a more negative spectrum, fear of failure and psychomotor agitation were higher in the gaming sessions, while the avoiding decisions, boredom, and challenging behaviors were higher in the playtesting sessions.

After this analysis, it is possible to highlight that this coding is cohesive with the previous one, which dichotomizes positive and negative behavioral observations. To this extent, it is possible to mention that engagement, awareness about one's own support needs, perception of competence, perception that their suggestions were included in the game, looking forward to the subsequent sessions, and not wanting to end the session summarize a total of 403 coded units, like the positive aspects of the behavioral observations presented in **Table 4**. Similarly, fear of failure, avoid making decisions. On the other hand, boredom, challenging behavior, and psychomotor agitation summarize a total of 85 coded units, representing the negative aspects of the behavioral observations presented in **Table 4**.

DISCUSSION

The present study aimed to provide preliminary answers to the question "How can games empower adults with ID?". The research was later organized around two specific aims that intended to explore this approach's effectiveness in promoting empowerment and well-being *per se* while investigating accessibility as a potential outcome of the process.

In the presented case study, overall data sustain the effectiveness of the proposed approach in promoting well-being and empowerment in the participants. As explored above, this allowed a decrease of their passivity, and an increase of their persistence, and interest in leisure time activities. Most specifically regarding well-being, improvements in communication were also registered, aligned with increased satisfaction with their own social and cognitive abilities. Increased knowledge and perceived ability to talk about their disability and support needs were also registered as expected, considering how the iterative process promoted playtesting and discussion, with accessibility as a framework.

An interesting aspect of the obtained results is that differences between the playtesting and gaming phases were registered concerning empowerment and well-being. In the playtesting sessions, characterized as more active in testing and feedback gathering, motor and cognitive accessibility barriers and their negative behavioral and attitudinal consequences in players were more present. This result reinforces how digital media are much more likely to be a source of exclusion than inclusion if accessibility is not prioritized (Gilbert, 2019). Nevertheless, even considering this aspect, positive behavioral observations were more frequent in the playtesting behaviors, than negative ones. This might be due to the high frequency of attitudinal and behavioral dimensions related to an increased awareness of their own support needs, engagement and playfulness, perception of their suggestions being included in the game, and perception of competence, promoted through in-game achievements. The relevance of gaining more knowledge about their disability and support needs was an empowerment-driven result that emerged both in the outcome and in the observation results. This might be related to the social perception of the incompetence of this specific population, specifically with pessimistic and paternalist narratives that accompany the construct of disability (Kliewer et al., 2006), linked to a medical model tradition in the field (Foley, 2017). Regarding the gaming sessions, it is possible to mention that cognitive and motor accessibility behaviors were prevalent in a much more positive manner, as drivers that contradict games frequent ableism. Behaviors were mainly positive, framing perception of competence as increased in pwID, when accessibility main issues were already tackled, as expected. In playtesting and gaming sessions, behaviors and expressions associated with a constant fear of failure were prevalent. It is possible to hypothesize that this sense of competence is emphasized in this population, considering that society tends to overprotect them, decreasing their chances to sense achievement (Sanders, 2006).

The analysis of the developed games made it possible to highlight a relative trend to make classical aesthetic game elements to this population, as mentioned above. By framing games for pwID in this fantasy-driven manner, games as a form of culture are emphasized and access to them. This meets the premises sustained by Cobigo et al. (2012) regarding promoting social inclusion through increased opportunities to participate in activities.

Still, regarding the developed games, the obtained results emphasize how including players' interests and voices in the creative process is also relevant to fostering engagement and enjoyment. An example of this premise is the game *Futebolástico!*, the most played by the participants. This game can be clearly

described as a labyrinth reskinned as a football field (**Figure 2**). The success of this game contradicts the researchers' initial expectations since the participants frequently developed paper and pencil labyrinth-based cognitive stimulation activities in the institution and reported low interest in them. This example can be better understood by the notion of "playworld" as presented by Frasca (2009), which considers the game world as composed of all the elements of the experience, including the mechanics and all the aesthetical and narrative elements. So two different games, with the same mechanics, can generate different meanings, emphasizing games' rhetorical potential, even for individuals that might struggle with meaning-making processes, like pwID.

To this extent, empowerment seemed to be promoted through the development of games that, through a participatory creative process, represented the narratives and experiences of pwID. This emerged through the inclusion of their interests and priorities from the earliest stage of game design and development and is sustained, for example, by the game concepts that tackle the participants' needs for more contact with the outside world and sensory stimulation exponentiated by the pandemic context. Therefore, our results corroborate those of other experiences in community media, that highlighted participatory processes as useful to enhance representations and narratives that are particular to people in underrepresented groups (Chee et al., 2021; Harrington and Dillahunt, 2021).

Summarizing, the obtained results are also aligned with a seminal work that establishes a contextual-behavioral model of empowerment, by increasing knowledge about central issues and their causes, in this case, ID; facilitating communication; enhancing opportunities for involvement; reducing barriers to equal opportunities, specifically accessing games; and minimizing environmental barriers (Fawcett et al., 1994). Although this represents a more classical perspective on the field of empowerment, several studies have been applying the empowerment model developed by Fawcett et al. (1994) to different groups and contexts, including LGBTQI + individuals (Vázquez et al., 2020), entrepreneurship (Hsieh et al., 2019), media creation (Frid, 2019), and political participation (Anshari and Almunawar, 2019).

Regarding the second aim of this study, namely the exploration of the promotion of accessibility through a PAR gaming approach, insights mainly emerge from the systematic observation of the process. By promoting accessibility, it was possible to increase participants' interests in leisure activities and decrease their negative behaviors and attitudes, both in playtesting and gaming sessions. Furthermore, the involvement of pwID in ensuring games' accessibility, operationalized through playtesting, also increased their information about disability and their ease of communication about support needs. Therefore, it is possible to understand the potential role of this type of participatory process in promoting self-perception, through a more critical lens, as opposed to societies' overprotective views.

From this perspective, a new question emerges, precisely "Does the existence of accessibility in games empower pwID?". Even if answering this question fully might involve new research, it is factual that by removing the existing barriers in this cultural form, we are allowing the impairment(s) of this population not necessarily to become disability(ies), aligned with the social model of disability. Moreover, we are able to provide some empirical data to sustain a conceptual premise developed in the scope of the same research project as this study – that accessibility can be empowering, foster well-being and, ultimately, inclusion (Sousa et al., in press). If this premise might be true for any digital accessibility, it can be even more relevant here, considering games' unique characteristics as a medium. For example, interactivity, goal orientation (Costikyan, 2002), motivation through failure, immediate feedback (Boyle et al., 2016), among other aspects, characterize games as spaces where decision making is required and, consequently, optimal to promote empowerment and self-determination.

The present study results also emphasize the feasibility of PAR as a methodological approach to the operationalization of the so-called social model of media accessibility, in an analogy with the social model of disability, as postulated by Fryer (2021). As in this study, this model includes the promotion of accessibility as tackled from the beginning of the design process, in a proactive strategy, as opposed to reactive strategies, that tend to see support needs as constraints instead of creative triggers (Terras et al., 2018). Aligned with this result, the present study also allowed to establish a preliminary validation of a model to operationalize accessibility through a participatory framework for developing games for pwID. The model, as the present research, is structured around three phases: (1) the comprehensive, ethnographic, and systematic exploration of players interests, habits, and accessibility needs; (2) the iterative and participatory development and playtesting of prototype versions; and (3) the launching of the final version of an accessible and inclusive game, that can be continuously improved with further feedback (Sousa et al., in press).

From the obtained results, it is possible to mention that PAR can only be seen as part of the process. It was by including such an approach in the process that all the initiative became empowering. Therefore, the present study can support filling an already reported gap – "serious" games tend to be studied through a much more experimental and, overall, positivist lens (Wästerfors and Hansson, 2017; Sousa, 2020). Through this observation, some answers to both research objectives can be provided, by acknowledging that pwID are more included in PAR approaches, with their voices heard and accessibility needs considered.

It is relevant to highlight that the produced insights cannot be analyzed without considering methodological options as inherent in the obtained outcomes. It was possible to consider accessibility as part of the creative process and obtain the above-explored well-being and empowerment results through this participatory framework. To this extent, it is vital to question if the results would be the same if the approach to the sessions was not guided by questions such as "What do you want to play?", "How do you want the game to be?", or "Would you like it to be a little slower?". The role of participation in the promotion of empowerment and well-being is sustained by the satisfaction shown by players with the inclusion of their needs and suggestions into the developed games. This result is aligned with the previously documented relevance of PAR to include the voices of underrepresented

groups in research (Cahill, 2007; Fish and Syed, 2021), including pwID (Jurkowski, 2008).

Limitations and Future Directions

Although the obtained conclusions are very interesting and can foster future studies on the role of accessible games in empowering underrepresented voices, it is essential to highlight that some limitations must be considered. This includes the limited sample size and the inherent cultural factors that might lead to different results in other social, cultural, or economic contexts. In the field of ID this is highly relevant since the social support systems for people with disabilities change from country to country, as well as the beliefs, stigma, and social representations. Moreover, it is crucial to highlight that the effect of games might be exponentiated by institutionalization during a pandemic context. Although the results may fit the unique characteristics of the games, it is undeniable that a context of such poor stimulation may have emphasized some of the obtained results. Therefore, replicating a similar methodology in a larger sample and a different context could reinforce and sustain the obtained results. Also, as in most game-based learning approaches, it is still difficult to establish if the gains in terms of empowerment are transferable to other daily life activities besides gaming.

Even if providing several insights that can help shape the future of the field, some limitations must be considered and discussed. The participatory process was heavily conditioned by the restrictions imposed by the COVID-19 pandemic. The low access to the institution only allowed the direct interaction between one of the researchers and the subjects, with no direct interaction between the students and the players, as initially planned. Although several efforts were developed to ensure that the voice of the pwID was listened to by the students, this process was mainly mediated, which can cause different biases. Moreover, gaming sessions were developed with only one participant at the time and not in groups as planned, which conditioned the observation of relevant interpersonal behaviors associated with social interaction, like "backseat gaming." The number of game sessions was also smaller than what was initially planned, considering that the same schedule had to accommodate 14 different individual sessions instead of group sessions.

In the integration of pwID's support needs into the gameplay, students' time needs did not always match perfectly with the timings of the school year. While being a minority, some games needed more in-depth improvements to be effectively playable by this population, highlighting the need for cost-effective design process planning in the field. The fact that these games were not used in the gaming session is also a limitation.

The lack of digital access of the study's sample of individuals with ID, with only one computer for playing the games available and only in the therapists' room, severely conditions the feasibility and long-term impact of the process. It does not allow play to happen spontaneously and through intrinsic motivation processes, conditioning a fully independent play experience through the constant intervention of a therapist or caregiver (Pitaru, 2007). Nevertheless, the games are now available online through a Creative Commons License, hoping this increases their effective autonomous use by pwID, and any other potential players. Plans to support the production of the tangible interfaces in a FabLab are also available online.

Other identified limitations are related to the implementation of PAR as a strategy to enhance the participation of unrepresented communities. Although most of the research design was developed to address their voices, the main research motivation emerged from the problem identified by the research team while analyzing the community and its specific context. Future studies must address this, by increasing the participation of pwID in the definition of their problems and needs, not only related to games as developed here, but in a broader and multidimensional manner. Moreover, this should involve further exploration of equity in accessing games and accessibility as promoters of socio-cultural inclusion, which can also imply accessibility and participation in other media and cultural products as a whole.

CONCLUSION

The results of this study present insights from a case study that sustain the effectiveness of a PAR gaming approach in promoting the empowerment and well-being of adults with ID. Moreover, it sustains the feasibility of promoting accessibility in games through participatory processes, in the specific context of pwID, through a proactive lens that tackles these concerns as part of the creative process. To this extent, accessibility emerges as closely linked to empowerment by making this specific cultural form – games – accessible for pwID and by representing this underrepresented population's specific narratives and experiences through this medium.

Therefore, this case study might present some preliminary answers to the question "How can games empower adults with ID?". Considering the obtained results, it is possible to consider participation in different phases of gaming, from creation to play, as a potential answer path. This can also be operationalized by the unique opportunities provided by games in terms of decision making, self-determination, and, consequently, empowerment. If accessibility is framed as part of the creative process, it can also support empowerment through increased access and self-consciousness about the nature of disability and each individual's own support needs. Furthermore, games can also empower adults with ID by promoting meaningful leisure time activities, communication, and a greater perception of competence. By including them in the process, the perception of their voices being heard was also increased.

The obtained results can be considered as reinforcing the theoretical arguments that sustain the adoption of inclusive design approaches that match the personal needs with the tools and the environment through fostering the accessibility of games, with a specific focus in adults with severe ID. The relevance of PAR in the inclusion of underrepresented groups' voices, through a change-driven approach, is also emphasized by the results explored above.

As explored above, the limitations of this study include the limited sample size and the specific socio-cultural context where it was developed, which also poses barriers to further

generalization of these conclusions. Additionally, the study was developed in a pandemic context that required more mediation of the participatory processes than initially planned. This conjunction of factors may justify the need to replicate this study in the future, under different circumstances, and try to address these limitations.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: the data presented in this study are openly available in FigShare at https://doi.org/10.6084/m9.figshare.19164218 and at https://doi.org/10.6084/m9.figshare.19164215. All names, detailed descriptions, and other data that made participants potentially identifiable was replaced by numerical IDs.

ETHICS STATEMENT

The study was conducted in accordance with the ALLEA Code of Conduct for Research Integrity, and approved by the Lusophone Research and Development Institute (Instituto Lusófono de Investigação e Desenvolvimento; ILIND) Ethics Committee (statement no. 6 from 27th of September 2021).

AUTHOR CONTRIBUTIONS

CS, JN, and MD: conceptualization, methodology, and validation. CS: data curation and investigation. CS and JN: formal analysis, visualization, and writing–original draft. JN and CS: project administration, resources, and software. MD and JN: supervision. JN and MD: writing–review and editing. All authors: contributed to the article and approved the submitted version.

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