

Exploring the Potential of Game Audio for Wellbeing

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ABSTRACT

Music listening has long-standing ties to mental health, positive affective states, and wellbeing. Even outside of clinical contexts, music is increasingly being explored as a cost-effective, ubiquitous way to support emotion regulation and stress reduction in people's everyday lives. Games have also been shown to have the capability to improve player well-being in certain contexts. However, the role of players' exposure to background music in games toward leveraging this effect has not been explored specifically. We explore the potential of games to act as a tool for relaxation and stress reduction for the general public and discuss future research directions.

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wellbeing; games; audio; background music; positive gaming; stress reduction.

INTRODUCTION

Mental health is described by the World Health Organization (WHO) as a state of wellbeing in which individuals manage their lives productively and are able to contribute to society [45]. The improvement of mental health is therefore important from both an individual perspective, as well as from a societal one. A large variety of demographic factors are correlated with an increased risk of mental health issues, including certain professions, minority groups, or individuals of lower socio-economic status [44]. While mental health issues are stigmatized, they are highly prevalent. Further, a survey of the health system in Canada in 2015 found that a majority of individuals with undiagnosed mental health issues ignore or self-medicate their conditions [11].

While some of the risk factors are genetic, exposure to stress in everyday life plays a significant role in increasing the likelihood of individuals experiencing mental health issues, including but not limited to burnout and depression. Specific professions also carry increased risks of mental health issues, often

relating to the high stress environments they are performed in. For example, some professions like education or health care services feature environments with chronic imbalances in the demands they place on individuals in comparison to resources provided to meet those demands [39]. Exposure to stress and related mental health issues in turn also predisposes people to physical illness such as cancer and cardiovascular disease; this link between mental and physical health issues also leads to significant economic consequences [39, 44]. The WHO have emphasized the importance of prevention for achieving this goal [44]. The reduction of stress in everyday life is therefore a good measure to improve the health of the general population and support their wellbeing.

Games are, ideally, fun and enjoyable. One of the main motivations of players of digital games is escapism, that is, it facilitates relaxation through distraction from real life [61]. This cognitive distraction is a positive and important way for individuals to manage negative emotions [33]. While gameplay can also be linked to increased rage, this generally correlates with pathological use (that is, obsessive playing rather than engaged playing) rather than merely with prolonged exposure to gameplay. Many types of gameplay are associated with short- and long-term positive effects on players' affect and wellbeing [33]. Further, games are relatively cheap, widely accessible, and easy to use, particularly for generations that grew up with pervasive technology and video games. Given that cost factors are considered a systemic barrier stopping individuals from accessing mental health care, and that mental health issues are more likely to occur among younger individuals, that is, under 30 years of age [11], this makes games a particularly interesting candidate for assisting with the prevention of mental health issues in the general population.

Music is also linked to positive effects on mental health: the history of music as a therapeutic measure is extensive and culturally comprehensive [4]. Many of these effects are ascribed to actively making music, for example, drumming to improve the mental health of individuals with post-traumatic stress symptoms [2]. However, even passive music listening can lower the risk of mental health issues [36]. For example, studies have shown that music listening after stressful experiences increases individuals' sense of wellbeing and decreases depression [26]. Because of these effects, passive music listening is used in clinical settings to ease and control patients' pain and facilitate relaxation, where it shows a consistent positive effect on psychological measures [4].

With this paper, we explore the potential of games to act as a preventative measure against stress in everyday life by

facilitating relaxation and stress reduction, and in particular, the role of audio in this effect. We discuss future research directions and two potential use cases for studies.

RELATED WORK

In this section we discuss related work on music listening and gaming in the context of improving wellbeing, and explore games designed to be and perceived as being relaxing.

Music Listening for Wellbeing

Music has a long history of use in therapeutic settings due to its positive influence on mental and social wellbeing [4, 36, 57]. For example, group drumming has been used to combat feelings of isolation and helplessness, and provide an outlet for negative emotions among soldiers diagnosed with combat stress reactions [2]. Group drumming has also been shown to improve social development (e.g. self-esteem) and mental health of at-risk adolescents [59]. Of course, these effects may also be linked to the social context in which group drumming occurs; social context of gameplay has similarly been shown as a predictor of player wellbeing [58], and an important factor in game enjoyment [60]. Overall, however, there is a clear link between music and the experience of flow [8, 12].

Even passive music listening (as opposed to music making) has been linked to improvements in wellbeing and a reduction of stress. For example, passive music listening has also been used as a therapeutic measure: a review on the effect of music listening found that standard care practices for depression were improved through the addition of music therapy [38]. In education for individuals with special needs, it is used to facilitate relaxation, memory, and emotion regulation [17]. Listening to music activates physiological and emotional responses, as well as regions of the brain that involve reward processing [6, 41]. Individuals' emotional responses to music depend on listeners' familiarity with it, their exposure to it, and its complexity [24]. Even outside of clinical settings, individuals have been shown to use music listening of their own initiative for emotional self-regulation [31, 51]. Similarly, a multi-method approach by Västfjäll et al. [57] showed that music listening significantly lowers self-reported stress in everyday life.

Gameplay & Wellbeing

Playing games is also linked to wellbeing, and previous work has pointed out that by providing relaxation and distraction, games have the potential to help players manage negative emotions [33]. Similarly, a survey by Vella et al. [58] found positive effects of gameplay on wellbeing. According to Sonnentag & Fritz, stress recovery is mediated by four aspects: psychological detachment, relaxation, mastery experiences, and control [53]. Research on players' motivations for playing has found escapism to be an important component, in the form of facilitating relaxation through distraction [52, 61].

The phenomenon of wellbeing through gameplay has been linked to self-determination theory, which describes humans as trying to satisfy three psychological needs: autonomy, competence, and relatedness [14]. When these needs are met, individuals experience enjoyment. Games provide players

with experiences of autonomy, and (when well-balanced) competence. Social interaction in games fulfils the need for relatedness; facilitation of social interaction is part of the reason for the popularity of games [60]. Co-located co-playing correlates with greater fun, challenge and perceived competence [19].

Johnson et al. [27] have proposed a model of videogames and wellbeing, in which they discuss three determining factors for positive effects of gameplay: player characteristics, game features, and experience of play. Mandryk and Birk [37] explored how some of these factors correlate with wellbeing in a survey, and found that people with depression or anxiety—despite activating behaviour being an issue with these conditions—still played games a few times a week. Another online survey by Reinecke [48] showed that players explicitly use games after stress in order to recover. Further, the importance of gameplay for stress recovery was increased for players with less social support. Reinecke also found that players who have a tendency to cope with stress through emotional responses (e.g., distancing) are more likely to use games for stress relief than participants who cope with stress through problem-focused coping (e.g., pinpointing the problem and finding solutions). For our research question on the role of audio in gameplay effects on wellbeing, this is particularly interesting given the close connection of music to emotional responses.

In a subsequent study, Reinecke et al. [49] explored how participants reacted to different recovery options, that is, interactive or non-interactive media, after a stressful task. Their results show that media exposure in general, enjoyment, and interactivity are highly relevant factors for stress relief. In a study exploring psychosocial adjustment of youths aged 10 to 15, Przyblski [47] found that low levels (<1 hour) of electronic gaming per day was a key indicator of psychosocial adjustment, correlating with higher life satisfaction and prosocial behaviour compared to non-players. This effect was reversed for high levels of play (>3 hours). In a study on MMORPG gameplay, Kirby et al. [29] found a small but significant negative effect of gaming on psychological wellbeing. This effect was mediated through the type of use: obsessive play lowered psychological wellbeing (i.e., when playing adversely affected players' lives), while engaged use did not. Overall, games offer significant potential for facilitating stress reduction and providing needs satisfaction, when not used pathologically.

Many Facets of Zen Gaming

It should be noted that there is a large diversity of opinions regarding what kind of game is considered relaxing. There are some games that are explicitly designed to be particularly engrossing and relaxing. A lot of these can be classified as casual games, and feature simple mechanics and a calm or player-controlled pace. For example, many of these games involve growing or raising virtual plants or animals, generally at a slow pace or in real time (e.g. *Viridi* [21] or *Zen Koi* [22], in which players grow succulants or raise and breed koi fish, respectively). Similarly, casual farming games ('ville games) attract a significant amount of players, even though they do not pose a great deal of challenge even for players with little game literacy [32]. A parody of these games led to the phenomenon of clicker games, wherein players' only mechanic consists of



Figure 1. The game *Stardew Valley* is considered very relaxing due to both game mechanics (which incorporate the *pottering* game pattern) and aesthetics.

clicking (e.g., *Cow Clicker* [5]). Nevertheless, this has sparked the development of a large number of similar clicking games. Other games that might be considered relaxing involve puzzles – generally without a time limit, or with a non-timed mode. Examples include *Monument Valley* [56], a puzzle game that plays with M.C. Escher-style level layouts, using impossible objects (e.g., Penrose triangles) for architectural design.

However, there are also games that offer more extensive game worlds and mechanics, that are said to be particularly relaxing. One example is *Stardew Valley* [9], an open-ended role-playing game in which players farm, forage, fish, and extract resources while fighting monsters in the mines (see Figure 1). Many game reviews have remarked on the game’s relaxing and absorbing qualities, pointing out the open world, simple mechanics, and continuous progress towards player-defined goals [13, 46, 50]. Many of these also mention the background music as playing a role in the relaxing effect.

Lundgren & Björk [35] have also explored games that employ calm, arrangement-based game mechanics, which they name “*pottering*”. They describe the use of these pottering mechanics in games such as *Zoo Tycoon* [20], *Minecraft* [42], *The Sims* [40], and *FarmVille* [63]. Among the patterns they emphasize in these games is *calm flow*, which they describe as an almost meditative experience. In contrast, fast-paced games are also mentioned in the context of relaxation. For example, racing games are considered relaxing by players partly due to their challenge-based immersion. Taking flow theory to its limit, high but still manageable challenge in games leads to a flow state, which for many players is rewarding, and sometimes even relaxing (even, for example, *Dark Souls* [18]).

LEVERAGING COMMERCIAL GAMES FOR WELLBEING

The related work shows that video games have the potential to induce a calming and relaxing effect on players by providing a distraction from stress factors. This can be leveraged to improve wellbeing and mental health in the general population. Regardless of whether they are designed to provide relaxation through pottering or reaction-based challenges, games are generally designed to be engrossing and immersive. This also includes their sound design, ranging from aesthetically pleasing sound effects and narration to suitable continuous background music. However, despite research on effects of music listening and research on the effects of gameplay on

wellbeing, we do not yet understand the role that game audio plays in these effects on wellbeing.

Potentially, the background music of games that are perceived as relaxing may be particularly well suited to improving wellbeing through music listening alone, without the game. The research based on self-determination theory, and stress recovery factors suggests that the influence of gameplay itself should have the greater effect, as it satisfies these psychological needs to a larger degree. However, we would like to spark a discussion in the games user research community on the role that audio can perform in increasing the effects of gameplay on wellbeing. Further, how should game audio be designed in order to maximize the potential increase of this effect? In the following we discuss potential research directions in this area.

Which Existing Games Cause Relaxation?

As mentioned, some existing commercial games are known to be perceived as relaxing and engrossing by players. However, there is little research on whether they have a measurable effect on people’s affective state and mental wellbeing. By exploring how beneficial these games can be, research has the opportunity to encourage gameplay with casual games for stress relief as a cost-effective preventative way of reducing mental health issues in the general population. As such, the games research community should consider exploring games that players regard as particularly relaxing in more detail. For example, this approach might begin with player surveys or an analysis of blog reviews. By exploring which commercial games cause relaxation, the games research community will achieve an increased understanding of how this effect occurs.

Effect of Game Genre

We previously discussed that the games and game elements that players consider relaxing may differ greatly, ranging from pottering games or puzzle games, reaction-based racing games, to high-challenge games. Game audio performs different functions depending on game genre; this effect goes as far as to elicit highly divergent reactions when exploring player experience upon the removal of audio in a strategy game compared to a stealth game [28]. We thus suggest that the effect of game audio on wellbeing may also differ depending on the game genre. In particular, the effects of different audio types (e.g., sound effects, voice/narration, and background music) may also vary in their effects on wellbeing depending on game genre. By exploring how the different audio types and game genres can be combined to leverage a maximum increase in subsequent wellbeing, the games research community could provide guidelines for game developers to create game experiences that are ideal for stress relief and mental health.

Feedback Function of Audio

Audio performs a large variety of functions in games, among them dramaturgic uses (i.e., affirming the visuals or providing a counterpoint to it), stylization or emphasis, representations and evocations of time, locations, or emotions, or providing a means of immersion [3]. Further, the effect of audio set to media not one-sided; the visuals and story narrative inversely also affect listeners’ music perception [23]. Finally, in interactive media such as games, audio also interacts with the

player: music can be used to comment on player decisions, or influence future one [3]; interactivity is considered a key difference between game and film music [15].

Game audio is said to support cognitive appraisal, in that it supports perceived realism, hides the game medium, and heightening emotional responses [15]. A study by Nacke et al. [43] reported highest flow values for gameplay with sound effects but no background music; this emphasizes the role of audio for providing feedback to the player. As the effect of gameplay on wellbeing is linked to the fulfilment of psychological needs including mastery experiences and competence, the feedback function of audio is particularly important for supporting and communicating players' successful actions.

The Role of Game Background Music

As discussed, research on music listening has shown strong ties to improved wellbeing. Given that certain games are considered particularly relaxing, how much of a role does the background music play in these specific games? Related work has shown that the presence of background music can affect players' perception of a game, and increases immersion [34, 62]. Further, the tempo of background music influences player behaviour, and there is evidence that allowing players to choose their own custom background music increases enjoyment [7].

Some game soundtracks are designed explicitly to be absorbing and soothing, and many game soundtracks are sold independently of the game (e.g., the *Bastion* [30] or *Monument Valley* [54] soundtracks). However, there has been no research on whether the background music might already be well suited for music listening for the purpose of stress relief. The games research community should explore how much of the relaxing effect of games is mediated through the games' background music. How much of it is caused by the audio itself, and how much is caused by the combination of audio and game mechanics, through satisfaction of psychological needs?

Potential Benefits of Exploring These Questions

By exploring these research questions, the games research community will be able to design games that leverage their potential for stress relief to the greatest degree possible. This will help to improve players' everyday life as a preventative measure against mental health issues. Further, this will also potentially open up research directions towards stress management for people already diagnosed with mental health issues such as depression or post-traumatic stress symptoms, and shift the focus of games research for wellbeing from only preventative to include therapeutic applications.

USE CASES: POTENTIAL GAMES

In this final section, we discuss two potential use cases in the form of games which are generally considered relaxing, and which may be a starting point for research.

Monument Valley

This puzzle game by *ustwo* consists of M. C. Escher-style level designs (see Figure 2), which the player can rotate in three dimensions while the camera remains fixed in a two-dimensional perspective (which are reminiscent of *Fez* [10]).

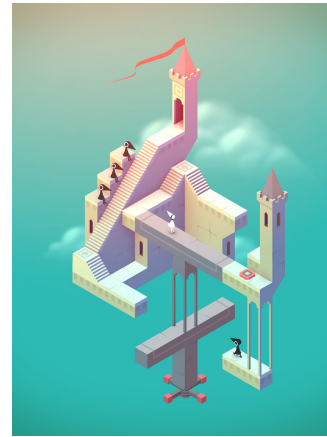


Figure 2. The game *Monument Valley* is widely described as a relaxing puzzle game due to both game mechanics with a calm pace, and calming background music.

The game has received high praise for its game mechanics, but is also described as relaxing and “*actively soothing*” due to its background music [16]. With its game duration of roughly 2 hours overall [55], and the potential to present players with specific levels without requiring lengthy tutorials, it would be well suited to an in-lab study setting.

Stardew Valley

Playing *Stardew Valley* is considered relaxing by many fans [13, 25, 50]. The game showcases many pottering game patterns as described by Lundgren and Björk [35]: *construction* by allowing the player to arrange their farm, *nurturing* (for example through the farming elements), *value of effort* through facilitating long-term goals (e.g., re-building the community center), *calm flow* (even the combat mechanics are not fast paced), and *framed freedom* through the game mechanics of farming, foraging, fishing, and fighting monsters while extracting resources from the mines.

The soundtrack of *Stardew Valley* has very positive ratings on Steam [1]. It has also been mentioned in reviews specifically as being relaxing [25], and also in the context of being crucial to achieving a stress-free combat system [46]. Due to these player responses, as well as an easy learning curve for beginners, it is also well suited to a study exploring the relaxing effect of music in gameplay on wellbeing.

CONCLUSION

Mental health is an issue of increasing societal and financial importance, and prevention strategies include helping individuals to reduce and manage stress in everyday life. In this paper, we elaborate on research areas exploring the effects on wellbeing of music listening and playing games, respectively. We further discuss games which are considered relaxing and point out research directions for exploring the role of game audio in improving player wellbeing, and through stress reduction, also helping to prevent mental health issues. With this paper, we hope to spark a discussion and on the role of audio in game design for wellbeing, as well as prompt potential collaborations to further this research direction.

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