Mental health care for young people using video games: a pilot RCT on the development of a new intervention method toward Hikikomori and Futōkō [version 1; peer review: 1 not approved]

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**Abstract**

**Background:** Young people in their teens and twenties don't seek treatment immediately for mental health issues. This is due to the perceived stigma linked to mental health, pragmatic inconveniences to reach clinical settings, and the tediousness to seek help or engage with adults in traditional ways. Alternative approaches aside from drugs administration are needed.

**Method:** We conducted an internet-delivered pilot randomized controlled trial directed to Hikikomori and Futōkō experienced subjects. This study aimed to understand the difference in efficacy for an intervention using a fictional story vs factual scientific information (self-aid texts), as well as the feasibility of an internet delivered program. Evaluation of emotional transportation and mental health related measures were administered at base line before the program and at one week after the completion of the program.

**Results:** 40 participants were enrolled. A post-intervention (T2) Independent T-student showed that Emotional Transportation was significantly lower for the intervention group than for the control group at T2. Relaxation was significantly higher for the intervention group than for the control group at T2. For the other outcome variables, the difference was not statistically significant. An ANCOVA showed that there was a significant effect of groups on emotional transportation (lower in the intervention group). There was a significant effect of groups on empathy (lower in the intervention group); for the other variables the effects of groups were not detected.

**Conclusions:** The results showed a significant diminishment in emotional transportation and empathy for the interventional group contradicting the hypothesis that an enhancement of emotional transportation mediates the positive mental health effects. A marginal
improvement in relaxation in the intervention group (T-test) was found. In the posthoc analysis, the positive effects on the relaxation of pre-intervention (habitual) high emotional status of participants were confirmed. This trial is registered with UMIN, ID UMIN000044204.

**Keywords**
Hikikomori, Futōkō, gamification, fictional narratives, play therapy, internet delivered mental health treatment

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**Competing interests:** Francesco Panto declares the possession of the intellectual propriety of Anime Ryōhō © used in the original game (intervention group). The original theory of Anime Ryōhō © will be discussed in an upcoming book. All other authors report no conflicts of interest.

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Introduction
Fiction and non-fiction persuasion effects

In our daily lives, we consume entertainment in various forms (movies, drama, anime, manga, concerts). These activities can provide a narrative consumption experience (Andrade & Cohen, 2007; Deighton, 1992; Escales & Stern, 2003). Data shows how a significant part of the income of an average person is dedicated to entertainment-related activities (Americans spent 5.8% on average) (U.S. Bureau of Labor Statistics, 2020). Entertainment can include emotional melodramas. This refers to a subtype of dramatic entertainment with a focus on emotional depiction, human struggles, and poignant stories (Britannica). The protagonist usually is depicted along with their sufferings and challenges. The protagonist tries to overcome their problems through sacrifice and bravery. This depiction could foster deep emotional reactions in the spectator. This form of entertainment is ubiquitous and very profitable. From a scientific point of view, it is still unclear why consumers enjoy this kind of entertainment so much. Emotional transportation and empathy toward the characters and the story of emotional melodramas could be the key to understanding these psychological effects (Deighton, Romer, & McQueen, 1989). Some research advanced the hypothesis that a difference in individuals' empathy (high and low empathizers) interacts with the stimulus characteristic (fictional narratives) level of fictionality in determining the extent of transportation developed toward characters of a story. This could influence the overall effects of the fictional narrative in terms of enjoyment (Argo et al., 2008). An important factor in fictional narrative effects could be the extent to which a spectator is absorbed (Green & Brock, 2000; Wang & Calder, 2006) into the narrative world. A lot of research traditionally focused on the effects of marketing and advertising (Aaker & Williams, 1998; Bagozzi & Moore, 1994). Evaluating the effects of emotional melodramas could be useful in identifying moderating factors, like the role of the level of fictionality (Argo et al., 2008). A broader term for emotional melodrama is “Fictional narratives”.

Effects of fiction on empathy

A story can be deemed as fiction or nonfiction based on to what extent the pieces of information underlying the story are true or based on true facts. A story can be entirely fictional or mostly fictional with some non-fictional elements in it. Surely the realism of a story seems linked to the responsiveness of the viewer. If a story seems real people are more likely to make self-inferences (Dalager, 1998). The more realistic the story seems to the viewer, a more intense emotional response could occur (Johnson, 2012). The transportation can mediate the psychological effects of a fictional narrative. Green and Brock (2000) defined transportation as a process in which “all mental systems and capacities become focused on events occurring in the narrative” and the subject becomes “lost in a story.” Empathy of the person and the believable degree of the story (Aldoory, 2001) could mediate the transportation and absorption into the world of the story. Why is empathy considered a central part of the effects of fictional narratives? Empathy is described broadly as the ability to understand other people’s emotional or psychological situations (Zahn-Waxler & Radke-Yarrow, 1990). Empathy could predict social behavior, so is considered a pro-social emotion (Batson et al., 1995). Empathy has shown to be interesting not only for its social effects but also for its benefits in the realm of marketing. Eliciting empathy in customers during public service advertisements could influence them to react actively to the message. To influence consumer behavior, some researchers have argued that fictional narratives could be useful in eliciting positive reactions and
Emotional arousal and fiction

Some researchers tried to determine whether emotional reactions to fiction like sadness and anxiety are distinguishable or stronger from emotional reactions to fact (Goldstein, 2009). Goldstein explored whether emotional responses to stories presented as fiction versus fact are different. The study also compared emotional responses to stories in film versus sadness experienced in real life. The results showed similarities between emotional responses to tragic events in fiction versus tragic events in real life of the participants. Notably, the level of sadness reported when recalling the events (true or fiction) were identical. This was confirmed even when the life events were particularly tragic, such as a death of a relative or a serious health problem. An important difference was that the emotional experience of a real-life tragic event was characterized by sadness plus an increased level of anxiety. Sadness reported after watching a film or a drama was not accompanied by anxiety. Coplan (2004) suggested a possible explanation for this difference. The sadness of a real-life event tends to linger after the event is finished; in contrast, when a film ends, we know that we can distance ourselves from that world. This can explain why we enjoy watching films that elicit negative emotions. Usually, anxiety is only related to true life events. Goldstein stated that precisely because the fiction-elicited sadness is unadulterated by anxiety, we pay money to watch sad movies. Because we can use the sadness experienced within the movies to understand our emotions and be prepared to deal with it in our real lives, we precisely enjoy fiction. In this light, the negative emotions of a fictional narrative could be cathartic. Regarding the notion that emotional reactions to fiction may be stronger than that to factual information, there are contradicting data. Researchers in this field have no doubt that fictional works can manipulate our emotions. Contrary to factual works, fictional works are organized to stimulate the sympathy of the audience (Mar et al., 2009). A possible explanation for why stronger emotions are elicited by fiction was proposed by Harris (2000) who stated that while watching fiction our appraisal system is quieted. In other words, when we watch fiction, we don’t judge in terms of the realism of the story, so we enter a safe space in which we can express and feel our emotions (Harris, 2000). Keen (2006) stated that nonfiction readers are skeptical and investigative, whereas fiction readers become immersed in the story and tend to believe what they are reading. Fiction has been described as a “safe arena” for experiencing emotions. In fiction we get rid of self-protection and allow ourselves to feel, and being in a controlled environment we can also explore emotions that usually we don’t get in touch with in real life. In fiction, we don’t have to experience the consequences of our emotions in real life (Zunshine, 2006). Fiction can function as a cognitive and emotional simulation of a real-life event but in a safer space. Coplan (2004, 2006) also argued that we tend to emotionally engage with fictional characters because “we feel no obligation toward them”. For example, if we feel sympathetic toward victims of an incident aired in the news, we might feel the pressure to do something to help them. However, with fictional characters, we have no obligation to them once the story is over. Other scientists argue that the emotional reaction to fiction is similar to the non-fiction one because when we consume fiction, we tend to suspend disbelief, and consequently we react to fiction as if it were real. What other effects can we expect from enjoying fictional narratives? Dunbar et al. (2016) explored neurobiological pathways linked to watching emotional dramas. Our enjoyment of comedy might be linked to laughter, as laughter activates the endorphin system (Manninen et al., 2017). This could be linked to a sense of reward and pleasure. Endorphins acting as analgesics increase tolerance to pain. This could explain why we like comedy. We already discussed the tendency to enjoy tragic plots in narratives as well. Emotional arousal triggered by sad stories could also activate the endorphin system. Because the same areas of the brain which respond to physical pain are also involved in psychological pain (Meerwijk et al., 2012). Social rejection or viewing emotionally valanced pictures or music seems to be linked to an elevation in pain threshold, and consequently this can attenuate responses to negative emotional experiences (Kross et al., 2011). Watching a dramatic film could increases pain threshold as well (Weaver and Zillman, 1994). The endorphin system seems fundamental also for its link to social bonding. Endorphins though the C-tactile neural system enhance the sense of belonging we feel when we are part of a group. This system seems to be activated by a plethora of social activities like laughter, singing, and dancing. Dunbar (2016) tested the hypothesis that emotionally arousing dramas increase the sense of belonging to a group. Johnson (2012) demonstrated in two experimental studies, the effects of reading fiction on empathy and prosocial behavior. Reading fiction was traditionally related to educational and moral development (Alexander, Miller, & Hengst, 2001). Mar et al.’s (2006) research focused on the process of empathetic growth that a reader or a fictional narrative goes through. They discuss how fiction allows the person to learn by acting as a simulation of social experience, especially when the individual emotions are congruent with the story’s character. When this happens, the viewer starts to draw inferences and make predictions about the plot development and the relationships within the story. This indirect experience of the social interactions of fictional characters, according to Mar et al. (2006) could lead to empathetic growth. Empathy is considered a multifaceted skill with affective and cognitive components (De Vingemont & Singer, 2006). Specifically, perspective-taking is considered a basic understanding of another person’s thoughts and emotions. Affective empathy and cognitive perspective-taking are

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considered important components of emotions we feel toward characters. While consuming fiction may foster empathy, from a psychological point of view determining whether these feelings translate into real-world behaviors is worth considering if we want to build a mental health intervention using fiction. The author of this research focused on the construction of a program that implements visual culture for the sake of the mental health of young Hikikomori and Futokó sufferers. The term visual culture refers to the use of visual stimuli in the communication of a message. Photography, animation, painting, and video represent a few examples of visual culture we encounter in our daily life. Visual culture is not a result of technological development (even if it surely contributed to its spreading). Humans from the Paleolithic Age used images to depict and frame events and emotions. With the technological developments, “visual culture is everywhere” as stated by Mirzoeff (2009). Between television, computers, and tablets, we spend a major portion of our daily life staring at a screen. Albert Bandura’s studies on observational learning can be applied to visual culture (Bandura, 1977). If we consider visual culture as an environmental factor, we can certainly predict that an exposition to visual culture productions can lead to behavioral changes. When people observe famous characters or actors in cinema, series, cartoons, fashion, social media, etc., they exhibit similar behaviors or a tendency to emulate their behavior. This is deemed possible by the emulation of a role model. Individuals’ appearances on television and social media could induce respect and appreciation. The behavior of these famous people or characters can be imitated as model behavior by the spectator. A notorious example was the 2015 ice bucket challenge, following world-famous names, many famous and non-famous people imitated the same behavior to attract attention to amyotrophic lateral sclerosis (Yılmaz & Yılmaz, 2019). Exaggerating a behavior through visuals may cause the behavior to be perceived as model behavior (Berger, 1977). If the behavior is exaggerated and a little unrealistic to the spectator may become more appealing (glamorized). The more a behavior is idealized the more the advertising could become appealing (Åslund et al., 2010). According to social learning theory (Bandura, 1977) reciprocal determinism, when a behavior is imitated, personal factors and environmental factors interact with each other. Imitating a behavior means also changing our life stories.

**Gamification and its clinical implications**

Visual culture and fictional narratives can also include video games. In recent years video games have become incredibly widespread and represent one of the most popular entertainment media (Entertainment Software Association, 2015). For the mental health effects of video games, inducing motivation seems the most promising benefit. A substantial amount of research confirms this hypothesis (Garris, Ahlers, & Driskell, 2002; Gee, 2003; Hense & Mandl, 2012; Przybylski, Rigby, & Ryan, 2010). The concept of gamification implies the use of video games not only for entertainment purposes but to reach these beneficial effects. The classic definition of gamification is the “use of game design elements within non-game contexts” (Deterding et al., 2011). Gamification can be applied in a variety of contexts, using in-game content to motivate specific behaviors which can be used in real-life situations (Werbach & Hunter, 2012; Zichermann & Cunningham, 2011). Work, education, health, and marketing are some areas in which gamification is successfully used (Arai et al., 2014; Landers, 2014; Jones, Madden, & Wengreen, 2014). Even if there is a lack of theoretical foundation to explain how games affect motivation, empirically there are a plethora of studies demonstrating these effects (Hamari, Koivisto & Sarsa, 2014). We can assume that the use of gamification at least can foster goal-directed behaviors (Schunk, Meece and Pintrich, 2013), by transferring game design elements to non-game environments (Deterding et al., 2011).

A few attempts to use video games for mental health include computerized cognitive behavior therapy (CCBT). CCBT has been demonstrated to be effective in treating depression in young people (Pennant et al., 2015). The online approaches using computerized administration can reduce obstacles to reaching the therapy setting (if locations are difficult to reach), represent a low-cost solution, and reduce the stigma linked to help-seeking behavior for mental health problems (Christensen, Reynolds, & Griffiths, 2011). 25% of young people experience depression by the end of adolescence (Kessler et al., 2001). Even if cognitive behavioral therapy (CBT) is considered a first-line treatment, because antidepressant therapy for young people could be risky (Wise, 2019), most adolescents do not seek help despite great impairments in daily life (Mariu et al., 2011). For the difficulties in accessibility and the stigma related to help-seeking behavior in mental health, many young people prefer to access support from relatives or use self-help or internet-based information (Farranda et al., 2006). An example of a successful intervention using a game was made by SPARX. SPARX was made by a team of researchers and clinicians from The University of Auckland. The project was financed by the country in New Zealand. SPARX is an interactive fantasy game that delivers cognitive behavioral therapy to treat depression in young adults. The young player chooses an avatar and travels in a fantasy world dominated by GNATs (Gloomy Negative Automatic Thoughts). A few intervention studies were conducted to verify the effectiveness of this program in reducing depressive symptoms in help-seeking adolescents compared to treatment as usual. In a randomized controlled trial with 187 adolescents with depression, SPARX was found to be non-inferior to standard treatment, so SPARX is a potential alternative to usual treatment for adolescents with depressive symptoms (Merry et al., 2012). SPARX includes seven levels, which teach young people skills like relaxation, problem-solving, and recognizing and challenging negative automatic thoughts with instructions in a play-based learning fantasy environment. SPARX is structured like a game; when the player starts, a “guide” character (a virtual therapist), states the purpose to help young people “who feel down”. In SPARX-R, a modified version for young people, the guide states: “This version of SPARX
was made to help young people who are having hassles and feeling down, stressed, or angry a lot of the time. Even if you are doing fine, SPARX can help strengthen your skills for dealing with problems when they do come along” (Fleming et al., 2020). Another game worth mentioning is Pokémon GO. Kato et al. (2017) analyzed the social phenomenon of Pokémon GO and the possible implications for Hikikomori sufferers, hinting at the future of the gamification approach for mental health. Kato et al. found that the game was able to enhance the motivation of Hikikomori(s) to go outdoor and participate in social activities. The researchers stated that they were amazed to see patients who couldn’t go out venture outdoor for the first time and spend their time in parks filled with other gamers.

**Hikikomori, Futōkō, Otaku and possible interventions**

Hikikomori is a socio-medical condition born in Japan and consequently reported in other economically developed countries. Hikikomori features a withdrawal to various extents from social life. Hikikomori people spend the day confined indoors or they go out avoiding social interactions. According to the Japanese Ministry of Health, Labor, and Welfare (Saito, 2010), Hikikomori is defined as “a phenomenological concept referring to a state of avoidance of social participation (e.g., schooling, employment, socializing outside the house) as a result of various factors. In principle indicates a person generally at home for more than six months, however, this concept recently includes subjects who go out in a way that does not comprise socialization with others”. The lifetime prevalence of Hikikomori in Japan is estimated at around 1.2% (Koyama et al., 2010). A Japanese cabinet report (2019) has estimated the actual amount of Hikikomori in Japan as around 1,150,000 subjects (around 1.2% of the Japanese population). Staying continuously indoors is not a necessary feature of Hikikomori. In fact, according to Saito (1998), it is not necessary to be physically restrained indoors to be considered Hikikomori. The Hikikomori phenomenon is profoundly embedded with school refusal or in Japanese, Futōkō. This is true, particularly for young Japanese students. The author’s research aims to arrange an intervention that could be helpful to school refusal as well. An investigation conducted by the Ministry of Education, Culture, Sports, Science, and Technology (MECSST) has shown that amongst 3,315,453 students registered at high schools in Japan, 48,579 (1.5%) did not attend school regularly. These students are called Futōkō students (Aruga, Suzuki, & Tagaya, 2011). Within school refusal students, dropouts were 12,777 (26.3%). “School refusal” is defined as absence from school for more than 30 days in a year. The reasons for the absence exclude illness and financial problems. The Futōkō student generally is reluctant to attend school for psychological or physical reasons, or social traditions. The students not willing to attend school usually have conflicting emotions between the obligation to attend and the suffering in doing so (Saito, 2006). Even though only a small number of students end up not attending school, a study demonstrated that more than 70% of high school students suffer from school evasion feelings (Yamashita, 1998). Students with feelings of school avoidance (FSA) are more prone to exhibit physical symptoms (abdominal pain, low vitality, feelings of irritation, and body fatigue) (Nakamura et al., 2010). The school refusal experience may be the cause of other mental health problems. Factors related to school refusal have been summarized by Aruga (2020). School grade, gender, family composition, and other various physical and psychological factors could be hidden in the background. According to Aruga (2020), significant predictors of the FSA included isolating tendency, perceptions of maladjustment in learning settings, the experience of mental health problems, unsupportive parenting attitudes, having a mobile phone at a younger age, being male, low self-esteem, poorer understanding in the school learning and experience of being bullied. Aruga (2020) stated that it is important to help students to acquire skills to adjust to different relationships and foster self-esteem, especially early when students are in 10th grade. Identifying the students who are being bullied and providing adequate mental health support is deemed fundamental. Listening to students’ and parents’ anxiety and perceptions of maladjustment could bring opportunities for consultation. A lot of effort has been made in developing interventions for school refusal behavior. One big problem is that a significant proportion of school refusers do not meet any diagnostic criteria (Egger, Costello, & Angold, 2003). Similarly Hikikomori youths who totally refuse to go to school are underrepresented in the scientific literature. There is little empirical evidence showing the effects of interventions. Consequently, intervention studies with this segment of school refusers also are critical. An underrepresented group of school refusers is those who refuse to attend school but engage in activities outside school (staying home to watch television, going to the mall, going to work). These youth often are labeled as “truants” and are considered deserving of punishment (Lyon & Cotler, 2007). Hikikomori and internet addiction is a complex relationship. Some data point out to the internet as an aggravating factor for social withdrawal (Taylor, 2006). Internet addiction and Hikikomori or Futōkō could become comorbidities of each other. From a different perspective using the internet is indeed the only way for socially withdrawn individuals to communicate with real society, and consequently the usage of the internet could be beneficial for their daily life (Lee et al., 2013; Chan & Lo, 2014). It could be a potential way to interact with medical professionals or even represent a means to attend school. In Japan, fictional narrative (mostly in the form of anime and manga) consumption behavior is often associated with the concept of Otaku. Otaku is a “person with specific interests in a genre or a particular type of object. Otaku(s) are generally extraordinarily knowledgeable about their field of interest and heavily passionate, but usually lack in social common sense” (Kam, 2013). In Japan, specifically, Otaku(s) show high consumption of anime or manga productions and related goods. The relationship between socially withdrawn behavior and Otaku is complicated and not yet elucidated. Saito T. (2019) suggested that Hikikomori individuals often appear
Interventions for Hikikomori are considered very complex and are based on a multi-disciplinary approach. The family intervention considered most effective is the four-grade step by step approach (Saito, 2020). Family members of a Hikikomori have difficulties in approaching the patients primarily for the lack of knowledge about the mental health topics of Hikikomori and the stigma toward this phenomenon (Kato et al., 2017). Is considered important for relatives and family members of Hikikomori to understand this phenomenon and to learn the appropriate skills and knowledge to help Hikikomori patients. For instance, Kubo et al. (2020) developed a 5-day Hikikomori Intervention Program for a family of Hikikomori Patients. The program was inspired by Mental Health First Aid (MHFA), an educational program developed in Australia in 2000 by Langlands et al. (2008). The aim of the program is to increase mental health literacy and to provide coping skills to people who deal with mental health problems. Another educational program dedicated to family members of Hikikomori is the CRAFT Program (Community Reinforcement and Family Training). This program was originally conceived for substance use disorder families (Smith & Meyers, 2004). Sakai later modified the program to adapt to Hikikomori’s needs. These kinds of educational programs help to target problematic behaviors within the family dynamics. Parental criticism and aggressive behavior from the Hikikomori person are considered the core behavioral problems. With the right interventions problematic behaviors can be targeted and corrected to foster more appropriate interactions within the family (Hanley, Iwata, & McCord, 2003). Kubo et al. (2020) arranged a combination of MHFA and CRAFT to support family members of Hikikomori sufferers, and they successfully demonstrated the effectiveness of the program with a single-arm open trial. Matsuguma and Niemiec (2020) proposed an interventional program for Hikikomori using strengths-based theory. Matsuguma presented the results of this attempt in a case study. Psychological strength was defined as “a pre-existing capacity for a particular way of behaving, thinking, or feeling that is authentic and energizing to the user, and enables optimal functioning, development, and performance” (Proctor, Maltby, & Linley, 2010). This skill can be fostered by helping the individual to manage feelings, thinking, and behavior, avoiding overuse or underuse of strengths. For example, overuse of kindness can turn into emotional promiscuity; underuse of kindness can turn into indifference (Freidlin, Littman-Ovadia, & Niemiec, 2017). Psychological strength is considered good for improving self-esteem (Proctor, Maltby, & Linley, 2010) as well as decreasing sadness and hopelessness in patients with suicidality (Huffman et al., 2014). The authors describe a case of a 17-year-old male who became Hikikomori at age 9, firstly refusing to go to school. He felt oppressed by a conformity-valuing school culture and strict school rules. Since he started to shut in, he used to play online video games for seven hours a day and he usually slept during the day. Using positive and strength psychology a team of psychologists started to listen to his stories about his accomplishments during the online video game experience. According to the criteria for strengths-spotting (Kondo et al., 2013), the psychologist identified his strengths and helped him to recognize his positive experiences in the video game. For example, he played 50 vs. 50 match-type games via a network when he was 13. This game required team play, and he was very good with his strengths in the online video game to the real-world. Starting to acknowledge his successful experiences in video games, the client starts to reconstruct his identity from a positive viewpoint. His self-esteem increased and his depressive symptoms decreased. For school refusal the main treatment usually includes psychosocial interventions. Most of the interventions implement behavioral and cognitive strategies to reduce psychological symptoms associated with school refusal and increase attendance. Behavioral strategies include positive reinforcement with gradual exposure to the school environment (Gosschalk, 2004; Moffitt, Chorpita, & Fernández, 2003). Social skills training to cope with negative school situations has also shown promising results (Gosschalk, 2004; Moffitt, Chorpita, & Fernández, 2003). A combination of psychosocial interventions or “package” seems the more feasible approach in most cases. Hospitalization, psychotherapy, and the use of tranquilizers are also an option when necessary (Blagg & Yule, 1984). Behavioral strategies include in-vivo progressive exposure to school, relaxation training, and contingent reinforcement for school attendance; cognitive strategies include recognizing distorted cognitions and structuring coping plans. With these kind of strategies improvements in anxiety, depression, externalizing problems, and self-efficacy for handling school situations are expected. Individual cognitive-behavioral therapy (ICBT) has been demonstrated to be more efficacious than “placebo” (Seligman & Ollendick, 2011). A series of promising interventions are internet-based approaches. Particularly for the nature of Hikikomori and school refusal sufferers who often shut-in and are difficult to be reached with traditional clinical approaches. For example, C-BED (Community-Based Enterprise Development), an internet-based...
Methods

Ethics and consent

The current study was approved by the Bio-Ethical Committee of Tsukuba University on 29th June 2021 (ethical approval number 1612).

Participant Consent

Written informed consent for publication of the participants details was obtained from the participants via the participation form.
The study
Since little research has examined the effectiveness of an original narrative program in a form of a game with young socially impaired individuals, the following study was performed to provide a preliminary assessment of the effectiveness of such intervention and an exploration of the feasibility and compliance amongst youngsters with this kind of mental health intervention. This study aimed to investigate: (i) the ability of an original narrative program in the form of a game to enhance participants’ empathy skills and consequently psychological well-being; (ii) whether the participants could finish the program without dropping out, as the novelty of this program was to entertain participants while providing empowerment of their psychological well-being; (iii) explore if a program using fictional narratives in a way to enhance emotional response (emotional transportation) could be as meaningful as the attempts to enhance cognitive pathways, for example in the internet-delivered CBT program, SPARX. The trial was registered at UMIN-CTR with the following ID UMIN000044204. No changes were made in the protocol after the registration of the study.

Participants
As a universal pilot study, strict inclusion/exclusion criteria were not used. 40 individuals with social withdrawal experience (Hikikomori or school refusal) who met the criteria of (i) being Japanese residents; (ii) speaking Japanese; and (iii) self-reporting a social withdrawal experience in the past were enrolled in this pilot study. Participants were required to fill out a participation form online to request participation in the study. After the authors confirmed the participant’s mail address and age (people under 20 were not suitable for this study being considered minors in Japan), participants were randomly assigned to the intervention or control groups. In this study, the goal of the new intervention method was not to make the socially withdrawn individual participate in society in a traditional sense, rather, it was to help the participants to enhance their emotional coping mechanisms to deal with their daily life challenges and to maintain a positive sense of well-being. The selection criteria were: i) having experienced social withdrawal or school refusal in the past or currently (based on self-reporting); ii) having an internet connection and a computer with the specs to download and play the game; iii) being 20 years of age or older; iv) understand the main purpose of this study and can give informed consent to participate in this study. The exclusion criteria were: i) the inability to self-identify as having experienced social withdrawal or school refusal; ii) being under 20 years old.

Intervention study materials
An original visual novel game Believe Your Light (Figures 1, 2) was produced using a visual novel games software (Visual Novel Maker by Degica, 2017/11/16) and was used in this pilot study to explore the psychiatric efficacy of this program in improving mental health (empathy, general psychological health, self-esteem, mood). The game was expected to take around 8 hours to finish, the participants could access the game and save their progress at any time, for this reason, they could finish the game in several sessions. The technique utilized to set the characters and the story was a novel technique invented by the first author (Francesco Panto), called Anime Ryoho © (アニメ療法), based on the structure of a fictional story with fictional characters who overcome mental health struggles and become empowered by their experience. We compared the effects of this novel program to a program using self-education tools consisting of self-
aid written brief manuals published by the Japanese Ministry of Health and Welfare. A visual novel game is a form of game entertainment that allows the player to engage with the story presented in the form of 2D illustrations while reading the text like a novel (in this work, the character’s next line changes depending on the choices, but the ending of the story does not). The game used in this study is a game with original characters and a storyline that unfolds while the player clicks in the dialogue window. For the two original characters, we used two original illustrations appositely commissioned and copyright-free music, sound effects, and background images. During any playing time, the screen displayed a background image, a standing picture of the original character changing expression based on the story development, and a message box containing the character’s dialogue. Visual novel games are mainly based on reading a text like a novel, and players can engage with the story through their choices in in-game dialogues while enjoying music and the characters’ story. The story of each of the two characters in this work consisted of 10 chapters and was structured like a “growth story” or “coming-of-age story”. Each of the two-character main protagonists had difficulties in daily life based on a psychological problem. In the first three chapters, the characters talk about their problems through daily life and show their struggles through unfortunate events. In the fourth and fifth chapters, the negative emotions reach their peak, and the characters lose the power to move forward and the desire to do their best. In chapters six to seven, through some sort of catalyst (self-enlightenment, help, and support of the relationships around them, etc.), the characters regain confidence in themselves and become more positive. Chapters nine and ten introduce the new lives of the characters who have been transformed in both mind and body.

Control group program materials
The material used in this study was public documents prepared by the Ministry of Health, Labor, and Welfare consisting of self-aid texts for mental health. We used a total of five documents: Resource 1. Cognitive Therapy and Cognitive Behavioral Therapy for Depression (Resources for Patients); Resource 2: Mental Health Awareness Tips; Resource 3. Stress Reduction Know-How; Document 4. Health Education IV: Ministry of Health, Labor, and Welfare Excerpts (136-146); Document 5. Health Guidance Leading to Behavior Change - Behavioral Therapy for Lifestyle Improvement Resources 1-4 and Document 5 are available on the Ministry’s website (Ministry of Health, Labour and Welfare, Japan).

Outcome measures
General Health Questionnaire – 28 (GHQ-28). The General Health Questionnaire – 28 (GHQ-28) Japanese version (Maruyama, Sato, & Morimoto, 1991) is a self-report questionnaire used to screen psychological wellbeing, as well as to detect possible psychological disorders. The GHQ-28 identifies: (1) the inability to carry out normal functions; and (2) the appearance of new and distressing phenomena (Goldberg & Hillier, 1979). Factor analysis of the GHQ-28 identified four 7-item subscales: somatic symptoms (items 1-7), anxiety/insomnia (items 8-14), social dysfunction (items 15-21) and severe depression (items 22-28). A high correlation exists between the anxiety subscale and the total score. Researchers stated that this could show that anxiety is very common in many psychiatric disorders (Goldberg & Hillier, 1979).
Subscales are not independent of each other, so the scale is used as a total score to identify the existence of psychiatric symptoms compared to the state of a healthy individual (Salter et al., 2013). For scoring, the individual is asked to rate how he/she feels according to the following criteria: better than usual, same as usual, worse than usual, or much worse than usual. One of the most common scoring methods adopts a Likert scale of 0 to 3, resulting in the score range varying from 0 to 84 (higher scores are indicative of worse mental conditions). For this study we scored from 1 to 4, with 1; “nothing at all” and 4 “frequently”. This Likert scoring system was implemented in the original 60-item GHQ (Goldberg & Hillier, 1979). A score ≥5 has been suggested to hint at a possible psychiatric disorder (Anderson et al., 1996).

**Rosenberg Self-esteem scale.** Rosenberg Self-esteem scale, (Rosenberg, 1965) is a 10-item scale that measures global self-worth assessing both positive and negative feelings about the person’s perception. In this study, we used the Japanese version of the scale (Umegaki, 2017). The scale is uni-dimensional, and all items are scored using a 4-point Likert scale format ranging from strongly disagree (1) to strongly agree (4) (strongly agree, agree, disagree, strongly disagree). Items 2, 5, 6, 8, and 9 are reverse scored, where “strongly disagree” gives 1 point, “disagree” 2 points, “agree” 3 points, and “strongly agree” 4 points. Higher scores indicate higher self-esteem. Factor analysis identified a single factor. All the 10 items of the Rosenberg Self-Esteem Scale are not equally discriminating and are considered to be differentially related to a different aspect of self-esteem. People with high self-esteem are considered to be more likable and attractive and tend to build better human relationships compared to people with low self-esteem. At the same time, some other measures seem to contradict these assumptions. Narcissists are very charming at first but tend to alienate others and disrupt relationships in the long run. Self-esteem has not been confirmed to predict the quality or duration of relationships. Leadership could have an indirect relation to self-esteem. Self-esteem has shown strong a relation to happiness regardless of stress and other circumstances, and high self-esteem can lead to greater happiness. Low self-esteem is more likely to lead to sadness and other negative emotions (Baumeister et al., 2003).

**Short-form self-report measure to assess relaxation effect (S-MARE),** (Sakakibara et al., 2014). S-MARE is a self-report scale used to assess relaxation. The scale is based on the Relaxation Inventory (Crist et al., 1989). In the item, we can find three subscales (a) physiological tension, (b) psychological relaxation, and (c) anxiety. For each sub-scale, the Cronbach’s coefficient was .93, .94, and .85, indicating a sufficient reliability in measuring relaxation. S-MARE scores were significantly correlated with the Emotional Relaxation Scale (Tokuda, 2011) (r=.446) and with State Anxiety (r= -.531) (N=172). S-MARE has shown reliability regarding the correlation with the cardiac parasympathetic tone (physiological reaction to relaxation stimuli). S-MARE is indeed a valid measure to assess relaxation effects. Normally the assessment of the relaxation effect is carried out after the exposure to a relaxation stimulus evoked by a relaxation technique. For this study, we ask the participants to recall the relaxation state they experienced at the moment of the questionnaire filling. The instrument is a 5-point Linkert scale with scoring ranging from strongly disagree (1) to strongly agree (5).

**Multidimensional Empathy Scale** (Suzuki & Kino, 2008). The Multidimensional Empathy Scale (MES) is a Japanese 24-item self-report scale to assess the 5 dimensions of empathy. The instrument is a 5-point Linkert scale with responses ranging from “not fitting at all” (1) to “fitting a lot” (5). The scale can assess self/other-orientation of either cognitive or emotional components of empathy. The five dimensions are 1) other-oriented emotional reactivity, 2) self-oriented emotional reactivity, 3) emotional susceptibility, 4) perspective taking, and 5) fantasy. The internal consistency indexes for every sub-scale were .71 -.78 .69 .70. The Japanese version was validated by several studies and each of the five sub-scales demonstrated a solid relationship with commonly used scales like Interpersonal Reactivity Index (IRI) or Questionnaire Measure of Emotional Empathy QMEE (Mehrabian & Epstein, 1972).

**Japanese Edition of Profile of Mood States (POMS)** (Akabayashi et al., 1990). POMS questionnaire is a standard test used to measure mood. The first POMS questionnaire was developed in 1971 by Douglas et al. (Spielberg, 1972). The questionnaires consist of a series of descriptive words/statements that describe people’s common feelings. The most commonly used version is the POMS 2, which is suitable for adults aged 18 years and older (POMS 2–A) and another for adolescents 13 to 17 years of age (POMS 2–Y). Both POMS 2 instruments are available as full-length (65 items) and short versions (35 items). In this study, we use the short version (35 items). The subjects are asked to answer based on how they feel in that moment. The score uses a 5-point Likert scale, ranging from “not at all” (0) to “extremely” (4). The only exception is two esteem-related affect subscales which are reverse-scored. A total mood disturbance (TMD) score is calculated by summing the totals for the negative subscales (tension, depression, fatigue, confusion, anger) and then subtracting the totals for the positive subscales (vigor and esteem-related affect). The Japanese edition of POMS was translated from the original version (65 items) by McNair et al. (1971). In the Japanese version, six mood scales were measured: depression-dejection, vigor, anger-hostility, fatique, tension-anxiety, and confusion. The POMS scores correlated with the SADS scores (schizophrenia).
Predictor measures

Narrative Transportation Scale (NTS-J). The Japanese version of the scale (Osanai & Kusumi, 2016) was used in this research. NTS-J consists of 12 items in a seven-point scale from “not fitting at all” (1) to “fitting perfectly” (7). Transportation into a fictional narrative’s world is considered a psychological mechanism that can affect beliefs. The transportation experience includes elements such as imagery, affect, and attentional focus. The NTS-J was developed by Green and Brock (2000). A shorter version of the same scale was developed by Appel et al. (2015). Green and Brock argued that transportation is associated with story-consistent beliefs. In this light, highly transported participants have beliefs more consistent with the story consumed and showed a more positive evaluation of the fictional characters. The persuasion effects of narratives have been strongly suggested. A highly transported individual is persuaded to change their real-world beliefs in response to the fictional world experience (Osanai & Kusumi, 2016). Additional studies of the Japanese version of the scale showed the reliability of the scale and the correlation in measuring imaginative involvement and literary response (Bal et al., 2011). Osanai & Kusumi’s scale required the narrative task “Kin no Wa” and “Chiyogami no Haru” to the respondents. For this study, we instructed the participants to answer accordingly to their habitual emotional response to fictional narratives.

Research process

We conducted a randomized controlled study from August 2021 to November 2021. To test the research hypothesis, we chose a group of patients with a past of social withdrawal problems (like Hikikomori and Futōkō sufferers), because of the probable affinity of these subjects towards the use of fictional narratives in their daily life (Panto et al., 2021). Panto F. was responsible for the recruitment and randomization. The study was designed as a single blinded one in which only the participants weren’t aware of the difference between groups. The flyer sponsored the opportunity to play the game regardless of the groups affiliation (control group participants were granted to play the game after the completion of the questionnaire at T2). To encourage the participation of these subjects in the research program and considering that the authors want in the future to make this type of intervention available as a game application to be downloaded from the internet, the recruitment process took place both on- and offline and the study took place online. The authors produced a flyer with an explanation about the research and a QR code of the participation internet site embedded. The flyer was distributed in several psychiatric clinics in Kanto, as well as non-profit help groups for Hikikomori and school refusal sufferers. In addition, the PDF of the flyer was uploaded online to sites dedicated to Hikikomori and school refusal subjects for a limited time, with the help of the managers of these sites. Once we ascertained the consent of the subjects to participate via the participation form, we proceeded with randomization, randomly assigning each subject to the intervention or control group. Each subject participates via email, a nickname, age, and sex. Any other personal information was not recorded. After randomization using a software (program randMS, software Filemaker Pro Advanced®), each subject was assigned a password to access the part of the site dedicated either to the intervention program or to the control program. Subjects assigned to the intervention program did not have access to the part of the site devoted to the control program and vice versa. Subjects were instructed to complete the evaluation questionnaire immediately before the program (T1) and one week after they finished participating (T2). After data collection, we provided a participation incentive (a 2500 JPY prepaid card accessible via mail) to all participants who completed the program and the questionnaires. The trial protocol is shown in Figure 3.

Data analysis

To test the hypothesis that participants with past and current Hikikomori and school withdrawal experience who received the fictional narratives intervention would improve their mental health condition after 1 week (T2) through an enhancement of emotional transportation more than the control group, an independent samples t-test and ANCOVA analysis were performed. Afterward, to investigate the role of high emotional transportation of the participants (before intervention) on mental health (all other variables except emotional transportation) we conducted a post hoc analysis using ANCOVA, inputting groups, and the score of emotional transportation at T1 as median split as fixed factors. The level of statistical significance was set at p<.05. All data analysis was performed using SPSS v. 25 (IBM SPSS Statistics, RRID: SCR_019096).

Results

The study began in August 2021 and ended in November 2021. 40 participants (18 female, 22 male, mean age 33 years; SD 10.1) completed the study (maximum 60 years, minimum 20 years). 16 of the 40 participants were in the intervention group and 24 in the control group. Participants were both Hikikomori and Futōkō based on self-reports. Surveys were administered at Time 1 (immediately prior to program participation) and Time 2 (one week after program participation). A total of 61 participants were enrolled in the study (24 in the control group and 37 in the intervention group). 21 participants were excluded from the analysis due to dropping out (only the T1 survey was completed). The remaining 40 participants (16 in the intervention group and 24 in the control group) completed the program and the follow-up survey at T2 (one week after the completion of the program), consequently, they were suitable for the analysis. With regard to the
The multi-dimension empathy scale (MES) used in the study to assess empathy, due to a technical problem in the online questionnaires only data for three of a total of five sub-scales were collected (precisely self-oriented emotional reactivity, perspective taking, and fantasy). Other-oriented emotional reactivity and emotional susceptibility were excluded from analysis. The participants’ descriptive statistics are shown in Table 1. The means of the scores of each variable at T1 and T2 for intervention and control group are shown in Table 2. To investigate if the pilot study of fictional narratives intervention would improve the mental health condition of Hikikomori and Fukoko experienced participants, after 1 week (T2), through an enhancement of emotional transportation, we conducted an independent T-student and an ANCOVA analysis of variance. As shown in Table 3, a pre-intervention (T1) independent T-student test indicated that there wasn’t any significant difference between the two groups, confirming that randomization process occurred correctly. Consequently, a post-intervention (T2) independent T-student was conducted to explore the effects of intervention on participants (Table 4). The results shown that emotional transportation was significantly lower for the intervention group (Md=39.56) than for the control group (Md=47.37) at T2, t (38) = 2.42, p = 0.02 (2 tail). Relaxation was significantly higher for intervention group (Md=48.5) than for the control group (Md=42.16) at T2 t (38) = 1.539.
For the other outcome variables, the differences were not statistically significant. An ANCOVA analysis was conducted to confirm further the effects on outcome variables (Table 5). The score of emotional transportation at T2 of the control group was significantly higher (n=24, mean=47.37) than in the treatment group (n=16, mean=39.56). Additionally, within the treatment group, the score of narrative engagement was higher at T1 (n=16, mean=46.87) than T2 (n=16, mean=39.56), indicating a lowering of narrative engagement in the intervention group. There was a significant effect of groups on emotional transportation F (1,37)=6.37 p=0.016. The score of empathy in T2 of the control group was higher (n=24, mean=51.37) than in the treatment group (n=16, mean=47.62), indicating a lowering of empathy in the intervention group. There was a significant effect of groups on empathy F (1,37)=7.43 p=0.010. For the other variables, the estimated marginal means of general health at T2 of the control group was higher (n=24, mean=76.75) than in the control group.
treatment group (n=16, mean=75.43). The estimated marginal means of relaxation was higher at T2 for the intervention group (n=16, mean=48.50) than for the control group (n=24, mean=42.16). The estimated marginal means of self-esteem was lower at T2 for the intervention group (n=16, mean=24.06) than at T2(n=16, mean=24.16). The estimated marginal means of mood states was lower at T2 for the intervention group (n=16, mean=79.43) than T2(n=16, mean=79.95). However, the difference between groups was not significant for any variable and the effects of groups was not confirmed.

A post-hoc analysis, to examine the effect on outcomes of high emotional transportation of participants pre-intervention on the outcome's variables, was conducted. T1 scores of emotional transportation were classified into high and low groups by median split, and the relationship with each outcome score T2 was explored. The results in Table 4 showed that the main effect of emotional transportation T1 was significant in relaxation in T2 F (1,35) = 4.68 p<0.037. This indicates that higher pre-intervention emotional transportation was associated with higher post-intervention (Table 6).
Discussion
The role of emotional transportation

This pilot study wanted to explore the possibility of positive mental health outcomes for people with a history of social impairment by an original visual novel game. The technique implemented in the game comprises the depiction of a story in which the protagonist goes through difficulties and eventually finds a way to cope with their inner struggles. We expect that using a story with fantastic characters in the form of a game with visuals and musical effects to convey emotional reactions would be more effective than a self-aid educational lecture about mental health. In other words, we explored the effects of emotional transportation versus cognitive persuasion. At the same time with this pilot study, we tried to find a way to structure a story of an original fictional narrative that can be not only entertaining but also constructive for the spectator or player’s emotional sphere. The results showed a significant diminishment in emotional transportation and empathy (although the empathy scale lacked two sub-scales) for the interventional group versus the control group, contradicting the hypothesis that an enhancement of emotional transportation mediates the positive mental health effects for the original game used in the pilot study. At the same time, the mean values of outcomes related to mental health (general health, relaxation mood states, except for self-esteem) showed a slight tendency to improve for the interventional group. This was true especially for relaxation even if the effect is marginal and only detected in the T-test. In the posthoc analysis the positive effects on relaxation of pre-intervention (habitual) high emotional status of participants were confirmed. This result was previously suggested by Panto et al. (2021), Green and Brock (2002) have previously discussed how difficult it is to manipulate emotional transportation in an enhancement direction. According to the same authors, creating a diminishment in emotional transportation is relatively easy to achieve; this phenomenon was called “disrupting narratives”. Further studies with a better participation design are needed to better clarify the meaning of this pilot study. In the first place, the rationale beyond this study was to explore the difference in persuasion effectiveness depending on the emotional or the cognitive pathway. The influence of an argument differs between narrative stories and non-narrative texts or simple lists of points (Gebbers et al., 2017). The influence of stories has been attributed to subjects’ deep immersion in the story word (flow experience) (Gerrig, 1993; Green & Donahue, 2009). This experience has been defined as Transportation by Green (2004) or Narrative Engagement by Busselle and Bilandzic (2008). Transportation is considered a psychological state depending on several factors, some situational, such as watching a movie alone and paying attention (Tal-Or, 2016), having previous information about the story obtained prior to engaging (Dixon, Bortolassi, & Sopćak, 2015), as well as individual propensity to get transported into the story world. For example, Appel and Richter (2010) argued that individuals more in need of affection are more transported than individuals low in need of affection. Some researchers suggested that we can define a “Transportability” trait, referring to a latent predisposition to be emotionally transported to a story (Mazzocco et al., 2010). The effects of stories on the attitudes of subjects have been examined in a variety of fields, such as attitudes toward minorities (Green, Brock, and Kaufman, 2004; Johnson, 2012), attitudes toward consumer brands (Kim, Ratneshwar, & Thorson, 2017), and climate changes attitudes (Jones, 2013). In the fields of health and health-related behavior, the effects of stories have been analyzed as well. This has included sun protection (Dunlop, Wakefield, & Kashima, 2009), organ donation (Reinhart et al., 2007), and binge drinking (Van Leeuwen et al., 2016). On the other hand, we have social cognition models of behavior that emphasize social cognition and cognitive functions in the persuasion process (Conner & Norman, 2015). We used the control group nonfictional text to focus on evaluation and cognition in the attitude change of subjects instead of transportation. Besides positive or negative mental health effects, we expect an enhancement of emotional transportation or empathy for the subjects of the intervention groups who engage in a story with high content of fiction. Instead, we measured a diminishment in emotional transportation. As stated by Green, Brock, and Kaufman (2004), this process could be ascribed to “disrupting narratives”. It is in fact extremely difficult to manipulate transportation as suggested in previous studies. Engagement and emotional involvement in the narrative proved difficult to manipulate. Attempts to increase transportation have been unsuccessful many times (Green, Brock, & Kaufman, 2004; Green & Brock, 2000). However, in one of Green and Brock’s (2000) experiments, they succeeded in reducing transportation by having the participants perform distracting tasks while reading a narrative work. Thus, it may be easier to reduce engagement than to increase it. It seems easier to use distracting factors to decrease the focus on the story and consequently transportation. With the design of this study (completely internet-delivered, based on self-report about the timing of follow up) we were unable to observe the participants, determine whether the instructions were followed, or provide an environment that would facilitate the focus of the participants on the appreciation of the narrative work. So, a lot of distractors could have played a role in this diminishing effect. Banerjee and Greene (2012) analyzed the differences between first and third-person narratives in terms of emotional transportation and found that there wasn’t any difference whether the story was narrated in the first or a third person. This study explored anti-drug persuasion obtained through emotional transportation. According to the authors, greater transportation was associated with stronger anti-cocaine expectancies. Another interesting result of this research was that the effects of transportation toward anti-cocaine expectancies (health education), were mediated by greater sadness and lower contentment. A high level of transportation was associated with a higher level of sadness, but a higher level of sadness was associated with a lower level of anti-cocaine expectancies. Traditionally researchers indicated a positive association between sadness and positive persuasive outcomes (Dillard & Peck, 2000). Sadness is defined as a withdrawal emotion, the action tendency of sadness is inaction or withdrawal (Dillard & Shen, 2005). If a fictional story
elicits too much sadness, the behavioral change could be hindered, being that too much sadness led to inaction. Instead, according to Banerjee and Greene (2012), lower levels of sadness were associated with stronger persuasive outcomes. In this light the story used in this pilot study could elicit a lower level of sadness and maybe more contentment, being associated with lower emotional transportation but better health outcomes (relaxation, etc.).

Possible factors behind the results
It has been suggested that the effects of narrative persuasion (thus emotional and behavioral change) may mediate the so-called sleeper effect (Eagly & Chaiken, 1993). In this case, it is possible that the changes caused by the intervention program will not be highlighted unless the participants are followed up a few months after the program. The sleeper effect is one of the psychological phenomena related to persuasion. In general, the effect of persuasive communication gradually increases over time, beginning immediately after the viewing of the persuasive message. The sleeper effect is thought to occur when a persuasive message is accompanied by a contradictory cue (discounting cue) like an unreliable source or strong expectancies toward the persuasion. Normally when a subject is exposed to a persuasive message (e.g., an attractive and persuasive television advert) in the normal course of events, supportive attitudes toward the message increase immediately after receiving the message. Over time, however, the newly formed attitude gradually returns to the attitude held before receiving the message. This process of normal decay of persuasive messages appears to be the most frequently observed longitudinal pattern in the study of persuasion (Eagly & Chaiken, 1993). On the other hand, when messages include clues of inconsistency (e.g., message disclaimers, unreliable sources, etc.), recipients begin to doubt the legitimacy of the message, suppressing the attitudinal change caused by persuasive messages. However, as time goes on, the source of the message and the associated distrust fades, the unconvincing part of the message is forgotten, and the message situation is assumed to be legitimate. In this case, the message tends to become more persuasive over time. This is called the sleeper effect (Hovland & Weiss, 1951; Cook & Flay, 1978). The sleeper effect was originally discovered when the effects of propaganda films were examined. Soldiers’ behavior after viewing the film was measured five days and nine weeks later. The results from the propaganda showed no significant change after five days, but a greater effect (supportive attitudes) after nine weeks. In other words, it is believed that the soldiers forgot about the strong propaganda pressure after nine weeks, and the credibility of the message increased. Other factors which could explain the results of the pilot study in relation to the marginal effects on outcomes and the diminishing in emotional transportation of the intervention group are the generation of defense mechanisms against negative emotions. The contents of the original game in the intervention program touched on human vulnerability, mental suffering, and life troubles. In other words, the contents are extremely emotional, rather than the educational contents of the control group. It’s possible that the participants invoked defensive mechanisms like blocking in response to negative emotions elicited by the program (Cramer, 2014). Another possible factor implicated is reactance. Reactance occurs when a subject experiences psychological pressure to accept a certain view; in this case, the subject tends to adopt the view contrary to the intention of the persuasive process (Steindl et al., 2015). This effect is often used in reverse psychology. For the above reasons, in a longer follow up more positive effects could have been detected. The material used to produce the original game was very basic due to the low budget. A visual story capable of eliciting high emotional transportation maybe needs to be richer in characters’ expressions, music, and visual effects similar to popular commercial products. Another possibility is that the contents of the stories (emotional struggles) didn’t match the participants’ perceived condition.

Mental health help delivered by the internet
The internet-delivered mental health intervention field is a novel one but is surely promising, especially in a digitalized society. Some of the most data-backed interventions are represented by CBT in the form of an application or a game. CBT elicits the cognitive pathway of persuasion directed to behavioral changes; instead, the game of this pilot study aimed to use emotional transportation rather than the cognitive pathway as a means to induce attitude and behavioral change and this is almost unprecedented in a serious game. Regarding CBT in the form of a game, we can refer to the attempt performed by Mantani et al. (2018) with Kokoro App and SPARX by Kuosmanen et al. (2017). The Kokoro app is an application that includes sessions of self-monitoring, behavioral activation, and cognitive restructuring presented by anime-like characters. The participants in the study were 164 patients with antidepressant-refractory depression recruited from 20 psychiatric clinics and hospitals in Japan. The primary outcome was depression severity assessed at week nine. The study demonstrated the effectiveness of the Kokoro app. Aside from the results on the primary outcome, considering the accessibility and affordability the authors believe that this kind of internet-delivered treatment should be considered in the future as a valid alternative to TAU. This pilot study proposing a mental health support tool intended primarily for young people with emotional disturbance could be an accessible and affordable support tool for people reluctant to get into touch with medical facilities. SPARX wants to promote well-being and prevent low mood, stress, and anger in youths. SPARX is a serious game that teaches the player positive coping mechanisms, problem-solving and help-seeking techniques, and the novelty of SPARX is that in doing these tasks the game uses elements of games like challenges and interactions with program characters. These gaming elements are suggested to improve engagement and facilitate learning (Wouters et al., 2013). The original game in this pilot study follows similar logic (more prone to transportation
any concept. A person transported is also reluctant to critically analyze the contents. Gerrig and Prentice (1991) showed the plausible effect of fictional narratives consumption, when a person becomes transported, he will be less able to disbelieve the event he just watched. There may be more stability. Gilbert (Gilbert, 1992; Gilbert, Tafarodi, & Malone, 1993) suggests that changing beliefs is a very difficult task for people. Several researchers (Prentice, Gerrig, & Bailis, 1997; Strange & Leung, 1999; Wheeler, Green, & Brock, 1999). The results of our study after a 1 week of follow-up showed a significant diminishment in emotional transportation and empathy but a slight improvement in relaxation (significant only for T-test) and other mental health measures (non-significant). Fictional narratives showed promising effects on anxiety symptoms and emotional tension. Chan (2019) explored the effectiveness of an alternative intervention approach for Hong Kong hidden youth using a gaming platform to provide play therapy. Results showed the efficacy of play therapy on empowerment effect, sense of well-being, and coping abilities (psychological capital). Chan (2019) used role-playing games like “Capture territories”, board games like “Monopoly”, and simulation games like “The Sims Online”. Chan (2016) argued that the mainstream society approach toward treating socially withdrawn individuals is for them to become productive and contribute to society, and enhance social skills and careers to reconnect them with society; however, the risk is to overlook their interests and natural tendencies. According to Chan and Lo (2014) socially withdrawn people “(i) habitually stay on the online gaming platform for a prolonged period of time; and (ii) are able to develop close online friendships”. So, they are able to build social human relationships via the internet. Based on the concept of ‘starting where the client is’ (Goldstein, 1983, p. 267), Chan (2019) wanted to use online games as therapeutic play for socially withdrawn individuals. For the same reasons, the authors conceived an approach that wants to facilitate emotional regulations rather than a drastic reconnection to mainstream society. As Chan (2019) pointed out, the traditional approach could rather lead to a disempowerment of these subjects because they faced their inability to meet mainstream society’s expectations. On the contrary, empowerment is based on helping them within their interests and comfort zone, at least in the first phase. The pilot study carried out by the authors retains some aspects of already existing approaches using CBT providing games or play therapy but at the same time conveys some novelty to the literature emphasizing the use of original fictional stories in which characters go through emotional struggles to overcome them. We can suppose that the relaxation effect hereby measured was linked to the physiological and psychological relaxation experienced while participating in the program. According to previous research, the relaxation effect is correlated with emotional relaxation, physiological tension, and state anxiety. Participants in the interventional group tended to be more relaxed while participating in the program. Even if the results were marginal, this result could have a meaningful interpretation. Aiming to achieve emotional regulation via the appreciation of a story rather than a boring lecture could act as a protective factor against physiological and emotional tension. The effect of fictional narratives on anxiety symptoms and emotional tension could be very useful. Cognitive elaboration often arises from a rhetorical message (public advertisements, texts, or visual material high in information contents) whether transportation is more easily aroused from narrative and fictional stories. With a rhetorical message, the viewer tends to be heavily influenced by the credibility of the message source. For example, if a person were told that an advertiser is not trustworthy, they will be unlikely to be persuaded by a product from that non-trustworthy advertiser (even if the product is particularly good). On the contrary, people are more motivated to accept a fictional world, often temporarily, at least for enjoyment purposes (Rubin, 1994). From jury decision-making (Pennington & Hastie, 1988) to likelihood estimates (Gregory, Cialdini, & Carpenter, 1982), the influence of narrative has been demonstrated. Another important difference between rhetorical messages (non-fiction) and fiction is represented by characters; “Character is the driving force in fiction” (Surmelian, 1969, p. 139; Radway, 1997, p. 282). In the narrative world, characters are an internal source of information and beliefs, so the attachment to protagonists may have a role in belief changes. On the contrary, in non-fictional messages, the source of credibility is external or “given”. In this light, the credibility source of the narrative may be more stable. Gilbert (Gilbert, 1992; Gilbert, Tafarodi, & Malone, 1993) suggests that changing beliefs is a very plausible effect of fictional narratives consumption, when a person becomes transported, he will be less able to disbelieve any concept. A person transported is also reluctant to critically analyze the contents. Gerrig and Prentice (1991) showed that transported subjects seem to incorporate even false assertions such as “mental illness is contagious,” into their real-world belief structures after being influenced by a narrative. Fiction-based belief change has been proved by several researchers (Prentice, Gerrig, & Bailis, 1997; Strange & Leung, 1999; Wheeler, Green, & Brock, 1999). The results of our study after a 1 week of follow-up showed a significant diminishment in emotional transportation and empathy but a slight improvement in relaxation (significant only for T-test) and other mental health measures (non-significant). Fictional narratives showed promising effects on anxiety symptoms and emotional tension. In 2014, Dumtrache tested the effects of cinema therapy on diminishing anxiety in young people. Participants who took cinema therapy sessions scored lower on the Hamilton anxiety rating scale compared to participants in the control group (Dumtrache, 2014). Mojdeh et al. (2013) examined the effects of watching a movie on a family member’s anxiety level during their relative’s surgery. The anxiety level was assessed with STAI. Even if the person was anxious about an oncoming relative’s surgery, watching a movie significantly reduced anxiety (Mojdeh et al., 2013). These results hint at a possible protective role of fictional narratives regarding anxiety and emotional tension (Fatahi et al., 2021). In the posthoc analysis the positive effects on relaxation of pre- intervention (habitual) high emotional status of participants were confirmed. This positive result was already suggested by Panto et al. (2021). The results about diminishing emotional transportation could reflect the contents of the original game being low in sadness and high in contentment or, on the contrary, could reflect a lack of emotional transportation toward the story by the participants (depiction of negative emotions, lack of similarity, and relation with the story). Regarding mental health effects, the estimated marginal means for all the measures except for self-esteem
It is clear how media and entertainment don’t represent per se a toxic factor for our mental health, but rather the frequency of use and the entertainment content we consume shape the positive and negative effects on our minds. In the context of mental health for young people, it is nonsensical not to use a resource so powerful and so ubiquitous as technological entertainment. So, the next step would be to find a means to implement this resource in a meaningful way. This research wanted to make the first attempt to understand with kind of positive psychological effects we can expect from the consumption of entertainment and in particular fictional narratives. Traditionally the use of games or the consumption of media has been related to violence and anti-social behavior (Przybylski & Weinstein, 2019), however as shown in the discussion the use of materials that are pro-social in nature seems to, on the contrary, boost pro-social behavior and emotions, constituting a protective factor for consumers. This research represents one of the first attempts to understand which dimensions of mental health could possibly be improved using narrative fiction materials with socially impaired individuals (Hikikomori and school refusal sufferers) and to structure a way to reach them remotely. This is especially meaningful for socially impaired individuals. For Hikikomori and school refusals sufferers, it is incredibly difficult to connect to mental health aid resources. Recently experts in the field agree that the final goal in helping these people is not to make them participate in the social context in a traditional manner but instead to support them emotionally in the way they prefer without any coercion. From this point of view, the final goal shouldn’t be to “take them out” but instead to support their mental health during the “shut-in” period. In this study, we assumed that the emotional transportation aroused by the consumption of fictional narratives could lead to an improvement in psychological well-being. In persuasion research, this topic has been explored with researchers trying to understand the role of emotional and cognitive pathways involved in emotional and behavioral changes in the recipients of a message. We tried to explore a few dimensions like empathy, self-esteem, relaxation, mood state, etc. The lack of research on this topic toward Japanese socially impaired individuals represents the first limitation. We didn’t genuinely understand which dimension of mental health could be particularly influenced by the consumption of fictional narratives. Another limitation is that the population we choose for this research isn’t representative of the ideal population we want to dedicate this program to in the future. In fact, to make easier the interpretation of results and for the affinity of fictional narrative consumption and social impairment, we chose to recruit Hikikomori and people with experience of school withdrawal, and for the limitations in the numbers we had to recruit older participants. Even if in the future we want to utilize this program totally delivered by the internet, assessing the effects in a particular psychological dimension in a pilot study is fundamental to controlling environmental conditions and minimizing any confounding factors that could influence the results. This should be made by precisely controlling the study participation environment and checking that the instructions are observed. In this study when we ask the participants about their fictional narratives consumption habits in the questionnaire survey and when we ask them to answer the questionnaire after the participation in the intervention and control program, we couldn’t monitor the participants’ behavior. We don’t know if the instructions about the timing of answering the survey were followed (for example we made a 1-week follow-up questionnaire survey, but this was always available to participants, consequently we don’t know if the instructions were respected). Another big limitation of the present study was surely the materials used in the intervention group. The model theory predicted that an enhancement in emotional transportation could benefit indirectly the emotional and behavioral dimensions of the consumer. To achieve this task a material consisting of a fictional narrative story will have to be produced with this scope in mind. The story must not only be able to enhance emotional transportation but must also resonate with a variety of issues which can make a lot of consumers engage at the same time. Also, as the very famous movies, games, and anime productions teach us, the quality (visual musical, and technology-wise) must be very high. This monumental task is not easy to achieve with few resources. If we look at the budget of great blockbuster movies or worldwide famous Japanese productions, it is easy to understand how many people and how much money are involved in the production of these monumental artworks. The
The novelty of the program we want to propose with this study is that while being a tool for mental health it would be entertaining and funny to engage with, in particular to young people. This pilot study’s attempts, however, didn’t have any reference on to what extent negative emotion depiction serves as the scope of enhancing mental health, or on the contrary, constitutes a hindrance. In the future, more attempts are needed to understand the relative role of positive emotions and negative emotions’ depiction role on emotional persuasion.

**Conclusion**

Even if the results were marginal for mental health predictors and we couldn’t detect an improvement in emotional transportation after a week, the results of this pilot study are encouraging for further exploration in this field. Firstly, we confirmed a wish to engage in fictional narratives consumption by socially impaired individuals aside from pure pleasure. Secondly, we confirmed an effect on emotional transportation and empathy of fictional narratives, as well as an improvement in relaxation. However, the rationale and the right process to structure an original fictional narrative remains an ongoing task, being that we demonstrated that it is difficult to manipulate emotional transportation. In the future, the authors are planning to explore more the efficacy of an internet-based program in the form of a game or an anime production with a fantastical story to understand further the possible positive and supportive role of remote interventions for emotionally struggling youths. The internet-delivered mental health intervention field is a novel one but is surely promising, especially in a digitalized society.

**Data availability**

**Underlying data**

Harvard Dataverse: Mental health care for young people using videogames; a pilot study on the development of a new intervention method toward Hikikomori and Futoko, Panto et al. https://doi.org/10.7910/DVN/YBCEGO.

This project contains the following underlying data:

- data Mental health care for young people using videogames a pilot study on the development of a new intervention method toward Hikikomori and Futoko Panto et al sav.tab

**Extended data**

Harvard Dataverse: Mental health care for young people using videogames; a pilot study on the development of a new intervention method toward Hikikomori and Futoko, Panto et al. https://doi.org/10.7910/DVN/YBCEGO.

This project contains the following extended data:

- Study protocol presentation.pdf
- English translation of S-MARE and MES scales.docx
- Intervention original game for windows in Japanese.zip
- Original game copyright disclaimer CC license.pdf

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication). Please see the license PDF file for specific license details on the game.

**Reporting guidelines**

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Thank you for the opportunity to comment on this interesting paper

I have no specific expertise in this clinical area and have reviewed this largely in terms of trial methodology and reporting. I hope others can comment on the introduction who have expertise in the clinical phenomenon under consideration

The title is slightly odd as it discusses children, but the people in the study are all over 20 with an average age of 35. This might be clarified. Did the participants find the content acceptable?

The introduction is very detailed and long, far longer than is conventional, and I wondered if that was necessary. The discussion was also quite dense and would benefit from greater structure and use of paragraphs

This is described as a pilot trial but the main presentation is on the outcomes (described as a 'preliminary assessment of effectiveness and compliance'), whereas many pilot trials are delivered in terms of other issues to do with the feasibility of the study. I think this work needs to be placed more clearly in the context of current thinking on these issues (https://pilotfeasibilitystudies.biomedcentral.com/).

Was any pre-study power calculation done? This needs to be clarified. How was the 'target' of 67 derived?

The aim is stated to be 'amongst youngsters', but this is not the target of recruitment and this needs to be clear. I assume this pilot used an adult audience for 'proof of concept' although I was surprised that the content was appropriate for people up to 60 years of age.

There needs to be clarity about numbers. The number of people in the trial is the number
randomised (n=61). Loss to follow up is normal but needs to be distinguished. The study did not
enroll 40 patients (page 9 of the pdf), it enrolled 61 of which 40 completed the study.

It would be helpful to know how many people were recruited from each referral source, although
those data may not be available.

The manuscript needs to be clearer about details such as the randomisation process and how
concealment of allocation was ensured. I do not understand how the process led to such
imbalance at baseline (37:24) and this needs to be explained and discussed. It does suggest an
issue if the programme was set to 1:1

I do not understand the CONSORT, as ‘FOLLOW UP’ suggests that no-one was lost to follow up or
failed to complete the intervention, but the box above suggests that 21 did not complete. There is
a huge imbalance in loss here between arms. A standard intent-to-treat analysis would analyse
outcome data from non-completers. Did anyone not complete the intervention, but still provide
outcome data? All this needs to be clarified and understood if we are to make sense of the results,
because at present it looks like bias will be present in any analysis that loses more than 50% of one
group, and none of the other.

It is generally not recommended to test for differences at baseline (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1116277/), and these data should be provided
descriptively. Baseline data should be provided for ALL patients randomised to assess the success
of the randomisation (which is done with descriptive data). The authors could then look at
differences between ‘completers’ and ‘non-completers’ in baseline data to assess potential bias
due to loss to follow up.

Data need to be consistently presented in terms of the number of decimal places.

The reason for the use of both the t-test and ANCOVA needs to be clarified. ANCOVA controlling
for the baseline score on the outcome and for any pre-specified prognostic factors would be the
norm in trial analysis, although they would generally be for a primary assessment of effectiveness,
rather than a pilot.

Although the moderator analysis using the median split is theoretically interesting, the trial is not
really big enough to provide a strong test (most trials are not) and a median split is likely to
exacerbate these problems. The authors could consider removing this analysis, or should be very
cautious about its interpretation. Again, there are published guidelines about conduct and
reporting of subgroup analyses in trials (Sun et al Credibility of claims of subgroup effects in
randomised controlled trials: systematic review. BMJ 2012; 344: e1553, Sun et al. Subgroup
Analysis of Trials Is Rarely Easy (SATIRE): a study protocol for a systematic review to characterize
the analysis, reporting, and claim of subgroup effects in randomized trials. Trials 2009; 10: 101)
which could be referred to, although I think any subgroup analysis in a pilot is probably not
appropriate.

Although compliance is an aim, I am not sure any data are provided on this beyond the limited
data in the CONSORT, and this needs to be clarified.

There is the basis for an interesting pilot study here, but the presentation and analysis needs to be
brought into line with current conventions and some significant ambiguities need to be clarified if readers are to assess this paper properly.

References

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Comparative effectiveness research

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.
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