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Storytelling Games for General Anxiety: Clinician Perspectives on Walking Simulator Games as Intervention

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General anxiety is a common mental health condition across the world, with many barriers preventing people from accessing treatments. A growing body of evidence suggests that serious games offer appealing and effective solutions for anxiety. Despite their potential, an understanding of game design qualities and contextual game mechanics in game-based interventions are significantly under-explored, especially for general anxiety. Alternative and emerging game genres may offer new intervention approaches previously overlooked in digital mental health research. We use story-led exploration games, particularly the environmental storytelling walking simulator game genre, as an analytical template to understand new game design strategies and features that can potentially enable engaging and efficacious serious games as interventions for general anxiety. Using semi-structured interviews and thematic analysis, we summarize input from expert clinical participants who identified and evaluated several game design qualities towards developing walking simulators as potential serious game interventions.

CCS Concepts: • Human-centered computing~Human computer interaction (HCI)~Empirical studies in HCI • Applied computing~Life and medical sciences • Software and its engineering~Software organization and properties~Contextual software domains~Virtual worlds software~Interactive games

KEYWORDS: Games, Play, Psychology, Health, Wellbeing, Storytelling

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1 INTRODUCTION

Generalized anxiety disorder (GAD) is one of the most identified common mental health disorders in the UK [1, 2], leading to a range of significant physical symptoms and impairments on life quality and participation [3, 4]. Given the prevalence of GAD and its effects on people's health, one potential approach to improving traditional treatment reach

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and addressing disengagement attrition found in digital health programs [5, 6] is the use of appealing and effective games as interventions [7].

A growing body of evidence indicates the therapeutic viability of serious games for mental health [8], and their advantages over traditional treatments because of their appealing approaches to therapeutic outcomes [9]. However, only a subset of game types has been explored for anxiety disorders, leaving a rich variety of new genres to be investigated [10, 11], and build on previous research to consider other therapeutic modalities and serious game approaches [12]. Hence, studies into other types of serious game genres will offer opportunities for new, undiscovered qualities that can contribute towards a purposeful, disorder-specific intervention for the spectrum of anxiety disorders and more specifically GAD [13].

One potentially fruitful genre that may lend itself well as a GAD intervention is the first-person perspective story-led exploration game, the Walking Simulator (WS). Users walk through immersive game worlds with an emphasis on exploration, discovery, and story-led interactions [14, 15]. This style of game may foster engaging intervention opportunities that optimize the potential benefits of game world exploration found to be associated with users' increased desire to continue playing games [16].

One of the aims in this study is to address the calls for more game design specialization in digital mental health research [17]. Despite the beneficial potential of serious games emerging in research literature, there remains a rich opportunity to explore how game mechanics, design elements and game world content in underexplored genres, such as the WS game, may offer effective mental health interventions [18]. Researchers highlight the importance of understanding game design elements and game mechanics that influence the therapeutic potential of digital health interventions [19], improved engagement [20], and the translation of clinical practice into the application of therapeutic game activities [21].

Our research goal is to address this knowledge gap by finding out how the game design features that make up WS game experience can potentially enable engaging and efficacious serious games as interventions for GAD. To achieve this goal, we ask: (1) Which core potential game design qualities of the WS genre can be employed to help shape a beneficial experience? (2) How can these features potentially integrate therapeutic practices?

Observing notable game research approaches [22, 23], we conduct semi-structured interviews with clinicians and healthcare professionals participating as subject matter expert informants and consultants early in the design development research [24]. As recommended by the National Institute of Health and Care Excellence (NICE) design standards of the Evidence Standards Framework for digital health technologies, our findings build an evidence base of expert credibility and support the inclusion of professional involvement during developmental stages of potential interventions [25]. We provide a set of core WS game design recommendations that can potentially guide clinicians and game designers wishing to employ WS games as GAD interventions.

Our findings identify several key properties, such as the prominence and interactions of specific game world content and storytelling devices of WS games, that have potential to elicit and crucially translate therapeutic practices that can positively impact GAD users [21]. Contributing to knowledge gaps on understanding effective game design qualities that can be applied as interventions for GAD, our study enables an initial understanding of the therapeutic viability of WS games, with potential clinical application into serious games,

guidelines, game frameworks and insights to broader serious games and commercial games that wish to support GAD users.

2 RELATED WORK

2.1 Background on GAD

Considering more accessible and engaging ways to support people living with GAD is commensurate with the increasing underdiagnoses and negative impact of GAD symptoms [26]. GAD's key symptoms include increased emotional arousal associated with excessive worry, heightened tension and panic that can be difficult to control [1]. Treatment uptake for anxiety disorders is also challenged by over-stretched healthcare resources [27], with a significant population living with GAD remaining untreated [28]. Traditional treatments for GAD include pharmacological interventions (e.g. tricyclic antidepressants), cognitive behavioral therapy (CBT) and emerging alternative low intensity therapies, such as mindfulness techniques [28, 29].

2.2 Prior Work on Anxiety and Serious Games

A mere 7.7% of digital health interventions offer a diversity of somatic approaches such as meditation or mindfulness [29]. Existing digital health research for anxiety disorders, including GAD, centers on virtual reality (VR) video approaches [30] and reactive biofeedback experiences [31], along with phobia interventions including aerophobia [32] and social phobias [33]. There are also positive studies into exergames and potential effects on anxiety levels [34].

Other serious game studies for anxiety that implemented GAD scales often used a mixed outcome focus developed for children [35], and adolescents and teenagers [36, 37]. Studies reported promising early results with the 3D 'Journey to Wild Divine', aimed at regulating biofeedback responses and emotional management training for young people with neurodiversity [38, 39]. There were subsequent critiques on the study [40]. 'Dojo', another 3D biofeedback game targeting anxiety among teenagers, reported promising initial effects and engagement, followed by reports of participant's difficulties in maintaining interest and motivation [41]. The adolescent participants criticized the limited number of virtual environmental spaces in 'Dojo', obliging users to repeat completed game spaces [42].

Similarly, an RCT study comparing a successful commercial video game with a neurofeedback serious game for anxiety, 'Mindlight', suggested higher user appeal in the commercial game control arm [43], indicating to us an opportunity to harness the qualities of appeal found in the critically and commercially successful WS genre as potential interventional vehicles.

2.3 Potential of WS Games

We envisage that the experience of playing a WS game can potentially foster a unique sense of user autonomy, conduct the transfer of low intensity therapies, and offer new directions via story-led exploration game genre as GAD interventions [44]. We believe that WS games host a range of unique game design features that have the potential to convey healthcare

pathways through storytelling, which could induce positive effects on users' emotional well-being [45, 46]. WS games uniquely encourage users to build voluntary game interactions from narrative clues found throughout virtual environment exploration, and users' interpretation of story-led game worlds [47, 48]. By appropriating game world storification strategies [49], WS game components have the potential to address the need for appeal and engagement linked with higher retention for improved outcome of interventions [50]. Moreover, WS games offer little or no combat challenges, potentially providing GAD users uniquely accessible and inclusive experiences, reflected by the genre's low barrier to entry, reduction of traditional gaming complexity and removal of aspects of failure or risk such as game death [51, 52]. WS games offer opportunities that are exclusive to the genre, such as autonomous and unique narrative strategies [47], minimalist game world interactions [53], and potentially meditative game experiences, such as that of "slow, solitary, and peaceful walking" [54]. WS games may also increase GAD user engagement said to be linked to the games' intrinsic minimalist narrative triggers, and encouragement of user creativity [55]. Such enhanced engagement could potentially lead to improved retention and thus broader therapeutic application [56].

2.4 Design Elements

There is a knowledge gap in understanding design strategies and features of serious games as interventions, especially for GAD. The relationship between the impact of clinical interventions and their contextual game design processes should be further considered [12, 57]. Recent work using commercial exploration games as an intervention for depressive symptoms, highlighted the importance of drawing on game mechanics to be "specifically designed" to achieve a successful applied game approach [58]. Bridging game design mechanisms and contextual qualities may elicit effective game-based interventions in this under-explored area [10, 59]. The alternative game qualities of the WS game genre may appeal to and benefit a broader diversity of users with different play requirements. WS games, with a view to smartphone scale-up, address a potential compromise of accessibility - VR may be too expensive, and biofeedback technology may be cumbersome. The WS format may address the under-researched potential using design qualities of story-led games to understand elements that can "affect variables on the pathways to change" [60].

Therefore, we hypothesize that exploring WS game design qualities and contextual game mechanics as potential conductors of therapeutic principles, may reveal important data on variable outcomes and an understanding of how diverse applied game genres can be effective digital interventions for GAD [13]. We work with clinicians based on accessibility and economic viability, leading us to build the proposed serious game design principles via the ubiquitous smartphone [8]. We consider a prospective design implementation pathway using smartphones, adapting to the general acceptability found in digital smartphone app-based retention rates [61]. We identify and evaluate which WS game design features and qualities hold potential interventional merit, addressing a divide between the mental health and game design community through our focus on potential core game dynamics with clinical specialisms for GAD [62].

3 METHODOLOGY

Previous researchers have suggested that mapping the scientific and theoretical foundations into game mechanics can generate insights identifying effective game elements [63], and experts in the field should be part of reviewing and shaping proposed interventions [64]. Therefore, we haven't included users in this early phase of this research, as potential target users do not necessarily "possess the knowledge about the strategies that will assist them in alleviating distress and coping with psychological difficulties" [65]. To this end, our study will draw on the input of clinician subject experts to create a foundation of evidence using informant design [12, 66], to help shape and guide the development of clinical game design features of exploration games as potential digital therapeutic applications for GAD [21].

3.1 Participants

We recruited 10 mental health professionals for our study. Participants were researchers and practicing clinicians, including 3 psychiatrists (PSYCH), 3 psychological wellbeing practitioners (PWP), 1 mental health therapist (MHP), 1 senior clinical psychologist (PSY), and 2 senior nurse leaders (SRN). See Table A for a detailed Participant Information Index.

3.2 Recruitment

We recruited participants using the existing University network of clinician contacts including honorary members and representatives engaged with current broader institute projects. Using a snowball recruiting method, potential participants were engaged and contacted via email. We invited participation with necessary participant information sheets (PIS) provided in advance.

3.3 Material Methods

From January 2023 to August 2023, we collected exploratory qualitative data using semi-structured, one-to-one interviews that were audio recorded and transcribed. We drew interview questions from a pre-defined list asked reflexively following a recap of the PIS. The interviews, approximately 75 mins in duration, were reflexive and guided by both prompted and unprompted input from the participants, with a flexible structure of 10 questions in total.

On a practical resource level to minimize participation barriers, due to the time limitations and busy schedules of the participants, we decided that asking the participants to evaluate videos of WS games would limit burdens to a resource-deficient healthcare system and use participant time more effectively. In addition to the impracticality of clinician participants playing games, using non-interactive videos of games has also been shown to yield useful results in game design research [66].

We presented each clinician videos of gameplay from several WS games, selected to showcase defining features and design qualities of the genre so participants could evaluate and comment on them meaningfully. The rationale for game selection is based on definitive examples in the genre. We chose selections of gameplay that illustrated the game genre's conventions, comparable design features, variability of interactions, aesthetics and mechanics [67]. Our selection of games included 'Dear Esther' (2012, Chinese Room), 'Gone

Home' (2013, Fullbright Company), 'Firewatch' (2016, Campo Santo) and 'Everybody's Gone to the Rapture' (2015, Chinese Room) ('Rapture'); see Appendix B for the list of games presented. We presented our selection of WS games in two main videos (5M:07 and 8M:33). Participants were encouraged to speak freely and were provided independent control of the videos. The first video presented revolved around evaluations of virtual environments and game word interactions. The second video revolved around WS storytelling experience and other genre specific qualities such as reduced point-based interactions. The interviews were guided by several main topics that included the therapeutic suitability of WS game world exploration and interaction of virtual environments, storytelling devices, implementation of anxiety reducing techniques and reflections on potential interventional applications of game elements.

3.4 Ethics Approval

The study was approved by the Research Ethics Committees of the University. All participants provided written informed consent.

3.5 Data Analysis

For the data analysis, we undertook a thematic analysis (TA) approach, following the key processes as outlined by Braun and Clarke [68]. Following a process of familiarization of the transcribed interview data, codes were generated inductively based on participant statements. This process helped to exploit the details of theme variability and supported the role of researcher as an interpretative storyteller [69, 70]. Themes and subthemes were then collated and refined for coherency and definition. We reached a point of code stability with 10 participant interviews [71, 72]. We identified several repeated core codes across the WS game design qualities for potential emotional regulation that included environmental spaces for grounding, virtual relaxation exercises, exposure therapy techniques, the addition of virtual companions and storytelling devices. We evaluated key points reflexively with participants input [73]. Following the development of codes as "building blocks" [69], relevant codes were reviewed and shaped into candidate themes and subthemes, then revised and defined for reporting.

4 RESULTS

The participants evaluated the WS games and identified several key game design qualities and features with the potential to reduce user GAD symptoms. On a high level, the themes include: (TH1) Therapeutic potential of WS game world design; (TH2) Therapeutic activities using WS game world content; (TH3) Exposure therapies and emotional regulation approaches through WS game environment design; (TH4) Solitary game experiences and virtual companions; and (TH5) Storytelling devices and their therapeutic potential.

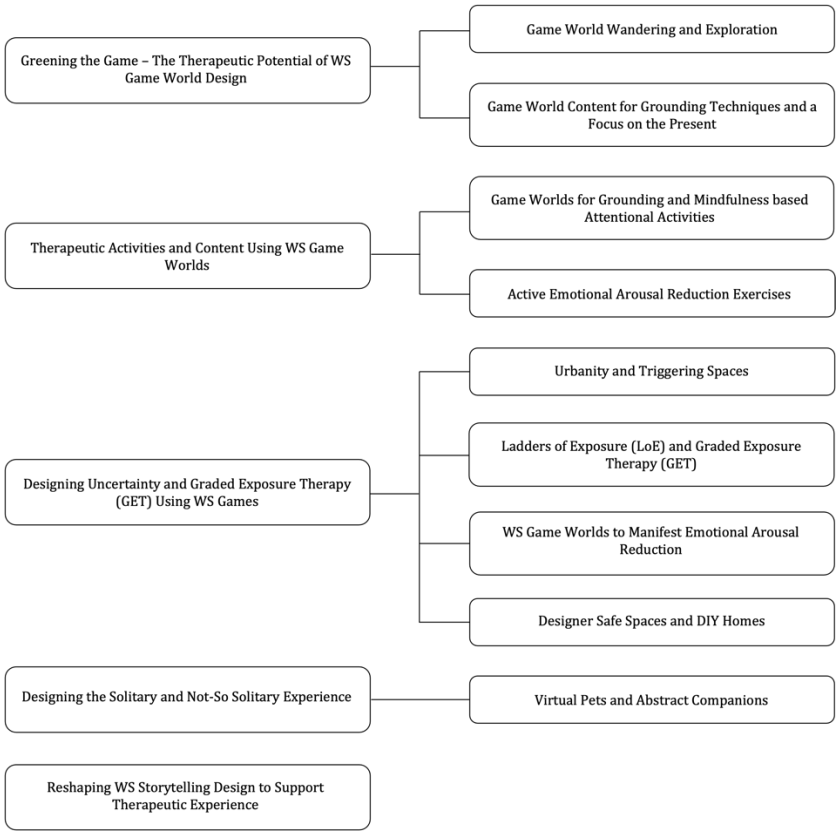

Fig. 1. Thematic map presenting key identified themes and subthemes.

4.1 (TH1) Greening the Game – The Therapeutic Potential of WS Game World Design

The way in which nature-based spaces are presented in WS games was a recurring game feature identified by the participants, with the natural environments often associated with "pleasurable experiences" (PSYCH3). Words such as "grass", "forest", "nature", "green spaces", "water" and "greenery" were descriptors of the game worlds across participants who cited games including 'What Remains of Edith Finch' (2017, Giant Sparrow), 'The Vanishing of Ethan Carter' (2014, The Astronauts), 'Wilderness' (2023, Protopop), 'Dear Esther' and 'Walden' (2017, USC Game Innovation Lab). Participants noted the detailed vegetation design that filled WS game environments: "the countryside, the brambles, that was a nice touch as well" (MHP1). Other participants felt the game environments can provide GAD users a sense of child-like adventure, youthful exploration and possibility, associated with relaxation and a sense of well-being (PWP2).

PSYCH1 emphasized the positive potential of the WS game design aesthetics, colors and sounds associated with the game world natural environments. PWP3, echoed by PWP1, added that the realism of the natural game worlds presented by WS games may be useful for GAD users to walk through, supported by the sound design of unseen but present wildlife, such as "insects buzzing" or the sound of breezy grass. It was highlighted that anxious users

can potentially focus on the detailed atmospheric sounds and draw on the visual senses of the WS game worlds as a link to grounding techniques (MHP1).
However, PSYCH1 also suggested users could be negatively triggered by interactions with the symbols of economic disparity presented in some game environments of the showcased WS game examples, such as well-maintained private gardens and thatched houses: "Most people don't live in places like that. But I wouldn't be using homes and gardens, bear that in mind, it's a private garden, people who are deprived, it will just raise their anxiety."

4.1.1 (TH1.1) Therapeutic Benefits of Game World Wandering Around and Exploration. Walking around and exploring virtual environments is a significant characteristic of WS gameplay. Experiencing a walk through the WS game world, the nature-based aesthetics of WS game spaces, was seen as potentially beneficial: "I think if users were particularly in a heightened state of arousal at any time, immersing yourself into many of those woodland environments wandering around with those ambient natural sounds. I can absolutely see the benefit of just existing there and walking around there and exploring that." (PSYCH3)
PWP1 commented on the ways WS games promote storytelling interactions through game world exploration, providing GAD users potentially helpful autonomy to either follow the story-led game structure, or to freely explore the expansive environments. Considered a potential intervention for GAD, WS games enable adventurous freedom for users to move through nature-based environments, which may be helpful in reducing user anxiety through a sense of distraction (PWP2).

Participants PWP3 and PWP1 resonated on the importance of choice. End users in a potentially heightened state of anxiety may benefit from design configurations that allow users some autonomy in choosing types of calming WS natural environments and the associated aural aesthetics.

4.1.2 (TH1.2) Implementing Game World Content for Grounding Techniques and Designing a Focus on the Present. Grounding involves "contact with the Earth's surface electrons by walking barefoot", with research suggesting some clinical potential, including using artificial grounding techniques [74]. PSYCH2 described grounding as "becoming aware of yourself, your body, your surroundings, and the present". WS game worlds content can divide GAD user attention, providing end users opportunities to engage in emotional regulation exercises by using the detailed natural environments, focusing on the sounds and identifying types of wildlife (MHP1, PSY1, PSYCH2).

Actively encouraging attentional focus on the stimuli of nature-based WS game environments could provide an immersive distraction from negative thoughts and promote a sense of well-being for GAD users: "There's absolutely something about taking notice of your surroundings and having those natural sounds and in fact…to really focus and concentrate on the sort of immersive environment of the computer game…I think it probably would benefit it from having that nature around." (PWP1).

4.2 (TH2) Therapeutic Activities and Content Using WS Game Worlds

4.2.1 (TH2.1) Call of the Wild: Designing WS Game Worlds for Grounding and Mindfulness based Attentional Activities. When asked if emotional regulation for GAD can be achieved using grounding techniques through WS games, PSYCH2 affirmed that if users are in a heightened state of anxiety, there are opportunities for emotional regulation and distress tolerance using visualization skills associated with Dialectical Behavioral Therapy (DBT)

through game world content; "noticing certain things, being asked to notice certain details. Anything that draws you out of, say, an internal turmoil into the present moment, I think would be helpful."

PWP2 echoed a mindfulness approach, advocating for short distraction activities, "mini mindfulness tasks" that can be integrated into the gameplay throughout WS game worlds. PWP3 also highlighted the potential links of mindfulness activities using attentional focus with the immersive content of WS game environments, such as observing nature sounds or counting butterflies to divide users' attention away from their anxiety symptoms. Examining WS game 'Walden' (2017, USC Game Innovation Lab), PSYCH1 saw the game's nature-based induced activities, such as camping, swimming or fishing in virtual lakes, as an important opportunity to enable active distraction or grounding for users: "I would be really pushing for that. The activities that are in green and blue space".

PSYCH2 flagged that the intrinsic nature-based qualities of the detailed WS game environments, such as the "bending reeds or wafting reeds" may not evoke enough distraction for very anxious GAD users, as those qualities may be an insufficient "competition for the anxious mind". Some deliberate activity that can pull users away from their anxieties and, "demands some cognitive tension" to actively distract users could be useful (PSYCH2). This involves using the WS game worlds for its intrinsic environmental qualities, such as digital wildlife, actively engaging mentally through recurring mindful tasks: "it's about trying to capture those repetitive tasks that require a certain amount of mindfulness… some cognitive load or cognitive burden of some sort. Which could be about counting those insects." (PSYCH2).

4.2.2 (TH2.2) Designing Active Emotional Arousal Reduction Exercises. Interactive elements of the WS game environmental content may encourage active exercises for reducing emotional arousal, such as breathing, suggesting a customization of WS game visualizations. By using 'Rapture' as an example, the glowing abstract orbs that move around the WS game environment can be configured to support users using purposeful animations and interactive breathing activity guidance (PSYCH2).

Users may be able to redirect their focus and engage in mindfulness activities, such as counted breathing, using configurations of the most symbolic quality of WS games – the act of walking through spaces and the related sounds of movement:

> "It's a little bit like '5, 4, 3, 2, 1' with the grounding techniques, but it's guiding them through that into the environment. That could be quite helpful...If he (the player) is walking, you could maybe line that up to breathing, stepping for 4, and then holding for 4, and then breathing out for 4…So, you're using the environment in a helpful way." (MHP1)

SRN2 acknowledged that the WS game can offer therapeutic experiences which can help GAD users regulate emotional states in the first instance, but argued that this genre required design considerations that offer generalizable skills to GAD users applicable in the real world to challenge ruminations: "There is merit in relaxation and controlled breathing but you can't avoid the world…You want the game to teach people techniques that they can take out of the game and try in the real world" (SRN2).

4.3 (TH3) Designing Uncertainty and Graded Exposure Therapy (GET) Using WS

Graded Exposure therapy (GET) is a type of cognitive behavioral therapy (CBT) employed to treat anxiety disorders, involving the hierarchical and stepped exposure of increasingly challenging simulations and emotionally triggering stimulus [75]. When using GET in low intensity psychological therapy, PWP3 elaborated on how WS games could aid users to build tolerance and interact with increasingly challenging WS game spaces as a method of building resilience and anxiety management:

> "As a treatment for GAD…learning to tolerate the discomfort that feels until it's no longer threatening, and then they can move up to the next level…because that is the graded exposure that you're addressing therapeutically in GAD, which is about building up this tolerance."

The participants posited the importance of abstaining from avoidance behaviors and indicated that WS games and their associated environments could help GAD users to engage and manage those fears to improve their coping strategies: "It's okay to have uncertainty, and then to be able to manage that in the game." (MHP1). There is potential for WS game world content to be symbolic and analogous. Qualities of the WS game can be emotionally charged (PWP3) or "cathartic" (PSYCH3), acting as components of safe and triggering situations, as long as the parameters of the game experience are explained to end users (SRN2).

When asked about WS game's darker content or shadowy environments that might increase uncertainty or trigger anxiety in GAD users, participants highlighted the potential of promoting exposure to these game design elements of uncertainty as an opportunity for users to learn to tolerate and manage their anxiety emotions and develop acceptance of those emotions (PWP1).

4.3.1 (TH3.1) Urbanity and Triggering Spaces. In relation to their professional experience working with young people, the participants linked urban qualities and the unpopulated nature of the WS game worlds as anxiety triggering spaces (PWP3, PWP2). Singled out for its potential to be an "anxiety generating image" (PSYCH1), the office-like locations in 'The Stanley Parable' were linked to anxiety-inducing associations of work and schools (PWP2, MHP1, PWP1). Potentially triggering WS game environments also included the mysterious basement space in 'What Remains of Edith Finch' where "bad stuff happens" (PWP3), or night time and dark shadow scenarios in WS games that may be potentially problematic because they bear associations with challenging nocturnal periods for GAD users with a lack of distraction stimuli from their anxiety (PWP2).

4.3.2 (TH3.2) Designing WS Games to Implement Ladders of Exposure (LoE) and Graded Exposure Therapy (GET). WS games, using its integral natural environments, could function as abstract symbols or analogies of certainty and uncertainty to support GAD users to mentally prepare for anxiety-inducing situations ahead: "using the environment and nature as a way of being able to spell out where there might be problems on the horizon" (PWP1).

Describing an implementation of GET in WS games, some participants highlighted design content that evoked natural light, or the use of candlelight, as a potentially useful anchor to support users through challenging spaces such as night time environments (PWP3, MHP1). For GAD users, the analogous and abstract, such as the candles in the night of 'Dear Esther', or even ghostly sources of light seen in 'Rapture', could provide helpful symbolic therapeutic

tools for users to manage their night time uncertainty, providing a sense of direction, comfort, and support (PWP2).

With consideration to WS, game design for GAD users with an informed CBT based "ladder of exposure" (PWP3) could be implemented to gradually build users' anxiety resilience, enable acceptance of anxiety in challenging situations, and develop user tolerance and desensitization to those emotions in stages, via "exposure to uncertainty" (PWP1). In some cases, the input from participants involved a variation of the ways that WS game aesthetic qualities, such as "sunshine as opposed to thunder clouds" (PWP3), could be configured to support GAD users engaging in the graded ladder of GET: "You could really adapt this gaming environment I think to create that ladder" (PWP3).

Using a conceptualized intervention design, the urban environments in some of the example WS games, showcased as anxiety triggering spaces that users could step into and out from, to manage their anxiety through GET design woodland safe spaces using the genre game worlds:

> "I can see some use in these kind(s) of first-person games to help with graduated exposure…I know a lot of my young people will talk about things like bus stations, public transport, school…that interface between those kind of environments, those anxiety provoking environments, and then that transition into that woodland retreat, or escape…rather than just as a relaxation tool…a bit of graduated exposure for those people that might struggle in something like a bus station, or a busy building." (PSYCH3)

SRN2 connected the exploration of WS virtual environments with exposing users, possibly alongside a character in the game, to environments that cause fears as a method to avoid rumination and to find understanding in exposure: "Your player could be somebody in the game exploring these areas, and some other characters in the game could be somebody that talks about lots of fears of going to these places…Part of the reward in the game is learning how to recognize that process, decide not to engage (with the thoughts), and go and do that exposure, and observe what happens and get rewards from that".

The participants understood that it was not possible to return to a specific safe space in WS games and that the gameplay is multi-linear with progression through game worlds mono-directionally. Considering a configuration of the exploration gameplay in WS games, some participants suggested that GAD users can walk between different game worlds – transitioning from nature-based safe spaces and walking to environments that are more challenging (PSYCH3). It is important to offer a calming space as default before giving users, who may be in a heightened state of anxiety, too many overbearing options (SRN1), and then freedom to explore their fears further by venturing out and make progress in a controlled way (PWP1).

As part of a WS styled GET intervention, some participants suggested significant opportunities for GAD users to control a repetitious process of self-managed exposure, emotional management and resilience building using the game worlds (SRN1, PWP3, SRN2). Based on their professional therapeutic work with teenagers, PSYCH3 viewed potential for users to iteratively navigate through walking from safe simulated WS woodland environments to uncertain and anxiety-inducing situations, determining their stay duration

and returning to the natural environment iteratively: “I think I can see there's lots of applications there” (PSYCH3).

PSYCH2 felt the natural environments in WS games were helpful as safe spaces, but raised the importance of end users having options of natural environments as people have differing preferences for helpful safe spaces. PWP2 echoed that WS games offer useful environments and suggested ways of customizing a variety of walking routes using the WS analogy of light, color and tone through the game worlds that can be helpful to end users to support their emotional stability: “It'd be good to have like different paths, with a different feeling, so a darker path, a lighter path...It'd be good to have options”. Equally, when considering designing WS games as an intervention for GAD, participants emphasized the WS design balance between choice and structure. Giving users too many options could be overwhelming and lead to anxiety, therefore a clear set of goals and rules can help people feel more in control, providing enough structure and freedom to explore to help users feel safe and supported (PWP1).

4.3.3 (TH3.3) Using WS Game Worlds to Manifest Emotional Arousal Reduction. PSYCH1 warned that freely providing safe spaces environments to GAD users at any point during the ladder of exposure could inadvertently “reinforce the anxiety”. PSYCH1 recommended that it would be beneficial for users with GAD to try to manage their anxiety reduction within a triggering space before leaving. As in real world therapeutic practice for anxiety, the ability for GAD users to manage access to a variety of triggering WS game world environments, to pace their own exposure, as well as to be able to rate and manage symptoms, can integrate anxiety reduction techniques, such as guided imagery or breathing exercises, into graded exposure ladders, helping users to manage their anxiety whilst being exposed to uncertainty in WS games (SRN1, PSYCH1).

PSYCH2 had some hesitancy about using WS games as a vehicle for ET because users living with GAD can experience universal ruminations; that is, worries and panic thoughts which may attach to any situation, and the presented game situations may not successfully represent the specific worries of GAD users.

4.3.4 (TH3.4) Designer Safe Spaces and DIY Homes. Some participants suggested the benefits of configuring the WS gameplay significantly to add a safe space that the user can access at any time (PWP2). MHP1 suggested the addition of a bespoke safe space to help GAD users manage emotions in relation to uncertainty - a physical location in the game world, accessible at will and customizable through aesthetic modifications:

> “I think that would be helpful because it's comforting, it's in a place of uncertainty when you're feeling really anxious…I think that would be useful. Having a home or a central place that you can make your own is important. Having some autonomy to be able to make your own decisions, have some parts of the world be how you want it to be.” (MHP1)

PWP2 also suggested, based on their work with younger adults, that configured features implemented into WS format can include an additional option to modify and enhance a safe space home base to support users with GAD to feel empowered and make this safe space their own: “They don't have a lot of control over what their bedroom looks like at home because they don't have a lot of finances coming into them to change things.” (PWP2)

Fig. 2. A screen capture image of the game 'Dear Esther' (2012, Chinese Room). © 2017 Sumo Digital Ltd.

4.4 (TH4) Designing the Solitary and Not-So Solitary Experience

WS games are generally individualistic and solitary game experiences consisting of expansive unpopulated game spaces with no characters to interact with. Some participants felt the unpopulated game worlds was a potentially negative characteristic overall for GAD users: “It has a sinister feel without any other signs of life. There were just no people, no sign of life anywhere, it looked like everyone had been exterminated” (PSYCH1). The unpopulated urban environments of the WS games evoked negative feedback from the participants revolving around empty buildings potentially causing anxiety: “Feelings of abandonment are more in those urban areas…there was nothing in it. It was a bit triggering” (PWP3). PWP3 highlighted that, in combination with the aesthetic realism of WS games, the lack of people in the natural spaces and suburban houses featured in the environments was “slightly sinister” and even “a bit post-apocalyptic” (PWP3). Other participants echoed those sentiments regarding the potentially alienating and menacing effect of the solitary game play: “there were definitely places there that felt a bit menacing, a bit more lonely…they weren't just uninhabited, but maybe not even inhabitable.” (PSYCH2).

PWP1 suggested the solitary nature of WS games may induce a diversity of reactions, it could go “one way or the other”, for some end users it may be a beneficial that “there’s no sort of disturbance around”, whereas for other end users it may trigger loneliness or separation anxieties.

When asked if the general quality of abandonment in these kinds of exploration games can be used in some way therapeutically for users with GAD, PSYCH2 indicated that if there is an element of social phobia involved it might be “very useful”. Similarly, PSYCH1 signposted the potential benefits of unoccupied game worlds for people with neurodiversity. As it was outside the scope of this research, neither provided further comment. Some participants elaborated that, especially for end users with coexisting social phobias, the lack of people and empty WS environments could still offer a sense of comfort:

“Maybe there's a quality of what the Germans call, Heimeligkeit. Some environments have a quality of homeliness don't they, so even if it's no one else there, you don't feel alone”. (PSYCH2)

PSY1 suggested that the solitary feature was “a plus in some ways”, providing opportunities for user self-reliance and building user confidence of being alone (PWP2). SRN1 suggested that, from a primary and family care perspective, users being on their own in WS games “will be helpful”, because users may be looking for spaces to “escape people” and have solitary time in the game.

4.4.1 (TH4.1) Implementing Virtual Pets and Abstract Companions. When asked to consider solitary game play in WS games, many participants highlighted the benefits of customizing WS games to adapt, by way of addition, the inclusion of living entities or pets for end users. PSY1 supported adding a living companion if it avoided a talking formula and “as long as it wasn't too cheesy or cartoonish”. A living creature can act as a therapeutic pet symbol to support GAD users in feeling accompanied without activating anxiety ruminations through questions or interactions: “One thing that GAD patients have found really helpful, that I've worked with, is having a pet…or something you could have with you to give you that safe type feeling.” (PWP2).

The inclusion of virtual animals could function as pet companions or “your own little pet” (MHP1). Having choices of a variety of animal-based companions are important, as some animals may trigger anxiety in users who had previous negative experiences with animals (SRN1). The WS game format can be configured to provide choices of companion to reduce loneliness and to reassure: “You could incorporate that into the game, couldn’t you? That would feel a bit less lonely, wouldn’t it? If you’ve got a pet with you” (PSYCH1). Participants suggested the configured addition of options to include “interaction with various gentle, friendly animals” (PSYCH2) into WS games. Participants also expanded on the natural wildlife theme, suggesting that the distraction potential of WS game worlds can be improved if users can engage in rewarding animal interactions that include continuation-based feeding and petting of animals (PSYCH3).

Sound-based companions integrated into a WS game to accompany end users can minimize the sense of solitary abandonment, taking abstract forms in terms of unseen living activity represented through sounds: “Like the sounds of a car going past or somebody clipping the hedges. Or some children's voices in the background, as if they were playing a game” (PWP3). Alternatively, abstract forms, such as light orbs, to symbolically navigate dark and potentially triggering environments can cultivate calmness, if portrayed in a friendly fashion, to help end users regulate their emotions: “This might be something about interacting with entities that are soothing. Rather than people, not necessarily representing people” (PSYCH2).

4.5 (TH5) Reshaping WS Storytelling Design to Support Therapeutic Experience

The use of text fragments is an interactive storytelling design feature particularly unique to the WS game genre. Several participants accepted the use of virtual letters and floating narration-based text as a potentially useful storytelling device in the proposed use of WS games as an intervention for GAD. Two text fragment associated storytelling devices were identified from the WS games that could be potentially useful to people living with GAD: a) virtual handwritten letters for players to read; and b) floating visualized narration text in

the environment or narration subtitles that appear during exploration. Virtual handwritten letters are interactive objects in several WS games which are spread across the game environments to be discovered and read by players as part of an essential narrative device that guides players' trajectory through the game worlds. Some participants factored the WS environments aural and visual text qualities that could lead to therapeutic experience through listening and reading, which could encourage GAD users to engage the senses using "two different parts of the brain" (PWP3).

Several participants indicated an interest in the therapeutic potential of the WS virtual handwritten letters feature to support end users experiencing anxiety through grounding and attentional focus of user senses:

> "It kind of popped up, and it filled the screen…I think having those two senses activated helps, and that's why, with the storytelling, I think (it) would pull people in when the mind is starting to wander off. You're going to focus more, but especially good for those who, if they are sat playing the game and they are starting to worry about things. I think it just pulls them in a little bit more." (PWP2)

Other clinicians agreed on the link between grounding techniques and a strong visual-aural engagement from interactions that may draw on user senses, such as those engaged with WS virtual handwritten letters devices. One participant suggested that the moving light sources from 'Rapture' can work alongside or in tandem with the literary qualities of WS games to direct anxious users through exploration of environments safely (PWP2). Another clinician highlighted that users, as players and readers experiencing anxiety, to interact with the virtual handwritten letters for the potential of the storytelling device to support in grounding: "You can read the text on the books. The letter was presented to you so you could read it, and then you can click off…it's a bit sensory…someone speaking to you, and having the written text as well as the voice is helpful". (MHP1)

Some participants relayed accessibility concerns, with PSYCH1 positing that the overall storytelling approach of WS games may not be conducive as an intervention. The long swathes of text and information, intrinsic in the WS letter device, could impact negatively on users' anxiety, raising issues on the visibility duration of texts and letter reading functionalities in the showcased example game 'What Remains of Edith Finch':

> "Too much reading. Particularly if you're anxious. It's just too many words…Because you don't know how long to leave it on the screen for, before people can finish reading it." (PSYCH1)

Potential modifications could be made to the storytelling device that include reducing text density and simplifying language: "It's really important to get the number of words down. Keep it down to 'Age 13' in terms of complexity." (PSYCH1).

Another storytelling device in the notable walking simulator games, such as 'Dear Esther' or 'What Remains of Edith Finch', uses either subtitles to reflect the words of the narrator's voice, or explicitly integrates text of the narrator into the environment. The participants who acknowledged the narrator's text visualized into the game, viewed its therapeutic potential favorably, for autonomy as a storytelling game intervention tool (PWP1). However, the same clinician was concerned about the potential for reading of texts to be

"difficult in terms of access for some young people" (PWP1). Other participants were also concerned about potential negative outcomes that reading narration text in a game would have on a player experiencing anxiety: "thinking about people's reading speeds, but also when people are anxious, they are not focusing as well as they may normally…especially if they find it difficult to listen and read, it might just trigger anxiety". (PWP3)

There were other concerns surrounding equalities and inclusion about the kinds of language content and accents used in the WS game, 'Lake Ridden', to present talking characters. PSYCH1 felt some of the dialogue spoken by the characters was problematic: "That's just so irritating, who says "Dolly". For lots of reasons...Certainly not people living on a council estate in Peckham…Who would know what an apothecary means? That whole language is totally out of touch" (PSYCH1).

PSY1 and MHP1 suggested that potentially, the WS texts and narrator voices can support users engaging in mindfulness, by observing the game environment and engaging their senses through attentional focus or mental tasks with environmental stimuli: "having something that talks you through doing that" (PWP2) or using narrator voices and text therapeutically to guide and evoke an active relaxation breathing process to calm episodes of heightened anxiety (PSYCH2). Again, the importance of choice, from toggling voices on or off, choices of gender identity, to speed or tone, was important for participants (SRN1, PSYCH1, MHP1).

5 DISCUSSION

The focus of this paper was to explore the ways that WS core game design qualities and strategies can lend themselves to potentially support or integrate therapeutic practices that can positively impact GAD users through gameplay. Overall input from the expert participants were generally positive about the WS core design qualities as a potential game-based intervention for GAD. Our findings suggest that the WS format presents GAD users with potentially appealing, safe and immersive therapeutic opportunities to motivate user's adoption and mastering of effective anxiety reducing strategies. Our surprising findings also reveal potential design implications for improved therapeutic experience harnessed by adaptations and configurations in interactive storytelling tools, and ways to shape core game genre design mechanisms as beneficial interventions for GAD.

5.1 Designing Therapeutic WS Game Worlds, Wandering, Mindfulness and Exploration

Our findings demonstrate significant positive feedback from the participants about the therapeutic potential of core elements of WS game worlds to evoke calming experiences for GAD users, the absence of anxiety, and a potential digital space of hedonic well-being [76]. Participants agreed that WS game environments and considered design of the immersive environments can harness the mental health benefits associated with interacting with and noticing nature, as well as offering alternative approaches to improving people's access to nature [77, 78, 79], echoing previous studies suggesting higher positive experience in virtual environments over real environments when presence and immersion were achieved [80].

We recognize that potential elements of real natural environments won't be accurately mimicked by WS games, however, this genre of storytelling games can also offer new ways to access realistic natural environments that might not be easily available to users [81, 82].

Design considerations from this study may be potentially exploited in future research looking into WS design factors affecting immersion, game worlds and exploration through new genre of storytelling games.

Our participants emphasized the potential of emotional regulation for GAD users via game world exploring and 'wandering around' the atmospheric nature-based environments, a design quality that the WS genre is known for [52, 54]. This novel promotion of game world discovery and freedom, potentially offers design opportunities to naturally foster a sense of autonomy that may be beneficial for mental health interventions [83].

The participants saw opportunities in customizing design of WS game environments to integrate therapeutic activities, such as mindfulness exercises [84], and short diaphragm breathing known to be helpful for anxiety [85]. Our findings offer early-stage data on potential design considerations of WS inspired game worlds that may build on previous research about the effective digital delivery of interactive mindfulness activities, using story-led exploration games [86].

Therefore, future researchers or game developers could potentially build on the game world activities which this genre offers, to support the therapeutic generalizability of exercises fused into the WS story-led gameplay [87]. It is of note that WS games 'Stanley Parable' and 'Dear Esther' were modifications (mods) that leveraged the source engine tools, assets and physics of the commercial game Half Life 2 [88]. Given that commercial games have the potential for greater adherence and cost effectiveness [89], there is an opportunity for the design outcomes described in this paper to be implemented by developers as walking simulator mods to existing commercial games.

Our research uncovers a further understanding of intrinsic game factors and working mechanisms deemed important in broader digital mental health applications [90]. Follow up studies in design iteration and user input on acceptability that develop and evaluate the key characteristics identified here will help set formative guidelines for the wider research community.

5.2 Reshaping WS Game World Design for Graded Exposure Therapy (GET)

Our findings provide preliminary suggestions which could help inform game level design to sequence both safe and anxiety-triggering spaces in WS games to support a process of exposure when using GET. Many participants fleshed out how a ladder of exposure (LoE) can be integrated using WS environments, to induce a designed repetitious and iterative process for approaching GET [75]. Some participants also viewed symbolic design features found in WS games, such as light orbs or virtual candle light, as potentially useful design support tools that can draw on the potential benefits of using virtual candle gazing for focus and attention [91].

Intrinsic qualities of WS games, such as game world exploration, can offer users new ways to maximize the potential benefits of "free time" [43], and hedonic experiences through user choice, preference and control [92]. These qualities may cultivate the therapeutic design potential of this genre's game spaces and reduce potential negative outcomes of using serious games with GET, such as user discomfort with poorly executed exposure to triggering game environment and treatment avoidance [75].

5.3 Being Alone in WS Games, Designing Abstract Companions

WS games are generally solitary play experiences, with significant gameplay engaged in exploring expansive unpopulated spaces [51]. Some participants alerted that this game feature may not be conducive to helping GAD users. To mitigate this particular risk, future research can consider the addition of therapeutic creatures and virtual companions, inspired by game design aesthetics of WS game as a configurable design feature. Combined with GET, the normally unpopulated game world design quality of WS games could be potentially useful to GAD users as safe spaces and for anxious users with neurodiversity.

5.4 Therapeutic Storytelling Tools, Game Designing Text Fragments and Narration

A key storytelling feature of WS games is the use and reading of text and listening to voice narration [55], forming a hybrid of game playing and interactive literature experience [53]. Text fragments, such as virtual handwritten letters or floating visualized narrator texts as subtitles, were met positively by the expert participants, with provisos for the configuration and adaptation of this storytelling device to facilitate the players sense of immersion and involvement in the game world [93]. This WS design feature potentially opens game design implications associated with narrative activities that may increase empathy and positive attitudes [94], as well as diversifying approaches to how we implement narrative devices in storytelling serious games [95]. However, to strike a balance amongst causing adverse outcomes for people feeling anxious, user accessibility [96], and negative outcomes of overly simplified game content and mechanics [97, 98], means clinician and game developers should carefully observe text density, speed, duration, and language, without compromising the appeal and therapeutic potential for literary storytelling uniquely offered by WS game.

The findings on these narrative game design devices may warrant further research whilst observing the UK guidelines for digital health and care technologies on equalities and inclusivity considerations asking for equitable access to digital experiences for all users with anxiety [99].

5.5 Concepts in Healthcare Application

In a broader discussion with the participants, our findings provide some early insights of the potential clinical implementation and adoption of the core design elements in the story-led WS genre as GAD interventions into therapy or in-the-wild support. Some participants indicated that design qualities and features of WS games might facilitate a self-directed approach for GAD users that may work well as part of a pre-CBT waitlist scheme, such as the Improving Access to Psychological Therapies (IAPT) program. Some participants also noted the potential of applying WS games as a relapse prevention tool or in between therapy sessions as a blended clinician guided model, echoing previous serious game research suggesting an adjunct digital treatment model [42]. The application of WS games, and their potential identified game mechanisms, as an intervention in a health service context requires further investigation.

6 LIMITATIONS

There may be a range of other potential game design qualities not discussed. This may be due to a lack of game design knowledge often found in digital health research [18], or a lack of time and resources during this research to mine deeper into the relevant WS game design dynamics and their associated possibilities. We observe that our findings indicate that the commercial or off-the-shelf WS games may not be suitable for immediate use in interventions for many reasons (e.g. anxiety triggering content, language accessibility) and as a result, there will need to be some customized design mechanics if WS games are to be used for GAD. Due to time limitation with the participants and their busy schedules, participants watched several clips of WS gameplay which, although comprehensive and indicative of the key characteristics of WS genre across several games, excluded the potential benefits of participant playtesting. We note that there were numerous challenges for the participants to play the games due to time constraints, and as such, this tradeoff is a pragmatic consequence of having access to the expert study participants. However, the clinicians offered useful initial insights and framework data from analyzing the media that open opportunities for target users to build on in future studies.

All the clinicians in this study were working in a UK context. We acknowledge that there may be differences in other healthcare systems, warranting further study to determine similarities or differences in outcomes for potential diverse target groups. We involved a small group of expert participants, rather than directly with users, in our qualitative research study. We acknowledge that not working with patients is a limitation, but an acceptable one in our preliminary research stage and following recommendations of the NICE Evidence Standards Framework for digital health technologies [25]. We are conscious that this framework hasn't been vetted by all stakeholders, yet obtaining new knowledge from domain experts into this framework contributes a credible foundation to build on at this early stage. Obtaining user-centered feedback on the expert clinician input, prototype evaluations and validating acceptance are the important next steps in our work on the development of WS games as an intervention.

7 CONCLUSION

There is a gap of knowledge regarding the role of design and game experience in existing serious game and anxiety studies. The data generated from this study responds to calls for non-pharmacological approaches that seek an understanding of design features and qualities towards transparent, accessible and inclusive game-based interventions for anxiety disorders. Our study identifies clinician recommended WS game design principles and contextual qualities that may help game designers and mental health professionals work towards new research on novel and engaging story-led game tools suitable for GAD interventions. To the best of our knowledge, this is the first study to report on data generated by mental health experts regarding the potential use of design qualities of story-led exploration games, particularly the WS game genre, as an interventional framework. This offers new data that can be shaped to help regulate GAD user emotional levels and develop skills for anxiety management through game design principles and game world elements for a wider mental health intervention remit.

However, we acknowledge that GAD is a complex condition which requires some of the identified WS game elements to be blended and reshaped to enhance its application as an intervention. We found that there isn't an individual approach that WS games could be implemented for GAD. The multi-use potential of WS serious games requires different design decisions within the broader framework of the genre and we suggest that more research is needed to consider specific mental health conditions and user groups. Future research can explore how the rich and multi-faceted mechanisms of story-led exploration games provide opportunities between clinicians and users.

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A PARTICIPANT INFORMATION INDEX TABLE

Table A.1. Participant Information Index Table

CHI Index	Role	Experience
PWP1	Senior Children and Young Person's Psychological Wellbeing Practitioner	Specializes in evidence-based low intensity cognitive behavioral therapy for young people, and improving access to psychological therapies programs
PWP2	Psychological Wellbeing Practitioner	Expertise in low intensity cognitive behavior therapy (CBT) interventions for children and adolescents with emotional problems
MHP1	CBT Clinician Therapist	Cognitive Behavioral Therapy
PSYCH1	Consultant Psychiatrist	Mood Disorders. Service Delivery
PWP3	Psychological Wellbeing Practitioner	Psychological interventions for common mental health disorders. Neurology. Occupation mental health
PSYCH2	Psychiatrist.	Psycho-pharmacologist. Forensic Psychiatry of Adolescence.

PSYCH3	Psychiatrist	CBT and Mental Health Interventions
SRN1	Senior Nurse	Clinical Trials. Neurology. Psychiatry. Cognition Disorders. Nursing. Mental Health. Cognitive Impairment
SRN2	Senior Nurse. Cognitive Behavioral Therapist	CBT. Psychological interventions for common mental health disorders.
PSY1	Senior Clinical Psychologist	Neurodevelopment. Environmental Spaces.

B LUDOGRAPHY LIST - WS GAMES PRESENTED TO EXPERT PARTICIPANTS

1. Fi Silva, 2017, A Bright Light in the Middle of the Ocean
2. The Chinese Room, 2012, Dear Esther
3. Eastshade Studio, 2019, Eastshade
4. The Chinese Room, 2015, Everybody's Gone to the Rapture
5. Campo Santo, 2016, Firewatch (2016, Campo Santo)
6. The Fullbright Company, 2013, Gone Home
7. Midnight Hub, 2018, Lake Ridden
8. Galactic Café, 2013, The Stanley Parable
9. The Astronauts, 2014, The Vanishing of Ethan Carter
10. Giant Sparrow, 2017, What Remains of Edith Finch
11. USC Game Innovation Lab, 2017, Walden

C LUDOGRAPHY LIST – OPTIONAL GAMES PRESENTED REFLEXIVELY

1. Kongregate, 2017, The Trail
2. Liminal Senses, 2021, Count Sheep ASMR
3. Protopop, 2023, Wilderness

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