

CARLA PATRÍCIA GONÇALVES E SOUSA MIRA

**EMPODERAMENTO, BEM-ESTAR E ACESSIBILIDADE EM JOGOS
DIGITAIS**

Orientador: Professor Doutor Manuel José Carvalho Almeida Damásio
Coorientador: Professor Doutor José Carlos Santos Neves

Universidade Lusófona de Humanidades e Tecnologias
Escola de Comunicação, Arquitetura, Artes e Tecnologias da Informação

Lisboa 2022

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Epígrafe

“This is our vision, this is our dream. An Inclusive Community is the key to our future if we are to join you as equals. However we need your support and commitment if we are to build communities that are truly inclusive. We need you to believe in the justice of our cause. We need you to help us make things change so we all can share a richer and fuller life. We have learnt to speak out.” (Martin, 2009, p. 127)

“The ultimate goal: accessibility and representation become the norm.” (Sturm, n.d.)

Dedicatória

Ao Felipe e ao Nuno.

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Sumário

Devido às suas características únicas, os jogos têm sido cada vez mais estudados como relevantes para a aprendizagem, representação, empoderamento, bem-estar e, em última análise, inclusão social. No entanto, no campo da deficiência em geral e da Deficiência Intelectual (DI) em particular, estas vantagens estão ainda imersas num conjunto de barreiras e obstáculos decorrentes da falta de acessibilidade deste *medium* e da falta de representação nos processos de investigação e criação. A presente coletânea de artigos científicos propõe uma abordagem conceptual e empírica a estas questões, com o objetivo principal de explorar o papel dos jogos digitais no empoderamento e bem-estar das pessoas com DI. Na abordagem empírica implementámos um processo de Investigação de Ação Participativa, envolvendo adultos com DI ($N = 14$) e estudantes do ensino superior ($N = 17$), visando três objetivos principais: (a) explorar a eficácia desta abordagem no empoderamento e bem-estar de adultos com DI institucionalizados; (b) verificar a viabilidade das abordagens participativas para a promoção da acessibilidade em jogos; e (c) explorar o valor pedagógico desta atividade no desenvolvimento profissional de futuros *game designers* e *game developers*. Nesta medida, a metodologia adotada incluiu uma abordagem etnográfica ao processo de criação colaborativa de jogos, envolvendo ambas as amostras, alinhada com avaliações pré e pós-processo. Entre Março de 2020 e Fevereiro de 2021 foram realizados: um *focus group* sobre interesses e hábitos mediáticos, nove sessões de criação participativa com *feedback* do público alvo, três rondas de *playtesting* e 162 sessões de jogo com adultos com DI. Deste processo resultaram 10 jogos acessíveis para pessoas com DI — criados considerando os seus interesses, necessidades, características cognitivas e motoras —, e 10 interfaces tangíveis (controlador) concebidos à medida de cada jogo.

Os resultados obtidos sublinham a eficácia da abordagem apresentada na promoção do empoderamento e do bem-estar em adultos com DI, registando-se níveis estatísticos significativamente superiores após o processo ($p < .05$) que foram corroborados pelos dados da observação participante. Quanto aos estudantes, observaram-se níveis estatisticamente mais baixos ($p < .05$) de atitudes de preconceito em relação a pessoas com DI e um maior conhecimento da implementação de características de acessibilidade em jogos. O referido empoderamento, parece ter sido promovido pela aplicação de um processo criativo participativo de desenvolvimento, do qual resultaram um conjunto de jogos ajustados às narrativas e experiências das pessoas com DI. Embora este trabalho seja um estudo de caso com uma amostra limitada e desenvolvido num

contexto específico, é possível identificar as suas potenciais contribuições para uma maior inclusão de pessoas com DI na indústria de jogos e nos estudos dos *media*. Sendo esta uma questão de direitos, também é estratégia exequível para abordar questões de acessibilidade e representação. Os resultados deste estudo podem ajudar a enquadrar uma discussão mais ampla sobre a inclusão das vozes dos grupos sub-representados por via dos jogos e como estas estratégias podem ser parte da formação dos futuros profissionais daquela área.

Palavras-chave: Jogos; Deficiência Intelectual; Acessibilidade; Empoderamento; Bem-Estar; Investigação Ação Participativa.

Abstract

Because of their unique characteristics, games have been increasingly studied as relevant to learning, representation, empowerment, well-being, and, ultimately, social inclusion. However, in the field of disability, these advantages are 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, which seems to be exponentiated in the field of Intellectual Disability (ID). The present scientific articles' collection proposes a broad conceptual and empirical approach to tackle these issues, with the main goal of exploring the role of digital games in the empowerment and well-being of people with ID. In our empirical approach, we have implemented a Participatory Action Research (PAR) approach to target this gap, involving both adults with ID ($N = 14$) and higher education students ($N = 17$), through three main aims: (a) explore the effectiveness of this 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 participatory approaches; and (c) explore the pedagogical value of this activity in the professional development of future game designers and developers. To this extent, the adopted methodology included an ethnographic approach to the collaborative game creation process, involving both samples, was conducted, aligned with pre and post-process assessments.

One focus group about interests and media habits, nine co-creation sessions with feedback from the target audience, three playtesting rounds, and 162 gaming sessions with adults with ID were conducted between March 2020 and February 2021. This process resulted in 10 accessible games for people with ID, created considering their interests, needs, cognitive and motor characteristics, as well as in a different tangible interface (controller) for each game, adapted to their motor impairments.

The obtained results emphasize the effectiveness of the presented approach in promoting empowerment and well-being in adults with ID, with statistically significantly higher levels ($p < .05$) illustrated on the post-assessments and corroborated by the participant observation data. On the other side, students showed increased knowledge of implementing accessibility features in games, aligned with statistically significant lower levels ($p < .05$) of prejudice-driven attitudes towards people with ID. By analyzing the developed games, it is possible to mention that empowerment seemed to be promoted through the development of games that, through a participatory creative process, represented the narratives and experiences of people with ID.

Although this work is a case study with a limited sample and developed in a specific context, it is possible to highlight its potential contributions to greater inclusion of people with ID in both game industry and game studies, as a matter of rights and feasible strategy to tackle accessibility and representation issues. Furthermore, it can frame a broader discussion about how games represent the voices of underrepresented groups, and how these strategies might be included in the training of future game designers and game developers.

Keywords: Games; Intellectual Disability; Accessibility; Empowerment; Well-Being; Participatory Action Research.

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1. Introdução

Ao jogar um “bom” jogo direcionamo-nos para o lado mais positivo do espectro emocional humano, através de um *engagement* promotor das condições físicas e psíquicas necessárias para desencadear todo o tipo de emoções e experiências positivas (McGonigal, 2011). Estas condições parecem ser induzidas de forma neuroquímica, através da sua influência nas vias colinérgicas, serotoninérgicas e dopaminérgicas, associadas à atenção (Villano et al., 2017), novidade (Rangel-Gomez & Meeter, 2015) e recompensa (Haber, 2011), respetivamente. Todos estes fatores, pela sua natureza, promovidos através da atividade de jogar.

Os jogos são assim vistos como tendo processos inerentes de criação de significados, o que os enquadra como forma de transmitir valores, abrindo um amplo espectro de possibilidades aos indivíduos. Deste modo, os jogos permitem complementar visões mais lineares associadas a outras formas de narrativa, através de uma experiência única de interação que envolve a manipulação simultânea de diversas variáveis (Frasca, 2009).

No entanto, e ainda que os jogos pareçam constituir um espaço particular de expressão cultural destinado a proporcionar experiências intensas através da interação e da produção de significados, para as pessoas com deficiência é, tendencialmente, adotada uma lente muito mais redutora e categórica que tende a vê-las numa ótica clínica/terapêutica, descurando o seu papel enquanto jogadores (Wästerfors & Hansson, 2017).

Considerando este contexto, a presente coletânea de artigos científicos foi norteadada pelo objetivo de explorar o papel dos jogos digitais no empoderamento e no bem-estar das pessoas com Deficiência Intelectual (DI), através de abordagens mais participativas para a sua criação e acessibilidade. Assim, pretendeu abordar-se o problema geral da falta de representação e acessibilidade desta população, tanto na investigação em jogos como nos processos criativos, visando o empoderamento destas pessoas e a capacitação dos futuros profissionais da área.

Os artigos apresentados visam estabelecer um *roadmap* da complementaridade e progressividade das abordagens a este problema. Tal inclui: o estado da arte acerca da eficácia dos jogos neste âmbito (Anexo I); uma abordagem à representação atual das pessoas com DI nos estudos existentes (Anexo II); uma proposta metodológica para a operacionalização de premissas de inclusão nos estudos envolvendo jogos e pessoas com DI (Anexo III); a descrição e análise do estudo de caso desenvolvido com as pessoas com DI, com base nas conceitualizações dos artigos

anteriores (Anexo V); e a sistematização do trabalho e das conclusões obtidas com os estudantes acerca do valor pedagógico desta prática (Anexo VII).

1.1. Organização da Tese

Considerando a natureza do presente documento, é importante relevar que a leitura do mesmo não se sobrepõe à leitura dos artigos científicos que compõem a presente investigação e que se encontram presentes nos Anexos I, II, III, V e VI. Os mesmos foram elaborados tendo em conta as normas de publicação do periódico ou conferência específica, o que justifica a sua disparidade em termos de formato, extensão e normas de referência bibliográfica. No Anexo IV pode ser encontrado o comprovativo de aceitação do artigo cuja publicação não estava efetivada à data da entrega da presente tese.

A presente tese é constituída por uma secção introdutória (secção 1), pela sistematização dos objetivos de investigação (secção 2) e pela discussão dos resultados (secção 3). Na secção introdutória pretende estabelecer-se o *framework* geral de emergência do trabalho, incluindo aspetos mais organizacionais e informativos, a motivação para a escolha do formato de coletânea de artigos científicos, a sua articulação com os Objetivos de Desenvolvimento Sustentável (ODS) da Agenda 2030 da Organização das Nações Unidas (ONU), a sistematização de todas as atividades de disseminação e publicação científica realizadas, e ainda a estratégia que lhes foi sendo inerente. Na secção dos objetivos de investigação encontra-se explanada a pergunta de investigação do presente trabalho, listando-se todos os objetivos gerais e específicos que lhe são inerentes, bem como os artigos que os exploram em detalhe. A discussão dos resultados não tem por objetivo discutir em detalhe os resultados de cada estudo, mas sim estabelecer uma perspetiva integradora sobre as ligações entre os mesmos, as conclusões gerais que daí emergem e o contributo para o estado da arte, refletindo-se acerca das suas limitações e gerando *insights* para trabalhos futuros.

Para um enquadramento teórico e metodológico mais amplo, bem como uma compreensão mais profunda dos resultados e conclusões obtidas, deverão ser consultados os artigos científicos produzidos (Anexos I, II, III, V e VI).

1.2. Articulação com os Objetivos da Agenda 2030 da Organização das Nações Unidas

Garantir a congruência do quotidiano das pessoas com deficiência com os postulados da Convenção sobre os Direitos das Pessoas com Deficiência (CDPD) e com os 17 ODS da ONU implica, necessariamente, garantir a sua participação plena na sociedade (Madans, Loeb, & Eide, 2017). Neste sentido, este trabalho apresenta a sua principal articulação com o ODS 10 (“Reduzir as desigualdades no interior dos países e entre países”), dirigindo-se mais concretamente à necessidade expressa de empoderar e promover a inclusão social de todas as pessoas independentemente da sua deficiência (United Nations, 2015). Neste caso, com base na promoção da acessibilidade e do acesso à forma cultural que são os jogos digitais. Através da criação de um conjunto de jogos acessíveis e da produção de evidência sobre processos criativos mais participativos — ainda que aqui numa função mais associada ao entretenimento —, é possível denotar alguma convergência com os ODS quatro e oito, “Assegurar a educação inclusiva e equitativa e de qualidade, e promover oportunidades de aprendizagem ao longo da vida para todas as pessoas” e “Promover o crescimento económico sustentado, inclusivo e sustentável, emprego pleno e produtivo e trabalho digno para todas as pessoas” (United Nations, 2015).

1.3. Motivação e Escolha do Formato

A motivação para a realização da presente investigação emergiu, sobretudo, de três fontes principais: a) Uma noção clara da invisibilidade das necessidades das pessoas com DI e do constante silenciamento das suas vozes e decisões, conforme corroborado pelo estado da arte (Coles & Scior, 2012; Ditchman et al., 2016); b) O potencial já documentado dos jogos no impacto social, na aprendizagem e na promoção do bem-estar dos indivíduos (de Freitas, 2018; Halbrook et al., 2019; Horn, 2014; Keating, 2016), que permitiu identificar potencial neste *medium* para repensar algumas das disparidades já elencadas; c) O facto de nos últimos anos a literatura ter evoluído no sentido de reconhecer os jogos enquanto uma manifestação cultural central, mas que ainda é mais um veículo de exclusão do que de inclusão social (Gray & Leonard, 2018). Esta investigação emergiu assim também destes três eixos, propondo uma abordagem para repensar o empoderamento e o bem-estar, através de processos criativos mais inclusivos e participativos.

No que concerne à escolha do formato, a opção pela coletânea de artigos científicos prendeu-se com aquela que parece ser uma notória e urgente necessidade de disseminação de evidência sobre o empoderamento e a participação das pessoas com DI na investigação, especificamente no campo dos *game studies* e, de modo mais alargado, dos estudos dos *media*. Esta urgência foi sendo

corroborada pelo interesse dos periódicos pela presente investigação, o que reforçou esta noção. Além disso, a experiência prévia de publicação da doutoranda, com 13 contributos indexados à Scopus à data desta tese para além dos realizados no âmbito da presente investigação, permitiu fundamentar a exequibilidade deste plano. Será também importante salientar a centralidade do *peer review* que esta estratégia possibilita na coesão dos *insights* produzidos.

1.4. Publicações e Atividades de Disseminação Científica

A estratégia delineada para o presente trabalho visou a publicação do equivalente aos capítulos necessários numa tese de modelo “tradicional” em periódicos científicos de renome na área, considerando o seu enquadramento com os requisitos do programa doutoral. Assim, é possível dizer que o artigo publicado nos *Proceedings of the 13th ICDVRAT with ITAG* (Anexo I), aliado com o artigo publicado no número especial “Videogames and Culture: Design, Art and Education” do *International Journal of Film and Media Arts* (Anexo II) constituem o estado da arte. Já o artigo aceite para publicação no *Journal of Gaming and Virtual Worlds* (Anexo III) representa uma abordagem conceptual às noções de acessibilidade, participação e inclusão, por forma a desenvolver o modelo de intervenção e análise que norteou a componente empírica da presente investigação. Os resultados empíricos obtidos e a sua análise crítica encontram-se apresentados nos artigos da *Frontiers in Education* (Anexo V) e *Multimodal Technologies and Interaction* (Anexo VII). Deste modo, são explorados os resultados obtidos considerando tanto as pessoas com DI, quanto os estudantes de Videojogos enquanto públicos-alvo. As publicações, características e estado encontram-se sistematizadas na Tabela 1.

Tabela 1. *Publicações realizadas no âmbito da presente investigação*

Autoria	Título	Ano	Periódico	Indexação Scopus	Quartil mais elevado	Estado
Sousa, C., Neves, J. C., & Damásio, M. J.	Empowerment and Well-Being through Participatory Action Research and Accessible Gaming: a Case Study with Adults with Intellectual Disability	em análise	Frontiers in Education	Sim	Q2 (calculado em 2020)	Submetido (Anexos V e VI)
Sousa, C., Neves, J. C., & Damásio, M. J.	Intellectual Disability Through Gaming: Operationalizing	in press	Journal of Gaming and Virtual Worlds	Sim	Q3 (calculado em 2020)	Aceite para publicação (Anexos III e IV)

Accessibility, Participation, and Inclusion						
Sousa, C., Neves, J. C., & Damásio, M. J.	The pedagogical value of creating accessible games: a case study with higher education students	2022	Multimodal Technologies and Interaction	Sim	Q2 (calculado em 2020)	Publicado (Anexo VII)
Sousa, C.	Empowerment and ownership in intellectual disability gaming: review and reflections towards an able gaming perspective (2010-2020)	2020	International Journal of Film and Media Arts	Sim	n/a	Publicado (Anexo II)
Sousa, C., Neves, J. C., & Damásio, M. J.	Research in Serious Games for People with Intellectual Disability: a Meta- analysis Study	2020	Proceedings of 13 th ICDVRAT with ITAG	n/a	n/a	Publicado (Anexo I)

É importante salientar o incremento de coesão que o trabalho registou, em consequência do processo de *peer review*. O *feedback* dos revisores enfatizou as limitações decorrentes dos constrangimentos metodológicos, que incluem a pandemia e a dimensão da amostra; por esse facto, foram revistos alguns procedimentos de análise estatística, nomeadamente escolhendo testes estatísticos com mais poder para grupos reduzidos. Já o entendimento dos jogos criados no âmbito da investigação como sendo narrativas conjuntas que representam as pessoas com DI, resultou de uma troca de ideias com investigadores subsequente à apresentação dos mesmos na conferência da *International Association for Media and Communication Research (IAMCR)*.

Além das publicações apresentadas, a realização da presente investigação sustentou a participação em eventos de disseminação científica, conforme sistematizado na Tabela 2, que permitiram recolher e discutir o *feedback* de outros investigadores neste âmbito, possibilitando uma maior coerência conceptual e posterior coesão dos textos submetidos para publicação. Atualmente, ainda estão a ser utilizadas algumas conclusões provenientes, direta ou indiretamente, deste trabalho em submissões para conferências. Tal facto pretende sustentar o planeamento de trabalhos futuros que permitam maximizar e validar de modo mais amplo as conclusões obtidas. Também o modelo de criação com estudantes proposto para o desenvolvimento de videojogos acessíveis continua em implementação, estando o seu valor pedagógico em constante análise.

Tabela 2. Apresentações em eventos científicos realizadas no âmbito da presente investigação

Autoria	Título	Evento¹	Data	Local	Estado
Sousa, C., Neves, J. C., & Damásio, M. J.	Accessibility and Empowerment in Digital Games: a Case Study with people with Intellectual Disability and Higher Education Students	9 th European Communication Conference (ECREA 2022)	n/a	n/a	Submetido
Neves, J. C. & Sousa, C.	Bridging Academia and Civil Society for Access and Inclusion: Insights from Action- Research Experiences	IAMCR Conference Beijing 2022	n/a	n/a	Submetido
Sousa, C., Neves, J. C., & Damásio, M. J.	Exploring the Pedagogical Value of a Game Creation Action-Research Experience Involving University Students and Adults with Intellectual Disability	XVIII Foro Internacional sobre Evaluación de La Calidad de La Investigación y La Educación Superior	28 de Setembro de 2021	Virtual	Apresentado
Sousa, C., Neves, J. C., & Damásio, M. J.	The role of games in the promotion of life skills in people with intellectual disability: A systematic literature review	8 th European Communication Conference (ECREA 2021)	8 de Setembro de 2021	Virtual	Apresentado
Sousa, C., Neves, J. C., & Damásio, M. J.	Participatory Game Creation for People with Intellectual Disability: Insights from an Action-Research Experience	IAMCR Conference Nairobi 2021	11-15 de Julho de 2021	Virtual	Apresentado

Ainda no âmbito da presente investigação, foram realizadas duas comunicações e uma publicação por convite. Em evento organizado pela Federação Portuguesa para a Deficiência Mental (HUMANITAS), foi realizada no dia 9 de Março de 2021 a comunicação “Desenvolvimento de Jogos Inclusivos como Estratégia de *Empowerment* em Pessoas com Deficiência Intelectual”, enquadrada na constituição de uma rede de jovens investigadores na área. A 10 de Dezembro de 2021, no evento *online* da mesma organização “Nada do que é humano nos é alheio: Contributos e desafios para uma sociedade inclusiva”, foi levada a cabo a comunicação “HUMANITAS e Lusófona - Um Projeto em Rede”. Por fim, a convite do Moody College of Communication da University of Texas at Austin, foi publicado na revista *online* desta escola –

¹ Os dados da tabela dizem respeito apenas a eventos cuja participação envolve a submissão, *peer review* e aceitação dos trabalhos. Eventos e atividades por convite não constam da mesma.

Media Ethics — o artigo de reflexão “The Inclusion of People with Intellectual Disability in Media and Communication Research: Insights and Contributions from Haraway”; trata-se de um texto que concretiza uma crítica aos pressupostos do consentimento inerentes às pessoas com DI, utilizando alguns aportes teóricos do texto “A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s” de Donna Haraway, possibilitando uma maior amplitude reflexiva ao planeamento das implicações práticas inerentes a este trabalho.

Além das publicações, comunicações e atividades acima explanadas, foi possível efetuar duas candidaturas a financiamento que, ainda que não tenham sido bem-sucedidas, permitiram a receção de *feedback* mais concreto sobre a implementação da abordagem proposta — nomeadamente os programas *New European Bauhaus Prizes 2021* e *2º Prémio de Investigação Científica e Reabilitação Doutora Maria Lutegarda*. A integração desses comentários num planeamento para uma validação mais ampla das conclusões obtidas, concretizada através de outros projetos de investigação é um dos resultados relevantes da estratégia delineada para o futuro.

Também considerando as atividades desenvolvidas na presente investigação, nomeadamente ao nível do *networking*, foi possível integrar a COST Action *aSTEP - advancing Social inclusion through Technology and EmPowerment* (CA19104), sendo esta doutoranda membro do grupo de trabalho responsável pela sistematização da evidência acerca das tecnologias assistivas enquanto promotoras de inclusão social e empoderamento. Ainda neste âmbito, tornou-se membro do *Games and Social Impact Media Research Lab* (GLOW; <https://glow.ulusoфона.pt/>) e responsável pelas estratégias de acessibilidade, disseminação académica e avaliação de resultados da *Oficina de Prototipagem e Experimentação em Recursos Acessíveis Tangíveis* (<https://operat.ulusoфона.pt/>).

2. Objetivos de Investigação

Considerando o enquadramento explorado, é possível dizer que os diversos artigos que compõem este trabalho se organizam em torno na questão de investigação “Como podem os jogos digitais contribuir para o bem-estar e empoderamento de pessoas com DI?”. Por conseguinte, é possível estabelecer o objetivo geral desta investigação: “Explorar o papel dos jogos digitais no empoderamento e no bem-estar de pessoas com DI”. Com base neste objetivo geral, considerado como uma perspetiva integradora dos objetivos dos artigos científicos produzidos, foi também definido um conjunto de objetivos específicos. Na Tabela 3, é possível encontrar uma sistematização da exploração dos objetivos específicos ao longo dos diversos artigos que compõem

o presente trabalho, permitindo uma melhor compreensão do enquadramento conceptual, metodológico e conclusões obtidas.

Tabela 3. *Articulação dos objetivos específicos ao longo dos trabalhos apresentados*

Artigo	Anexo	Objetivo(s) Específico(s)
Intellectual Disability Through Gaming: Operationalizing Accessibility, Participation, and Inclusion	III	Estudar a integração do modelo social da deficiência no gaming e nas suas práticas (O1).
		Examinar o <i>gaming</i> e os seus fenómenos tendo em conta as especificidades contextuais das pessoas com DI (O2).
		Explorar modelos mais participativos para a inclusão das pessoas com DI na criação e investigação na área dos jogos (O3).
Empowerment and Well-Being through Participatory Action Research and Accessible Gaming: a Case Study with Adults with Intellectual Disability	V	Analisar a eficácia de uma abordagem de Investigação Ação Participativa (Participatory Action Research; PAR) e <i>gaming</i> no empoderamento e no bem-estar de pessoas adultas com DI a viver num contexto institucional (O4).
		Estuda a exequibilidade da promoção da acessibilidade dos jogos através da PAR, tendo adultos com DI como estudo de caso (O5).
The pedagogical value of creating accessible games: a case study with higher education students	VII	Analisar o valor pedagógico do <i>game design</i> e <i>game development</i> com e para pessoas com DI na promoção de atitudes mais inclusivas e competências de acessibilidade em estudantes de videojogos (O6).

Os artigos “Research in Serious Games for People with Intellectual Disability: a Meta- analysis Study” e “Empowerment and ownership in intellectual disability gaming: review and reflections towards an able gaming perspective (2010-2020)” não se encontram presentes na Tabela 3 por terem uma função sobretudo de enquadramento teórico, que permitiu situar este estudo entre as lacunas do estado da arte existente.

3. Discussão dos Resultados

O presente trabalho consistiu numa coletânea de artigos científicos orientados para dar resposta à questão “Como podem os jogos digitais contribuir para o bem-estar e o empoderamento de pessoas com DI?”. Através das abordagens conceptuais e empíricas desenvolvidas, é possível fornecer sustentação ao papel dos jogos na promoção destes dois aspetos, associada sobretudo à sua acessibilidade e a uma visão da participação e representação nos processos. Esta será norteadada pela inclusão das pessoas com DI, por um Modelo Social da Acessibilidade e pela formação de profissionais mais conscientes. Seguidamente, estas premissas são explorados em detalhe, sob uma

perspetiva integradora entre os diversos artigos, que permite estabelecer o contributo de cada um deles para as respostas elencadas.

3.1. Integração dos Artigos Apresentados

Sob uma perspetiva evolutiva, o presente trabalho iniciou-se com um processo de Revisão Sistemática da Literatura (RSL) que permitiu a elaboração de dois *outputs* de índole distinta, constantes nos artigos I e II. No primeiro, a partir de uma seleção de artigos recolhidos ($N = 8$) tendo em conta o desenho de investigação, foi elaborado um estudo de metanálise que permitiu aferir a eficácia dos jogos na promoção de diferentes competências em pessoas com DI. Este estudo enquadra-se numa primeira visão da presente investigação, muito mais ligada a uma perspetiva dos jogos enquanto intervenção terapêutica mais categórica (Wästerfors & Hansson, 2017), que foi sendo repensada no seu decurso.

Esta desconstrução iniciou-se por via de uma nova abordagem a toda a amostra de artigos científicos recolhidos ($N = 54$), que implicou uma análise crítica ao papel das pessoas com DI nestes estudos, os esforços para promover metodologias inclusivas de investigação e a forma como este campo pensava o seu empoderamento através do *gaming*. Desta forma, foi possível concluir que a inclusão compreensiva e detalhada das pessoas com DI não se apresentava como uma prioridade nos desenhos de investigação dos estudos que compunham a amostra. Esta conclusão contraria a premissa de que a colaboração significativa deve ser parte dos processos de investigação envolvendo esta população (Schwartz et al., 2020), bem como a relevância atribuída à consideração pela experiência subjetiva das pessoas com DI na promoção da inclusão social (Cobigo et al., 2012). A minoria de estudos que adotaram mais do que um método de investigação coaduna-se com as conclusões anteriormente elencadas por Cano, García-Tejedor, & Fernández-Manjón (2015), no que concerne à prevalência de visões redutoras e mutuamente exclusivas no estudo dos jogos para pessoas com DI. As conclusões obtidas alinham-se com o trabalho de Wästerfors & Hansson (2017), reforçando a exclusão das pessoas com deficiência da investigação em jogos através da ênfase das suas necessidades terapêuticas, em vez do seu empoderamento ou da sua necessidade de serem agentes ativos dos processos de *gaming*. Assim, ficou claro a necessidade de repensar o papel destas pessoas, o que pode incluir o empoderamento através de uma cultura mais participativa e o envolvimento com práticas mediáticas significativas, tal como postulado por Knobel & Lankshear (2010). Ao promover práticas criativas que vejam os jogos não

apenas como ferramenta terapêutica ou pedagógica, mas como uma forma de expressão cultural inteligível para pessoas com DI, sustentamos uma inclusão na esfera pública enfatizada pela noção de acesso como precursor necessário da participação, tanto nos *media* quanto nas estruturas democráticas (Carpentier, 2011). Deste modo, a necessidade de promoção da sua acessibilidade torna-se ainda mais central.

Com base nestas conclusões, foram definidos os três primeiros objetivos específicos de investigação (O1, O2 e O3), visando constituir um modelo metodológico sólido para a posterior fase empírica do presente trabalho (artigo III). Através deste artigo, foi possível concluir que o desenvolvimento de práticas mais inclusivas na área dos jogos para pessoas com DI implica abordagens alternativas e disruptivas às questões da acessibilidade, inclusão e participação — três pilares complementares com similar relevância para o processo. Além disso, estas conclusões sustentaram a noção de abordagens mais proactivas que reativas, que incluam o envolvimento ativo das pessoas com DI desde o processo criativo. Esta aplicação das premissas do Modelo Social da Acessibilidade (Fryer, 2021) ao campo dos jogos para pessoas com DI preconiza a inclusão da acessibilidade enquanto parte desse mesmo processo criativo, o qual implica iterações constantes que materializam a sua voz nos jogos desenvolvidos, priorizando tanto as suas necessidades de acessibilidade, quanto as representações narrativas da experiência de ter uma deficiência. Este modelo nortearia o desenvolvimento da *framework* presente no artigo III e reproduzida na Figura 1, sendo os estudos empíricos desenvolvidos sob a forma de abordagens à sua implementação prática.

Outra conclusão importante deste artigo é a de que se os jogos podem funcionar como promotores de um amplo espectro de variáveis associadas ao bem-estar. Então, a necessidade de melhorar a participação de diversas populações e o acesso aos mesmos pode ser visto como uma questão de direitos, considerando também a premissa de Carpentier (2011) abordada acima. Deste modo, este estudo permitiu explorar a equidade no acesso aos jogos como um pilar da inclusão sociocultural, não descurando a relevância de outras formas de *media*, vistas como um todo. A potencial aplicabilidade do modelo da Figura 1 a outras populações com necessidades específicas de acessibilidade não é, por isso, excluída da perspectiva dos estudos futuros daqui decorrentes.

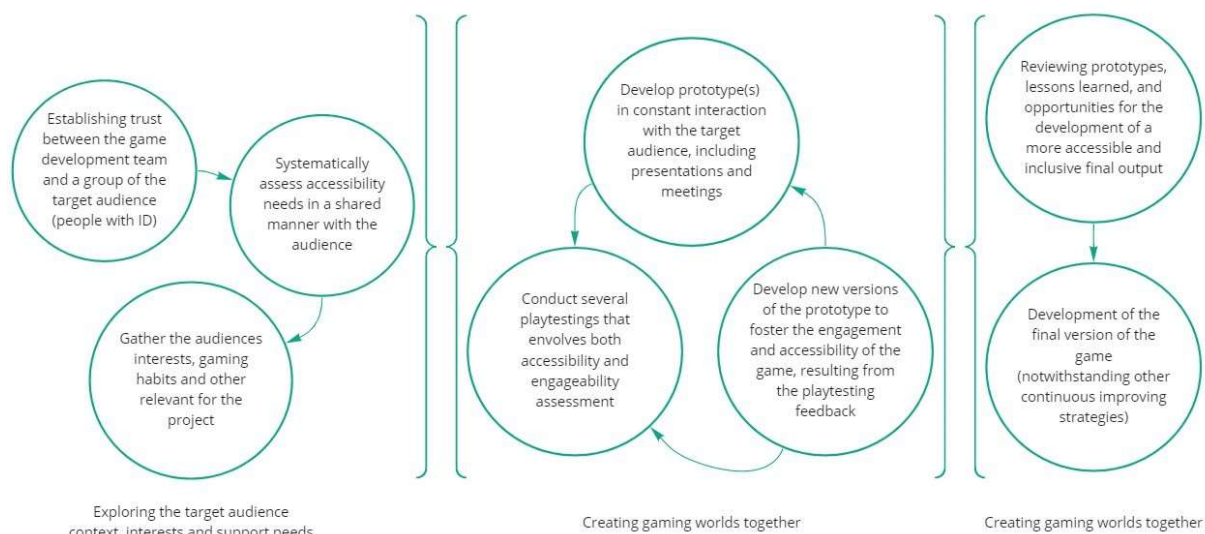


Figura 1. *Framework para o desenvolvimento participativo de jogos para pessoas com DI. Retirado de Sousa, Neves, & Damásio (in press)*

Tendo em conta todo o enquadramento exposto e as lacunas que emergiram dos estudos discutidos acima, foi delineado o modo como todo o processo empírico seria conduzido. Assim, o processo criativo dos jogos envolveu duas amostras complementares: os estudantes da Licenciatura em Videojogos ($N = 17$) e as pessoas com DI ($N = 14$) da instituição com a qual foi estabelecida parceria no âmbito da presente investigação. Após o processo criativo, todas as suas iterações e *playtestings*, foi ainda realizado um período de sessões de jogo semanal com as pessoas com DI, conforme descrito no artigo V.

Com base nos dados que emergiram destas abordagens empíricas foram elaborados dois estudos complementares (artigos V e VII), em linha com objetivos definidos, sendo um focado nos resultados com as pessoas com DI (O4 e O5) e outro nos dos estudantes (O6). Em ambos os estudos, a abordagem metodológica enquadrou-se sobretudo nos pressupostos da PAR (considerando o modelo da Figura 1), a conexão desta abordagem com o estudo de grupos sub-representados (Zeller-Berkman, 2014) e o seu papel enquanto uma epistemologia estendida capaz de incluir diferentes representações e vozes (Gayá, 2021). Além das premissas da PAR, é relevante salientar que uma abordagem multi-métodos (*mixed methods*) foi incorporada na presente investigação, atribuindo-se a mesma relevância às recolhas de dados pré e pós processo, do que ao processo em si, reforçando a relevância da integração metodológica nos estudos dos *media* (Snelson, 2016). Este tipo de integração metodológica é particularmente central no estudo dos

jogos, estabelecendo-se por uma perspectiva dialógica entre diferentes fontes de informação, integradas sistematicamente (Lieberoth and Roepstorff, 2015). A etnografia dos media, associada neste sentido a uma atitude do investigador, é também crucial para esta integração. Possibilita uma abordagem à subjetividade das experiências e contextos de interação, proveniente do estudo empírico dos *media*, que visa transcender o debate quantitativo-qualitativo (Ardevól & Gómez-Cruz, 2014).

Considerando o O4 (explorado no artigo V), os dados obtidos sustentam a eficácia da abordagem proposta na promoção do bem-estar e do empoderamento das pessoas com DI. Assim, registou-se uma diminuição da sua passividade e um aumento da sua persistência e interesse por atividades de lazer. No que concerne ao bem-estar, foram registadas melhorias ao nível da comunicação e da sua satisfação com o desempenho social e cognitivo. Aliado a estes aspetos, os participantes demonstraram um maior conhecimento sobre as suas necessidades de suporte e sobre a sua deficiência — expectável dada a forma como o processo iterativo proposto promoveu o *playtesting* e a discussão tendo a acessibilidade como meta. Ao nível do empoderamento, a promoção parece ter sido operacionalizada pelo desenvolvimento de jogos que, através de um processo participativo, representaram as narrativas e experiências das pessoas com DI. Esta conclusão emergiu da inclusão dos seus interesses e prioridades desde o início do processo de *game design* e *game development* e corrobora os resultados de outros estudos, como aqueles que sublinham os processos participativos de criação de *media* como úteis para a disseminação de narrativas que são particulares a grupos sub-representados (Chee, Hjorth & Davies, 2021; Harrington & Dillahun, 2021). Além disso, os resultados obtidos também se alinham com algum trabalho seminal acerca de modelos contextuais para promoção do empoderamento. Isto é, corroboram modelos de empoderamento que incluem: a melhor compreensão de questões centrais e respetivas causas da deficiência; a facilitação da comunicação; as oportunidades de participação; e a redução das barreiras ambientais (Fawcett et al., 1994).

Já no que concerne ao O5, é possível salientar a relevância e exequibilidade dos modelos participativos, neste caso da PAR, na promoção da acessibilidade dos jogos. Ao promover a acessibilidade deste modo foi possível fomentar o interesse dos participantes pelas atividades de lazer, reduzindo os seus comportamentos e atitudes negativas, tanto no *playtesting* quanto nas sessões de jogo. Além disso, foi possível consciencializar as pessoas acerca das suas necessidades de suporte, realçando o potencial papel dos processos participativos na promoção da auto-perceção

através de uma lente mais crítica que se opõe às visões excessivamente protetoras e infantilizantes da sociedade face às pessoas adultas com DI (Callus et al., 2019). Através destas conclusões, é possível dar alguma sustentação empírica ao modelo conceptual da Figura 1 e ao artigo correspondente (Anexo III), sobre o papel da acessibilidade no empoderamento, no bem-estar e, consequentemente, na inclusão. Se esta sustentação poderá ser válida para a acessibilidade digital em geral, ganha relevância acrescentada considerando as características únicas dos jogos enquanto *medium*. Por exemplo, a interatividade, a orientação para objetivos (Costikyan, 2002), a motivação através do fracasso, o *feedback* imediato (Boyle et al., 2016), entre outros aspetos, caracterizam os jogos como espaços onde a tomada de decisão é necessária e, consequentemente, os tornam adequados para a promoção do empoderamento e da autodeterminação — dois fatores prioritários para a inclusão das pessoas com DI (Wehmeyer & Shogren, 2016). Esta conceção pode também ser vista como suportando a exequibilidade das estratégias participativas na promoção do Modelo Social da Acessibilidade (Fryer, 2021), explorado em detalhe no artigo III.

Considerando os dados recolhidos através da observação participante e junto dos estudantes, foi possível fornecer evidência empírica para sustentar que fazer da acessibilidade um pilar na aprendizagem do *game design* e *game development* é exequível e tem relevância na promoção da representação de grupos com necessidades específicas, a multimodalidade e a tangibilidade. Aprofundando a resposta ao O6 (artigo VII), é possível salientar que as conclusões obtidas acerca da aquisição de competências de desenvolvimento acessível demonstram a relevância do estreitamento da ligação entre a academia e as organizações da sociedade civil, como a que colaborou no projeto, para a promoção da mudança social através da criação participativa de *media* e de processos inclusivos de aprendizagem. Estas conclusões alinham-se com as de abordagens similares noutros campos da produção audiovisual, como o cinema, que sustentam a relevância dos projetos de ligação à comunidade no desenvolvimento de produtos mais acessíveis e na formação de profissionais mais conscientes destas necessidades (Franganillo et al., 2021; Putnam et al., 2015).

No que concerne ao valor pedagógico da presente abordagem para os estudantes de Videojogos, denotou-se relevância a dois níveis. Por um lado, a aquisição de competências de desenvolvimento de jogos acessíveis, considerando as necessidades do público-alvo. Por outro lado, a redução das crenças estigmatizantes para com pessoas com DI. Ambos podem ser vistos como relevantes para o desenvolvimento de melhores profissionais no futuro, mais capazes de incorporar práticas

direcionadas à acessibilidade no seu trabalho, promovendo a inclusão e a representação na indústria dos jogos.

3.2. Contributo para o Estado da Arte

O presente trabalho constitui um contributo relevante para o estado da arte ao estender o potencial já documentado dos jogos, em diversos estudos, metodologicamente mais enquadrados na teoria dos efeitos dos media (Granic et al., 2014; Pallavicini et al., 2018; Rosa et al, 2016; Sousa & Costa, 2018) e conforme sistematizado no artigo I, a populações sub-representadas, cujas necessidades específicas de acessibilidade tendem a ser vistas como demasiado complexas e sob um ponto de vista redutor (Ellis & Kent, 2011; Wästerfors & Hansson, 2017).

Além dos resultados sustentarem a exequibilidade e eficácia dos jogos a esta parte, os resultados do presente trabalho contribuem com uma visão mais ampla no campo dos estudos dos media, no sentido que corrobora modelos de promoção da acessibilidade que envolvem de forma proactiva as audiências desde o processo criativo, tomando em conta as suas necessidades, narrativas e vozes. Assim, enquadram-se reflexões mais abrangentes sobre a inclusão das pessoas com DI como tendo pleno direito de definirem o seu consumo mediático, enfatizando-se a relevância dos media digitais enquanto frequentemente ligados à equidade social (Elccessor, 2016). Além disso, fornece-se também evidência empírica associada aos *media* como possível caminho para a reconfiguração de uma esfera pública digital, onde a participação “não é contingente a um corpo capaz” (McRuer, 2013, p.374).

Outro contributo relevante para o estado da arte relaciona-se com o fornecimento de evidência que sustenta as abordagens participativas como formas adequadas à formação de profissionais, no âmbito dos jogos digitais, mais conscientes da diversidade das audiências. Este é um indicador dos potenciais benefícios do estreitamento da ligação entre a academia e a sociedade civil, neste caso, com impacto na formação destas pessoas e na melhoria da representação de diversas audiências.

Ao segmentar os contributos, tendo em conta os diversos artigos científicos, é possível enfatizar como a metanálise realizada (artigo I) sustenta a eficácia dos jogos numa população com necessidades de acessibilidade tão específicas, fornecendo evidência relevante para trabalhos futuros no campo. Já ao nível do artigo II, salienta-se a sustentação das lacunas existentes na literatura, no que concerne aos modelos de representação das pessoas com DI nos *game studies*, constituindo-se uma base para repensar as abordagens existentes. Capitalizando neste estado da

arte, o artigo III apresenta-se como um caminho possível para colmatar algumas das lacunas identificadas, através de modelos participativos que representem diversas vozes e narrativas. Além da sua aplicabilidade a esta população específica, poderá constituir bases para futuras abordagens, que o pensem considerando outros contextos e populações sub-representadas. Ao nível do artigo V, fornece-se evidência empírica à adoção de modelos mais participativos e representativos, sustentando-se a exequibilidade desta abordagem na promoção de variáveis centrais e concretas, como o empoderamento e o bem-estar. De modo complementar, o artigo VII corrobora a possibilidade de inserir a diversidade como componente curricular dos cursos de formação na área dos jogos, repensando os processos criativos desde a sua base. Estas conclusões constituem contributos relevantes ao estado da arte, extensíveis às práticas pedagógicas e ao posicionamento das universidades em relação aos diferentes *stakeholders* dos processos de inovação, neste caso as Organizações Não Governamentais (ONGs).

A disseminação dos jogos desenvolvidos, constituindo os mesmos exemplos de acessibilidade e representação, serão disseminados online, de forma aberta e através de uma licença *Creative Commons*, neste caso a Atribuição-NãoComercial-SemDerivações, através do site OPERAT (<https://operat.ulusoфона.pt/>). Este aspeto, aliado com a disseminação científica efetivada pelos artigos e respetivos dados é ainda um contributo para o enquadramento das investigações realizadas no âmbito dos programas doutorais com as premissas de *open science*, cada vez mais crucias e sustentadas pela Comissão Europeia (European Comission, 2019).

3.3. Limitações e Direções Futuras

Pese embora o interesse dos resultados gerados e o seu potencial papel para fundamentar estudos futuros acerca do papel dos jogos acessíveis no bem-estar, no empoderamento e na inclusão de audiências sub-representadas, é essencial sublinhar algumas limitações no trabalho efetuado. Aqui, deve ser incluída a dimensão da amostra, os fatores culturais que lhe são inerentes e como estes poderiam levar a resultados distintos noutros contextos sociais, culturais e económicos. No campo específico da DI, tal fator é muito relevante, dada a disparidade dos sistemas de suporte social de país para país, com base em diferenças nas crenças, no estigma e nas representações sociais. Além disso, é relevante sublinhar a potencial saliência dos efeitos dos jogos durante o contexto pandémico. Ainda que os resultados obtidos se possam enquadrar nas características únicas dos jogos enquanto médium, é inegável que um contexto de tão pouca

estimulação os pode ter multiplicado. Consequentemente, replicar uma metodologia similar, numa amostra mais alargada e num contexto distinto poderia reforçar e sustentar os resultados obtidos. À semelhança da maioria dos estudos na área da aprendizagem baseada em jogos, é também difícil objetivar se os ganhos em termos de empoderamento são transferíveis para o quotidiano destas pessoas, além do *gaming*.

Também o carácter participativo dos processos foi fortemente condicionado pelas restrições impostas pela pandemia da COVID-19. As dificuldades de acesso à instituição parceira não permitiram, por exemplo, o contato direto entre as pessoas com DI e os estudantes, tal como inicialmente planeado. Ainda que diversos esforços tenham sido feitos para garantir que os estudantes incluam a voz das pessoas com DI nos seus trabalhos, este processo foi sobretudo mediado, o que pode ter originado diferentes vieses. Além disso, as sessões de jogo e *playtesting* tiveram de ser realizadas de modo individual, em vez de grupal, como planeado. Assim, foi difícil observar diferentes aspetos comunicacionais e do relacionamento interpessoal, frequentemente associados aos jogos e conforme preconizado no modelo da Figura 1, do artigo III. Este aspeto também condicionou o número de sessões realizadas, já que no mesmo horário tiveram de se concentrar sessões individuais para 14 pessoas, em vez das sessões grupais.

Abordagens futuras poderão capitalizar os modelos e resultados desenvolvidos para estudar de modo mais amplo o papel dos *media* no empoderamento e bem-estar de grupos sub-representados, através de abordagens participativas às questões da representação e acessibilidade que transcendam o caso utilizado – o das pessoas com DI e dos jogos digitais. A esta parte, deverá também ser abordado o estudo da inclusão destas pessoas, tanto na academia como na produção audiovisual, de forma a permitir uma visão clara das problemáticas da representação e da representatividade. Isto é, a consideração pelas suas necessidades de suporte e a sua presença nas equipas de criação e na indústria.

Outro dos objetivos futuros cruciais que daqui decorrem, centra-se na necessidade de ampliar as conclusões obtidas, testando os modelos desenvolvidos com amostras mais alargadas e em contextos distintos. Assim, poderá fornecer-se sustentação a mudanças efetivas e amplas que transcendam a inovação no campo académico e incluam a diversidade como um dos pilares para a sustentabilidade na indústria dos jogos. Será também relevante que estudos futuros abordem a diversidade na formação e nos processos criativos aplicadas aos modelos de negócio, até no sentido mais amplo da produção audiovisual que possa transcender o campo dos jogos.

Esta operacionalização futura da diversidade nos modelos de criação, deverá incluir a acessibilidade como um horizonte constante. Para o efetivar, deverão ser realizados mais estudos que caracterizem as audiências e que a sustentem como uma necessidade da maioria e não da minoria ou de um nicho. Assim, a noção defendida por Gilbert (2019) de que todas as pessoas necessitarão de *features* de acessibilidade e tecnologias assistivas, dado o envelhecimento e a temporalidade da nossa capacidade física e cognitiva, ganhará nova força e transferência para o quotidiano.

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Anexo I - Research in Serious Games for People with Intellectual Disability

Research in Serious Games for People with Intellectual Disability: a Meta-analysis Study

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ABSTRACT

Currently, the potential of games as an intervention tool in a broad range of areas has been increasingly explored by researchers. Notwithstanding, and when considering individuals with Intellectual Disability (ID), the need for more data emerges, as well as the need to systematize and summarize such data, allowing evidence-based decisions to all the stakeholders in this field. The present study aimed to systematize the existing evidence regarding the effectiveness of serious games in the promotion of life skills in people with ID. Several scientific databases were consulted, as well as researchers' social networks to obtain a sample as wide as possible. Through a process composed of different phases, several inclusion and exclusion criteria were applied to the initial search results. The obtained sample of studies ($N = 8$) was then systematically analyzed, including a meta-analysis procedure, to summarize the quantitative data on the effectiveness of serious game based interventions for people with ID. Results from the meta-analysis study emphasize larger effect-sizes than conventional methods (non game-based) interventions with people with ID (fixed-effects, $g = 0.417$; 95% CI [0.169, 0.666]; $Z = 3.293$, $SE = 0.127$, $p = .001$), in the promotion of a broad range of variables associated with well-being, from cognitive abilities to psychotherapy related skills. Such results can frame the discussion regarding serious games as a relevant and feasible strategy to promote skills in people with ID, allowing evidence-based decisions in this field, aimed at supporting an increasing and enhanced inclusion of games in their daily lives.

Keywords: Intellectual Disability; Serious Games; Systematic Literature Review; Meta-analysis.

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1. INTRODUCTION

Intellectual Disability (ID) is defined as a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social and practical domains (APA, 2013). The social paradigms of approaching ID have been gradually changing, from social charity to social citizenship, through the inclusion - segregation - integration - inclusion path (Emygdio da Silva, 2009; Fontes, 2009). These changes are in line with the centrality currently attributed to the context in defining the effective disability of people with ID. According to the World Health Organization (WHO), although ID is seen as an health condition, from which results a set of impairments in body functions and structures, activity limitations, and participation restrictions, all these factors can only be understood when considering their complex interactions with the contextual factors, that comprise both personal factors and environmental barriers and hindrances (WHO, 2001). In the field of intervention, practices mainly based on medical/biological perspectives have been gradually replaced by more holistic perspectives (Emygdio da Silva and Coelho, 2009).

Currently, the potential of games as intervention strategies in the fields of learning (Sousa and Costa, 2018), cognition (Pallavicini et al., 2018; Rosa et al., 2016), and motivation (Granic et al., 2014) has been increasingly supported by research. Particularly, in the field of ID, games have been considered as a relevant alternative to the

current therapy/training methods, though the recognized need for developing new and innovative games that can truly correspond to subjects' needs (Tomé et al., 2014). Moreover, games are also being discussed as having a potential to foster the decrease of the environmental barriers and hindrances that people with ID face in their specific contexts (Sousa, 2020).

Games for ID, as a specific field in game studies has been primarily focusing on three types of main aims: learning or skills promotion; the definition of methodologies for game design and game development; and the identification of patterns and behaviours in the use of video games by people with ID (Cano et al., 2015). The need for more empirical results and the methodological weaknesses of the existing studies in the field has also been highlighted (Cano et al., 2015; Jiménez et al., 2015).

In the broad field of social sciences, the increasing rate of studies being conducted, as well as the need to synthesize both the differences and similarities across studies, their methodologies and results, place the need to organize and summarize the existing research as a priority, compared with the need to develop completely new research. One of the possible methods to effectuate such progression in an area of knowledge is through the conduction of meta-analysis, a methodological and statistical approach to drawing conclusions from empirical literature (Card, 2012).

Besides research, also in the field practice, the selection of interventions and treatments must be considered the most critical activity of practitioners committed to improving the outcomes and lives of individuals with ID. Therefore, it is crucially important for them to know the most effective interventions or evidence-based programs for such a population. Moreover, evidence-based practices in the field of ID are considered as relevant for all the involved stakeholders, but more directly for teachers, administrators, service providers, and support teams. Aligned with this, the need to widespread the application of such practices for individuals with ID is currently considered a high priority for improving the outcomes with this population (Stoiber et al., 2016).

The present study aims to summarize the most recent evidence on the effectiveness of serious games in the promotion of a broad range of life skills in people with ID, through a meta-analysis study. Ultimately, it is expected that the obtained results allow evidence-based decisions in this field, aimed at supporting an increasing and enhanced inclusion of serious games in the intervention practices with this population.

2. METHOD

2.1 Sample Selection Process

Studies primarily focusing on people with intellectual disability were included in the sample. The use of a specific "gold standard" diagnosis for participants to be classified as ID was not considered as an inclusion criterion. Studies were included regardless of participants' type or degree of ID. Studies primarily focusing on people with dementia and Alzheimer's disease were excluded, as well as studies approaching other disabilities, like learning disabilities, such as Attention Deficit Hyperactivity Disorder (ADHD), that are frequently confused in literature.

Studies were included if there was a control group for comparison, and if they make usage of serious games as a strategy to promote any type of life skill, compared with conventional intervention methods. Regarding the research design, to be included studies must constitute experimental approaches and, most specifically, Randomized Controlled Trials (RCTs). A broad definition of serious games was adopted, considering the premise that "not all game characteristics, such as, challenge, fun and play are appropriate descriptions or labels for all serious games" (Marsh, 2011). Thus, studies making usage of games, simulations, or experimental/experiential environments with a purpose (Marsh, 2011) were included in the sample.

Since this meta-analysis is part of a broader Systematic Literature Review study, the schematic search process did not start by searching only for RCTs, with this inclusion criteria being applied in the end of the eligibility phase. The process started with a schematic scientific database search, including Ebsco, PubMed, B-On (the largest database in Portugal, with most of the other ones associated with it), Academia.edu, and ResearchGate, by using the following terms and Boolean operators: [games AND (intellectual disability)]. Variations of this search formula included different forms of designating ID, such as "cognitive disability", "intellectual disabilities", other expressions such as "serious games" among others. Academia.edu and

ResearchGate were also used as a data collection tool, to access Grey Literature, explicitly eventual research outcomes not controlled by commercial publishers. This process constitutes the Identification phase of the SLR.

The following phases were based on a set of inclusion criteria set out above, regarding ID and serious games. To be included, studies must also be published in sources that include a peer-review process, and clearly approach the use of games for the promotion of life skills in people with ID. Additionally, and considering the study aim of systematizing the most recent scientific evidence, the included studies were published between January 2010 and February 2020 (the systematic search was developed in early March 2020).

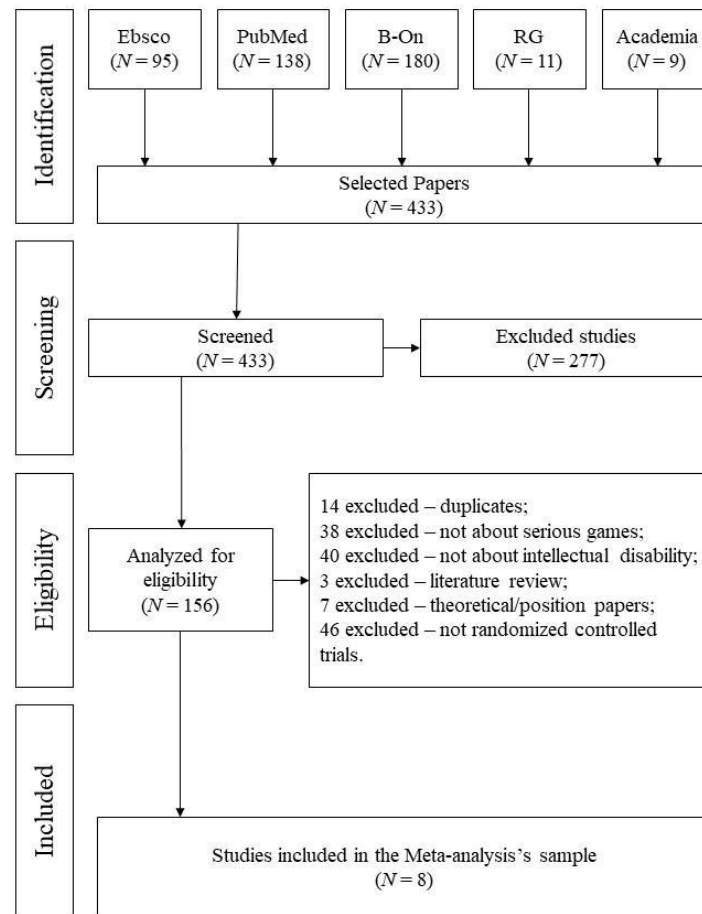


Figure 1. Flowchart of the sample selection process.

Using the above defined criteria, 8 scientific papers were included in the final sample. The selection process throughout this sample is represented in Figure 1. In the Screening phase, the criteria were applied at a superficial level, meaning that only titles, abstracts and general information were considered. In the Eligibility phase the criteria was followed by thoroughly analysing each study, before deciding on including or excluding it. The final sample is composed by: Study 1 (Choi et al., 2012); Study 2 (Söderqvist et al., 2012); Study 3 (Tsimaras et al., 2014); Study 4 (Brankaer et al., 2015); Study 5 (Siberski et al., 2015); Study 6 (Garcia-Villamizar et al., 2017); Study 7 (Cooney et al., 2017); and Study 8 (Silva et al., 2017).

2.2 Data Analysis

The selected papers were analysed considering two different matrices. First, some general aspects of the research were categorized, namely year of publication, sample size (N), sample age group, aspects regarding ID, research aims, expected intervention's outcomes, and aspects regarding serious games and platform. The gathered data was then analysed using the Statistical Package for the Social Sciences (IBM SPSS), version 22. Next, studies were analysed considering the reported quantitative results, which were summarized using the Comprehensive Meta-Analysis Software (CMA), version 2.

In the meta-analysis, hedges' g was adopted since it provides a superior estimate of the standardized mean difference in small samples (Higgins et al., 2003). Considering the nature of the meta-analysis results and non statistical assumptions regarding studies similarity, a fixed-effects model was also adopted (Tufanaru et al., 2015).

3. RESULTS

3.1 Overview of Studies

Eight studies matched the inclusion criteria. The present meta-analysis as a total sample of 301 subjects with ID, with an average of 37.63 individuals per included study. Samples in the studies ranged between 20 and 62 subjects.

Regarding the year of publication, it is possible to observe that all studies are from the last 10 years. Therefore, it can be safeguarded that the reported data corresponds to the most recent scientific evidence. The distribution by years was as follows: 2012 – two studies (25.0%), 2014 – one study (12.5%), 2015 – two studies (25.0%), 2017 – three studies (37.5%).

Five studies in this meta-analysis (62.5%) had a sample composed by adults, while three studies (37.5%) were mainly focused on children and/or youth. The samples were mainly composed by individuals with ID. In some cases, researchers indicated further specifications about the diagnosis, particularly concerning the level of impairment (e.g. mild ID) or the existence of comorbidities (e.g. ASD, anxiety, or depression). It is relevant to note that all the studies ($N = 5$; 62.5%) specifying further conditions regarding ID and the level of impairment had included individuals with mild or mild to moderate ID in the sample (Brankaer et al., 2015; Choi et al., 2012; Cooney et al., 2017; Silva et al., 2017; Tsimaras et al., 2014). Further information on sample composition and characterization of the studies in this sample is detailed on Table 1.

Table 1. *Characterization and composition of the studies in the sample ($N = 8$).*

Study ID	Sample Size	Sample characterization
Study 1	$N = 29$	“Students under the age of 18, with mild intellectual disability and attending primary one to three were recruited.” (Choi et al., 2012)
Study 2	$N = 41$	“All participants had ID ($IQ < 70$, retrieved from clinical records) and were registered with the mental habilitation center in the area of Buskerud in Norway.” (Söderqvist et al., 2012)
Study 3	$N = 20$	“This study involved 20 adults aged 20-25 years (...), and with moderate ID ($IQ: 35-50$) (...)” (Tsimaras et al., 2014)
Study 4	$N = 30$	“Participants were 30 children with mild ID (...)” (Brankaer et al., 2015)
Study 5	$N = 32$	Adults with ID (Siberski et al., 2015).
Study 6	$N = 40$	“(...) adults with ASD and ID who met DSM-IV criteria (...)” (García-Villamizar et al., 2017)
Study 7	$N = 52$	“Fifty-two adults with mild to moderate ID and anxiety or depression (...)” (Cooney et al., 2017)
Study 8	$N = 27$	“Twenty-seven adults with Down Syndrome (DS) (...)” (Silva et al., 2017)

Considering the main aim of the studies in this sample we can broadly state that they intended to explore the promotion of life skills in people with ID through interventions based on serious games. We can consider as life skills, a broad range of variables, that can be directly or indirectly associated with well-being, from cognitive abilities to psychotherapy-related skills. Most specifically, the studies aimed to the promotion of: skills associated with the so-called Daily Life Activities (Choi et al., 2012); cognitive abilities (García-Villamizar et al., 2017; Siberski et al., 2015; Söderqvist et al., 2012); behavioural aspects, associated with other clinical symptomatology (Cooney et al., 2017; Tsimaras et al., 2014); learning associated outcomes (Brankaer et al.,

2015); and physical/motor outcomes (Silva et al., 2017). It is relevant to clarify that the expected outcomes above categorized are not mutually exclusive, and it is possible to hypothesize that improvements on cognitive abilities can ease individuals' performance on daily life activities or learning tasks, for example. Nevertheless, since the studies did not present data regarding skills transferability, these categories were developed based on the aims systematized on Table 2.

Table 2. Main aims of the studies in the sample ($N = 8$).

Study ID	Aim
Study 1	<i>"To motivate children ID to learn handwashing and improve their performance by using computer-assisted teaching method." (Choi et al., 2012)</i>
Study 2	<i>"(...) we investigated the feasibility of cognitive training for improving Working Memory (WM) and Non-Verbal Reasoning (NVR)." (Söderqvist et al., 2012)</i>
Study 3	<i>"The purpose of this study was to examine the effect of a digital interactive game in distractibility, hyperactivity, impulsiveness and other relative symptoms in individuals with Attention Deficit Hyperactivity-Disorder (ADHD) and ID." (Tsimaras et al., 2014)</i>
Study 4	<i>"(...) we developed and evaluated a numerical domino game that specifically targeted the association between these digits and the numerical magnitudes they represent." (Brankaer et al., 2015)</i>
Study 5	<i>"To investigate whether participants with ID would improve in cognitive function after cognitive training (...)" (Siberski et al., 2015)</i>
Study 6	<i>"(...) to examine effects of a therapeutic recreation program designed to increase Executive Function (EF), social skills, adaptive behaviours and well-being of adults with Autism Spectrum Disorder (ASD) and ID." (García-Villamizar et al., 2017)</i>
Study 7	<i>"To evaluate the utility of a Cognitive-Behavioural Therapy (CBT) computer game for adults who have an intellectual disability." (Cooney et al., 2017)</i>
Study 8	<i>"This study aims to analyse the effects of a Wii-based exercise program on physical fitness, functional mobility and motor proficiency of adults with DS." (Silva et al., 2017)</i>

Several games were used in the studies, from the ones specifically aimed at cognitive training, to the ones aimed at commercial games, which can be justified by the broad concept of serious games adopted in this meta-analysis. Choi et al (2012) used a simulation game based, where the interaction was based on a tangible hand washing station (with faucet, soap dispenser, and towel). Both Siberski et al. (2015) and Söderqvist et al. (2012) used serious games based on already existing cognitive training applications and/or computerized tasks for the intervention. Tsimaras et al. (2014) intervention was based on a digital interactive tennis game, and Silva et al. (2017) also adopted sports-related motion-based games, in this case commercial ones. García-Villamizar et al. (2017) included "instructional electronically based games" in their therapeutic recreation intervention strategy. Cooney et al. (2017) adapted a previously developed CBT game and mobile application for children to the needs of adults with ID, suffering from anxiety and/or depression. Brankaer et al. (2015) is the only study in the sample using an analogical serious game, in this case a numerical domino game. Regarding the games' platforms, most were computer games ($N = 5$; 62.5%); followed by motion-based games, for Nintendo Wii or another non-specified platform ($N = 2$; 25.0%); and one analogical game (12.5%).

3.2 Meta-analysis

In Study 1, results showed that children with ID can improve their handwashing skills, using a tangible simulation game (Choi et al., 2012) ($g = 0.087$; $CI = 95\%$; $-0.657 - 0.832$). Study 2 supported children's improvements in WM and NVR through their inclusion in an intensive and computerized adaptive cognitive training process (Söderqvist et al., 2012) ($g = 0.017$; $CI = 95\%$; $-0.585 - 0.619$). In study 3, a digital interactive game was effective to improve distractibility, hyperactivity and impulsivity in adults with both ID and ADHD (Tsimaras et al., 2014) ($g = 2.333$; $CI = 95\%$; $1.225 - 3.441$). Study 4 makes usage of an analogical numerical domino game to effectively increase children's learning outcomes regarding numbers and the numerical magnitudes they represent (Brankaer et al., 2015) ($g = 0.358$; $CI = 95\%$; $1.225 - 3.441$). In Study 5, adaptive computerized cognitive training was used to effectively improve cognitive training in adults with ID (Siberski et

al., 2015) ($g = 0.248$; $CI = 95\%$; $-0.577 - 1.074$). Study 6 reports EF gains in adults with ID, through their enrollment in leisure activities that include electronically based games (García-Villamizar et al., 2017) ($g = 0.736$; $CI = 95\%$; $0.108 - 1.365$). In Study 7, a CBT computer game was used to produce clinically significant change in anxiety symptoms in adults with ID (Cooney et al., 2017) ($g = 0.506$; $CI = 95\%$; $-0.065 - 1.078$). Study 8 supports Wii based exercises as an effective tool to improve physical fitness, functional mobility and motor proficiency in adults with ID, most specifically DS (Silva et al., 2017) ($g = 0.088$; $CI = 95\%$; $-0.671 - 0.847$).

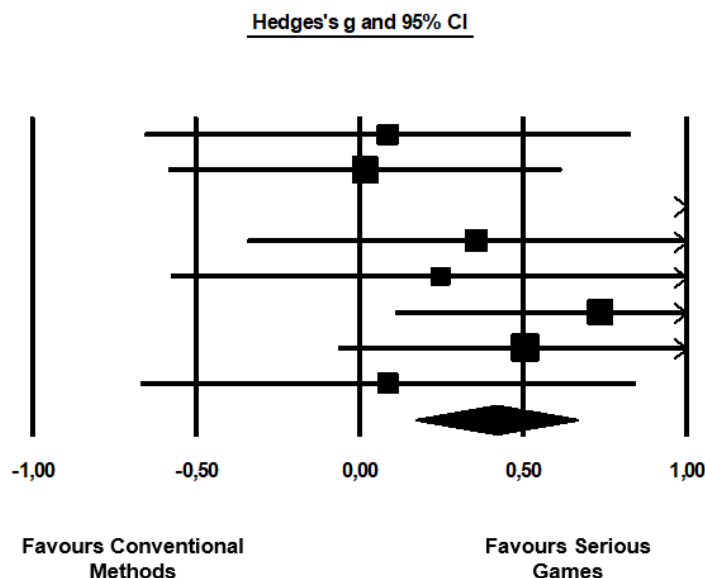


Figure 2. Forest plot for effect sizes (Hedge's g) and 95% confidence intervals from individual studies.

Using a fixed-effect analysis, the effect ratio for the eight studies was 0.417 with a confidence interval of 0.169 to 0.666, which indicates that interventions based on serious games can increase the interventions' outcomes by at least 15%, and per chance by as much as 65% in comparison with conventional methods ($Z = 3.293$, $SE = 0.127$, $p < .005$). Results are shown in Figure 2.

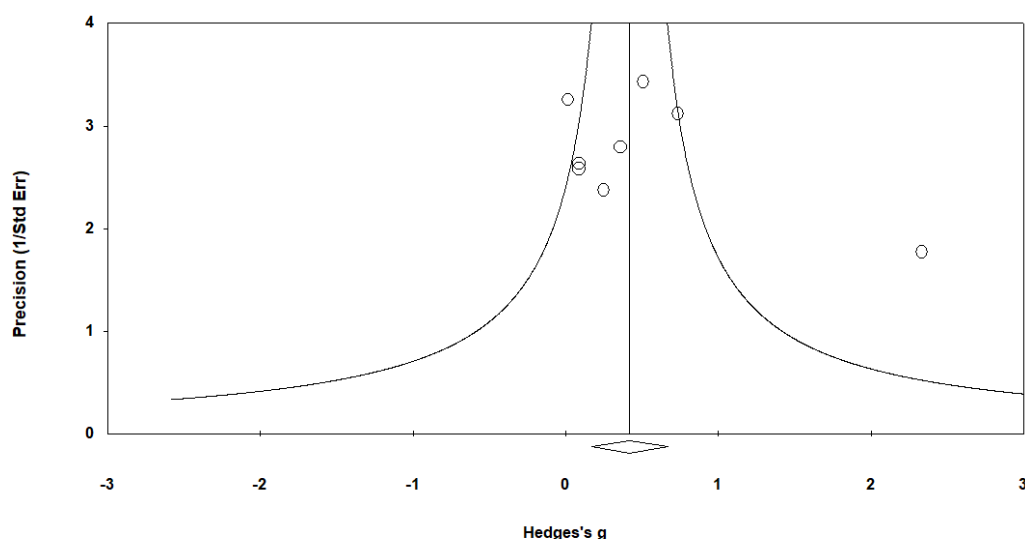


Figure 3. Funnel plot of precision (Hedge's g).

The studies have demonstrated an absence of reporting bias since the funnel plot was symmetrical, as shown in Figure 3. The heterogeneity between studies in the analysis is significant and moderate ($I^2 = 56.069$; $p < .05$).

4. CONCLUSIONS

The present study analysed a sample of eight studies, from an initial search including more than 400 studies, aiming to summarize the most recent evidence on the effectiveness of serious games in the promotion of a broad range of life skills in people with ID. In the sample's summarized results, the approaches based on serious games seem to show consistent gains in the promotion of several different skills in individuals with ID. The meta-analysis results point towards the existence of statistically significant differences between groups, being the interventions including serious games more effective than other conventional intervention methods.

Considering these data, using serious games can be considered a valid approach in the process of promoting skills in individuals with ID, supported by enough scientific evidence to frame its wider adoption as an intervention methodology. The obtained data regarding the effect-sizes of such interventions allow evidence-based decisions in this field, aimed at supporting an increasing and enhanced inclusion of games in the daily lives of people with ID. In addition, the collected sample shows that significant differences are found with both children and adults, and in the promotion of different types of skills, including the ones related with daily life activities, cognitive abilities, psychotherapy outcomes, motor outcomes, or learning-related abilities. This data strengthens the transversal potential of serious games in biopsychosocial approaches with individuals with ID, considering their ability to promote several skills within one type of intervention. This data also reinforces the prominent future of serious games as valuable intervention tools, with populations where the therapeutic answers are often seen as limited.

Some limitations of this study may include some heterogeneity of the research designs and the requirement for RCT as a factor of exclusion of a significant part of the sample studies, ending with a sample size not as larger as initially hypothesized. Also, RCTs frequently assess pre and post skills in the samples' individuals, without assessing their progress in the intervention, including motivational aspects, or other more subjective constructs, that can also be very relevant.

Future research must include the studies that are being carried out, separating the analysis of effectiveness by more specific aspects, for example regarding the serious games, age groups, or the context where the study was developed. Moreover, aspects related with specific game designs, gameplay environments, and game mechanics should be analysed, regarding its effectiveness in the intervention, and discriminating the most suitable for the promotion of each group of skills. Considering the lack of experimental approaches with RCTs in this field, that conditioned the sample size of this study, future studies should also consider the need to adopt research designs as systematic as possible and to report the obtained data in detail. Another relevant aspect regarding serious games and ID that would be relevant in future studies is the exploration of the transferability of the obtained outcomes to subjects' daily lives, and to activities outside the scope of the study.

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Anexo II - Empowerment and Ownership in Intellectual Disability Gaming: Review and Reflections Towards an Able Gaming Perspective

EMPOWERMENT AND OWNERSHIP IN INTELLECTUAL DISABILITY GAMING: REVIEW AND REFLECTIONS TOWARDS AN ABLE GAMING PERSPECTIVE (2010-2020)

CARLA SOUSA

Abstract

As with other populations, the usage of games by people with Intellectual Disability (ID) has been increasingly approached by research. Notwithstanding, the role of games in the lives of people with disabilities tends to be studied through a categorical picture that emphasizes its therapeutic characteristics and neglects games as recreation and as a form of cultural expression. The present work aims to review the main research outcomes of the last 10 years in the field of gaming and ID. It presents an analysis of the main research objectives, and approaches to gaming adopted in the analysed studies, as a path to reflect on two specific concepts: empowerment and ownership. Therefore, a Systematic Literature Review (SLR) methodology, accompanied by statistical and content analysis procedures, was adopted to analyse a sample of 61 peer-reviewed research papers (2010-2020) in this field. The obtained results emphasize the passive role of individuals with ID in games research, with gaming mainly seen through therapeutic or game-based learning approaches. The presented reflection on inclusive research, through the parallelism between game studies and critical disability studies, also highlights that the access to games, as a cultural expression, for people with ID could foster the inclusion of these individuals in the public sphere, both in media and in the democratic civic structures. The produced insights intend to frame future approaches that situate the potential of games and their accessibility as strategies to decrease environmental barriers and hindrances that people with ID face in their specific contexts and foster inclusion.

Keywords: Intellectual Disability; Games; Empowerment; Ownership; Systematic Literature Review; Inclusion; Accessibility.

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Intellectual Disability (ID) is defined as a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social and practical domains (APA, 2013). The social paradigms of approaching ID have been gradually changing, from social charity to social citizenship, through the inclusion - segregation - integration - inclusion path (Emygdio da Silva, 2009; Fontes, 2009). This change is in line with the centrality currently attributed to the context in defining the effective disability of people with ID. According to the World Health Organization (WHO), although ID is seen as an health condition, from which results a set of impairments in body functions and structures, activity limitations, and participation restrictions, all these factors can only be understood when considering their complex interactions with the contextual factors, that comprise both personal factors and environmental barriers and hindrances (WHO, 2001, p. 18). Therefore, it is relevant to distinguish between two concepts often misused, disability and impairment. The current conception, developed by WHO (2001, p. 18) as explained above and the recent advances in the field of critical disability studies clarify that impairment is a set of individual factors, while disability is the result of the way the contextual factors allow the individual to develop their daily live, despite such factors (Ellis & Kent, 2011, p. 3). In other words, this paradigm approximates contextual factors and human performance, considering these factors the most relevant determinant of disability. This also highlights the critical reflection about the risks of using the concept of disability in the public sphere, considering that this might neglects the solution of a problem that is not in the individual's body but in the environment (Martins & Cordeiro, 2015).

This framework might also open space to introduce new concepts, such as ableism, as an expectation of primacy of able bodies, or disableism, as the unwillingness to accommodate different needs, to the current research scenario. Such critical views of disability seek to emphasize the social, cultural, and political relevance of impairment to research, particularly in the context of digital technologies, seen as powerful tools to

eradicate socially constructed disability (Ellis & Kent, 2011, p. 3-4).

Another relevant concept to reflect on the inclusion of people with ID as full members of the gaming community is access, that in digital media frequently appears as tied to social equality and political participation (Ellcessor, 2016, p. 7). Access is, therefore, a necessary precursor to participation in media, as well as in democratic civic structures (Carpentier, 2011), that in disability might be tied to the "formation of a newly imagined and newly configured public sphere where full participation is not contingent on an able body" (McRuer, 2013, p. 374).

This new way of thinking the relationship between digital media, disability and, in particular, ID will only make sense if it accompanies changes in this field of research, regarding the adopted approaches and methods. According to Schwartz, Kramer, Cohn, & McDonald (2019), inclusive research with people with ID is about the inclusion of this individuals in the process as "co-researchers", fostering their meaningful collaboration in all its stages and the value of contextual factors. Such view involves the transformation of individuals, who otherwise would be research subjects, as instigators of ideas, by developing research problems that are owned by people with ID, giving them some control over the process. This also includes the conduction of research to further the interests and address relevant issues for people with ID, leading to improve their lives, through collaboration and by accessing and representing their views and experiences (Walmsley, 2001). Moreover, Cobigo, Ouellette-Kuntz, Lysaght, & Martin (2012) emphasize the importance of including subjective measures and forms of assessment that embrace personal experience to foster a paradigm directed towards the social inclusion of people with ID.

Consistent with the set of concerns discussed above, there is also a strong activist drive regarding the uniformly accepted terminology in this field, that emerged with the grassroots movement led by self-advocates and their families to

replace the stigmatising terms, such as mental retardation (Ford, Acosta, & Sutcliffe, 2013). This emerges from the social movement of self-advocacy that fosters the voice of people with ID and their ability to stand up for themselves, to address inequalities and discrimination. Self-advocacy is nowadays considered as crucial to empowerment, sense of belonging, self-identity, social identity, leadership, confidence, social connection, and meaningful occupation (Fenn & Scior, 2018).

Games and (Intellectual) Disability

It is possible to argue that it is in the centrality of the context and in the promotion of inclusion through improved access, that games can establish themselves as an important bridge for people with ID. Nevertheless, the contrast between the innovative assistive technologies built for mobile devices and the continued inaccessibility of cultural media expressions, such as games highlights the struggles of question the dominant ideologies of ability and digital media, and how the integration between disability and mainstream mobile cultures is limited (Ellcessor, 2016, p. 120).

This can be better illustrated by the apparent centrality of the notion of serious games in ID games research. According to a Systematic Literature Review (SLR) developed by Cano, García-Tejedor & Fernández-Manjón (2015, p.562), research in serious games for ID has been primarily focusing on three types of main aims: learning or skills promotion; the definition of methodologies for game design and game development; and the identification of patterns and behaviours in the use of video games by people with ID. However, such research perspectives tend to be mutually exclusive and neglect the centrality of the player's satisfaction and engagement in the process. In addition, the authors also underline the lack of empirical results, highlighting some methodological weaknesses of the existing studies (Cano, García-Tejedor & Fernández-Manjón, 2015; Jiménez, Pulina, & Lanfranchi, 2015).

Despite its potential in promoting skills, and at the social and recreational levels, it is important to emphasize that, given the impairments usually associated with ID, not all the currently existing games can be considered effectively playable by this individuals, highlighting the relevance of accessibility once again (Jiménez, Pulina, & Lanfranchi, 2015). In addition, people with ID frequently have other associated conditions, such as motor impairments (functional diversity) or deafness, raising even more questions regarding accessibility issues in the available games (Szykman, Gois & Brandão, 2015).

As previously said, the game studies universe tends to adhere to an instrumental vision of the person with disability, that is understood through a categorical picture, instead of being seen as an "artful game world member". This is reinforced by methodological questions, such as the dominance of experimental or quasi experimental research designs, in which the subjects frequently do not have choice of what they are going to play and/or in the way they are going to do it (Wästerfors & Hansson, 2017). Also according to the results of Wästerfors & Hansson (2017), the immersion of people with disability in gaming is categorized by specific paths, being one of them the view of games as a biographical or situational refuge, with games being treated as an allegorical and concrete site through which the individual defines and interprets his or her life. The individual's self-management of this path and the efforts to maintain immersion in the game, despite the inherent accessibility issues, foster the required competence in the individual to take ownership of gaming, becoming game world active agents (Wästerfors & Hansson, 2017). In the field of gaming and disability, self-advocacy as also emerged mainly through charities and activist movements. In the United States of America (USA) and United Kingdom (UK) respectively, Special Effect (<https://www.specialeffect.org.uk/>) and Able Gamers (<https://ablegamers.org/>) develop their work by providing individuals with accessibility devices for gaming. Nonetheless, it is important to point out that this work aims

mainly to overcome physical, and not intellectual/cognitive, impairments.

The present paper presents a path of critical analysis of the outcomes of a SLR about games and ID, as an effort to explore the role of these individuals in games research, the adopted methods, and existing efforts to foster inclusive research, and reflect on empowerment and ownership in disability gaming.

Methodology

Sample Selection

The SLR process started with a schematic database search, including Ebsco, PubMed, B-On (the largest database in Portugal, with most of the other ones associated with it), Academia.edu, and ResearchGate, by using the following terms and Boolean operators: [games AND (intellectual disability)]. Variations of this search formula included different forms of designating ID, such as "cognitive disability", "intellectual disabilities", among others. Academia.edu and ResearchGate were also used as data collection tools, to access Grey Literature, that is produced on all levels of government, academics, and business but is not controlled by commercial publishers. This process constitutes the Identification phase of the SLR.

The following phases were based in a set of inclusion criteria:

- Studies must be published in sources that include a peer-review process;
- Studies must have a publication date between January 2010, and February 2020 (the systematic search was developed in early March 2020);
- Studies must clearly approach games usage for ID and constitute empirical approaches.

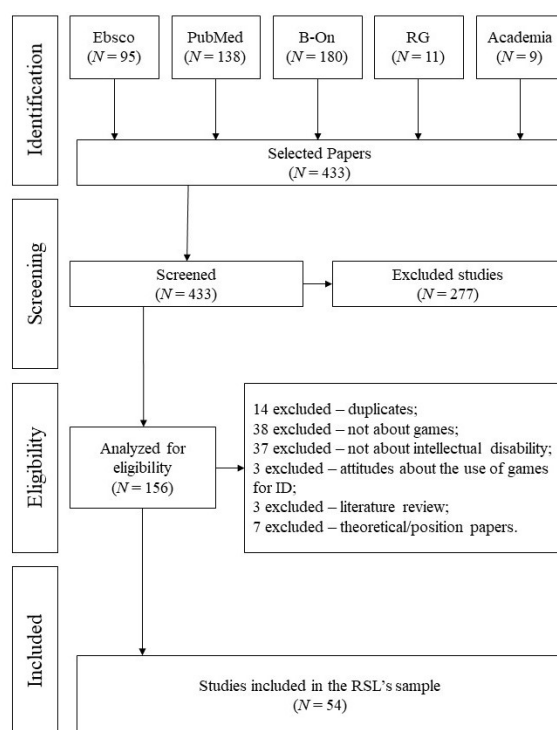


Fig. 1 Flowchart of the sample selection process

Studies approaching other disabilities, like learning disabilities, such as Attention Deficit Hyperactivity Disorder (ADHD), that are frequently confused in literature were also excluded. Using the above defined criteria, 54 scientific papers were obtained. The selection process throughout the final sample is represented in Figure 1. In the Screening phase, the criteria were applied at a superficial level, meaning that only titles, abstracts and general information were analysed. In the Eligibility phase the criteria was followed by thoroughly analysing each study, before select the final sample. Given the need to reference all studies included in the sample and the space limitations inherent to a journal, the final sample can be consulted through the link: <http://videojogos.ulusofona.pt/pdfs/EmpowermentAndOwnershipIntellectualDisabilityGaming.pdf>

Coding System and Data Analysis

The presented study is part of a broader RSL project and aims to reflect only on the components of such work that prompt the reflection about empowerment and ownership in gaming and ID. Therefore, the applied and now presented coding is part of a more complete list.

For this specific work, the SLR used the following coding system:

1. Main Research Objective
2. Sample
 - a. Size
 - b. Classification (1 - individuals with ID; 2 - individuals with ID and individuals without ID; 3 - individuals with intellectual and motor disabilities; 4 - individuals with associated psychological/developmental conditions)
 - c. Age Group (1 - adults; 2 - children and/or youth; 3 - adults and children/youth)
3. Terminology
 - a. with ID
 - b. Specific neurodevelopmental condition or syndrome
 - c. with Cognitive Disabilities
 - d. Intellectually Disabled
 - e. with Intellectual and Developmental Disabilities (ID/DD)
 - f. with developmental delay
4. Approach to gaming
 - a. Therapeutic (associated to assess, control or help control physical or psychological conditions, cognitive stimulation and rehabilitation)
 - b. Mainly recreational
 - c. Game-based learning (specifically for develop skills or acquire knowledge)
5. Role of the individual with ID
 - a. Role A (1 - consumer; 2 - creator)
 - b. Role B (1 - listen to in the research process, by means of participatory approaches, interviews, focus group, or other similar research techniques; 2 - only observed/systematically assessed by researchers; 3 - experts in the of ID were consulted; 4 - carers or trainers were consulted)
 - c. Role C (1 - listen to in the process of choosing game(s) to play; 2 - playing a game or games chosen by the research team)
6. Data gathering techniques
 - a. Standardized scales and measures
 - b. Usability surveys
 - c. Knowledge tests
 - d. Observation
 - e. 'Thinking Aloud' protocols
 - f. Focus groups
 - g. Tasks
 - h. Questionnaires (non-standardized)
 - i. Interviews
 - j. Performance data
 - k. Physiological measures
7. Did the study adopt a mixed-methods approach (more than one coded in data gathering techniques)?
 - a. Yes
 - b. No
8. Does the study clearly approach accessibility issues of games?
 - a. Yes
 - b. No

The coding system was developed through a bottom-up (considering the studies' manifest content) and top-down (considering the RSL specific objectives) process. After coding the 54 papers for each specific node and sub node, data was analysed

through descriptive statistical analysis (SPSS software, version 22) and through content analysis (NVIVO software, version 12).

Results

Sample and Terminology

The present study reviewed a sample of 54 studies, with a combined sample size of 1227 subjects, ranging between samples of two, and samples of 172 individuals ($M = 28,5$; $SD = 33,4$). In 87,0% of the studies ($N = 47$), the sample was only composed by individuals with ID. There were also studies: including individuals with ID and other associated psychological or developmental conditions, such as Autism Spectrum Disorder or Depression (7,4%; $N = 4$); including individuals with ID and associated motor disabilities (3,7%; $N = 2$); and including both individuals with ID and without ID (1,9%; $N = 1$). Most of the studies' samples were composed by children and/or youth (59,6%; $N = 31$), followed by studies with adults (32,7%; $N = 17$), and studies including both adults and children or youth (7,7%; $N = 4$). It is important to note that, for these data analysis, age groups were categorized as mentioned by each study's authors.

As terminology has been a constant concern for the community of people with ID and their families, that can be seen as one of the biggest areas of struggle in the scope of self-advocacy (Ford, Acosta, & Sutcliffe, 2013), it was important to specifically analyse the terms adopted by the researchers in each study. Most of the studies used the terminology "with Intellectual Disability" (70,4%; $N = 38$), the one also used in this review, followed by 11 studies (20,4%) that characterized the sample with the name of a specific neurodevelopmental condition etiologically linked to ID, such as Down Syndrome. Five studies adopted other terminologies to describe the sample, particularly "Intellectual and Developmental Disabilities" (3,7%; $N = 2$), "with cognitive disabilities" (1,9%; $N = 1$), "with developmental delay" (1,9%; $N = 1$), and "intellectually disabled" (1,9%; $N = 1$).

Approaches to Gaming and Games Research

A total of 49 studies provided clear information on the adopted data collection techniques, which is important to further reflect on the most used research methods and approaches to analyse the complex processed inherent to gaming. Since some studies used more than one technique, a total of 66 references to data collection techniques was analysed. Standardized/validated scales and measures were most used technique (22,7%; $N = 15$), followed by observation (18,2%; $N = 12$), and non-standardized questionnaires (12,1%; $N = 8$). Remaining results were ordered as follows: interviews (10,6%; $N = 7$); tasks (10,6%; $N = 7$); game performance data (7,6%; $N = 5$); knowledge tests (6,1%; $N = 4$); usability surveys (6,1%; $N = 4$); focus groups (3,0%; $N = 2$); physiological measures (1,5%; $N = 1$); and 'thinking aloud' protocols (1,5%; $N = 1$).

Given the above, and considering the sample of studies, it is possible to note that most of the studies adopted only one data collection technique (65,3%; $N = 32$), while the others (34,7%; $N = 17$) adopted a mixed-methods approach, triangulating the results obtained through more than one technique. Five studies did not provide enough information regarding data collection techniques to be categorized as single or mixed-methods and were excluded in this analysis.

Regarding the approaches to gaming adopted by each study, categorized as explained above, it is possible to note that most of the studies focused Game-Based Learning (56,6%; $N = 30$), followed by therapeutic approaches (37,7%; $N = 20$). Only three (5,7%) approached gaming for people with ID focusing mainly on its recreational elements. The main research aims of the three studies (as mentioned by researchers) were:

- To investigate the effectiveness of Stomp, a tangible user interface designed to provide new participatory experiences for people with ID (Wyeth, Summerville, & Adkins, 2011);
- To teach three adults diagnosed with mild ID to use an iPad in the context of playing the video game Angry Birds (Chan, Lambdin, Graham, Fragale, & Davis, 2014);

- To create roleplay games for children with mild ID, their caregivers, and their peers, who promote their social inclusion, through a kit (Vives et al., 2016).

In 94,4% ($N = 51$) of the studies the individuals with ID were positioned as game consumers, this is as subjects without any role in the game creation process, that play a game chosen and presented to them in its final version. In the remaining 5,6% ($N = 3$), individuals with ID were framed in the study as creators or co-creators. The strategies adopted in each study to operationalize the participation of the individuals with ID in the creation process were the following:

- Through the development of a game creation kit (MoJi) for children with mild ID, their caretakers, and peers (Vives et al., 2016);
- Through the adoption of a participatory design approach, where "children were consulted at the beginning of the project regarding their preferences and abilities regarding existing games", involved in usability tests, and consulted after the development phase, through collaborative processes (Robb, Waller, & Woodcock, 2019);
- "Children with intellectual disabilities were invited to participate in designing the technology at the outset and valued as experts in living successfully with disabilities. They contributed in the process of developing and validating the technology" (Kang, Chen, Miaou, & Chang, 2020).

In 77,8% ($N = 42$) of the studies the individuals with ID were only observed or systematically assessed by the research team, without being actively consulted, like for instance through an interview or a participative design procedure. On the other hand, in 16,7% ($N = 9$) of the studies, individuals with ID were listened to during the research process. There were also cases of studies where other individuals were consulted about the possible opinion or performance of the individuals with ID, particularly experts in the field of ID (1,9%; $N = 1$) and carers (3,7%; $N = 2$). Accordingly, and regarding the role of the individual with ID in the research process, it is possible

to categorize this role as passive in 83,7% of the studies ($N = 45$), and as active in the remaining 16,7% ($N = 9$).

In 83,3% of the studies ($N = 45$), the sample's subjects played a game presented to them and chosen by the research team. In contrast, in the remaining 16,7% of the studies ($N = 9$) individuals were somehow included in this choice, either directly, through strategies to collect their interests or needs, or through participatory design procedures. A total of 24 studies (44,4%) approached accessibility issues, although in the context of a game specifically developed for that study and not approaching the adaptation of existing or mainstream games. Most of the studies (55,6%; $N = 30$) did not approach accessibility issues.

Discussion

The present study aimed to develop a SLR about games and ID, as path for the discussion of empowerment and ownership of the individuals in this field.

A larger interest of research in games specifically for children/youth with ID was reported, although it is in the area of adult intervention that seems to exist greater difficulties in terms of significant occupation, especially after the end of compulsory education. Regarding the adopted terminology in the field of games for ID research, the most frequent is exactly "people with Intellectual Disability", what is in line with the claimed by self-advocates as the most dignifying term (Ford, Acosta, & Sutcliffe, 2013).

The review about methods and, specifically, data collection techniques adopted in each study's research design highlighted that, in this field, the comprehensive and detailed inclusion of people with ID's feedback is not prioritized, nor their empowerment in the research process. Such finding counters the postulated of meaningful collaboration in inclusive research (Shwartz et al., 2019), and the need to embrace the personal experience of people with ID as a form

of social inclusion (Cobigo et al., 2012). This is reinforced by the passive role of the individual with ID in the research process, that also counters the notion of “co-researchers”, explored by Shwartz et al. (2019). Likewise, the minority of research approaches that adopt more than one type of method strengthens the dominance of mutually exclusive views in this field, already mentioned by Cano, García-Tejedor & Fernández-Manjón (2015).

The view of games as a biographical or situational refuge (Wästerfors & Hansson, 2017), that implies that the person with disability takes ownership of gaming, only seems to be possible with changes in the field of game studies, that focus the issues of accessibility, through a broader adoption of inclusive research.

Most of the studies approach games through a therapeutic or game-based learning lens and, although it cannot or should not be totally dissociated from the recreational aspect, do not have recreation as the main focus. This supports Wästerfors & Hansson (2017) findings, regarding the exclusion of people with disability, although not specifically ID, as “artful game world members”, placing the research focus on their therapeutic needs, instead of prioritizing these individuals’ empowerment or need to take ownership of the gaming process. Moreover, this highlights the need to transform the view of people with disability and, particularly with ID, to become active game world agents. This can also include the conjugation of the concept of individuals’ empowerment, as brought by the fields of self-advocacy and social inclusion, and the views of empowerment through participatory culture and the engagement in significant media creation practices, such as postulated by Knobel and Lank-shear (2010) for the field of education. It is also important to point that in a relatively large sample of studies ($N = 54$), only one developed efforts to democratize a commercial game for people with ID with exclusive recreational goals, in this specific case Angry Birds (Chan et al., 2014), which illustrates the previously discussed.

The results also emphasize that the way people with ID are approached in research as gamers, considering their roles in the process, is crucial to somehow merge the field of critical disability studies and the field of game studies. Similarly, making games, not only as a therapy or educational tool, but as a cultural expression accessible for people with ID could foster the inclusion of these individuals in the public sphere, considering the notion of access as a necessary precursor to participation, both in media and in the democratic civic structures (Carpentier, 2011). This becomes even more relevant if we mention that the studies that address the issues of accessibility of games for people with ID are not yet a majority.

Considering the explored sample, people with ID are mainly positioned only as game consumers that play games chosen by others, namely researchers. This result is even more interesting if we note that most of the efforts to include people with ID in the games’ creation processes are based in participatory design strategies. There is only one mention to a study that effectively aims to democratize game creation tools for children with ID (Vives et al., 2016).

Such finding frames a reflection regarding media creation as a possible path for media participation and social inclusion of people with ID, and how self-advocacy can be crucial also in this field.

Limitations and Future Directions

It is important to clarify that this study does not intend to establish an utopic framework for the relationship of gaming and intellectual disability research. The above explored critical reflections are made with full notion of the complex challenges that research in ID poses and the inherent practical challenges (Coons & Watson, 2013). Moreover, the present study may not represent a complete view of the games and disability research landscape, since it is limited in a time frame (2010-2020), and cannot guarantee the inclusion of all the studies produced during such period, with a conscience

that several empirical works are also unpublished or somehow inaccessible.

The insights produced in this study aim to frame future approaches that situate the potential of games and their accessibility to foster the decrease of the environmental barriers and hindrances that people with ID face in their specific contexts, by establishing an able gaming research framework. Therefore, it is significant to clarify that neither this study, nor future ones, should confuse an able gaming perspective with an ableist gaming perspective, based on the primacy of able bodies.

The obtained results also emphasize the crucial importance of increasing the centrality of accessibility, not only of the games specifically developed in the context of research projects, but also of mainstream games, as a way to foster cultural inclusion and broaden the daily recreational experiences of people with ID. Future studies should focus the increasing need to critically reflect on the concept and the idea of assistive technology in the field of games, as it seems to be framed in approaches mainly based on medical models instead on a sociocultural view of digital media.

As a conclusion, the above presented and discussed results intend to provide some sustainability for the development of an able gaming perspective for games research, that truly applies the classic notion of "nothing about us without us" to this field.

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Anexo III - Intellectual Disability Through Gaming: Operationalizing Accessibility, Participation, and Inclusion

Intellectual Disability Through Gaming: Operationalizing Accessibility, Participation, and Inclusion

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Abstract

Nowadays, the potential of games to promote well-being and social inclusion is already widely documented by research. Yet, how this potential can reach out to underrepresented communities, namely those with very specific accessibility needs, ensuring their participation is still somewhat unexplored. The present article discusses accessibility, participation, and inclusion as three pillars to address the relationship between gaming and Intellectual Disability (ID). Through this approach, more participatory models of game development and research are proposed, including the operationalization of the social model of disability and the relevance of the context. Therefore, it proposes concrete models, where accessibility is part of the creative process, to better include the voice of the player with ID into gameplay, and ensure a final media object that, more than accessible, narratively represents the experience of having this disability.

Keywords: Games; Gaming; Intellectual Disability; Accessibility; Participation; Inclusion.

Introduction

People with Intellectual Disability (ID) experience high levels of digital exclusion (Terras et al. 2018). Therefore, their involvement with digital technology is seen as significantly lower than the involvement of those without disabilities (Sheehan and Hassiotis 2017). This exclusion can be interpreted as stemming from several different factors, from which the lack of accessibility seems to be one of the most relevant. With the complexification of digital media, the accessibility of design features, user interfaces, and experiences gained even a more central role (Terras et al. 2018). This lack of accessibility poses several constraints to the implementation of the current social model of disability in the digital world. This social model establishes disability as a result of the ineffectiveness of the environment to accommodate individuals' support needs, which can result from different impairments or specific

characteristics (Barnes 2019). Based on such a model and in the current state of the art, Cobigo et al. (2012) highlighted how the social inclusion of people with ID can 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.

In this regard, games emerge as having a significant potential to foster empowerment and inclusion with different populations, even if some knowledge gaps and policy opportunities can still be identified. Some of these gaps include the need to approach game adoption, usage, and experience by at-risk populations, namely operationalizing their impact on social inclusion, through a lens that considers the existing diversity in gamer populations and practices (Bleumers et al. 2012). Previous efforts to address this need reinforced the positive impacts of games in learning processes (Stančin et al. 2020) and in the promotion of practical, conceptual, cognitive, and social skills in individuals with ID (Tsikinas and Xinogalos 2018). Nevertheless, these studies tend to emphasize game design as a path for effectiveness, mainly seeing games as being developed with specific and "serious" purposes, somehow neglecting their role as a cultural form and a path for participation and social inclusion (Sousa 2020).

This perspective is in line with the idea that games research in the field of disability tends to adhere to medical perspectives of human beings, approaching games mainly as therapeutic resources instead of free virtual worlds that allow self-expression (Wästerfors and Hansson 2017). Such framing ignores to some extent people with disabilities as rightful members of the gaming world (Sousa 2020; Wästerfors and Hansson 2017). Unlike in research, in the video game industry change towards more accurate representations of human diversity is nowadays seen as a crucial goal, that includes the reduction of stereotypes, impacting virtual worlds but also society in a wider manner (Anderson-Barkley and Foglesong 2018).

To approach these issues and stemming from the need to develop theoretical models that support more inclusive practices, both in games research and in the games industry, we formulated three different yet complementary research questions:

- How can the social model of disability be integrated into gaming and gaming practices? (RQ1)
- How can gaming and its phenomena be better understood in the specific contexts of people with ID (RQ2)?
- How can game creation and games research be enhanced by participatory models to foster the inclusion of people with ID? (RQ3)

Through a critical theoretical positioning, we intend to support the definition of more inclusive and participatory methodological lines in media studies, particularly game studies, by operationalizing the ideas of participation, accessibility, and inclusion. Moreover, the present work intends to explore different theoretical and practical aspects of participation, to reach a framework proposal, able to support different interventions in the field.

Connecting Games and Intellectual Disability

To approach the connection between games and ID, it is possible to adopt different paths. In the field of learning, games provide a unique experience based on their specific characteristics, such as their ability to foster motivation through failure, self-paced autonomous learning, and provide immediate feedback (Boyle et al. 2016). Thus, it will not be surprising to report its already documented effectiveness in promoting different skills in people with ID (Sousa et al. 2021b), as well as its relevance at the clinical and therapeutic level (Cooney et al. 2017; Lau et al. 2020). Still, it is important to clarify that this is not the path adopted by the present reflection. Rather, it is to establish a parallel between the current conceptions of disability, particularly ID, and the specific characteristics of this medium. ID is a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains (American Psychiatric Association 2013). Nowadays, the models of ID have evolved, from a medical perspective to a social perspective, where the way context imposes barriers or supports individuals' needs is a central aspect. According to the World Health Organization (WHO), ID is seen as a health condition, that results in a set of impairments in body functions and structures, activity limitations, and participation restrictions. Nevertheless, WHO's current conception locates the understanding of disability in the analysis of the complex interactions between this individual's characteristics and the contextual factors that surround them, comprising both personal aspects and environmental barriers and hindrances (World Health Organization 2001: 18). Considering this importance attributed to the environment, the promotion of self-determination and participation appear as one of the main axes to guarantee the rights of people with ID (Vicente et al. 2020), namely the postulates of the Convention on the Rights of Persons with Disabilities (CRPD).

If games are characterized as complex interactive systems that, instead of imposing results, guide the players through the need of achieving a goal (Costikyan 2002), it becomes clear

how they give the player space for decision-making, as opposed to the passivity of other media. The possibilities provided by games for the promotion of self-determination thus become evident. Moreover, games take place in a specific 'arena' - the 'magic circle', which is clearly distinguishable from the 'real' world and where the consequences of decision-making do not obey the same rules (Huizinga [1944] 1980), being to some extent harmless to the player's daily life.

The potential of games in this context does not seem to be limited to the interaction of the person with ID with this media object but is also connected with raising awareness and reducing stigma (Belman and Flanagan 2010; Guy et al 2011; Mullor et al. 2019). By enabling the narrative and situational positioning of the player and through the implementation of specific design principles, games can foster empathy (Belman and Flanagan 2010), which crucially impacts the individuals' levels of prejudice (Monroe and Martínez-Martí 2008).

In both cases, play can 'serve' the inclusion of people with ID by its ability to support meaning-making and convey values. To better understand this phenomenon, and the meaning exchanges between the 'magic circle' and the context, it is important to explore games through different possible framings, as postulated by Salen and Zimmerman (2003). In this sense, games are understood as systems - a set of parts that interrelate to form a more complex whole, providing contexts for interaction, which can be spaces, objects, or behaviors that the player explores, manipulates, and 'inhabits'. There are four elements that all systems share: objects, attributes, internal relations, and environment, and how these elements are identified in a game depends on the framework through which it is analyzed. Thus, games can be seen as: formal systems, emphasizing them as a system of rules; experiential systems, framing games as the experience of play; or cultural systems, which prioritize the context in which the game happens. The formal system of a game is always inserted in an experiential system, and the game as a cultural system contains an experiential system and a formal system, and its simultaneity can be observed (Salen and Zimmerman 2003). For analyzing the intersection between games and ID, the understanding of games as systems (Salen & Zimmerman, 2003) is particularly relevant given the need to consider the social and cultural context in which this population is inserted, as well as the way it interacts with the activity of playing games. In this respect, it is important to emphasize the framing of the game primarily as an experiential system, based on the interaction between the player with ID and the game, including any

barriers and hindrances, but also as a cultural system, due to its permeability to individual factors of the players and the context.

Even if this connection seems obvious, as we explored earlier, several barriers to the participation of people with ID in the world of gaming seem to remain (Wästerfors and Hansson 2017), both in terms of accessibility and in terms of representation (Sousa 2020).

The adoption of participatory strategies is thus crucial and may provide answers to the ethical concerns, accessibility needs, and social inclusion needs of this population.

Inclusive and Participatory Methodological Approaches

When analyzing the research scenario for game studies and ID, it is possible to note a predominance of experimental or *quasi* experimental research designs that tend to reinforce the passive role of players with disabilities (Wästerfors and Hansson 2017). Broadly, in game studies, this type of approach is typically framed on the premises of the so-called theory of media effects, emerging from the initial moral panic associated with video games and research on the relationship between this media and violent behaviors and later associated with the assessment of games and learning or therapeutic outcomes (Lieberoth et al. 2015). Even though we can critically explore and analyze the issues of inclusion and participation associated with this type of research design, it is important to emphasize its centrality to establishing the effectiveness of approaches in the field of therapy and learning. We thus assume its obvious relevance at the level of public legitimacy of game-based interventions, namely to support policy-making.

On the other hand, adopting a purely positivist or even neo-positivist paradigm can pose some barriers to the emerging issues of participation and representation that are crucial in the ID model presented above, which reinforces the need for an extended epistemology that includes different 'ways of knowing' and voices (Gayá 2021). Therefore, research approaches in the field must also consider a cooperative/participatory paradigm, that assumes the centrality of critical subjectivity, experience, practice, and co-creation. In such a paradigm, the dialogue between objectivity and subjectivity is continuous, being the pillar of its ontology (Lincoln et al. 2018). Nevertheless, by considering the support needs of people with ID, we can acknowledge the existence of different barriers to their active participation in co-constructed approaches (Lennox et al. 2005) which, despite not making it unfeasible, highlight the need to rethink the paradigms, increasing its integration and its accessibility for the audience.

So, what is the best methodological option to address the concerns of the social model of disability by integrating it into games research and, potentially, into the games industry? Answering this question is a challenge, for which we can only present proposals. However, considering the potentialities and challenges presented above, it seems that this will necessarily involve hybrid models, based on the notion of methodological triangulation (Bolan et al. 2007). In this field, this strategy allows the analysis of game creation and gaming from a broader point of view, including gamers, their context, gameplay activities, and the interactions that occur.

Media ethnography can also constitute a relevant perspective to reflect on the intersection of games and ID, 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). This aspect is particularly relevant to comprehensively study issues related to specific social contexts and/or virtual worlds, through participant observation, which allows the understanding of media as a complex process of socially and contextually situated meaning construction (Schröder et al. 2003). Moreover, participatory media action-research, specifically when combined with the previously explored notions of co-construction, can also be a relevant approach to engage with this audience and to understand their needs and specificities, while exploring language, esthetic interests, and media and communication preferences. Its main purpose is to co-develop communication concepts that are meaningful, relevant, and appropriate to the life experiences of the individuals (Parker and Becker-Benton 2016).

Another relevant aspect regarding these approaches is their ability to approach several stakeholders, including the individuals with ID and the game designers/developers. Here, it is important to highlight the creative and development process as a potential object of research, based on the notion that creating games forces designers to examine how technical, material, and social systems work, take a stance on their functioning, and express this view for others as a first-person experience (Kafai and Burke 2016). Considering the challenges inherent to the context of the player with ID and the required accessibility practices this aspect gains even more relevance.

The selection of data collection methods, both for research purposes and for playtesting purposes is crucial in the inclusion of the individuals with ID in the process, specifically to ensure the representation of their voices and perspectives. Ensuring that methods that allow

the self-expression of individuals' views, experiences, and concerns (e.g. interviews), even if combined with more predefined methods (e.g. standardized scales) is, therefore, crucial (Sousa 2020). This can also be seen as a way of controlling the potential influence of the researcher's or designer's expectations about what the experience of having a disability is. The inclusion of frequent playtesting in the methodological approaches to the development and research of games can also be seen as representing a strategy to materialize the voice of people with ID in gameplay, by representing their accessibility needs, experiences, narratives, cultural aspects, and discourses. More than moments of playtesting, if we see this process as a pillar to ensure the optimal player experience, playtesting becomes a continuous and iterative process (Fullerton 2008). Moreover, playtesting can be seen as a bridge between game creation and gaming. Through playtesting these moments or phases are not mutually exclusive anymore, but integrated pieces of the same reality, where play is transformed through play. This view is crucial to ensure that games are a representation of the negotiation between the game designer's expectations and plans and the specific characteristics and, ideally, interests of the player, as we will further explore. Considering playtesting in such a central role for representation emphasizes the need for including in the testing protocols not only strategies to assess accessibility, but also comprehensive techniques to gather data on the matching between the prototype and the players' interests while exploring engageability (Hodent 2017).

Accessibility as Social Inclusion and Representation

The CRPD (The United Nations 2006: 5) establishes "full and effective participation and inclusion in society" as one of its general principles, alongside accessibility. In article nine, the accessibility obligations of the subscribers are further defined, with a specific mention to digital inclusion and to the accessibility of information and communications technologies and systems. Moreover, and considering the specific scope of games, article 30 also establishes the rights to participate in cultural life, recreation, leisure, and sport, emphasizing the need for "accessible formats" to support it (The United Nations 2006: 22).

Cobigo et al. (2012: 82) define social inclusion as

- (1) a series of complex interactions between environmental factors and personal characteristics that provide opportunities to
- (2) access public goods and services,
- (3) experience valued and expected social roles of one's choosing based on his/her age, gender and culture,
- (4) be recognized as a competent individual and

trusted to perform social roles in the community, and (5) belonging to a social network within which one receives and contributes support.

Examining this definition in light of the specific activity of playing games, highlights games' inaccessibility as a crucial environmental factor that can easily provide barriers rather than opportunities for participation. The experience of players with ID can be an experience of exclusion since their characteristics (age, gender, culture, etc...) may not be included, considering the underrepresentation of their voices in the game design process (Sousa 2020). Their inability to play would therefore reinforce perceptions of incompetence, based on the game's ineffectiveness to provide these players with adequate support. Moreover, if accessibility is not considered a priority, games can contradict their potential role in social inclusion, by reinforcing the production and dissemination of narratives that are exclusive to dominant and privileged groups (Gray and Leonard 2018).

The need to improve the study and implementation of accessibility in games gains even more relevance if we consider it beyond the needs of people with disabilities. If we think of accessibility as the integration of the specific characteristics of players in the game, we realize the benefit for all people in the adoption of study and development models that are more centered on the players, their characteristics, and needs. Therefore, this highlights the need to consider accessibility that is more than cognitive, psychological accessibility. Thus, it would include not only the specificities of players in terms of cognitive factors, such as attention or memory, but also their psychosocial attributes, including motivation, personality, or social skills (Terras et al. 2018). To address this issue, games' psychological accessibility has to incorporate the premises of the social model of disability, namely including players' support needs into gameplay, as well as their voices and experiences.

Fryer (2021) explored this notion, even if not specifically applied to games, proposing a so-called social model of media accessibility. This model intends to explore the existing barriers as a strategy to reframe media access and remove the inherent stigma. This implies disruptive and creative approaches, based on proactive instead of reactive strategies to ensure accessibility, while also inviting players with disability to participate in the process.

Like Terras et al. (2018), Fryer (2021) also reinforces the idea that a social model of accessibility must be based on the premises of Universal Design, ultimately allowing people with and without a disability to play together, discuss a movie, or a tv show, categorizing this as the ultimate goal of media accessibility. Another crucial aspect of this model is to move

accessibility away from a set of exclusively technical issues, emphasizing the need for an artistic/creative path in this field. Based on this premise, we can point out that ensuring accessibility in games and, generally, in media should present a cultural perspective and not only a utilitarian aspect (Fryer 2021). Although these notions may seem simple, their implementation in games, especially considering the need for interaction between the player and the system and the existence of a myriad of other accessibility needs (motor, sensory, among others) highlights the close connection between universal design and customization possibilities (Ellis 2019). The pillar of customization presents itself as crucial, both for accessibility for people with ID and for improving the experience for all people.

To better explore games accessibility, these concerns must be addressed as part of the creative process, instead of barriers that constraint the designers as they tend to be explored (Terras et al. 2018). One of the potential strategies to effectively do this is the approximation of the game creation process to a co-creative process from the beginning while promoting discussions, co-creation sessions, and different playtesting phases. Co-creation allows the development of games that truly represent the players' diverse experiences in the game system, in a collaborative and negotiated manner, supported by the game designer (Acharya and Wardrip-Fruin 2019). Therefore, besides including the different accessibility needs of players, games can also support the representation of the voices of the ID community, by embedding their daily life experiences and specific culture into the gameplay. This hypothesis is based not only on the previously explored framework but also on other experiences in participatory and community media, that highlighted co-design as useful to enhance representations and narratives that are particular to people in underrepresented groups (Chee et al. 2021; Harrington and Dillahunt 2021).

To operationalize co-creation and participation in a disruptive manner, would imply the adoption of techniques and strategies that challenge the current canons. This would include: the approaching of gaming for people with ID also as a merely recreational activity; consider the player with ID also as a potential creator; the inclusion of the voices of the players with ID, through participatory approaches, interviews, focus groups, or other similar research techniques; and the adoption of a mixed-methods approach when analyzing the phenomena, either for research or for creative purposes (Sousa 2020).

In a more systemic strategy, exploring games accessibility through the co-creation and inclusive research principles of representation can be facilitated by the engagement with

activists and activism-related institutions. This could be even more relevant to foster change in both academia and industry, if this engagement with the civic society institutions that represent ID, and consequently with the individuals with ID, was promoted early on in the training of new game designers/developers. Even if this is a hypothesis, a similar conclusion was drawn by Lopez et al. (2020) for other media, stating that "a greater interest in accessibility sparked at university level might contribute towards a more inclusive film industry". Also related to filmmaking, Franganillo et al. (2021) reinforced the relevance of engaging with the civic society, to train more responsible and inclusion-driven media creators. For the field of games and disability, and considering the emergence of different self-advocacy structures and charities, such as Special Effect (United Kingdom) or Able Gamers (United States), this type of approach could also produce positive learning experiences.

Exploring the Specific Gaming Context of Players with Intellectual Disability

In 2014, Shogren et al. reviewed the current state of the art to understand how the notion of context is being operationalized in the field of ID. More specifically, they intended to understand how the different components of this concept are relevant to better understand ID, both at the level of individuals and a more policy-linked level. In this approach, the context was conceptualized as a construct that influences human functioning, expressed both in personal and environmental characteristics and organizational and societal policies and practices. Context is, therefore, better understood from the individual's perspective, and potentially measurable, as an independent or intervening variable. To better understand how we can operationally define it concerning games and ID, the authors also reinforced that individual supports can enhance the context, or at least some aspects of it, at the meso and macrosystem (Shogren et al. 2014).

In the field of ID, context is seen mainly as: a framework for describing personal and environmental factors; a framework for supports planning; and a framework for policy development. Nevertheless, the need for more comprehensive frameworks that can support the integration of contextual factors into research and practice, namely to promote self-determination across micro, meso, and macro levels, is recognized by the authors (Shogren et al. 2014) and one of the main issues where we hypothesize game-based approaches can be an added-value.

If ID 'happens' in a context, so does gaming. Even if this premise can trigger a discussion that would be in itself a research paper, we will start by mentioning that games are also contexts – systems or sets of different related parts that form a more complex whole, while providing contexts for interaction (Salen and Zimmerman 2003). Such context is frequently called the ‘magic circle’ – the space or ‘playground’ defined *a priori*, either materially or ideally, where the reality is suspended and play happens (Huizinga [1944] 1980). Nevertheless, the question of the operationalization of the ‘magic circle’ in the specific context of people with ID remains, as it is populated by several, very specific, affordances and constraints. To approach a similar question but applied to children, Stevens et al. (2008) proposed the "separate worlds view of video game play" approach. By applying ethnographic principles, namely the notion of situated cognition, the authors intended to achieve a more comprehensive understanding of the phenomena associated with game-based learning, while considering the issues of ecological validity to broaden the vision of the 'magic circle' and include aspects typically seen as outside of it. In this model, three contexts of analysis are defined: (a) in-game, referred to the experiences lived in the gameplay, (b) in-room, applied to the immediate context where the person is playing, and (c) in-world, related with the wider worlds of activity that the player inhabits.

As an example, to better understand how this can be applied to daily life situations, it would be a model that could be helpful to understand: how a person with ID adopts strategies in puzzle games (in-game); how these strategies are supported by the carer that is playing with them (in-room); and how the skills developed by this person in puzzle games fostered their inclusion in a job (in-world). Therefore, it is possible to understand that this view intends to explain how the experiences that happen in a seemingly separate world – the game space, acquire meanings for the players through its interaction with the other ‘worlds’. The fact that this model places a significant part of the play experience on the different levels of the context in which it occurs, makes it quite aligned with the postulates discussed above of the social model of disability. Thus, it can be considered an important contribution to understanding play contexts as empowering or, in opposition, as disabling.

Interestingly, and to some extent in line with Stevens et al. (2008) proposal, Terras et al. (2018) elaborated an application of the Gamer, Game Mechanics, and Context tripartite model to the context of the uptake of serious games by people with ID. In this model, the authors acknowledge that gaming does not occur in isolation, but in a context that can be

conceptualized in three ways: (a) the set of variables that are internal to the individual (psychological) and depend on their psychosocial profile (the gamer); (b) the game features, design, and mechanics (game mechanics); and (c) the context where the game is played (external context). As the previous model, also Terras et al. (2018) intended to build an approach that supports the comprehension of gaming as a complex phenomenon, recognizing that context for people with ID tends to be even more complex, due to their needs of support, which impact the design and use of games.

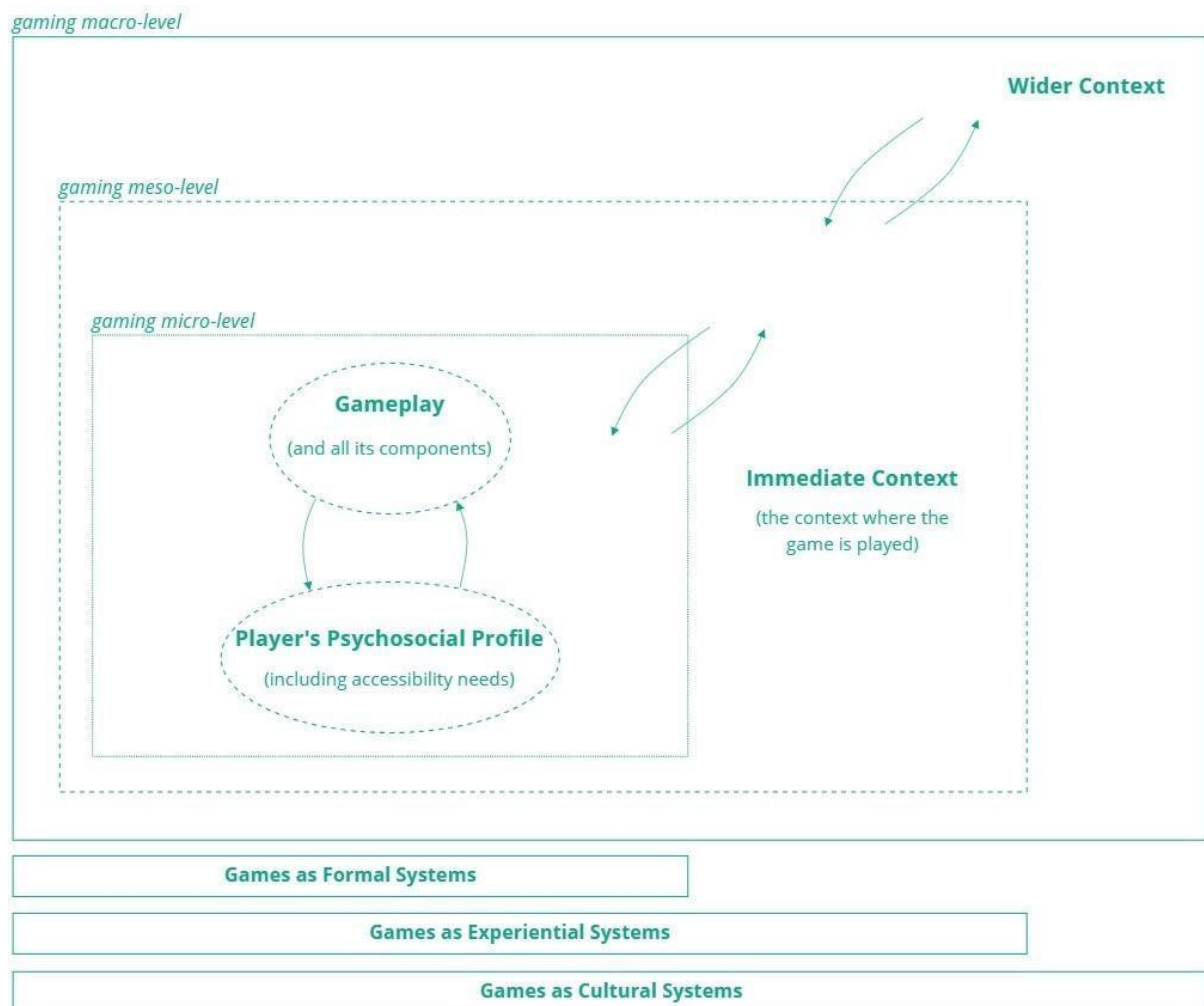


Figure 1. *Model for analyzing gaming in context for players with ID (Source: developed by the authors)*

Stemming from the contributions of Salen and Zimmerman (2003), Shogren et al. (2014), Stevens et al. (2008), and Terras et al. (2018), we developed a proposal for the analysis of gaming in context for people with ID (Figure 1). In this model, gaming is seen through the

same levels of context approached by Shogren et al. (2014). The gaming micro-level emerges from the combination of the “in-room” level (Stevens et al. 2008) and the psychosocial profile of the player (Terras et al. 2018), recognizing that these two dimensions are in continuous interaction. Therefore, the internal experience of playing a game results from the interaction between this game's components and features (including game design, and game mechanics) and the player's characteristics. These characteristics also include the player's cognitive and motor functionality, and this level is crucial to understand how the player's accessibility needs are supported or not by the game, and the impact of such factors in the experience. The gaming meso-level is based on the notion of "in-room" (Stevens et al. 2008), considering the immediate context where the game is played. This includes every aspect of the immediate environment, such as the need for support from caregivers to play and all the other interpersonal phenomena that can emerge (e. g. backseat gaming). In this dimension, material affordances and constraints, like the lack of computers or spaces to play should also be considered. The gaming meso-level is based on the notion of “in-world”, as introduced by Stevens et al. (2008), and includes the potential transfers that occur from the below contexts to the wider environment where the player is situated. Each level has its frontiers, even if always allowing exchanges between them. These exchanges are better explained if we consider that gaming as a micro-system has a clear parallel with the framing of games as formal systems Salen and Zimmerman (2003), but also considers the constant interaction with player's characteristics. Moreover, games as experiential systems (Salen and Zimmerman 2003) can support the understanding of the micro and meso-levels of gaming, while approaching the relationship between the two levels. The framing of games as cultural systems (Salen and Zimmerman 2003) highlights the permeability of the wider context of gaming to influence and be influenced by the below levels phenomena, supporting the comprehension of such aspects. Also regarding permeability, the absence of arrows representing direct exchanges between the micro and macro level is not occasional. It is connected with the idea that there are no 'direct' exchanges between these two levels. Even in games that aim to impact the macro-level (e. g. awareness-raising games), the game experience always occurs in a specific micro and meso context, and, therefore, exchanges are progressive.

Discussion

The Social Model of Disability and Gaming Practices

Regarding the integration of the social model of disability with the gaming practices (RQ1), both for research and development, the exploration of this model concerning games and their characteristics seems to provide some answers. If the context that surrounds a person and how it is enabling or disabling are the pillars to define their disability (World Health Organization 2001), the existence of more accessible games can easily be seen as a tool to support their well-being and inclusion. Acknowledging that other media can also be explored as having such roles, games and their characteristics, such as interactivity and goal-orientation (Costikyan 2002), motivation through failure, or immediate feedback (Boyle et al. 2016), present themselves as spaces for participation and decision-making by excellency. This gains even more relevance if we explore how the promotion of participation and self-determination is nowadays seen as a pillar for guaranteeing the rights of people with ID (Vicente et al. 2020). Nevertheless, this implies ensuring that games are truly inclusive and not exclusive. For that purpose, more participatory models of game development and research need to be implemented, alongside disruptive and creative strategies to embed accessibility and support needs into the gameplay, with the social model of accessibility (Fryer 2021) as a great example of it.

Gaming in the Context of Intellectual Disability

In an approach to explore gaming and its phenomena in the specific context of ID (RQ2), a three-level model was developed, explored, and presented in Figure 1. This model, adapted from the contributions of Salen and Zimmerman (2003), Shogren et al. (2014), Stevens et al. (2008), and Terras et al. (2018), intends to foster the comprehension of gaming as a complex interaction between different contextual levels, games as media objects, and the psychosocial profile of the player, that includes not only cognitive or motor accessibility needs, but also interests and personality aspects. Although this model could potentially be applied for all players, it is operationalized here by considering the specific context of people with ID and the particular importance this may have for how games function as vehicles of inclusion or exclusion. It is relevant to acknowledge that, for example, the fact that someone needs support from another person to play generates several mediating factors that must be considered and critically analyzed.

Also, and as reinforced before, understanding the context of ID for gaming purposes, must be addressed long before the distribution of the final version of a game. It implies involving the person with ID from the creative process and as much as possible in a co-designer and/or co-researcher role, thinking of their context and their accessibility needs as part of this process. Still, this model is not advanced as the ‘right answer’ to address this issue, but rather a hypothetical approach that reinforces the need to move away from linear or single-level models.

Participatory Models for Games and Inclusion

To answer the present study's third research question (RQ3) we explored several different factors that can be implemented both for game development and research purposes, mainly linked with a broad notion of participatory approaches. To operationalize the postulates of the CRPD, specifically articles nine and 30, it is important to guarantee models of approach that include the voice of people with disabilities, not only as a way to respond to their accessibility needs but also as a way to express themselves and see their own culture and daily experiences represented.

From this critical approach to RQ3, it was possible to identify a set of strategies that intend to achieve the previous aim, while fostering accessibility, participation, and/or inclusion. Thinking of accessibility, it is clear that disruption with the current canons that tend to apply accessibility guidelines only in a late stage of creative processes or in a reactive manner is a priority. Accessibility needs must be addressed proactively as part of the creative process (Terras et al. 2018), through different methodologies, such as the social model of accessibility or universal design principles (Fryer 2021). Therefore, iterative processes that include frequent playtesting appear as a form of materializing the voice of players with ID in the object that is being created. Moreover, this can be better achieved by using data collection techniques aimed to capture the subjective experience of players (Sousa 2020). Such views on accessibility are not exclusive to game creation processes but are also relevant to approximate game studies and inclusive research. This type of approach is also seen as important for participation, specifically through representation in the process and, potentially, in the final product. Ultimately, and aligned with the views of Fryer (2021) and Terras et al. (2018),

accessibility promotes equity in accessing games, other media, and cultural products as a whole, which should be a pillar of inclusion.

Transversely to the three issues explored in the present paper – accessibility, participation, and inclusion, the idea that adopting an extended epistemology that includes different perspectives in the process (Gayá 2021), through co-creation (Lincoln et al. 2018) seems to be central.

Potentially ways of achieving it could include: methodological triangulation (Ribbens and Poels 2009); framing games as systems, considering the definition of Salen and Zimmerman (2003); adoption of mixed-methods approaches when analyzing the phenomena (Sousa 2020), either for research or creative purposes; and foster the engagement between academia and activism related organizations to train more responsible and inclusion-driven media creators (Franganillo et al. 2021).

Based on these recommendations, and on the theoretical approaches explored before, particularly the action media communication development process (Parker and Becker-Benton 2016) we propose a framework for the development of games for people with ID, that can also serve research that approaches the game creation process (Figure 2).

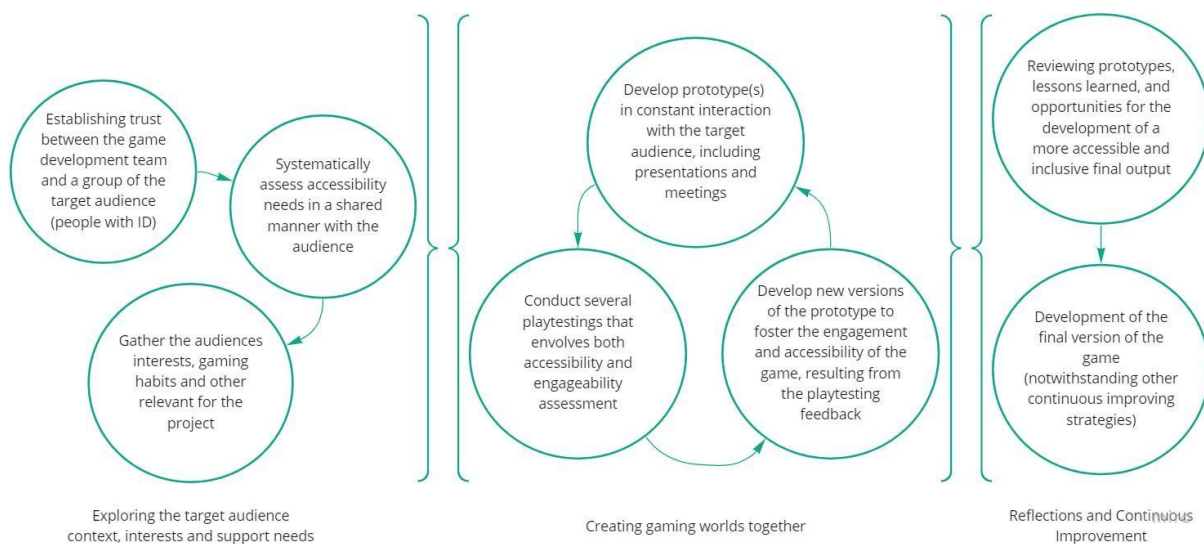


Figure 2. *Proposal participatory framework for the development of games for people with ID*
(Source: Developed by the authors)

The model is organized in three phases, that include: (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 always be improved with further feedback. The implementation order of the second block is not prescriptive, since this is a cyclic process that intends to materialize the voice of the players in the product under development, as a strategy to create shared narratives and meanings that also represent the experience of having ID. The implementation of such a framework must be complemented with the previously mentioned strategies, in terms of researchers' positioning and data collection techniques. Although it is here specifically approached for people with ID it is not incompatible with the notions of Universal Design, where the process must be developed for all. It represents an alternative to ensure accessibility and representation for specific groups of players when their needs and expectations are highly discrepant from those of the game designer.

Conclusion and Future Directions

By exploring the current theoretical framework, it is possible to conclude that the development of more inclusive practices in games for ID involves alternative and disruptive approaches to the issues of accessibility, inclusion, and participation. It implies the clear understanding that these three pillars are interconnected, having similar relevance to the process. Also, approaching alternatives must be proactive, instead of reactive, which includes the active involvement of the person with ID from the creative process, and through constant iterations that materialize their voice on the developed media project, representing both accessibility needs and narrative representations of the experience of having ID.

Moreover, through this approach, we acknowledge that, if games can work as promoters of a broad range of well-being-related aspects, then improving the participation and access to it is a matter of rights. This study ultimately intends to address equity in accessing games as a pillar of socio-cultural inclusion, which also implies accessibility and participation in other media and cultural products as a whole.

While this is an approach based on a broad set of other studies and perspectives, future studies are needed to empirically explore the applicability of the proposed models. This would necessarily consist of studying the proposed models with the involvement of people with ID, but could also involve attempting to validate extensions of the model to other populations with specific accessibility needs, also covered by the CRPD. More comprehensive studies are

needed to understand also the integration of people with disabilities, particularly ID, both in academia and in the games industry, to study widely not only the issues of representation but also the issues of representativeness.

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Carla Sousa has a Bachelor's Degree in Psychology, a Master's Degree in Clinical and Health Psychology, and a Post-graduate degree in Applied Neuropsychology from Lusófona University. PhD student in Communication Sciences in the same university, she is also part of the Centre for Research in Applied Communication, Culture, and New Technologies (CICANT) and is an invited assistant professor in the Bachelor's Degree in Videogames, Psychology, and Computer Engineering. Carla published several papers as author and co-author in peer-reviewed journals, and has done communications in national and international conferences in the field of communication, media, social inclusion, and games. She was part of several national and international funded projects such as "Co-create assistive games for people with Intellectual Disability - ID Games", "Game-Based Learning for Deaf Students - GBL4deaf", "Jogos Digitais para a Literacia Mediática e Informacional - GamiLearning", and "Eco for Life - ECFOLI" (2014-2-CY02-KA205-000406). Carla has also been involved in the organization of scientific events and in referee activities and is a member

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Manuel José Damásio holds a PhD in Media Studies (Universidade Nova de Lisboa) and did his aggregation also in communication at Minho University. He is an Associate Professor and the Head of the Film and Media Arts Department at Lusófona University, in Lisbon. He holds a vast experience in consulting and production concerning several areas of the field of audiovisual and multimedia production. He is the chair of GEECT – the European association of film and media schools and a member of the board of CILECT Executive Committee (International association of film and media schools). He is the coordinator of FILMEU – The European University of Film and Media Arts. He is the author of five books and several papers and chapters in international peer-reviewed publications.

Anexo IV - Prova de Aceitação *Journal of Gaming and Virtual Worlds*

[JGVW] Editor Decision

Sonia Fizek <fizek.sonia@gmail.com>

Fri, Jan 14, 2022 at 12:52 PM

To: Carla Sousa <carla.patricia.sousa@ulusofona.pt>, José Carlos Neves <josecsn@ulusofona.pt>, Manuel José Dam'ásio <mjdamasio@ulusofona.pt>

Carla Sousa, José Carlos Neves, Manuel José Dam'ásio (Author):

We have reached a decision regarding your submission to Journal of Gaming & Virtual Worlds, "Intellectual Disability Through Gaming: Operationalizing Accessibility, Participation, and Inclusion". I am happy to be able to say that we have decided to accept your submission for publication in issue 11:2 (2018).

We will now require a formatted copy of the manuscript and any images or figures ready for submission to Intellect for publication.

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We are looking forward to publishing your paper. Thank you for all the work you have already gone to prepare the article. I will be in touch again once I have received the prepared manuscript.

Yours,

Sonia and Melissa

Journal of Gaming & Virtual Worlds

Anexo V - Empowerment and Well-Being through Participatory Action Research and Accessible Gaming: a Case Study with Adults with Intellectual Disability



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) (Louvét 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 (Louvét 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 (Schröder 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.

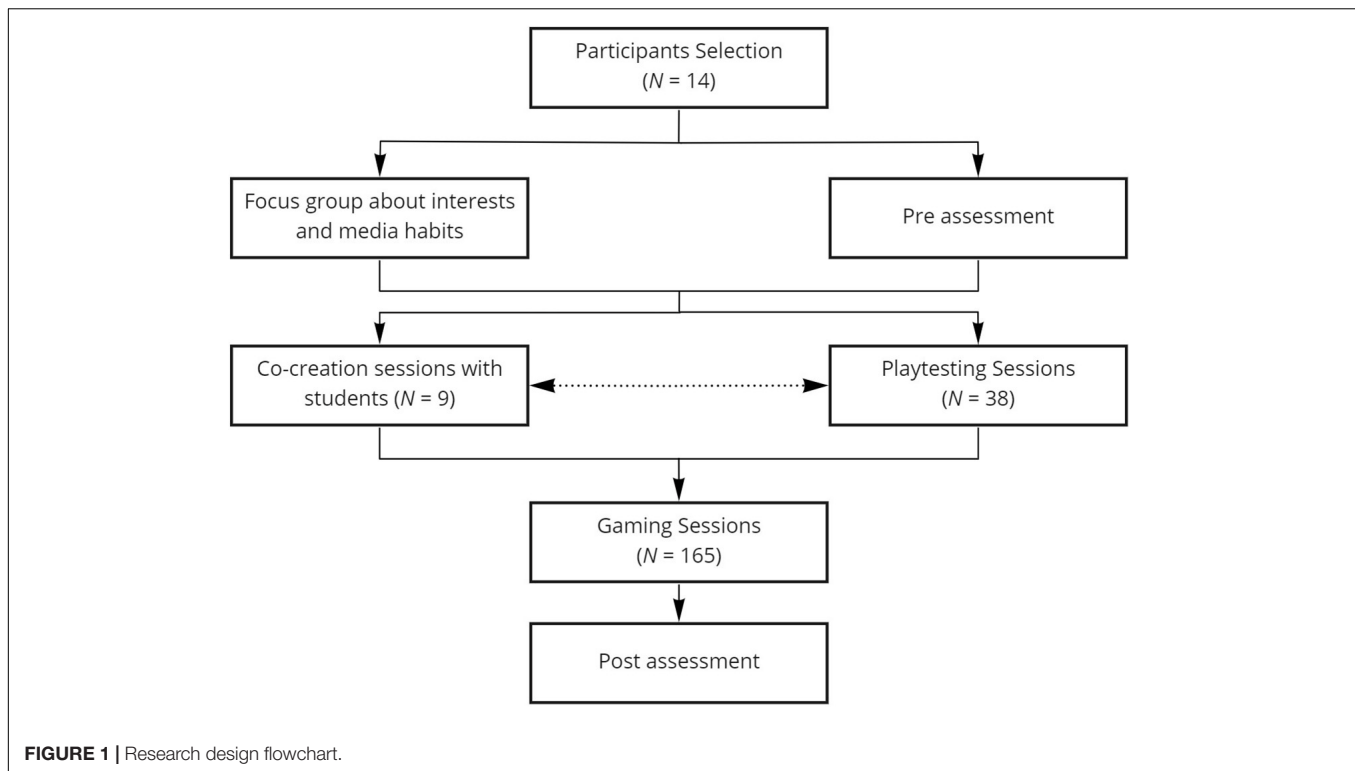
In summary, one focus group about interests and media habits, nine co-creation sessions where students analyzed the feedback gathered from the target audience, 38 playtesting sessions, and 162 gaming sessions were conducted, between March 2020 and February 2021, under the scope of the present study. 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



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, *Futebolático* 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

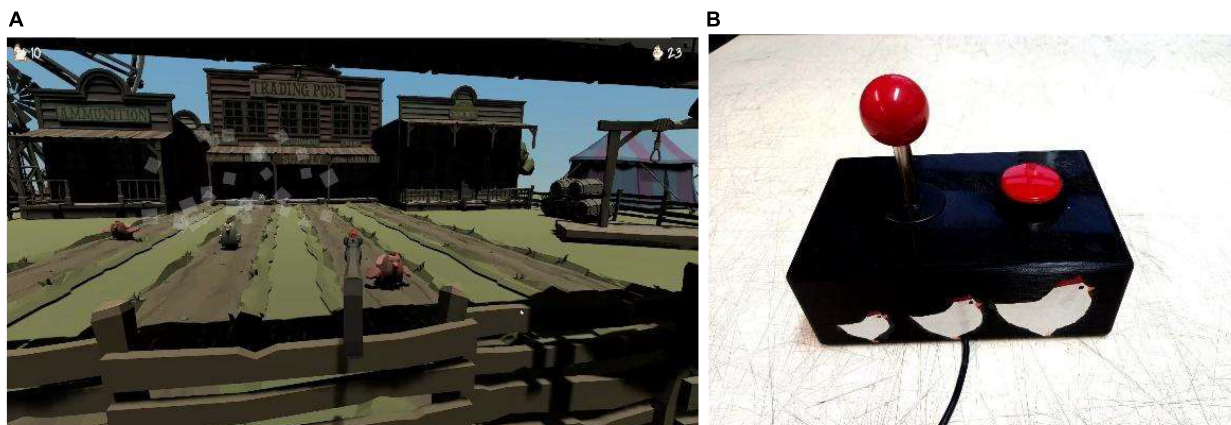


FIGURE 3 | (A) Screenshot of the game *Chicken Shooter*; and **(B)** Physical interface of the same game.

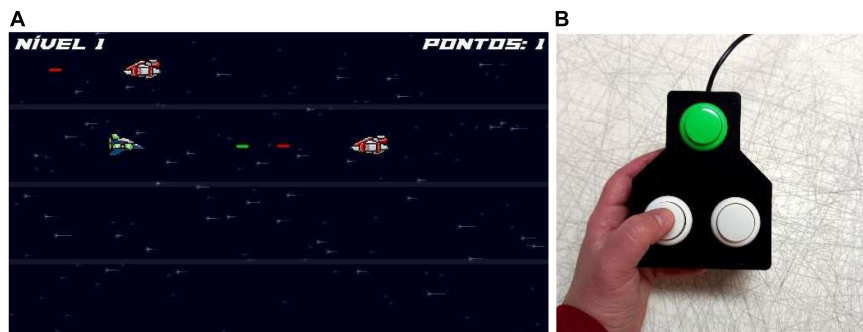


FIGURE 4 | (A) Screenshot of the game *Space Conqueror*; and **(B)** Physical interface of the same game.

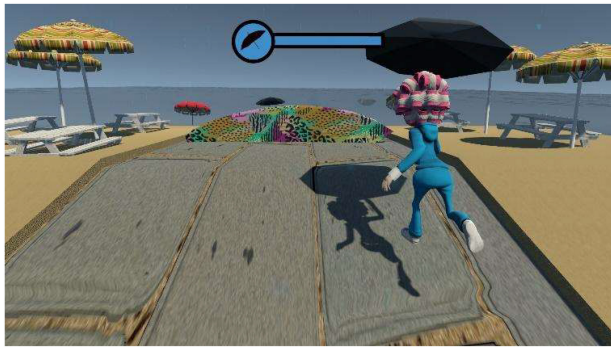


FIGURE 5 | Screenshot of the game *Endless Runner*.



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	PreMdn	PostMdn	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	PreMdn	PostMdn	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

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

Item	PreMdn	PostMdn	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.

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 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 (Kliwer 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).

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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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Anexo VI - The Pedagogical Value of Creating Accessible Games: A Case Study with Higher Education Students



Article

The Pedagogical Value of Creating Accessible Games: A Case Study with Higher Education Students

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Abstract: The potential of games in empowering underrepresented groups is a central theme in the field of media studies. However, to ensure that everyone can benefit from them, it is necessary to ensure that they are inclusive and accessible. In the present work, we have implemented a Participatory Action Research (PAR) approach to target this problem, right at the stage of training new game designers and game developers. Thus, through a game-design-based or experimental game design pedagogical approach, we intended to promote inclusive and accessibility-driven game design and development skills in students, while decreasing their negative attitudes towards people with Intellectual Disability (pwID). A protocol with a Non-Governmental Organization in the field was established and, during two semesters, students were challenged to develop 10 accessible games and physical interfaces for pwID and motor disabilities, through participatory processes. Pre and post assessment was conducted, through a mixed-method approach. After participating in this process, students reported satisfaction and increased knowledge of cognitive and motor accessibility, and inclusive game design in general. Moreover, the attitudinal assessment showed significantly lower levels of prejudiced beliefs towards pwID ($p < 0.05$).

Keywords: games; accessibility; intellectual disability; game-based learning; higher education; game creation; game design; game development; inclusion



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1. Introduction

Currently, games are increasingly seen as having the potential to provide empowering interactive experiences, enabling the promotion of social inclusion, through adaptable, motivating, and engaging strategies [1]. Nevertheless, as a cultural product, games can also reproduce the socially constructed forms of producing and maintaining power, expanding them for the virtual environment. Therefore, it becomes relevant to critically analyze how games can also be vehicles of exclusion, by expanding social exclusion to the gaming world [2] and responding with more inclusion-driven alternatives.

Intellectual Disability (ID) is a neurodevelopmental disorder that affects both intellectual and adaptive functioning, with transversal impacts in individuals' daily lives, including the 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 [3]. Nevertheless, the current models of disability shifted the paradigm, from a medical perspective to the so-called social model of disability. In general terms, the second (and current model) emphasizes how disability is produced, not by an individual impairment, but by society's inability to accommodate and include such an impairment, through accessibility, which produces a devalued life experience [4].

Therefore, it is important to emphasize that, given the cognitive functioning usually associated with ID, not all existing games are effectively playable by this population, which

again highlights the importance of accessibility [5], mainly considered the above-explored social model of disability. Additionally, people with Intellectual Disability (pwID) often have other associated conditions, such as motor disabilities, further driving questions regarding the accessibility of the available digital games [6]. Moreover, if accessibility is not considered a priority in the development process, games can contradict their potential role in social inclusion, by reinforcing the production and dissemination of narratives that are exclusive to dominant groups [7]. In this context, the need to target accessibility at the earlier possible stage, through transformative practices emerges as a key problem.

Considering media accessibility in general, Greco [8] highlighted the need to create a new critical pedagogical approach to the development of accessibility-driven skills in future media creators. This model, described as diversity-based, user-led, proactive-oriented, creativity-driven, and quality-centered, should be based on the avoidance of labels and stereotypes, valuing human variations and including them in the creative process through the voices of their representatives, instead of creators' assumptions based on their functionality. The involvement of the target audience in the production processes is also considered as a strategy for the promotion of accessibility and human dignity through this model [8]. To this extent, previous experiences, in other fields of media development (e.g., filmmaking), have shown the value of accessibility-driven pedagogical practices, both in the developed artifacts [9] and in the development of more inclusion-driven beliefs by students [10]. Moreover, this type of learning outcome is considered to emerge better if the university is framed as the center of knowledge, which works at the service of the civic society as a whole, providing students opportunities to adapt to different environments and challenges, through a value-driven education [11].

1.1. Game-Based Learning and Game Creation

Nowadays, with the adoption of a more student-centered pedagogical paradigm in higher education, games are already documented as feasible and effective learning spaces, supporting the development of transversal knowledge, conceptual understanding, and action-directed learning in a supportive environment [12]. For teaching game design and development specifically, it is difficult to operationally define the frontiers between the subject area of the courses and games as a methodology per se, but practical examples are easily found. For instance, games like *User Interface* [13], to trigger reflections about user interface development, or *SweetXheart* [14], to foster reflections on emotion induction through gameplay, and empathy promotion.

Besides learning through games, another relevant contemporary perspective would be the possibility of learning through the design and development of games. According to Kafai and Burke [15], the boundaries between playing games and "making" games are artificial and centered around academic purposes. This division is related to both activities being studied by different scientific fields. From these authors' perspectives, the "tangible side" of game creation also assumes relevance in the present work, considering how it is seen as promoting the emergence of more nuanced views about technology and more spaces for computational participation [15]. Even if their perspective is mainly applied to children, it seems essential to frame both pwID's experience as more accessible and students' experience as more technically integrated due to the development of physical interfaces.

Even though the promotion of accessibility-driven skills through game creation processes is not extensively documented as viable, it is possible to emphasize that it presents some relevant characteristics to this extent. This includes providing a "real world" learning environment based on tangible problems while emphasizing user diversity. Furthermore, such an aspect might be even more relevant if we have, as in the present study, interaction with the target audience that enables the meaningfulness of learning, based on the mutual exchanges between the process of "building something" and "evaluating something" [10]. Therefore, it is possible to approximate the steps of creating a game to the process of critically understanding how to design for accessibility. Moreover, since game creation is known as requiring a transversal comprehension of game features and contents, from

programming to art [16], learning through this path matches the centrality that accessibility must have from an early stage, as previously explored.

Additionally, Project-Based Learning (PBL) premises can also be seen as relevant for the present work since it configures an active student-centered pedagogical proposal. Therefore, students are challenged to build their investigation towards the fulfillment of a goal, while reflecting on real-world problems and practices [17]. Here, empathy is also seen as crucial, since it is both central to learning about accessibility [10] and feasible to be promoted through game design and development processes [18,19].

Participatory Action-Research (PAR), as we will explore below, is seen as having the potential to better frame this process, since it is classically defined as a methodological approach to empower the oppressed. Furthermore, it emphasizes process outcomes as a part of social change instead of focusing only on final outcomes [20]. This is seen as favoring an iterative process such as game creation. The mixed methods approach of the present study is also based on these premises by integrating baseline and endline measurements with systematic observations of the development process.

1.2. Methodological Framing

According to Waern and Back [21], although experimental game design can be seen as a regular part of any game design process in an intrinsic manner, it can also be considered a method for academic inquiry. Furthermore, this method does not necessarily aim to produce “good games”, but instead explores design aspects of communication factors that can be considered challenging, such as accessibility. Therefore, it is focused on the process and its exploration and not centered on approaching game design as a controlled scientific experiment.

Aligned with the premises explored by Kafai and Burke [15], this method seems to be increasingly used, even it can appear in the literature through several different designations, including experimental game design [21]; game development-based learning [22]; or game design-based learning [23]. However, despite the designation, these processes seem to have in common the use of game creation-driven processes to explore new development solutions through game design and, very frequently, learn about the process and acquire skills that also transcend it.

Combining the frequent marginalization of people with disabilities in gaming [24,25] and the need to explore the process as research established here, the adoption of PAR principles presented itself as very relevant. PAR can be considered as a specific form of action research defined by the systematic collection of data to implement action, empower change, and generate empirical and scientific evidence [26]. Furthermore, PAR that involves youth has been documented as providing participants with opportunities to learn and broadly contribute to knowledge-producing processes, raising awareness through critical thinking that fosters concrete actions and change [27]. Moreover, it also seems relevant to emphasize the voice of people with disabilities while shaping research to meet their needs, with Quality of Life (QoL) as an ultimate goal [28].

Mixed methods were adopted, considering the increasing relevance attributed to methodological integration in media studies and educational research. This intends to improve the potential perspective of the study’s aims through a triangulation that sets two well-known observation points to enhance the exploration of this third and less-observable object. Mixed method approaches are seen as crucial in games research, especially if the different methods are integrated systematically, by establishing a dialogical perspective between different information tracks [29].

Considering the defined framework, the present study aims to explore the pedagogical value of game design and development in the promotion of inclusive and accessibility-driven skills and attitudes by videogames students, through PAR. Most specifically, it will be based on the following research questions:

- RQ1: Can a collaborative project involving pwID be effective to promote inclusive and accessibility-driven game design and development skills?

- RQ2: How can game design and development foster attitudes for a more inclusive view of society?
- RQ3: What are the students' perceptions on the value of this experience to their professional development?

2. Materials and Methods

2.1. Participants

The presented study adopted a non-probabilistic sampling approach, with a convenience sample composed of higher education students enrolled in two complementary subjects of a Bachelor's degree in Videogames. Although all students participated in the process, only the ones that successfully provided answers to all the data gathering tools were included in the final sample. Therefore, thirty university students participated in the process, but only 17 provided valid answers to both questionnaires. The questionnaire administered before the game development process gathered a total of 17 answers, while the post-game development questionnaire gathered a total of 25 answers. The overview of this process is illustrated in Figure 1.

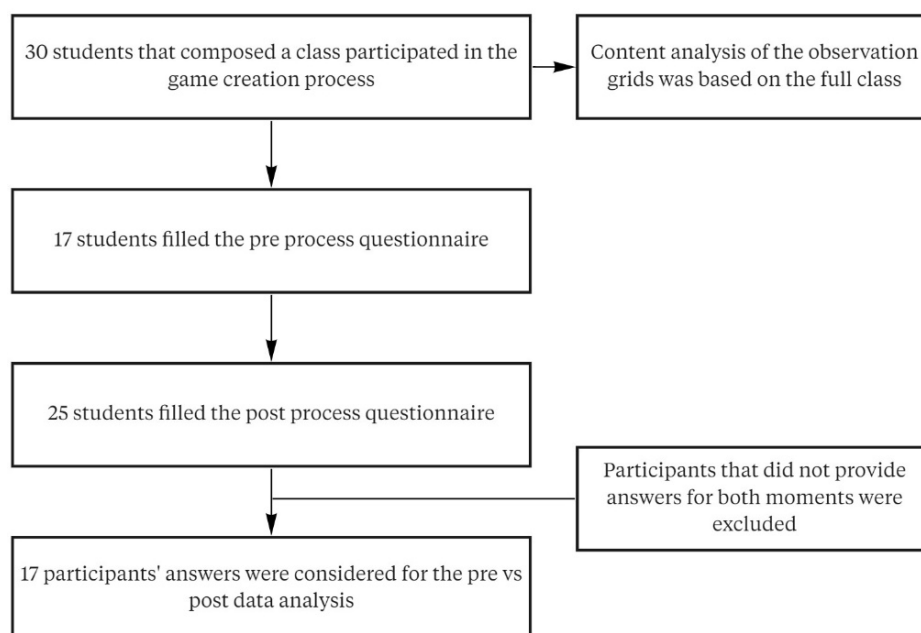


Figure 1. Flow-chart for participants and data inclusion.

From the 17 that fully complied with the requirements of the final sample (filling both questionnaires), 12 identified as males (70.60%), two identified as females (11.80%), and three (17.60%) preferred not to answer. The students were aged between 19 and 25 years old ($M = 21.12$; $SD = 1.62$). Most of the students had no regular contact with pwID ($n = 14$; 82.40%). The three other students (17.60%) stated that they have pwID in their families, with whom they contacted sporadically ($n = 2$; 11.80%) or monthly ($n = 1$; 5.90%). Full results can be found in Table 1.

Besides the presented sample of students, a group of pwID also cooperated in this experience through collaborative processes, as the target audience for the games. Fourteen individuals with ID participated in the development process and were recruited through a collaboration protocol with a Non-Governmental Organization (NGO) in the field. Considering the assessment details provided by the organization, all the participants were characterized as having severe ID, with relative autonomy, but a constant need for support in activities of daily living. Eight participants (57.14%) also had motor disabilities, ranging from the inability to autonomously use one of the hands to spastic tetraplegia. Seven participants (50.00%) used a wheelchair.

Table 1. Sample demographic data ($n = 17$).

Category	Subcategories	n (%)
Gender	Male	12 (70.60)
	Female	2 (11.80)
	Prefer not to say	3 (17.60)
Regular contact with pwID	Yes	3 (17.60)
	No	14 (82.40)
Nature of the contact	Family	3 (17.60)
	Professional	0 (0.00)
	Other	0 (0.00)
Frequency of the contact	Daily	0 (0.00)
	Weekly	0 (0.00)
	Monthly	1 (5.90)
	Sporadically ¹	2 (11.80)

¹ Sporadically = less than monthly.

The selection of this user sample was also based on a non-probabilistic process, obtained through a pre-selection made by the NGO technical staff, followed by a decision from the pwID. This process was the most feasible considering the institutional dynamics and, mainly, answered to the self-determination and empowerment pillars of the Convention on the Rights of Persons with Disabilities (CRPD).

2.2. Instruments

2.2.1. Community Living Attitudes Scale-Intellectual Disability

To assess the students' beliefs and attitudes regarding ID, the short version of the *Community Living Attitudes Scale-Intellectual Disability* (CLAS-ID) was used. This scale was developed by Henry, Keys, Jopp, and Balcazar [30], and was originally named *Community Living Attitudes Scale-Mental Retardation* (CLAS-MR). In more recent studies, like the ones developed by Su, Cuskelly, Gilmore, and Sullivan [31] and by Wilson and Scior [32], the designation CLAS-MR was replaced by CLAS-ID, and the concept of "mental retardation" disappeared also in the scales items, accordingly. Such a change coincides with the paradigm shifts in the field of ID, which include both the adopted words and the societal positioning of these subjects, to human rights and inclusion-driven framings [33].

In its short form, CLAS-ID is a self-report scale, composed of 17 items, grouped in four subscales: empowerment, exclusion, sheltering, and similarity. The empowerment subscale assesses the perception of the ability of individuals with ID to make decisions. The exclusion subscale approaches the desire to exclude pwID from community living. The sheltering subscale intends to assess the attitudes regarding the need to protect and supervise pwID. The similarity subscale assesses the way the respondents perceive pwID as equals. The answers to this instrument are given through a six-point Likert scale, ranging from one (totally disagree) to six (totally agree). When scoring the answer, items are recoded to allow that higher scores always represent more positive attitudes. Considered as a measuring scale that reflects the premises of empowerment and community inclusion of pwID, CLAS-ID shows good internal consistency and validity, with a Chronbach's Alpha higher than 0.70 in the four subscales, as well as the coefficient of test-retest reliability [31]. The short form subscales present strong and positive correlations with the full form of the scale, composed of 40 items [34].

2.2.2. Questionnaire for Students

The questionnaire for students was administered through an online form, which comprised demographic information, CLAS-ID items, and open-ended qualitative questions aimed to evaluate their knowledge about accessibility, perceptions of inclusion, and insight about the implemented pedagogical process. Two versions of the questionnaire were developed, one to be implemented before the starting of the game design and development

process, and the other after the end of this process. Both versions included CLAS-ID and a set of questions about inclusion and games accessibility-related skills and attitudes. Demographic data were collected only in the pre-process version. The post-process version also included open-ended questions about the perceived value of the experience for the professional future of the students as game developers/designers. The questionnaires started with an informed consent form, developed under the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and that was mandatory before the filling of the rest of the form. A private keyword process ensured the correspondence between the pre and post questionnaire from each participant.

Besides age and gender, the gathered demographic data included questions about the familiarity of each student with the reality of pwID, asking them about their close contacts with these individuals and, if this contact existed, the nature and the frequency of it. All demographic data was answered through multiple-choice questions, except for age, answered through a two digits' numerical format, and gender, answered in an open-ended manner to ensure the collection of all the multiplicity of possible answers.

After CLAS-ID, the third section of the questionnaire was composed of four questions, aimed to understand students' knowledge and beliefs about cognitive accessibility, motor accessibility (since the target audience were also composed of a majority of people with multiple disabilities), and inclusion, as following:

- What measures can be implemented in a game to make it more accessible for pwID or other cognitive impairments?
- What measures can be implemented in a game to make it more accessible for people with Motor Disabilities?
- How can games contribute to the inclusion of pwID?

The three open-ended questions included in the post process version intended to assess students' perceptions about their participation in this game design and development process, as follows:

- How do you describe the process of developing your game?
- Do you think that participating in this project can influence your professional future? In what way?
- If you had the opportunity to develop a game for pwID again would you do something differently? What would you do?

2.2.3. Systematic Observation Grids

To operationalize the methodological premises discussed above, namely regarding media ethnography and PAR, a systematic observation grid was developed to be filled in all the creation sessions. The developed grid was adapted from a previous contribution in the field, centered around game creation-based learning with children [35], considering these specific subjects, and research aims.

The grid was also developed to address two types of observation categories: descriptive categories and orthogonal categories, with the second one having a specific emphasis on capturing the different aspects of the design activity [36]. The descriptive categories included: date of the session; number of participants (students); place; and title of the concept/game under development. The orthogonal categories included: accessibility, separated into three subsections (cognitive, motor, and sensory accessibility); concerns about game experience; beliefs about ID; main comments of the students; and other aspects of the observation. These categories' conceptual correspondence with CLAS-ID and the developed questionnaire intended to support data triangulation.

2.3. Procedure

To better operationalize PAR, the entire creative process with the students was documented, as well as the subsequent playtesting and gaming sessions with pwID, in a

logic of participant observation and through an ethnographic approach, which allows the study of this form of media as a complex process of meaning construction, socially and contextually situated [37]. For this, a systematic observation grid was filled in each development, co-creation, playtesting, and gaming session.

At the beginning of a two-semester subject of the Bachelor's degree in Videogames, students were challenged to design and develop a game and a specific physical interface that could be accessible to the above-mentioned sample of pwID. Emerging from the key problem of the lack of accessible games for this population—most specifically games that primarily target entertainment, developed considering their specific interests and priorities [24]—students were challenged to move away from a vision more closely related to serious games or games with specific goals, typically external to the game world. During game creation, more than developing for a specific target, students were also challenged to develop games that can be interesting for everyone, even if containing specific accessibility options and features. User requirements emerged from information provided by the NGO, video observation of the audience, and an initial focus group about their interest and needs. Generally, the pwID that composed the audience had a complex set of support needs, characterized by limitations in social, conceptual, and practical domains, aligned with severe ID [3]. Therefore, the sample presented complex cognitive accessibility needs that justified the creation of games that could represent a low burden on memory, attention, executive functioning, among others. The sample also presented motor accessibility needs. Here, the most common condition was the inability to use both hands simultaneously and autonomously.

The games were developed over two semesters, with the first semester being dedicated to the concept and production of the test prototype. In the second semester, the prototype was tested with the audience, the game was finalized, and the physical interface was produced. All sessions, excepting the ones aimed at assembling the interface, were conducted through Zoom, due to the pandemic restrictions. Nevertheless, one of the researchers was physically present in all the sessions with pwID, in the venue of the NGO, to better explore their interaction with the games underdevelopment, as well as other contextual factors.

The concept phase began with a session on the interests, cognitive, and motor characteristics of the target audience, led by the researcher that was in constant and direct contact with the audience. The game concept and gameplay principles, developed with the assistance of the subject professors, were discussed and validated in two sessions interspersed in time, also with the researcher and considering the feedback provided by pwID. The first semester ended with the finalization of the game prototype and the second semester started with the respective playtesting, recorded on video, by pwID. This video registration was essential for the students to meet the interests and accessibility needs of the audience.

Through this procedure, one focus group about interests and media habits, nine co-creation sessions with feedback gathered from the target audience, and three playtesting rounds were conducted, between March 2020 and January 2021.

Since pwID were considered a high-risk population for COVID-19 transmission, direct contact with students was not possible as initially planned. Nevertheless, one focus group about support needs, interests, and media habits, nine co-creation sessions with feedback gathered from the target audience, and three playtesting rounds were conducted, between March 2020 and January 2021. Although pandemic restrictions did not allow for direct contact, it was clear that the various moments of feedback and video documentation brought a participatory nature to the game development process.

Games were developed in UnityEngine. Physical interfaces were designed on Onshape and produced in 3D printing with the integration of Arduino boards and switches.

Data were gathered during the participant observation of the research, with the filling of observation grids. The questionnaires, including demographic data, CLAS-ID, and open-ended questions, were filled in the initial session and after the end of the process, through an online form. All subjects gave their informed consent for inclusion before any data gathering moment.

2.4. Data Analysis

Data emerging from open-ended questions were analyzed through a content analysis procedure, characterized as bottom-up, due to the innovative nature of the present study. Therefore, an inductive coding procedure was adopted, to capture the complexity and richness of the phenomena associated with this creative process. This process was based on the postulates from Boyatzis [38] about coding and the thematic organization of observations. After documenting the manifest content, organizing it is conceptually similar groups, the codebook was developed, and all the material was coded. The sentence was adopted as the unit of analysis for this purpose. Frequencies of each coding were noted and the respective percentages were later calculated. Means and standard deviations were also calculated, when applicable, to analyze the number of units of analysis coded by each participant. Inter Coder Reliability was calculated with the support of an independent researcher, based on 11.76% of the material coded by the two team members (answers from two randomly assigned students). Divergences in coding were solved through group discussions. The agreement rate was 80.63%, which is considered acceptable [39].

Demographic data were analyzed using descriptive statistics and CLAS-ID data was analyzed using Wilcoxon signed rank test, version 26. This option was adopted considering the small sample size of this exploratory approach, as well as the inability to confirm all the paired sample *t* test assumptions, such as normal distribution.

Data from the participant observation notes were used to frame the overall results, as a strategy to capture the environmental influences and contextualized beliefs that produce both inclusion-driven and disabling outcomes in a creative process. This methodological option was based on the approach to the production of insights adopted by McGrath and Rudman [40].

3. Results

3.1. Developed Games

Ten games were developed through this process, nine digital games and one hybrid game (analogical with an electronic interface). The games presented great diversity in terms of genres, including one party game (*Adivinhas?*), one first-person shooter (*Chicken Shooter*), two simulations (*Canoe* and *FlyYouBirds*), two arcades (*Orbiter* and *Space Conqueror*), one endless runner (*Endless Runner*), one casual game (*Virtual Companion*), and two puzzles (*Futebolástico!* and *SoundQuest*). Overall, games mainly adopted an approach with a small number of inputs, around two or three, to support accessibility. Students progressively realized that the possibility to customize in-game options, such as speed or number of opponents was crucial to the success of their work. Observing the process makes it possible to mention that these features mainly resulted from playtesting conclusions and pwID insights. Generally, students seemed to increasingly favor accessibility solutions that favor user diversity, such as customization, considering their participatory experiences.

As mentioned above, every game had a physical interface specifically developed for it, serving a double purpose: enhancing games' motor and cognitive accessibility, considering the characteristics of the audience, and enhancing engagement through the creation of a tangible interactive product that is aligned with each game's aesthetic. An example can be seen in Figure 2.

The digital games' art frequently adopted classic games aesthetic trends, like pixel art. Another interesting trend observed in some games was the desire to provide pwID with sensory experiences that are not frequent in their daily lives (e.g., walking on the raining in *EndlessRunner*) or that can provide a certain notion of freedom (e.g., driving a boat in *Canoe* or flying in *FlyYouBirds*).



Figure 2. Images from the game Futebolástico! (a) Screenshot of the gameplay; (b) Physical interface of the game.

3.2. Inclusive Design and Accessibility Driven Skills

Regarding the question “What measures can be implemented in a game to make it more accessible for pwID or other cognitive impairments?”, students mentioned a set of information that resulted in 11 themes, with 31 subthemes. In the pre-development process questionnaire, students made a total of 54 mentions to accessibility measures, ranging between one and five measures per student ($M = 3.18$; $SD = 1.33$). The most mentioned theme was the possibility to allow customization within the game ($n = 12$; 12.22%), mainly the customization of the level of difficulty ($n = 8$; 14.81%). This was followed by: visual information-related measures ($n = 8$; 14.81%), most specifically the replacement of written words by pictograph representations ($n = 6$; 11.11%), and the need to accommodate players’ support needs ($n = 8$; 14.81%), materialized by the inclusion of subtitles ($n = 3$; 5.56%). The aspects that were not mentioned in the pre-development questionnaire included the need to: improve visual information clarity; to simplify the game design; to allow user interface customization; to remap controls; to increase difficulty progressively; and to include more explanatory elements in the tutorials.

In the post-development process questionnaire, students made a total of 63 mentions to accessibility measures, ranging between one and six measures per student ($M = 3.70$; $SD = 1.40$). As in the previous questionnaire, the possibility to allow customization within the game ($n = 19$; 30.16%), specifically the customization of the level of difficulty ($n = 14$; 22.22%) was the most mentioned. Also, the adoption of pictograph representations ($n = 10$; 15.87%), and the whole visual information-related measures ($n = 15$; 23.81%), were again the second most mentioned. Simplification-driven measures ($n = 9$; 14.29%), namely game design simplification ($n = 4$; 6.35%) appeared as the most mentioned theme and respective subtheme. Accessibility measures related to inputs lost representation in the post-development process questionnaire, alongside window of opportunity customization, the adoption of mechanics that are not based on speed or reaction time, the possibility to, in general, allow repetition of game moments/elements, the assist mode, the subtitles, and the need for non-passive tutorials. None of these was, therefore, mentioned.

Full results for both pre- and post-development process questionnaires can be found in Table 2. The frequencies and percentages totals were calculated based on main themes only (codings 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11). Adding up all the lines would lead to an erroneous result, where the subthemes would be considered in duplicate.

Table 2. Proposed cognitive accessibility measures, before and after the process ($n = 17$).

Codings for Cognitive Accessibility Measures	Pre <i>n</i> (%)	Post <i>n</i> (%)	Total <i>n</i> (%)
1. Accessibility	5 (9.25)	2 (3.17)	7 (5.98)
1.1. User interface accessibility	5 (9.25)	2 (3.17)	7 (5.98)
2. Simplification	5 (9.25)	9 (14.29)	14 (11.97)
2.1. Mechanics simplification	2 (3.70)	2 (3.17)	4 (3.42)
2.2. Gameplay simplification	3 (5.56)	3 (4.76)	6 (5.13)
2.3. Game design simplification	0 (0.00)	4 (6.35)	4 (3.42)
3. Inputs	3 (5.56)	0 (0.00)	3 (2.56)
3.1. Input number reduction	2 (3.70)	0 (0.00)	2 (1.71)
3.2. Variety of input modalities	1 (1.85)	0 (0.00)	1 (0.85)
4. Allow customization	12 (22.22)	19 (30.16)	31 (26.50)
4.1. Difficulty customization	8 (14.81)	14 (22.22)	22 (18.80)
4.2. Color/contrast customization	1 (1.85)	1 (1.59)	2 (1.71)
4.3. Speed customization	2 (3.70)	1 (1.59)	3 (2.56)
4.4. Window of opportunity customization	1 (1.85)	0 (0.00)	1 (0.85)
4.5. User interface customization	0 (0.00)	3 (4.76)	3 (2.56)
5. Mechanics	5 (9.25)	1 (1.59)	6 (5.13)
5.1. Mechanics not based on dexterity	1 (1.85)	1 (1.59)	2 (1.71)
5.2. Mechanics not based on speed	1 (1.85)	0 (0.00)	1 (0.85)
5.3. Mechanics not based on reaction time	3 (5.56)	0 (0.00)	3 (2.56)
6. Visual information	8 (14.81)	15 (23.81)	23 (16.66)
6.1. Pictograph representations	6 (11.11)	10 (15.87)	16 (13.68)
6.2. Simplification of visual information	2 (3.70)	1 (1.59)	3 (2.56)
6.3. Clarity of visual information	0 (0.00)	4 (6.35)	4 (3.42)
7. Allow repetition	2 (3.70)	0 (0.00)	2 (1.71)
7.1. Allow repetition of narrative elements	1 (1.85)	0 (0.00)	1 (0.85)
7.2. Allow repetition of tutorials	1 (1.85)	0 (0.00)	1 (0.85)
8. Accommodation of support needs	8 (14.81)	8 (12.70)	16 (13.68)
8.1. Assist mode	2 (3.70)	0 (0.00)	2 (1.71)
8.2. Mechanics' automation	1 (1.85)	1 (1.59)	2 (1.71)
8.3. Voice over	2 (3.70)	2 (3.17)	4 (3.42)
8.4. Subtitles	3 (5.56)	0 (0.00)	3 (2.56)
8.5. Control remapping	0 (0.00)	4 (6.35)	4 (3.42)
8.6. Gradually progressive difficulty	0 (0.00)	1 (1.59)	1 (0.85)
9. Feedback	2 (3.70)	6 (9.52)	8 (6.84)
9.1. Feedback clarity	1 (1.85)	3 (4.76)	4 (3.42)
9.2. Convey feedback through multiple sensory channels	1 (1.85)	3 (4.76)	4 (3.42)
10. Tutorials	1 (1.85)	1 (1.59)	2 (1.71)
10.1. Non passive tutorials	1 (1.85)	0 (0.00)	1 (0.85)
10.2. Tutorials with more explanatory visual elements	0 (0.00)	1 (1.59)	1 (0.85)
11. Gameplay	3 (5.56)	2 (3.17)	5 (4.27)
11.1. Decrease the punishment associated with errors	2 (3.70)	1 (1.59)	3 (2.56)
11.2. Allow freedom/decision-making	1 (1.85)	1 (1.59)	2 (1.71)
Total accessibility measures	54 (100.00)	63 (100.00)	117 (100)

Overall, more cognitive accessibility measures were mentioned in the post-development process questionnaire, and even if this is somehow residual, different distribution aspects can be highlighted, considering Table 2 data. The number and variety of inputs lost its emphasis in terms of cognitive accessibility, from three mentions (5.56%) in the pre questionnaire, to not being mentioned at all in the post questionnaire. Game mechanics-related measures also lost representation, from five mentions (9.25%) to one mention (1.59%). The possibility to customize different game aspects maintained its centrality from

pre ($n = 12$; 12.22%) to post ($n = 19$; 30.16%), but user interface customization appeared only in the post-development process ($n = 3$; 4.76%). The need to accommodate players' support needs also kept its centrality from pre ($n = 8$; 14.81%) to post ($n = 8$; 12.70%), but control remapping appeared only in the post questionnaire ($n = 4$; 6.35%). Simplification-related measures gained relevance, from five mentions (9.25%) to nine mentions (14.29%), with the emergence of game design overall simplification in the post-results ($n = 4$; 6.35%). Similarly, accessibility measures related to feedback gained relevance from pre ($n = 2$; 3.70%) to post ($n = 6$; 9.52%), both regarding its clarity and the need to convey feedback through multiple sensory channels. These subthemes went from one mention in the pre questionnaire (1.85%) to three mentions in the post questionnaire (4.76%).

Regarding the question "What measures can be implemented in a game to make it more accessible for people with Motor Disabilities?", students mentioned a set of information that resulted in nine themes, with 24 subthemes. The theme and subtheme structure were kept as uniform as possible from cognitive to motor accessibility, with slight adaptations to fit the coded content. In the pre-development process questionnaire, students made a total of 45 mentions to motor accessibility measures, ranging between one and four measures per student ($M = 2.65$; $SD = 1.70$). The most mentioned themes and subthemes were: inputs related measures ($n = 10$; 22.22%), specifically regarding the decrease of the number of inputs and sensitivity, with three mentions each ($n = 3$; 6.67%); measures related to game mechanics ($n = 10$; 22.22%), namely the avoidance of dexterity-based mechanics ($n = 6$; 13.33%); and measures driven to the accommodation of players' support needs ($n = 10$; 22.22%), most specifically control remapping ($n = 8$; 17.78%). User interface accessibility, game design simplification, user interface customization, visual information-related measures, and assist mode were not mentioned as motor accessibility measures in the pre questionnaire.

In the post-development process questionnaire, students made a total of 63 mentions to motor accessibility measures, ranging between one and five measures per student ($M = 3.71$; $SD = 1.40$). The possibility to customize different game aspects was the most mentioned theme ($n = 14$; 22.22%), most specifically to customize difficulty ($n = 6$; 9.52%). It was followed by inputs-related measures ($n = 11$; 17.46%), emphasizing the decrease of the number of inputs ($n = 6$; 9.52%), and by the need to accommodate players' support needs ($n = 10$; 15.87%), most specifically control remapping ($n = 6$; 9.52%). The need to decrease the variety of input types, their frequency, the attribution to several functions to the same input, voice over, and the decrease of the punishment after errors were not mentioned in the post questionnaire.

Full motor accessibility results for both pre- and post-development process questionnaires can be found in Table 3. The frequencies and percentages totals were calculated based on main themes only (codings 1, 2, 3, 4, 5, 6, 7, 8, and 9).

Overall, more motor accessibility measures were mentioned in the post-development process questionnaire ($n = 63$), when compared to the pre-development questionnaire ($n = 45$), justifying a higher average of measures mentioned by students, from 2.65 ($SD = 1.70$) on the pre questionnaire, to 3.71 ($SD = 1.40$) on the post questionnaire. Considering Table 3 data, some differences in distribution can also be highlighted. Motor accessibility measures related with inputs roughly maintained their relevance (Pre $n = 10$; 22.22%; Post $n = 11$; 17.46%), as well as game mechanics-related (Pre $n = 10$; 22.22%; Post $n = 9$; 14.29%), the adaptability of the game to different physical interfaces (Pre $n = 6$; 13.33%; Post $n = 8$; 12.70%), and the need to accommodate players' support needs (Pre $n = 10$; 22.22%; Post $n = 10$; 15.87%). The simplification of different game aspects increased its relevance (Pre $n = 2$; 4.44%; Post $n = 7$; 11.11%), with a specific emphasis on gameplay overall simplification (Pre $n = 2$; 4.44%; Post $n = 6$; 9.52%). The possibility to customize the game also increased its relevance (Pre $n = 6$; 13.33%; Post $n = 14$; 22.22%), most specifically the customization of difficulty (Pre $n = 3$; 6.67%; Post $n = 6$; 9.52%), and the emergence of user interface customization in the post questionnaire ($n = 2$; 3.17%). User interface accessibility,

that was not mentioned in the pre questionnaire, was mentioned three times in the post questionnaire (4.76%).

Table 3. Proposed motor accessibility measures, before and after the process ($n = 17$).

Codings for Motor Accessibility Measures	Pre n (%)	Post n (%)	Total n (%)
1. Accessibility	0 (0.00)	3 (4.76)	3 (2.78)
1.1. User interface accessibility	0 (0.00)	3 (4.76)	3 (2.78)
2. Simplification	2 (4.44)	7 (11.11)	9 (8.33)
2.1. Gameplay simplification	2 (4.44)	6 (9.52)	8 (7.41)
2.2. Game design simplification	0 (0.00)	1 (1.59)	1 (0.93)
3. Inputs	10 (22.22)	11 (17.46)	21 (19.44)
3.1. Decrease the number of inputs	3 (6.67)	6 (9.52)	9 (8.33)
3.2. Decrease the variety of inputs	1 (2.22)	0 (0.00)	1 (0.93)
3.3. Decrease input sensitivity	3 (6.67)	4 (6.35)	7 (6.48)
3.4. Increase input cooldown	1 (2.22)	1 (1.59)	2 (1.85)
3.5. Decrease input frequency	1 (2.22)	0 (0.00)	1 (0.93)
3.6. Several functions for one input	1 (2.22)	0 (0.00)	1 (0.93)
4. Allow customization	6 (13.33)	14 (22.22)	20 (18.52)
4.1. Difficulty customization	3 (6.67)	6 (9.52)	9 (8.33)
4.2. Color/contrast customization	1 (2.22)	1 (1.59)	2 (1.85)
4.3. Speed customization	1 (2.22)	2 (3.17)	3 (2.78)
4.4. User interface customization	0 (0.00)	2 (3.17)	2 (1.85)
4.5. Number of mechanics customization	1 (2.22)	3 (4.76)	4 (3.70)
5. Mechanics	10 (22.22)	9 (14.29)	19 (17.59)
5.1. Mechanics not based on dexterity	6 (13.33)	4 (6.35)	10 (9.26)
5.2. Mechanics not based on speed	1 (2.22)	1 (1.59)	2 (1.85)
5.3. Mechanics not based on reaction time	3 (6.67)	4 (6.35)	7 (6.48)
6. Visual information	0 (0.00)	1 (1.59)	1 (0.93)
6.1. Clarity of visual information	0 (0.00)	1 (1.59)	1 (0.93)
7. Accommodation of support needs	10 (22.22)	10 (15.87)	20 (18.52)
7.1. Assist mode	0 (0.00)	2 (3.17)	2 (1.85)
7.2. Mechanics' automation	1 (2.22)	2 (3.17)	3 (2.78)
7.3. Voice over	1 (2.22)	0 (0.00)	1 (0.93)
7.4. Control remapping	8 (17.78)	6 (9.52)	14 (12.96)
8. Gameplay	1 (2.22)	0 (0.00)	1 (0.93)
8.1. Decrease the punishment associated with errors	1 (2.22)	0 (0.00)	1 (0.93)
9. Physical Interface	6 (13.33)	8 (12.70)	14 (12.96)
9.1. Adaptability to different physical interfaces	6 (13.33)	8 (12.70)	14 (12.96)
Total accessibility measures	45 (100.00)	63 (100.00)	108 (100.00)

3.3. Attitudes towards Intellectual Disability and Inclusion

Through the analysis of CLAS-ID, filled by all the participants ($n = 17$), it is possible to highlight that statistically significant differences were found between pre- and post-game development processes in three out of four of the scale's dimensions. Students' attitudes regarding the empowerment of pwID significantly improved from before the game development process ($Mdn = 4.40$), to after this process ($Mdn = 4.60$); $T = 97$, $Z = 2.82$, $p = 0.005$. The beliefs towards the need to protect and supervise pwID, expressed in the sheltering dimension, also improved significantly from pre ($Mdn = 4.00$) to post assessment ($Mdn = 4.75$); $T = 120$, $Z = 3.42$, $p = 0.001$. The beliefs regarding pwID as equals, expressed in the similarity dimension, also registered statistically significant improvements from the first assessment point ($Mdn = 5.25$) to the assessment made after the game design and development process ($Mdn = 5.75$); $T = 120$, $Z = 3.48$, $p = 0.001$. Results obtained for the

exclusion dimensions did not show significant differences between the pre ($Mdn = 4.75$) and the post process assessments ($Mdn = 4.75$); $T = 30$, $Z = -0.78$, $p = 0.439$.

By critically analyzing CLAS-ID results and integrating them with the one's obtained through the content analysis of the question "How can games contribute to the inclusion of pwID?", it is possible to sustain the increasing beliefs of students related to the role of games in the inclusion of this population. The attitudinal content expressed by students in this question was organized into two main dimensions and 15 sub-attitudinal dimensions. The full results of this question's content analysis are expressed in Table 4.

Table 4. Students' attitudes regarding games and inclusion, before and after the process ($n = 17$).

Codings for Attitudinal Dimensions	Pre <i>n</i> (%)	Post <i>n</i> (%)	Total <i>n</i> (%)
Inclusion, similarity, and empowerment driven attitudes	23 (67.65)	55 (100.00)	78 (87.64)
Democratize games as cultural form	3 (8.82)	6 (10.91)	9 (10.11)
Games for awareness raising	4 (11.76)	1 (1.82)	5 (5.62)
Online games as fostering sense of community and belonging	2 (5.88)	4 (7.27)	6 (6.74)
Games as spaces for social interaction	7 (20.59)	7 (12.73)	14 (15.73)
Games for entertainment	2 (5.88)	8 (14.55)	10 (11.24)
Create standardized information measures for games' accessibility	2 (5.88)	6 (10.91)	8 (8.99)
Games as decreasing environmental barriers	1 (2.94)	4 (7.27)	5 (5.62)
Accessibility as a right	0 (0.00)	8 (14.55)	8 (8.99)
Inclusive design improves games for everyone	0 (0.00)	7 (12.73)	7 (7.87)
Games as a source of challenge	0 (0.00)	2 (3.64)	2 (2.25)
Games as spaces for the development of skills	2 (5.88)	2 (3.64)	4 (4.49)
Exclusion driven attitudes	11 (32.35)	0 (0.00)	11 (12.36)
Offer pwID the possibility to interact with neurotypical individuals	8 (23.53)	0 (0.00)	8 (8.99)
Games as a way for pwID do useful things for society	1 (2.94)	0 (0.00)	1 (1.12)
Games are necessarily a vehicle of exclusion	1 (2.94)	0 (0.00)	1 (1.12)
Accessibility measures as a barrier to designers and developers	1 (2.94)	0 (0.00)	1 (1.12)
Total accessibility measures	34 (100.00)	55 (100.00)	89 (100.00)

In the pre-development process questionnaire, a total of 34 attitudes and beliefs were coded, ranging between two and five per respondent ($M = 2.00$; $SD = 0.79$). Twenty-three units of analysis (67.65%) were coded in the first dimension, developed to aggregate positive attitudes and beliefs, considered as inclusion, similarity, and empowerment driven. Here, the potential of games to foster social interaction ($n = 7$; 20.59%), and to raise the awareness of neurotypical individuals for the reality of pwID ($n = 4$; 11.76%) were the most mentioned aspects. In the second dimension, 11 (32.35%) exclusion-driven attitudes were coded. Games as offering the possibility for pwID to interact with neurotypical individuals was the most prevalent ($n = 8$; 23.53%). Such an attitude was considered exclusion-driven, since students' views were mainly framed in an ableist notion that for pwID to interact with people without disability would, without a doubt, be an asset in their daily lives. These answers were also very frequently linked with a strong cleavage between people with and without disabilities, not perceived as similar.

Besides this, one student, in particular, expressed how they were against this type of accessibility-driven process. For them, games were necessarily a vehicle of exclusion, and "creating games to include these people greatly limits the game design". They proceeded to answer that "if the creators' idea does not make it possible to include these people, then you should not change the game just to include them".

In the post-development process questionnaire, a total of 55 attitudes and beliefs were coded, ranging between two and five per respondent ($M = 3.24$; $SD = 0.97$). All the attitudes were coded as inclusion, similarity, and empowerment-driven, with a stronger notion that games for pwID can be above all a form of entertainment ($n = 8$; 14.55%) and that accessibility is a matter of rights ($n = 8$; 14.55%). Moreover, the idea that games could be a space for social interaction gained even more relevance ($n = 7$; 12.73%), and the notion that accessibility driven inclusive design practices could improve games, not only for pwID but for everyone ($n = 7$; 12.73%) emerged. One student went further by suggesting that, as is already done with the Pan European Game Information (PEGI) age labels, games should have a system “to certify whether they are accessible and for whom”.

3.4. Student's Perception of the Process

When asked to describe the game development process, students' answers were very diverse, but generally structured in a similar way. Frequently, students mentioned something more challenging or frustrating about the process, followed by an aspect that they found positive or enriching. Examples would be “time-consuming but very rewarding” or “challenging, but fun, and above all rewarding”. Considering the content analysis results, 32 units of analysis were coded from this question, expressed through 17 different characteristics and beliefs groups. Most students considered the process both challenging ($n = 4$; 12.50%), reinforcing how it had to be done in a person-centered manner ($n = 4$; 12.50%). Aligned with this, students highlighted the struggles they experienced with the implementation and adaptation of games' difficulty levels ($n = 3$; 9.38%). Nevertheless, the development process was characterized as rewarding ($n = 3$; 9.38%), with answers such as

It is a very satisfying process when you know that the game will really help someone and make people enjoy themselves without having that fear of not being able to play because the game is too hard for them.

Considering students' perspectives, the development process was interesting ($n = 2$; 6.25%) and enriching ($n = 2$; 6.25%). Nevertheless, some diverse views were registered regarding its complexity, from being considered easy ($n = 2$; 6.25%), to being considered complex ($n = 2$; 6.25%), but feasible ($n = 2$; 6.25%). Other beliefs about the game development process included: the inherent frustration associated with the constant adjustment of the gameplay ($n = 1$; 3.13%); the notion that the process was very long ($n = 1$); the feeling that this project was more interesting than the other projects developed in the Videogames Bachelor's degree ($n = 1$; 3.13%); the perception of the process as necessary for being a competent professional in the future ($n = 1$); the process of being evidence-based and demanding of a profound research work ($n = 1$; 3.13%); and the notion that this process was similar to other game development processes ($n = 1$; 3.13%), requiring only more planning ($n = 1$; 3.13%).

The students unanimously agreed ($n = 17$; 100.00%) on the potential influence of participating in this project on their future as game designers and/or game developers. Forty-one reasons for this were mentioned by them, afterward grouped into nine themes. The acquired knowledge on how to develop with accessibility in mind was the most mentioned one, either for skills specifically aimed at cognitive ($n = 8$; 19.51%) or motor accessibility ($n = 8$; 19.51%). The project, seen as a trigger for being more aware of the potential mismatch between the capabilities and individual characteristics of the designer/developer and the target audience, was also very relevant in students' answers ($n = 7$; 17.07%). Moreover, students also mentioned frequently how the inclusive design practices they implemented could help them in the development of better games for everyone, regardless of whether they have a disability or not ($n = 5$; 12.20%). To this extent, a participant noted: “(...) I gained experience in how to develop games for specific audiences, with different limitations, which in my opinion is an asset not only for developing games for this population but for game development in general”. Aligned with this view, a participant also noted how this project would be a very valuable asset for their portfolio. Through this project, students felt they gained more awareness of games as also a potential vehicle of exclusion

($n = 3$; 7.32%), and how developing accessible media is a form of citizenship ($n = 3$; 7.32%). Their positive experiences related to the project were also expressed by their willingness to develop similar work in the future ($n = 3$; 7.32%), with one of them expressing how this makes them even more motivated to work as a game developer, considering this now as a form of helping society as a whole ($n = 1$; 2.44%).

When asked to reflect on what they would do differently if they had to repeat the process, three students noted that they would not do anything differently (17.65%), while the remaining 14 (82.35%) have demonstrated this willingness. From this 14, the main change would be increasing the direct contact between them and the pwID involved in the process, and hindered by the pandemic, mentioned eight times (42.11%) in the answers, such as

(...) but what I would do differently is to actually go there in person and play games, talk, spend a few afternoons with these people to understand and learn more about what they like, what their daily life is like and what they do for fun, the types of group activities, etc...

Increasing the effort in the implementation of customization features in the games and increasing the initial research about the target audience were both mentioned three times (15.79%) by the sample. Other mentioned aspects included: not basing the game features in the designers/developers abilities ($n = 2$; 10.53%); giving more relevance to User Experience (UX) from an early stage ($n = 2$; 10.53%); and increasing the effort in the implementation of more visual and pictographic information ($n = 1$; 5.26%). Overall, 19 aspects were mentioned, grouped in the previously presented six sets of reasons.

3.5. Participatory Observation

The nine development sessions with students, where the feedback and insight from the target audience were presented and discussed, were held on Zoom, with the participation of all the students ($n = 27$), including the ones that did not fill the questionnaire pre and/or post questionnaires. From the notes registered in the above-explored grid, it is possible to highlight that there was a certain avoidance in the students of lowering the difficulty level of the games, even after this was one of the main indications from the first playtesting. Although it seems to be based on the huge gap between the ability and gaming literacies of the students and the target audience, the situation has progressively improved, circumvented by customization options and by the decrease of the lower threshold in such options. This aspect was registered as concerning both cognitive accessibility and game experience, considering the barriers it initially imposed in the interaction, and the overall players' engagement.

Regarding motor accessibility, one of the main difficulties expressed by students was the need to avoid the usage of two simultaneous inputs. Also, this was progressively overcome, through the isolation of mechanics as an inherent part of level design.

Sensory accessibility was not as central as the previous ones and was mainly centered around strategies to provide visual information in clearer manners, both through different hierarchies and through pictographs. Here the biggest challenge seemed to be on how to align these concerns with the aesthetical proposals students developed for each game. It is important to highlight that this issue can also be considered as central for cognitive accessibility.

Regarding the game experience, it is possible to emphasize that the promotion of engagement was planned by students through the framing of the interests expressed by pwID, namely by providing them interactive experiences as an alternative to their limited daily lives. These limitations, imposed by institutionalization and exponentiated by the COVID-19 full lockdown for at-risk populations, such as pwID, were addressed by students through gaming experiences such as flying (*FlyYouBirds*), riding a canoe (*Canoe*), or running in the rain (*Endless Runner*).

Other aspects from the observation included a moment where a student, after the first session, proactively asked very specific and profound clarifications about the target

audience. These clarifications motivated an extra session about the target audience's interests and needs, where students proactively clarified what emerged when they started ideating about the game design.

4. Discussion

The present exploratory study aimed to explore the pedagogical value of game design and development in the promotion of inclusive and accessibility-driven skills and attitudes by videogames students, through PAR and a partnership between an academic institution and an NGO in the field.

Considering RQ1, it was possible to document that students not only developed more knowledge on how to create accessible games for pwID, but also showed a better understanding of accessibility measures that are in line with an inclusive design perspective. The centrality assumed by customization seems to be aligned with the development of a more person-centered approach to game design and development by students. Moreover, the results obtained regarding the implementation of customization within the development games were also obtained through the integration of students' creative vision and the narrative of having ID, provided by these individuals through playtesting. This empirically validates the premises approached by Harrell [41] on customization options needed to result from a co-construction perspective, that allow them to be implemented and situated critically. Gameplay adaptation to accommodate players' needs, also showed how students started reflecting on accessibility more as part of the game essence, instead of being accessory, consequential, or only *a posteriori*.

The development of physical interfaces as part of the process was also a relevant step towards the development of more accessible experiences, considering cognitive and motor support needs. Moreover, through this process, students were able to acquire a set of concrete skills, including the systematization of affordances and constraints, 3D modulation, ergonomics definition, and physical computing. The transmission of these skills seemed also to facilitate the processes of students' engagement and focus. It is recurrent for students to get to this point without ever having soldered or stripped a cable and end up helping less competent peers in the process, which adds a, so often rare, stimulus of physical interaction. For many of them, who spend the vast majority of their daily hours developing digital content, the development of a functional object was a novelty. These are people whose training and experience have kept them away from tangible creation, where a simple pair of pliers seem to have unveiled functions. We believe that, as Poissant [42] argues, the tangible dimension is still indispensable, and was an asset in the development of inclusive and accessibility-driven game design and development skills.

The development of skills by students, through the proposal of this specific challenge, also supports the feasibility of PBL in higher education, particularly to train more inclusion-driven media creators. It also stresses the importance of connecting their pedagogical development with institutions outside of the "academic circle", as a strategy to effectively tackle real-world problems and practices [19], in this case, the digital divide, or the exclusion of pwID from the gaming industry. Therefore, students' answers and feedback can be also seen as a hands-on, participatory model for both cognitive and motor accessibility that was co-constructed, even if requiring further discussion and validation.

It is also possible to emphasize that, while these results provide insights on the effectiveness of a combination between game design-based learning, PAR, and collaboration, they do not base conclusions about each one of these components *per se*. Although this was a methodological decision based on previous contributions regarding the pedagogies of accessibility, such as the one made by Putnam et al. [12], it still opens space for further research with non-combined methods.

This exploratory approach also provided some data regarding game design and development as strategies to foster more inclusive views of society, such as questioned in RQ2. Students' results, obtained from CLAS-ID and their attitudes regarding games for the inclusion of pwID showed the relevance of the proposed approach to the development of

more positive beliefs in these fields. The relevance of these results can be better explained by the premise of Gilbert [43], establishing that prejudice and stereotypes are an enormous barrier to the adoption of an attitude the author calls “designing with accessibility in mind”. This is supported by the less stigmatizing attitudes towards the empowerment, sheltering, or similarity with pwID, but also by the critical posture students acquired of accessibility as a human right, with the potential for improving game experience for everyone.

Moreover, students showed the effort to provide pwID with experiences that positively enrich their daily lives, while democratizing the classic aesthetic of videogames, even though none of this was in the briefing they were given. This highlights how more, besides accessibility, also inclusivity was approached in the developed media objects, presenting narratives that result from the integration of students’ creative intents, and the experience of being an institutionalized adult with ID during a pandemic.

Overall, students showed positive perceptions of the value of their involvement in the proposed practice to the future they will have as game designers or game developers. While acknowledging how demanding the process was, students were also able to link it with the valuable knowledge outcome they developed. Also, a proactive, autonomous research attitude was shown by students during it, with clarifications and support materials being frequently delivered on demand. These results provide data on the perceived value of this collaborative experiences for students, even if needs further development in the future, considering the sample size and the contextual homogeneity of the participants.

The restrictions imposed by the COVID-19 pandemic were also central in students’ debates about the experience. These were seen, both by researchers and subjects, as decreasing the collaboration between the three main stakeholders, namely pwID, students, and researchers, while increasing the mediation and needed intermediaries to keep the voice of the target audience included in the process. As discussed above, it also affected the narratives presented in the developed games, which seemed to be very centered around the experience of isolation. This aspect is very interesting since, while we centrally associate this with the pandemic context, Bartlett [44] also considered isolation a frequent, or even continuous, experience for people with disabilities. Such a premise, aligned with our conclusions, could support further investigation on the association between accessibility practices and how gaming worlds can provide alternative spaces and situational refuge for this population, aligned with work by Wästerfors and Hansson [25].

Still, regarding the pandemic context in which the study took place, it is essential to emphasize its influence on the results obtained through the students’ perception of the need to increase interpersonal and “live” relationships with the target audience. Although unintentionally, this is one of the main future directions that emerged from this approach, the need to increase spontaneous and personal contact between the two groups, students and pwID.

While the present study offers relevant insights into the importance of engaging students and pwID, through participatory approaches, in the accessibility and inclusion-driven training of game designers and game developers, it is important to emphasize its exploratory nature. Factors such as the sample size, the sampling strategy, the inclusion of the study in a broader process of formal education, and consequently evaluation, condition how the results obtained can be generalized. Thus, it is relevant to consider this study as a set of preliminary findings, to be further explored in other contexts and through broader methodological approaches.

Besides more extensive studies with similar objectives, exploring and comparing the beliefs of both parties’ views would be crucial to understand the extent of the obtained results. Therefore, future studies should compare students’ perceptions with pwID perceptions about the development process. Through this process, it would be possible to understand if the produced games represent the narrative of pwID, and the cohesion between game designers and the target audience’s beliefs, which would represent an added value.

5. Conclusions

The results obtained in the present study provide empirical bases to game design and development-based learning processes, as a novel approach in the field of game-based learning, which includes accessibility as a pillar while fostering the representation of underrepresented groups, multimodality, and tangibility. Its conclusions, regarding the skills related to games accessibility that were promoted in the students, stress the importance of tightening the bond between academia and civil society organizations, such as NGOs of pwID, to foster social change through participatory media creation, and inclusive learning processes.

Regarding the pedagogical value of the current approach to the game developers/students, it was relevant on two different levels: the development of accessibility-driven skills and decreasing discriminatory beliefs towards individuals with ID. Moreover, students showed lower levels of discriminatory beliefs toward pwID, adopting attitudes more in line with the principles of empowerment and community inclusion. Both results can be seen as relevant for the development of better professionals in the future that can genuinely incorporate accessibility-driven practices into their work while fostering inclusion and representation in the games industry.

The participatory process was heavily conditioned by the restrictions imposed by the COVID-19 pandemic, and characterized by its exploratory nature. Although several efforts were developed to ensure that the voice of the pwID was listened to by the game developers/students, this process was mainly mediated, which can cause different biases. This highlights the relevance of validating the present conclusions in a different context and larger samples. Testing other approaches to sampling, besides convenience, could also be relevant to improve the potential for results' generalization. The lack of subjects fully completing the questionnaires is also a limitation of the present study, which shortened the included sample, while reinforcing higher education students' survey fatigue.

Future studies should also address how these processes result in media representing the narrative of having a disability, as a strategy to increase underrepresented groups' voices while keeping the underpinned methodological concerns. Besides expanding the sample, this must be done by critically analyzing the players' perceptions, framed with the results obtained in the game designers/developers' inquiry.

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