

Identifying Commercial Games with Therapeutic Potential through a Content Analysis of Steam Reviews

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While evidence supports that some commercial off-the-shelf video games may promote mental wellbeing, it is an extensive time investment to experimentally identify games that benefit players. The time delay between commercial games research and commercial game development can render such research out-of-date. In this work, we explore player-written game reviews as a way to expeditiously identifying games with potential benefits for mental wellbeing. Through a content analysis of review data, we found that players publicly disclose experiences consistent with self-care. Our analysis generated categories related to coping and recovery, emotional regulation, social connectedness, and obsessive play. Through this process, we identified several games as strong candidates for further research. Our work contributes to an emerging research agenda of commercial video games as therapy (VGTx), by providing a technique for rapidly identifying games with therapeutic potential. Further, we demonstrate that Steam user reviews are a valuable source of affective player experience data—a contribution with broad implications for player experience research.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**; • **Applied computing** → **Consumer health**; **Health informatics**; **Computer games**.

Additional Key Words and Phrases: video game therapy, affective computing, game selection procedure, coping and recovery, emotional regulation, social connectedness, obsessive passion, game reviews, content analysis

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1 INTRODUCTION

In recent years, there has been substantial discussion around whether or not commercial off-the-shelf (COTS) video games have ‘therapeutic potential’ [18] — i.e. a benefit to mental wellbeing [18, 40, 45]. Overall, the results within related work have been promising: playing commercial games has been positively correlated with wellbeing [45]. There is evidence that video games can facilitate catharsis and mood repair [79], can improve wellbeing by satisfying basic psychological needs [93], and can help people to cope with and recover from difficult life experiences [43]. Commercial games have even been shown to initiate a reduction in symptoms for mental health illnesses such as depression [77, 78], anxiety [35], and post-traumatic stress disorder [29]. Military veterans who regularly play video games and have also received treatment for mental or behavioural health problems report that games offer them mental wellbeing benefits, and benefits associated with

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mental health recovery [13]. Taken together, this suggests that commercial games can positively affect—and in some cases transform—the lives of players.

Despite evidence of these benefits, it is clear that treating mental health issues is not as simple as playing the latest hit game. Chiefly, games are not a substitute for therapy. Beyond that, all player experiences are distinct, and different games (even those within the same genre or franchise) can lead to vastly different player experiences. While it has been suggested that the results from a small sample of games can generalize to a broad genre like ‘casual games’ [79], work by Vella et al. has found that genre preferences (including casual games) do not predict player wellbeing [98]. This suggests that the benefits of games should be identified on a game-by-game basis, rather than a feature-by-feature or genre by genre basis. This poses a set of challenges for researchers in this space to overcome.

At its core, the “video games as therapy” (VGTx) research agenda seeks to create or identify games that support players’ mental health needs (importantly, it is not an attempt to replace traditional therapy). While a standard vocabulary around games that enhance mental wellbeing has yet not emerged [18], foundational VGTx work refers to these games as having ‘therapeutic potential’ [18]. The current approach to identifying games with therapeutic potential is to conduct experimental investigations (typically randomized controlled trials), which has been critiqued as an overreliance on one data type [40]. Recent work by Colder Carras et al. called for interdisciplinary research efforts to explore the use of COTS video games as therapy [18]. Their work identified a major problem for the research community—that the current research paradigm is not able to keep pace with changes in game technologies, game communities, and games themselves. In the time that it may take to acquire funding and ethical approval, carry out a study, and report research on video games with therapeutic potential, several factors may make the findings obsolete. For example, as new games emerge, a game (or even genre) may fall out of fashion—limiting the scalability of a deployment, and possibly affecting the player experience in such a way that the game no longer provides its reported benefits. *Bejeweled 2* is widely cited as a COTS game that is linked to alleviating symptoms of stress, depression and anxiety [79], but the game is now over 15 years old. While old games can certainly be good games, and may remain beneficial, player expectations have shifted dramatically over time, and the Steam game distribution platform shows fewer than 40 daily peak concurrent players of *Bejeweled 2* as of February 2021. This sharp decline in popularity is a necessary consideration when trying to establish a scalable VGTx solution. Beyond falling out of favour with players, popular game franchises continually update their games in substantive ways through new titles, updates, and special editions or ‘seasons’ that, although they may not change the core mechanics, do change gameplay and interaction enough to affect the potential benefits to players. It has been argued that some of the early work discussing social connectedness effects related to guilds in *World of Warcraft* may now be obsolete, as the game’s subsequent updates have substantially reduced the importance and role of guilds [18]. Industry partnerships may help various facets of data collection [45], though many of these limitations continue to apply. This illustrates the need for an expedited approach for identifying games that have the potential to support players’ mental wellbeing.

1.1 Our Approach

While identifying candidates on a game-by-game basis can be successful in some cases, a key problem is determining which games to investigate. Beyond that, the current research approach takes too long, and puts its own findings at risk of obsolescence shortly after or even prior to publication. To address these problems, we conducted a study to explore an alternative approach to the current COTS VGTx method of choosing candidate games. *To avoid the limitations imposed by the rapid pace of the game community, we use disclosures from the game community to help*

us to rapidly identify COTS with VGTx potential. In particular, we analyzed game user reviews on the digital games platform Steam, and our study investigated whether (and to what extent) players describe VGTx-related benefits within their reviews. Previous work has made use of publicly available game reviews to establish heuristics for player experience evaluation [50]. While this prior approach showed the value of game critic reviews, the reviews of the players themselves could be beneficial, particularly as pseudonymized reviews may contain greater disclosure via the online disinhibition effect [50]. We argue that the data within user reviews is a valuable data source to determine whether and how people are using games for self-care.

We carried out an inductive content analysis with the top 50 reviews of each of the top 50 Steam games (2500 top-rated reviews total). Our findings provide evidence that players do describe mental health benefits within publicly available Steam game user reviews—particularly in relation to the themes of coping and recovery, emotional regulation, obsessive passion, and social connectedness. Further, the reports of these benefits clustered around seven video game titles. Our experience of reducing a sample of 50 of the highest rated games on Steam to a collection of seven games (many of which are lesser known independent titles) shows that our approach is effective at rapidly cutting through the noise and identifying games that may have high probability of offering benefits at scale. In a second step, we demonstrate that there is value in our approach by providing insight into how players link game features with VGTx, using the Mechanics-Dynamics-Aesthetics structural framework of game design [38].

The core contribution of this work is a player-centric approach to rapidly identifying commercial games with therapeutic potential. First, we identified that players disclose mental health factors in game user reviews—a finding that likely has implications beyond our current use case. By analyzing publicly accessible player review data, researchers can expeditiously identify potentially beneficial COTS games as part of the game selection process. We argue that this work can greatly expedite the current approach to identifying games that could support players' mental health needs.

2 RELATED WORK

2.1 Video Games as Therapy

Granic et al.'s work, *The Benefits of Playing Video Games* [40], was one of the first major explorations of the emotional and psychosocial benefits of video games. In their discussion of future research directions, Granic et al. proposed that games represent a “radical new approach to intervention”, which may be able to prevent and treat mental health problems while fostering mental wellbeing [40]. Further, it highlighted that the majority of studies in this area have been conducted using survey measures, and that relying exclusively on this data type limits the research community's understanding of how video games may be used as mental health intervention.

As this area has matured, emerging work by Colder Carras et al. has called for an interdisciplinary research agenda focused on exploring the applications and impact of commercial off-the-shelf games in therapeutic contexts [18]. Colder Carras et al.'s work synthesized many of the findings of VGTx research to date, and highlighted that games have shown benefits in areas such as: assessment and monitoring, cognitive distraction, mental health pathologies (e.g., anxiety, depression, post-traumatic stress disorder and schizophrenia), neurological rehabilitation, prevention of intrusive traumatic memories, psychotherapy, and social skills training. Their discussion also highlighted that commercial games have an advantage over serious games. In particular, they note that serious games have been compared to ‘chocolate-coated broccoli’—hinting at an inherent lack of palatability [18]. Extending on that, they argue that commercial VGTx are more analogous to “chocolate-coated strawberries”—a more palatable, and ecologically valid combination of benefits and appeal.

A point made by both Granic et al. and Colder Carras et al. is that games represent a highly accessible form of mental health intervention. It is generally believed that as few as a quarter to a third of people with a diagnosable mental health disorder will seek regular professional help [3, 62]. While games are not a substitute for traditional mental health services, games may help to alleviate this problem, as they are highly accessible, and can reach populations that have a difficult time accessing treatment [40]. Further, in an investigation into the intervention potential of games for mental health problems, Mandryk and Birk [56] found that players with depression were 'activating' (sufficiently motivated) enough to play games several times a week, and often daily; that although players with mental health issues use all types of platforms for playing, there was a preference for desktop play; and that there were no genre preferences, indicating that people with depression played games in a variety of genres. With video games being a self-administered intervention, they afford people an appealing, cost effective, stigma free, and unobtrusive way to cope with mental health issues.

With that in mind, the success of commercial video games as a therapeutic intervention hinges on whether or not people are actually willing to use them as an intervention. Recent work by Poppelaars et al. found evidence that providing explicit mental health messaging about a game can prompt young adults with elevated mental health symptoms to play it [72]. Their study compared two conditions, one in which the game was promoted as promoting mental health, and one in which the game was promoted as strictly entertainment. Poppelaars found that young adults were four times more likely to elect to play the game when it was explicitly promoted as being beneficial for mental health, as compared to when the game was promoted as entertaining [72]. This suggests that explicit mental health messaging is not a deterrent to people struggling with mental health issues, and that it may instead strongly encourage them to play games that claim to support mental health. Despite this difference in messaging, there were no differences in player experience in the sample of young adults, such that players from all conditions benefited across the same constructs.

Taken together, these results support the idea that commercial off-the-shelf video games can be beneficial, and that explicit messaging can encourage people with mental health issues to use them as a mental health intervention. This suggests that COTS VGTx have many of the necessary attributes to become a scalable mental health intervention. However, a central problem remains: game technologies, game communities, and games themselves update at a rate that makes it difficult for research to keep pace [18]. For the research agenda to be successful, it will need to rapidly identify VGTx games. One solution for this is to explore video game selection procedures for experimental research.

2.2 Game Selection Processes

The time, resources, and rigor required to conduct and report a robust randomized controlled trial suggests that researchers should include a detailed game selection process; however, there is limited evidence of any focus on game selection procedures in the literature. In work investigating VGTx effects, the selection of games appears somewhat arbitrary—many researchers select games based on hunches or personal preferences [61]. To further illustrate this problem, several studies have focused on games created by the game developer PopCap Games, such as *Bejeweled II*, *Bookworm Adventures*, *Peggle*, and *Plants Versus Zombies* [35, 77, 79]. The selection process for these games is not reported, beyond a broad focus on the genre of 'casual games'. While this type of selection criteria does not undermine the important contribution of these studies, it does raise concerns around generalizability. To further improve study design and the quality of research findings, researchers need structured game selection processes [94].

Research investigating the effects of commercial off-the-shelf games often fails to report or justify the game selection process [94]. Recent work by Tyack et al. [94] sought to address this problem

by identifying the benefits associated with a justified game selection process, and outlines two approaches that researchers can take to create a shortlist of appropriate games [94]. Their first approach involves using publicly available metadata elements such as genre, platform, or maximum number of players; while the second approach applies the Mechanics, Dynamics, Aesthetics (MDA) framework [51] to analyze a game's attributes, player behaviours, and player experiences [94]. Tyack et al. argue that in the absence of existing research, approaching video game selection from a design perspective is justifiable, and that the MDA framework can further support these decisions [94].

2.3 Leveraging Game Reviews

Research has found that game reviews contain a depth of themes and topics, providing a rich source of discourse around games [103]. Data from game reviews gives insight into player experience phenomena. These insights have been applied in a variety of ways—such as in the development of usability heuristics for PC games [70]. User reviews have also been examined in the context of exploring smartphone addiction [7]. A recent empirical study of Steam reviews by Lin et al., concluded that user reviews offer a depth of insight that can be leveraged by both researchers and game developers[52]. With negative reviews offering developers insight into how to remedy their game design, negative reviews have been a large focus of prior work. However, Lin et al., highlights that positive reviews have a depth of detail, and recommends further investigation into how positive user reviews can be leveraged [52].

2.4 Gaps in the Literature

One of the largest issues facing the VGTx research agenda is the relatively slow pace of identifying games with VGTx potential [18]. With VGTx related research often failing to report their game selection process, Tyack et al.'s formalized game selection process could be applied to partially alleviate this [94]. However, while using metadata and the MDA framework [51] is a rational approach to game identification in many contexts, we know that COTS games are already helping people in the wild [18, 40]—finding new ways to use public data about these existing experiences could provide a player-centric approach to identifying candidate COTS games for VGTx studies. With Steam user reviews being a source of rich qualitative data [52], a game selection process that leverages user reviews could allow VGTx research to keep closer pace with game communities.

3 METHODS

We explored the core problem of whether public game reviews can be used to identify candidates for VGTx research. It is important to note that our intended contribution is not to evaluate the efficacy of the identified commercial games, but rather to provide an expedited method for identifying commercial games that may have therapeutic potential—a step that will allow interdisciplinary researchers in the VGTx field to direct their research efforts at games that have early evidence of benefits. To achieve this, we structured our investigation around the following set of research questions that underlie the feasibility and potential application of the approach:

- RQ1. Do players disclose how a game has influenced their mental health in public forums?
- RQ2. What categories of mental health effects do players disclose in public forums?
- RQ3. How frequently do game reviews include disclosure about mental health?
- RQ4. What game mechanics, dynamics, and aesthetics co-occur with mental health disclosures?
- RQ5. Can game reviews be used to identify potentially therapeutic games?

3.1 Inductive Content Analysis of Highly Rated Games

To address RQ1 through RQ4, we conducted an inductive content analysis on player-written user reviews for highly-rated games. We chose the Steam distribution platform, as Steam is a popular platform for PC games, it has been discussed as an avenue for future research in the literature [52], and new games can receive thousands of written user reviews within days of release. We also chose to use highly-rated games, because prior work suggests that analyzing games with similar ratings can decrease the risk that differences in observations may occur due to the sample being diverse in quality [44].

3.1.1 Sampling Strategy.

While we had initially hoped to collect the 50 highest-rated games on the Steam platform, we quickly realized that a set of filters had to be applied in order to account for nuances of the platform. Steam appears to code some visual novels as ‘games’ owing to a trivial degree of interactivity. These visual novels were generally sexually explicit and are not representative of what is typically classified as a COTS game. As such, titles with the tags ‘Visual Novel’ and ‘Hentai’ were filtered from our list of games. Similarly, some games were essentially duplications of other games (e.g. *The Witcher 3: Wild Hunt* and *The Witcher 3: Wild Hunt – Game of The Year Edition*); in these instances, we opted to only include the entry with the highest number of user reviews. Of note, Steam only includes games that have at least 500 reviews in its highest-rated games list.

Based on these filters, we used a simple web scraper to collect the English review data for the 50 highest-rated games on the Steam platform. For each of the 50 games that met our selection criteria, we collected the 50 highest-rated user reviews—2500 user reviews in total. While users on the Steam platform typically use pseudonyms, we intentionally opted not to collect usernames owing to ethical considerations.

3.1.2 Generating Categories.

Using the filtered data sample, we conducted an inductive content analysis [30]—a methodology similar to an inductive thematic analysis [11]. In the first stage, we created an initial set of codes using the qualitative data analysis software NVivo. All members of the research team hold doctoral degrees, and have prior training in qualitative methods. To generate the codes, we took a latent analysis approach (i.e., a non-literal interpretation of what is being said) because game cultures and reviews often use satire, memetics, and hyperbole. Our initial codes looked at both potential effects on mental health, as well as features that may be supportive of mental health. After this initial coding process, provisional categories (analogous to themes) were discussed by all authors. Through this process, two categories (‘coping’ and ‘recovery’) were collapsed into a single category, as many instances of both ‘coping’ and ‘recovery’ were co-occurring. This refinement process supported five provisional categories and resulted in four final categories. With our categories established, we then coded the full set of data—using a constant comparative analysis approach [11]. The full set of data was coded, and no new categories were identified.

3.1.3 Calculating Frequencies.

We calculated the frequency with which reviews contained material about each category, such that we could report rank orders for each categorization type. In addition, we calculated the frequency of each category for each game. We report this data in a set of rank-ordered lists below.

3.2 Structural Analysis of Game Features

There are many ways in which games have been deconstructed [10, 37]; however, we employed the Mechanics, Dynamics, Aesthetics (MDA) Framework [51] to guide our structural analysis of the game’s features, due to its explicit focus on emotional experiences that result from play.

According to MDA, mechanics are the specific rules, actions, and behaviours that a game provides to a player, and describe how the system responds. Dynamics are the experiences resulting from the execution of mechanics by the player and the interactions with the game system. Finally, aesthetics are the emotional experiences evoked in the player through the dynamics of play. The MDA framework can be applied in both directions [51]: designers can decide on the emotions (aesthetics) they wish for players to experience, and then design the dynamics and mechanics that evoke this intended emotional experience. Alternatively, designers can critically assess how the mechanics yield different experiences (dynamics) and emotions (aesthetics) during play. We take the latter approach in our analysis.

4 RESULTS

This section details results for our inductive content analysis. Results are presented in the order in which the analyses were conducted. Some quotes have been edited slightly to increase their readability.

4.1 Do players disclose how a game has influenced their mental health in public forums? (RQ1)

Yes. Our analysis shows that some players are willing to disclose how a game has influenced their mental health in public forums. From the 2500 top-rated reviews, we identified 290 reviews that contain disclosures that relate to emotional states and mental health.

We identified at least one disclosure in 40 out of the 50 games sampled. The 10 games that did not include any disclosures were: *Baba is You* [41], *Epic Battle Fantasy 5* [60], *Ty the Tasmanian Tiger* [59], *The Witch's House MV* [38], *The Binding of Isaac: Rebirth* [66], *The Wolf Among Us* [92], *One Shot* [21], *Gunpoint* [89], *Touhou Luna Nights* [91] and *TIS-100* [101].

4.2 Categories

To address RQ2 (*What types of mental health effects do players disclose in public forums?*), and RQ3 (*How frequently do game reviews include disclosure about mental health?*) we conducted a content analysis of the 290 instances of mental health disclosure. Through this process we developed four categories that relate to mental health effects: Emotional regulation (n = 101 disclosures), Obsessive Passion (n = 82 disclosures), Social Connection (n = 55 disclosures), and Coping and Recovery (n = 52 disclosures). Each category has at least two games with 12 or more instances of mental health effects being discussed across the game's 50 reviews. It is important to note that Steam does not prompt people to talk about mental health—the platform is designed to discuss whether or not the reviewer recommends the game—yet mental health effects are still disclosed. This frequency of disclosure demonstrates the potential of using player reviews for identifying and shortlisting therapeutic game candidates.

4.2.1 Coping and Recovery.

This category represents a spectrum of discussion surrounding personal life circumstances. The user reviews give some insight into the types of challenges that people face in their lives, their mindset when opting to play a game, and how the game helps or helped them to cope with difficulties. Of note, the exact phrase “This game cured my depression” appeared numerous times throughout the reviews, typically without any additional context. Taken at face value, this would suggest that many people feel that games can mitigate their depression symptoms. While this may be somewhat true, it should be interpreted with caution as the phrase seems to have taken on a new life as a meme (the presence of dark humor—a coping strategy in its own right—was quite consistent when discussing coping with difficult life circumstances).

Coping and Recovery - Disclosure Examples.

- (1) This is way better than suicide prevention hotlines [*Stardew Valley*]
- (2) I just didn't realize how much I needed this. What a pleasant, supportive experience. [*Kind Words*]
- (3) I'm a student with depression and more mental problems than I can count on my finger. Stardew helped me cope through the harshness of it all by teleporting me into a serene, small coastal town full of some of the best parts of humanity. [*Stardew Valley*]
- (4) This game helped me overcome my fears when I was at the lowest point in my life. [*A Hat in Time*]
- (5) I quit drinking to be better at this game. It's a logistic masterpiece. [*Factorio*]
- (6) Terraria has helped me through the journey through life in many ways, it shaped part of my childhood, and helped me get over things in life that troubled me. [*Terraria*]

Instances of the coping and recovery category (n=52 disclosures) were observed in 17 games. In order from highest to lowest by frequency, they are: Kind Words [71] (n=18); Stardew Valley [19] (n=12); Factorio [100], Finding Paradise [36] (n=3); A Hat in Time [39], Celeste [58], Hotline Miami [23] (n=2); A Short Hike [1], Battleblock Theater [64], Glass Masquerade [85], One Finger Death Punch [82], Portal [96], Resident Evil 2: Biohazard [12], Slay the Spire [54], Supraland [88], Terraria [73], West of Loathing [6] (n=1).

4.2.2 Emotional Regulation.

This category focuses on how players discuss the self-regulation of their emotions. When coding for this category, we ensured that players were discussing their own emotions being changed by the game, rather than character emotions changing during the game. In some instances, players discussed specific emotional states that the game transports them into. In other instances, the user reviews are introspective, pointing to a cause-and-effect relationship between playing the game and a positive impact on emotions, mood or mental health.

Emotional Regulation Disclosure Examples.

- (1) I just wish I could thank the devs for this. I actually felt... I don't know... better, lighter, playing this. [*A Short Hike*]
- (2) It's truly very soothing and relaxing. Sometimes if I'm having a hard time sleeping at night, I will play Glass Masquerade just to help me relax! [*Glass Masquerade*]
- (3) Can a game be therapeutic? I haven't played long enough to learn any more than the basics, but I'm loving it. It's kind of a complete opposite to a lot of my other games - very relaxing! [*Stardew Valley*]
- (4) This game always makes me feel better... Being in an environment of positivity really has a good impact on my mental health too. [*Kind Words*]
- (5) Beautiful relaxing game. Puzzles are not too difficult - perfect for relaxing. [*Glass Masquerade*]
- (6) I have autism so this game is great to calm down after I have an episode :D [*Factorio*]

Instances of the emotional regulation category (n=101 disclosures) were observed in 24 games: Glass Masquerade [85] (n=19); A Short Hike [1] (n=15); Kind Words [71] (n=13); Finding Paradise [36] (n=12); Hook [55], Stardew Valley [19] (n=7); The Room [33] (n=4); Opus Magnum [102] (n=3); A Hat in Time [39], Factorio [100], Hidden Folks [2], Portal [96], The Room Two [34] (n=2); Bug Fables: The Everlasting Sap [65], Celeste [58], Hades [87], Hotline Miami [23], Just Shapes and Beats [9], Katana Zero [5], Mount and Blade: Warband [90], Muse Dash [68], Slay the Spire [54], Totally Accurate Battle Simulator [49], West of Loathing [6] (n=1).

4.2.3 *Obsessive Play.*

"Factorio is the only game so good and so addicting that I've had to consciously decide to quit playing because it was affecting my life outside in the real world. Twice. It really is electronic heroin. I would tell myself I have to be in bed by midnight, and end up getting to bed at 5am. Then I would lay in bed for over an hour with my mind BUZZING over how to optimize my train network, or my green-circuit build, or whatever. I wasn't getting enough sleep, I was getting to work late, and I was distracted throughout the day by still trying to engineer my factory. I had to stop. A few months later I slipped back into it, and the cycle essentially repeated. It's only a matter of time until we start Round Three."

This category was temporarily called 'addiction' in our preliminary categorization; however, upon further consideration, we determined that 'addictive' terminology is often colloquially used by players to describe enjoying something (for example, "I am addicted to chocolate"). This generally tongue-in-cheek exaggeration emphasizes game enjoyment rather than describing addiction in a clinical context. While this is an important distinction to make, some reviews do hint at a degree of compulsivity and obsession, which is a relevant factor when considering therapeutic interventions. We return to the differences between addiction, high engagement, and obsessive passion in the discussion.

Obsessive Play - Disclosure Examples.

- (1) Factorio is like meth addiction: You're on it for days at a time and you spend a lot of time around train tracks. 10/10, this game is heroin. [Factorio]
- (2) WARNING: HIGHLY ADDICTIVE!! :) [Factorio]
- (3) Ah yes, enslaved fun [Factorio]
- (4) You'll find yourself saying 'I'll just play one more day then save and quit' until it's 2:00AM. [Stardew Valley]
- (5) Please help, my life is falling apart because of this game. [Factorio]
- (6) Dangerous game... I started playing at 9 am I look up from the keyboard its 11 pm, I haven't eaten, I haven't showered, I haven't moved an inch. Apparently time ceases to exist when you play Factorio. [Factorio]
- (7) Have responsibilities that you're just sick and tired of fulfilling, like eating, bathing, or spending time with loved ones? Buy Factorio. [Factorio]
- (8) This game sucked away 44 days straight of my life [Slay the Spire]

Instances of the obsessive play category (n=82 disclosures) were observed in 22 games: Factorio [100] (n=19); Slay the Spire [54] (n=13); Stardew Valley [19] (n=9); Rimworld [53] (n=5); Muse Dash [68], Supraland [88] (n=4); Hades [87], Just Shapes and Beats [9], One Finger Death Punch [82] (n=3); Defense Grid: The Awakening [42], Hotline Miami [23], Mindustry [4], Opus Magnum [102], Terraria [73], The Witcher 3: Wild Hunt [14] (n=2); Celeste [58], Nova Drift [17], People Playground [63], Portal [96], Rabi-Ribi [20], Unreal Tournament 2004 [31], West of Loathing [6] (n=1).

4.2.4 *Social Connection.*

This category involves people making connections with friends, family and strangers through the game. Of note, commenting on game features such as a game having a 'co-op' mode was not enough to satisfy our coding; reviews needed to discuss interacting with others. In a minority of instances, game characters were also coded with social connection, because players discussed feeling connected with the characters or interacting socially with the characters.

Social Connection - Disclosure Examples.

- (1) I recently found out about this game and it is a very fun game to play with friends and family! [*Keep Talking and Nobody Explodes*]
- (2) It's great if you're sick of being competitive all the time while playing games with your friends. Sometimes teamwork feels real refreshing. [*Keep Talking and Nobody Explodes*]
- (3) This isn't a game, it's a social hub and it's beautiful and I could live there forever. [*Kind Words*]
- (4) I felt sad so I wrote a letter and threw it into the void. The void wrote back and was very kind, it made me feel better. [*Kind Words*]
- (5) Terraria has helped me bond with friends, and family. [*Terraria*]

Instances of the social connection category (n=55 disclosures) were observed in 16 games: Kind Words [71] (n=20); Keep Talking and Nobody Explodes [86] (n=13); A Short Hike [1], Battleblock Theater [64], Terraria [73] (n=3); Portal 2 [97], Stardew Valley [19] (n=2); Broforce [27], Bug Fables: The Everlasting Sap [65], Factorio [100], Mindustry [4], Mount and Blade: Warband [90], Muse Dash [68], Opus Magnum [102], The Room Two [34], The Room [33] (n=1).

4.3 Observations of Game Mechanics, Dynamics, and Aesthetics (MDA) by Category

To further triangulate our findings, our analysis considers the structure of the games that were most frequently discussed in each of our categories. To support this structural analysis, we applied the MDA framework [51].

4.3.1 The MDA of Coping and Recovery.

- Main MDA elements observed: player disclosure; characters with emotional struggles; difficult gameplay that requires persistence through failure

One of the most notable mechanics related to coping and recovery was unique to the game Kind Words—which had the highest number of disclosures of coping and recovery (n=18). Kind Words revolves around players writing 'letters' that can be anonymously shared with other players. Players who read these disclosures can anonymously respond, offering some support. This dynamic may be an effective way of promoting coping and recovery outcomes.

Within the reviews, a range of game features were discussed in relation to coping and recovery. At the highest level of abstraction these relate to overcoming challenges—either narratively, or mechanically. Within the MDA framework, this reflects the aesthetics of 'narrative' (game as drama) and 'challenge' (game as obstacle course). We note that virtually all games within our game sample contain some degree of narrative or challenge—and as such, this should be interpreted with some caution. A deeper examination suggests that playing as a character dealing with their own emotional struggles may be the most compelling link between coping and recovery instances and games in the review sample. This may be because playing as a vulnerable character better allows players to relate to the character. A review of the game Celeste [58] describes this in substantial detail:

“Madeline is a girl who is running away from her past. It never goes into detail about what exactly she's been through, but the dialogue is formed in a way that makes it easy to relate, or perhaps even insert your own backstory in some sort of subconscious manner. For anyone who's ever dealt with depression, anxiety, or low self-esteem, this will resonate in a big way. The constant struggle against one's darker nature and the compulsion to self-sabotage is played out beautifully onscreen.”

This theme of characters representing the players' emotional struggles is present in several games, for example: in *Stardew Valley* [19], you play as a character who wants an escape from modern city life—which is a fundamental aesthetic of the game. Similarly, in *A Short Hike* you play as a character who is struggling with their interpersonal relationships and their relationship with technology. Players may have a cathartic experience by resolving the emotional struggles of characters in the narrative.

We observed that several instances of coping and recovery were linked with persistence through failure. Some players see overcoming the challenges that they face in the game as evidence that they can overcome the challenges that they face in real life. By playing games where failure is common, players can gain a sense of determination that transcends the game itself. One *Hotline Miami* [23] player exemplifies this with lessons learned from the game.

“Patience. Determination. Knowing I can do it, even after a slight screw up. I learned that when life screws me up, I know I can press R button and just move on.”

4.3.2 *The MDA of Emotional Regulation.*

- MDA elements observed: calm aesthetics; easy challenges; lack of combat mechanics

The two leading games in this category—*Glass Masquerade* [85] (a jigsaw-like puzzle game) and *A Short Hike* [1] (a 3D platformer)—are different in many ways, but each game features colourful stylized graphics, relaxing music, and easy challenges that can be completed at the player's own pace. This is in line with the MDA framework's aesthetic of 'sensation' (game as sense-pleasure). While all games are likely to elicit some degree of catharsis or emotional regulation, games that leverage sensory feedback to elicit calming, whimsical feelings may be better suited to promoting emotional regulation.

One review for *A Short Hike* illustrates how the music and visuals form a cohesive, pleasurable aesthetic:

“I truly had the most intense, purest feelings playing this. The music and the visuals help to create such a unique experience, yet, one which I am familiar with. It's really hard to explain, but these were the best 3 hours I have ever had playing anything. It's really personal.”

While the link between emotional regulation via colourful graphics and relaxing music is well understood, the importance of the lack of challenge is illustrated by the *Glass Masquerade* quote: “*Beautiful relaxing game. Puzzles are not too difficult - perfect for relaxing.*” Games with fewer of these features had fewer instances of emotional regulation in our review sample. Of note, one player stated that *Glass Masquerade*'s sequel is significantly less emotionally pleasant, as the sequel has a more sinister tone. Interestingly, in the games with three or more instances of emotional regulation, only one game (*Stardew Valley* [19]) contains combat mechanics, and that game's combat is secondary to its farming and socializing component. This may suggest that the presence of combat can make the tone of a game less 'emotionally pleasant', or that combat increases the level of challenge to a degree that it is comparatively less conducive to emotional regulation.

If emotional regulation is being facilitated by a lack of challenge, this creates an interesting tension between coping and recovery, and emotional regulation. Coping and recovery seems to be promoted by persisting against difficult in-game challenges, while emotional regulation may be thwarted by difficult challenges. Some games in the sample (e.g. *A Short Hike*) seem to allow for both emotional regulation and coping and recovery by servicing the latter via narrative struggles rather than in-game obstacles and challenges.

4.3.3 *The MDA of Obsessive Play.*

- MDA elements observed: expression aesthetic; high optimization ceiling; theorycrafting

The three leading games in this category—Factorio [100] (a management simulation game), Slay the Spire [54] (a deck-building roguelike), and Stardew Valley [19] (a farming role-playing game)—share little in terms of game mechanics or narrative elements. However, each seems to incorporate the MDA framework’s aesthetic of ‘expression’ (game as self-discovery). Each of these games allows the player a relatively large degree of freedom over what they build, or what path they take. Since there is no fixed solution for creative challenges, players can spend as much or as little time on optimizations as they choose.

In Factorio, the game allows for a virtually infinite degree of optimization, which is chiefly limited by the player’s creativity. Many of the reviews for Factorio describe players deeply engaged in meta-game theorycrafting (e.g., developing spreadsheets, or thinking about strategies to play the game even when they were meant to be working or sleeping). For example:

“I would lay in bed for over an hour with my mind BUZZING over how to optimize my train network, or my green-circuit build, or whatever. I wasn’t getting enough sleep, I was getting to work late, and I was distracted throughout the day by still trying to engineer my factory.”

While Slay the Spire players do not explicitly link theorycrafting with obsessive play, this idea is hinted at in reviews:

“This is one of the most addictive roguelikes I’ve played and for some reason I just keep getting dragged back. The combinations of different decks and relics makes each run seem quite different and generally there is always something that will mess you up!”

Stardew Valley has the third highest frequency for this category, and similarly allows players to optimize their farm’s layout and seasonal crop yield using spreadsheets and online tools. With the player focused on designing and developing their farm for a large number of in-game hours, players have many opportunities to become emotionally invested in their farm. While speculative, this may suggest that meta-gaming such as theorycrafting is an antecedent to (or byproduct of) obsessive play in video game contexts.

4.3.4 *The MDA of Social Connection.*

- MDA elements observed: fellowship aesthetic; “social” co-op modes; interpersonal communication

The MDA framework’s aesthetic of ‘fellowship’ (game as a social framework), is fundamental to the theme of social connection. Of note though, many games that included co-operative mechanics did not have any discussed reports of social connection. In some instances, co-op was praised as being refreshing, compared to competitive play—suggesting that competition against others may not be sufficient for creating a strong sense of connection (in our game sample). It also appears that the inclusion of co-op mechanics does not guarantee that feelings of social connection will occur. We observed that more meaningful discussions of social connectedness occurred alongside deeper integration of social interaction in the reviewed game. Of note, the category’s top two games, Kind Words [71] and Keep Talking and Nobody Explodes [86] each had a substantially greater frequency of social connectedness instances. Each of these games has interpersonal communication as a core dynamic of the game. In Keep Talking and Nobody Explodes, one player can see and defuse a digital bomb, while other players only have access to the bomb’s instruction manual. As the game’s title suggests, in order to successfully defuse the bomb, players require a constant stream of verbal communication. This collaborative process is illustrated by the quote:

“It’s great if you’re sick of being competitive all the time while playing games with your friends. Sometimes teamwork feels real refreshing.”

In terms of creating meaningful communication, Kind Words centers on receiving and responding to letters from other people, with the letters often detailing personal struggles. With anonymous empathy forming the foundation of the game’s concept, it should stem as no surprise that this game fosters a sense of social connection. This is best illustrated by the quote:

“Anonymous letters written by real people around the globe, people sharing their thoughts and fears. Not only is it great just to feel like ‘giving’ a bit of yourself in replying anonymously, but it must be a case that seeing other people’s letters will just hopefully prove to everyone that being human means having failings, insecurities and weaknesses - and that’s okay, and above all, normal.”

Taken together, our results suggest that necessitating communication with other people is one of the most generalizable ways to foster meaningful social connection.

5 DISCUSSION

5.1 Can game reviews be used to identify potentially therapeutic games? (RQ5)

Our findings suggest that our technique of analyzing game reviews has value for rapidly identifying commercial games that have therapeutic potential. It is clear that some players publicly disclose how a game has influenced their mental health, implying that there is a huge body of relatively untapped data that can add player-centric insights to the COTS VGTx literature base, and to the player experience evaluation literature more generally. The degree of intimacy in the information provided by players in the reviews did vary widely, with some players vaguely describing their situation and others giving detailed insight into how a game affected their mental health and their life. Players also discuss a wide range of issues in their user reviews, from using games to relax and deal with general anxiety—through to deeper issues like suicidal ideation, alcoholism, and depression.

The main finding from our study is that a review-driven identification process can be particularly useful as a game selection procedure for VGTx research. By using this approach on a wide assortment of games, researchers can generate a shortlist of good candidates. Identifying candidates from within the set of games that are reviewed could be made more robust by applying strict inclusion criteria: for example, we chose to look more closely at the games that been discussed more than 10 times in a specific category. As the mental health reports in game reviews are unprompted, we felt that one in five represents a relatively high degree of discussion. To further refine the sample, we selected the top two games by frequency. These criteria provide us with seven games that could be recommended for further investigation of potential mental health effects: Kind Words [71], Stardew Valley [19], Glass Masquerade [85], A Short Hike [1], Keep Talking and Nobody Explodes [86], Slay the Spire [54] and Factorio [100]. Notably, Kind Words has the highest frequency for two categories: coping and recovery, and social connectedness. Our technique is thus able to reduce a sample of 50 of the highest rated games on Steam to a collection of seven titles (several of which are lesser known independent games that might not otherwise be noticed), showing that the approach is effective at quickly cutting through the noise and identifying the games that have high likelihood of offering benefits.

An inductive content analysis [30] of game reviews offers several advantages. First, it can be done quickly—particularly in comparison to experimental, interview, and survey methods. As examples of this, participants do not need to be recruited, many research ethics boards do not require ethical approval for this style of study, and the data set already exists. This approach avoids sampling effects, priming effects, and question order effects that need to be accounted for in other research

approaches; it also avoids several ethical concerns noted by Iacovides and Mekler [43] surrounding interviews about game play habits in the context of mental wellbeing and emotional coping (in particular, about how the data is collected, how questions will be phrased, and what level of support should be offered to participants who participate). There is also concern about researcher wellbeing; while this could still occur in a content analysis approach, the lack of face-to-face interaction may mitigate some risk. While work has called for HCI researchers to be involved in the VGTx research agenda, it is important to note that HCI researchers or Games User Researchers typically do not have sufficient training to engage in discourses around suicidal ideation and grief with vulnerable participants.

Finally, inductive content analysis provides opportunities for researchers who want to explore new themes. This method allows them to generate their own categories, and potentially code mental health effects in ways that have not been considered previously. Alternatively, researchers could choose to follow a deductive content analysis approach [30], using our categories from the outset. This would offer a substantial speed benefit, as generating themes was the most time-consuming part of our study. A deductive approach would allow a game's potential benefits to be assessed in a relatively brief time period.

5.2 Discussion by Category

5.2.1 Coping and Recovery.

Our coping and recovery category evidences that players discuss using video games to cope with difficult life experiences within public facing game reviews. Players discuss a wide range of personal circumstances and issues that they are dealing with, such as physical disabilities, coping with autism, alcohol addiction, suicidal ideation, eating disorders, depression, and anxiety.

“The incredibly short review is: if you love yourself, you should at least try this game [Stardew Valley]... I stopped working, and found myself in an incredibly bad spot mentally. My eating disorder kicked in, I was diagnosed with suicidal depression, with suddenly too much time on my hands and no energy to take up a new hobby. It was my partner who asked if I'd played, he himself picking it up around this time, and it was one soft encouragement of 'you already own it, just try it' that pushed me to start that first save file.”

This category is well supported by previous work showing coping and recovery benefits in the context of play [13, 43, 74, 83], and lends further credibility to the idea that games can encourage personal change and growth [43]. In our study, several people disclosed that the game they reviewed “saved their life”, suggesting that using games as a coping strategy can offer more than mere escapism for some people. Discourse around coping strategies (particularly in the context of video games) should recognize that coping strategies can be beneficial to personal development, rather than being innately maladaptive. However, by definition, coping is not necessarily the same as healing (i.e., needing to cope implies that the root problem still is present), but coping is an important precursor to healing and a major part of the recovery process [74].

The reviewed games that most frequently discussed coping and recovery were Kind Words and Stardew Valley. Kind Words is notable in that it is a sort of digital confession box, where you can make a ‘request’ for emotional support from the game's community. While anonymity is often associated with trolling and toxicity, the online disinhibition effect [50] also affords people a sense of safety when discussing personal issues. In the context of computer-mediated communication, self-disclosure has been shown to be facilitated by online impersonal and anonymous interaction technologies [40, 50]. Stardew Valley has also featured in previous literature—Iacovides and Mekler's work on the role of gaming during difficult life experiences [43] found that several participants

referenced *Stardew Valley*. As a result, the authors issued calls for further work to explore the game elements and features of *Stardew Valley*—and how these might support coping during life disruptions.

Another theme in the reviews was that multiple people had been given *Stardew Valley* by people who thought that it may be able to help them. This suggests that players are not just mindful of their own coping, but that it may help others in the same way.

5.2.2 *Emotional Regulation.*

A commonality across reports of emotional regulation were calm, relaxing, and meditative experiences. Researchers wishing to explore games for emotional regulation should consider focusing on games with slow-paced gameplay, relaxing music, peaceful narratives, as well as a lack of combat and conflict. Using video games for catharsis and mood regulation has been well established [13, 40, 75, 79]. Mood management theory in particular posits that people are generally motivated to seek out entertainment that will allow them to self-regulate their mood [75], particularly through down-regulation of arousal when stressed or up-regulation of arousal when bored [75] (i.e., arousal equilibrium). While the finding that people use video games for emotional regulation is not novel, our work provides additional evidence of the pervasiveness of emotional regulation in commercial games not designed for this specific purpose—and shows that people are willing to disclose those benefits in public online spaces, such as game reviews. This finding will be valuable as researchers continue to explore the affective properties of video games.

5.2.3 *Obsessive Play.*

As briefly noted in our results section, the obsessive play section had a working title of ‘addiction’. Many of the disclosures related to this discuss addiction and offer a comparison to addictive drugs, however very few disclosures indicate that they see their behaviours as impairing or distressing. There are three main interpretations of this finding. First is that people are becoming genuinely addicted to these games, with addiction being interpreted through the lens of ‘gaming disorder’ as described by the World Health Organization [67]. Given that these games are being positively reviewed by the users, and are often posed in a positive light, we feel that genuine addiction is unlikely, but that such behavior could be considered obsessively passionate, i.e., one way that passion can manifest in behavior according to the Dualistic Model of Passion [95]. In contrast to harmonious passion, obsessive passion is characteristic of a desire for an activity that is similar to an uncontrollable urge. Obsessive passion has been associated with negative outcomes such as decreased wellbeing [81] and, in games, with increased loneliness in [57]. Obsessive passion has been considered a compensatory response to unsatisfied needs [48], which might be reflected in the reviews. Thus, games categorized under the obsessive play theme might be associated with obsessive passion and therefore more dangerous for individuals with low out-of-game need satisfaction. An obsessive passion lens might be useful for further study of this category.

A second interpretation is that some of the discourse in online reviews is being partially informed by “moral panics” around gaming addiction [32], i.e., the notion that high engagement with gaming is, by definition, problematic, regardless of the benefits it provides players. The final interpretation is that being ‘addicted’ and being ‘like heroin’ is meant to be taken non-literally. The word “addicted” and comparison to drugs has become a hyperbolic anecdote. This is illustrated by the joking tone of reviews such as “*Factorio* is like meth addiction: You’re on it for days at a time and you spend a lot of time around train tracks. 10/10, this game is heroin.” Outside of a game context, this is analogous to those who say they are addicted to chocolate, but do not meet any clinical definitions of addiction—rather, they really enjoy chocolate, and would recommend chocolate to others. In the vast literature surrounding problematic gaming, there is significant work that aims to differentiate between high engagement and addiction.

It is also worth highlighting how we conceptualize the difference between obsessive play and coping and recovery. The observed instances of coping and recovery skew toward being a positive player experience; where play is seen as beneficial to the player. In contrast, obsessive play notes detrimental side effects associated with play, hinting at it being a more maladaptive behavior [15, 16, 22], along with an emerging perspective that problematic gaming should be viewed as a compensatory response to other underlying factors, rather than gaming being the problem in and of itself (cf., [83, 84]). With that said, many of the jokes extend to describe at least some adverse effects, to wellbeing, relationships—particularly to sleep. While the review scores for both *Factorio* and *Slay the Spire* make it clear that the vast majority of people thoroughly enjoy these games, playing obsessively can have detrimental impacts on wellbeing factors like sleep. This is particularly true for *Factorio* (19 instances), in which several people disclosed that they felt the need to quit the game because it was starting to impact their life outside of the game: this seems to suggest that some people are playing obsessively. Games with this quality should likely not be recommended to people with certain mental health needs (e.g. people with obsessive compulsive tendencies).

5.2.4 *Social Connection.*

Feelings of social connectedness are an important mental health and wellbeing factor [8, 80]. A substantial body of work has established that social connectedness can be facilitated by games played both in-person and online, for example, by helping people to form and maintain existing relationships [13, 28, 47, 98, 99], feel closer to others over a distance [46, 76], develop trust with stranger [25, 26], build social capital [24, 69], combat loneliness [24], and increase wellbeing [57]. Although beyond the scope of this paper, the social connections formed through games have demonstrated value to players, even when those social connections are made with anonymous strangers. Our analysis also suggests that simply interacting with others online is not sufficient for promoting social connectedness, and that teamwork and communication need to be of a particular kind in order to be beneficial. For instance, the analysis of the most supportive games through the MDA lens suggested two potential avenues. The presence of verbal communication mechanics (for example, needing to relay how to defuse a bomb in *Keep Talking and Nobody Explodes*) might indicate a game's aptitude for supporting social connections, which is in line with earlier work suggested the importance of conversational turns for social connections [25, 37]. Second, as exemplified by *Kind Words*, supporting empathy between players could be useful for facilitating social connection.

It is also worth considering the impact of negative social interactions. Behaviours such as trolling, griefing, and harassment are known to occur in and around video game spaces, largely due to the online disinhibition effect [50]. As our review sample only included some of the most highly reviewed games on the platform, it is possible that these games feature more heavily moderated communities. There is some evidence of this, as the game *Kind Words* has strict anti-trolling enforcement, and was designed to prevent trolls from receiving any positive or negative feedback from their victims. Further, our sample only included one games where a competitive game mode is the default (i.e. *Unreal Tournament 2004*).

5.3 Limitations and Future Work

While this work makes important contributions in exploring alternative strategies of discovering games that may have therapeutic applications, it is also laying the groundwork for future work. Each of the games identified and discussed in this review should be further evaluated to better determine whether they have generalizable mental health benefits—*Kind Words* in particular, as the reviews for this title disproportionately discuss mental health benefits. Experimental validation of games identified via this work would further establish this method as a robust way to identify potentially

therapeutic games. As validation is not a goal (and in many cases, is not recommended) in qualitative research, continued validation will be an important part of future work. To offset this limitation, the paper uses triangulation (via the MDA framework) to further increase the trustworthiness of the findings. Despite limitations around explicit validation, we show that players are willing to disclose a wide variety of mental health effects in a public context (a novel contribution that will be broadly beneficial to player experience literature). We also provide a rational methodology (beyond researcher intuition) for selecting games for further VGTx research—a contribution that will help direct research efforts.

Importantly, this work sought to explore games with therapeutic potential. While we believe our shortlist contains promising candidates for therapeutic applications, we have not identified generalizable benefits associated with playing any of the games discussed in our study—we have instead observed that people who have played these games are reporting an experience of these benefits. This approach is not a substitute to rigorous investigation, but can rapidly deliver a high degree of insight prior to a commitment of resources for a randomized controlled trial or other traditional methodology. We looked at 50 games, which is likely the largest search for games with potential therapeutic benefits to date; however, more than 20 games are added to Steam daily, meaning that analytical scale is a factor that must be considered. Similarly, we only coded the top 50 reviews for each game, and while this led to a large qualitative data set (2500 reviews), some individual games have more than 200,000 user reviews. Although our approach provides a reasonable level of depth and breadth, we cannot be confident that we achieved saturation in our discussion of individual games. Even though our identification approach is relatively fast, it is only capable of scratching the surface of the video-game domain. Future work should consider ways of broadening the investigation of this readily available data set—potentially using text mining techniques to partially automate the identification process.

A limitation of this work is that we do not have demographic information for any of the Steam users involved (Steam often jokes that its users lie about date of birth, with the majority of all Steam users born on January, 1st). In our own case, this does not limit whether or not people discuss potential therapeutic benefits. However, in instances where people are looking to explore benefits for a specific demographic, a review of pseudonymized data may not be an appropriate solution. Further, it is possible that some quality of Steam's demographics (e.g., playing on PC; being relatively 'hardcore' gamers) could create a unique environment for disclosure. Further investigation should determine whether similar disclosures occur on other game platforms.

In this work, we sampled a set of the most highly reviewed games on Steam. Because of this, our sample excluded many popular games on the platform (for example, Dota 2) that the video game community associates with negative phenomena, such as player toxicity. It is possible that reviewing a different set of games would give insight into a broader range of mental health phenomena, potentially including detrimental effects. Of note, the Steam platform only contains games for the Windows, Mac and Linux platforms. Future work should explore strategies for discovering therapeutic games on other platforms such as game consoles and mobile devices. With players discussing their use of games for mental health in a public forum like Steam reviews, it may also be the case that this type of player experience data can be extracted from more mainstream social media platforms such as Reddit, Facebook, and Twitter, or from other user review platforms such as Metacritic. This approach may allow for a game-platform agnostic method of identifying commercial games with potential therapeutic benefits. It is important to note that both the number of games reviewed and the number of reviews for each game were arbitrarily selected in order to give a reasonable level of breadth and depth. Future studies should further consider and potentially refine this approach.

6 CONCLUSION

This work contributes a novel method for rapidly identifying commercial video games that have therapeutic potential. This method addresses a central problem for the “video games as therapy” research agenda—that the current research paradigm is not able to keep pace with changes in game technologies, game communities and games themselves. We effectively turned this problem into a solution, by using player reviews to help us to rapidly identify COTS games with VGTx potential. We carried out a content analysis of game user reviews as a way to observe mental health benefits in-the-wild, to determine if this data source could give insight into games with therapeutic potential. Our content analysis examined 2500 top-rated user reviews from 50 of the top games on the Steam platform. Within that sample, 290 reviews contain disclosures that relate to emotional states and mental health. A substantial fraction of Steam player reviews discuss using games to relax, deepen relationships with friends and family, and manage mental health issues (within our sample, this includes eating disorders, depression, alcoholism, and suicidal ideation). Through our analysis, we developed four categories: emotional regulation, coping and recovery, social connection, and obsessive play. Applying these categories in a deductive content analysis of user reviews can allow researchers to rapidly identify games with therapeutic potential, as well as other mental health factors. Through our own inductive process, we reduced a sample of 50 games to a shortlist of seven games for further exploration: Kind Words [71], Stardew Valley [19], Glass Masquerade [85], A Short Hike [1], Keep Talking and Nobody Explodes [86], Slay the Spire [54] and Factorio [100].

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