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A Serious Game for Emotion Regulation in Adolescents:
Player Experience and Pilot Feasibility Study

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ABSTRACT

Early adolescence is a major time for friendship development, and interpersonal emotion regulation (iER) is a vital skill for social interactions. Serious games are an exciting way to engage young people with psychoeducational content. The authors developed a serious game teaching iER strategies to early adolescents in an interdisciplinary and participatory approach by working with industry professionals and including the target group throughout the development process. In a pilot feasibility study, player experience and the intended learning outcomes of emotion regulation were tested with 166 early adolescents. Results show positive player experience, with highest ratings in Usability, Personal Gratification and Enjoyment. Results about effects on emotion regulation (ER) are mixed, with personal ER increasing and iER decreasing. This shows the potential to include an engaging serious game in socio-emotional learning in schools, but also reveals several areas for improvement and the need for more rigorous testing in the future.

KEYWORDS

Interpersonal Affect Regulation, Digital Intervention, Social-Emotional Learning, User Experience, Early Adolescence

INTRODUCTION

The continual development of technology has led to digital games becoming a widespread phenomenon (Marchand & Hennig-Thurau, 2013). Games are appealing because they use a universal language and allow players to explore problems and uncertainties of everyday life in a secure environment (Costikyan, 2013). Video games play a major role in the general population (Österreichischer Verband für Unterhaltungssoftware, 2019) and early in adolescents' lives specifically

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(Brooks et al., 2016; Mittmann et al., 2022). But games offer more than just entertainment, as they can be used to present educational material in an engaging manner. Using game design elements within a nongame context is called gamification (Deterding et al., 2011). Two main reasons indicate the potential benefits of gamifications: First, they naturally embody characteristics that are relevant to learning, such as the repetition of content or the various difficulty levels (Gee, 2005). Second, game elements can be motivating for users, thereby increasing their engagement with the content (Connolly et al., 2012).

While gamification uses game-elements in all nongame contexts, so-called "serious games" are full games with a purpose beyond pure entertainment (Groh, 2012). They have gained attention from both the academic and commercial sectors as a means of intervention and learning (Breuer & Bente, 2010). Serious games can be applied to a wide range of topics and target groups, from employee training to healthcare and social education (Sawyer & Smith, 2008). Studies suggest that serious games are effective in comparison to traditional methods or no intervention at all (Hamari et al., 2014; Lau et al., 2017; Sitzmann, 2011; Wouters et al., 2013). This paper introduces a serious game designed for teaching interpersonal emotion regulation (iER) strategies to young adolescents.

Early adolescence, broadly defined as 10-14 years (Unicef, 2011), comes with a variety of changes and challenges, and most of these changes directly relate to the social lives of young adolescents. For example, the onset of puberty is accompanied by advances in psychosocial development (Valkenburg & Peter, 2011), which results in an increasing importance of friends and peers and more intimate relationships (Buhrmester, 1990). This means that, instead of only "sharing activities," more focus is put on self-disclosure and being understood and cared for (Reis & Shaver, 1988). Adaptive iER is a vital skill for the initiation and maintenance of friendships and can improve trust in friends (Niven et al., 2012) as well as help with finding new friends (Niven et al., 2015). It is therefore important to focus on iER skills as a teaching goal and intervention outcome during those defining years of early adolescence.

IER

IER is one part of emotion regulation (ER; Gross, 1998) and can be defined as deliberately influencing the emotions of another person (Niven et al., 2009). When looking at the concept in more detail, there are various approaches to define and classify iER. For example, the concept can be divided into conscious versus nonconscious and automatic versus controlled regulation strategies (Braunstein et al., 2017) or into response-independent versus response-dependent regulation (Zaki & Williams, 2013). We focus on a form of iER that has been called extrinsic iER, which means trying to regulate the emotions of another person, while intrinsic iER can be seen when looking for support of others to regulate one's own emotions (Zaki & Williams, 2013).

In their interpersonal affect regulation classification (IARC), Niven et al. (2009) found that (extrinsic) iER can either improve affect (through positive engagement and acceptance) or worsen affect (through negative engagement and rejection). Positive engagement strategies focus on improving the situation or problem that the target person faces, for example, by improving the way they think about a situation or by giving them practical advice on how to solve a problem. Strategies from the acceptance cluster focus on the person themselves, including cheering up the target person with humor, distracting them, or making it clear that they are cared for. The two-cluster structure of adaptive iER strategies (i.e., positive engagement and acceptance) described in the IARC was independently validated by López-Pérez et al. (2019).

RELATED WORK

In a face-to-face setting (e.g., the classroom), interventions targeting social-emotional learning in adolescents have been found to improve social-emotional skills and enhance well-being (Taylor et al., 2017). When looking at ER specifically, a study of an intervention concentrating on ER showed that

enhanced ER skills are associated with reduced risky sexual and violent behavior in early adolescents both short (Houck et al., 2016b) and long term (Houck et al., 2016a). Yet, the sample consisted of early adolescents with mental health symptoms and did not target iER. Analogue interventions that are implemented in the classroom without technology come with several disadvantages: They are hard to access, expensive, time-consuming, or require an external facilitator or teacher training (Mueser & Bellack, 2007; Rotheram-Borus et al., 2001). Consequently, a number of digital interventions have been developed for social-emotional skills and, more specifically, ER.

A recent meta-analysis found 11 digital interventions for children and early adolescents targeting ER. These spanned digital games as well as programs or biofeedback. While all digital interventions might have used some form of gamification also in a nongame context, looking specifically at digital games (n=8), the review found a small effect for reduced negative emotional experience and a general improvement of ER (Reynard et al., 2022). Aligning with the advantages of gamification, the review also found mostly positive feedback, player experience, and acceptability for the digital games. Some examples for digital serious games for adolescents are *Game Teen* (Rodriguez et al., 2015) or *Rage Control* (Kahn et al., 2009).

However, few serious games focus specifically on iER, especially for a general population. In *SPARX* (Merry et al., 2012), adolescents with a diagnosis of depression learn both personal and interpersonal strategies (such as communication and negotiation skills). Pacella and López-Pérez (2018) described *Emodiscovery*, a serious game for children to assess iER. In this game, children interact with different characters trying to cheer them up with options for different strategies. *Emodiscovery* targets a general population as well as autistic children with no concurrent intellectual disability but has been developed for children before the age of early adolescence (i.e., aged 8-11 years).

The Current Study

The necessity of interpersonal skills during adolescence, and the lack of serious games targeting iER in a general population of early adolescents led to the development of the serious game *School Can Be a Nightmare*. The aims with this game were to create a fun and engaging experience that explores iER in a fictional world. After development, we conducted a pilot feasibility study to examine player experience and initial learning outcomes of this game.

THE GAME *SCHOOL CAN BE A NIGHTMARE*

School Can Be a Nightmare is a single-player adventure game with three levels and a hub world (connecting the levels). We decided to develop an adventure game as the genre allows for the player to meet various characters in different situations and with different emotional problems who can be characterized sufficiently. The game was created with the commercially available RPG Maker MV. The finished game is Web-based and can thus be played on any device, and it can be played in German or English. Total playtime depends on the player, as the explorative nature of the game allows for individual speed but is usually 2-3 hours. The game is played from the perspective of a young adolescent (same age as the target group).

Interdisciplinary Co-Development

We used an interdisciplinary co-development process to create *School Can Be a Nightmare*. In line with the suggestions of Fleming et al. (2016) to increase the impact of serious gaming, we collaborated as an interdisciplinary team with both academic and industry members: psychologists, psychiatrists, computer scientists, professional software developers, and a professional writer and theater director.

Furthermore, we included stakeholders (i.e., young adolescents) in the iterative development process to maximize the quality of the end product. An initial series of workshops with whole school classes (first year of secondary school) in lower Austria was conducted before technical development.

These workshops consisted of four phases or activities. First, we wanted to find out about ideas and strategies that young adolescents would use in order to help others. For that, we gave young people an emotion, and they could write down ways to help a person experiencing that emotion. We used the six basic emotions. Ideas were then collected on a poster around each emotion. Second, we used an arts-based and creative approach to design scenes and situations in the game. In small focus groups (approximately five young adolescents per group), we explained the idea and goal of the game we wanted to develop. We then gave participants a variety of printed images of characters and settings, such as a jungle, a spaceship, or an underwater world. Participants were prompted to create a story around these characters while always including an emotion. Focus group leaders only intervened in the creative storytelling process when participants strained too much from the task, for example, by asking questions like "So how would this character (or character name if participants gave them one) feel in this situation?" or "If you were there, how could you help the character (or character name if participants gave them one)?" We furthermore focused on asking young adolescents how the scene would translate into a game, for example, how they would notice that a character was scared or sad.

We also used an online questionnaire to evaluate specific gaming and game feature preferences with 52 young adolescents (aged 8-12 years) from Lower Austria. Questions were: What should a good game include? What is your favourite game? Which rewards do you like? What do you like to do in games? What annoys you in games? Which types of games do you play? All questions had multiple choice options as well as an open-answer format.

Both results and input from workshops and the online questionnaire fed storyline and game design. We synthesised ideas and wishes from young adolescents with what could realistically be achieved within the scope of the project. For example, young adolescents' favorite game was *Fortnite*. Even though it was not possible or desirable for us to create *Fortnite* or indeed any first-person shooter game, we included references (e.g., one character loves playing *Fortnite*) in our game.

After the start of technical development, we included young adolescents in an iterative feedback process. We had a small group of young adolescents who tested the game over the course of the project as well as one-time workshops with whole school classes with specific prototypes of the game. Feedback from these sessions (especially concerning difficulty level and which parts were especially fun or boring) was then implemented in new versions of the game.

Storyline and Gameplay

The game is set in a school, and the playable character (PC) is a pupil. To avoid gender bias, players can change their appearance to five different looks (including different hair colors, skin colors, genders, and a humanoid green monster). After a tutorial scene in the bedroom of the PC, where players learn the controls of the game, the storyline starts with a normal school day. The next day, the PC has to stay home because of a fever. But while they are away, something strange happens at their school and, when they return, everything has changed: Pupils are very aggressive and are fighting and arguing. After some time, there is an explosion, and everyone (except the PC) disappears. The school is dark and dusty, and the PC does not know what has happened. The player needs to find four other remaining pupils to form a group with them. Together, they can pass through three portals that can be found in the school and that lead to different fantasy worlds. In these fantasy worlds, the group encounters a variety of different people and creatures, all of them struggling with their own emotional problems.

The first level revolves around exclusion and bullying. The group finds a creature who has been banned by its people for being too ugly. This level also touches upon retribution and responsibility and, furthermore, it dives into the group dynamics and friendship of the PC and their companions. The second level takes the group to medieval times. They meet a young knight who is scared to participate in his first tournament. The group motivates him to participate and then helps him when he loses his first tournament. The story also touches upon sexual identity as the knight is in love with the prince (both male). In the third level, the group finds three islands who are at war with each other. They need

to help them resolve their conflicts to be able to avoid the global catastrophe that threatens to flood their islands. The group helps them build a new life together on a fourth island called Paradise Island.

After each level, the group encounters the goldfish Happy, who helps them resolve the mystery of what happened to the school. They find out that every school is guarded by an animal. The guardian animal of their school was killed, leading to the school descending into chaos. Happy was rushed in to help and, together with the player's and the group's help, they are able to restore the school. Nobody except the group remembers what happened.

The player is led through the game by various quests. Whenever they talk to a character, characters give hints on what they want and need, and often the player needs to find items, bring them somewhere, connect story lines, and help others to progress in the game. As the game is very narration-heavy, we also included many mini-games and puzzles throughout the game, including logic puzzles, memory puzzles, reaction-speed games, and turn-based fights with monsters. Screenshots of the game can be found in Figure 1.

Psychoeducational Content

The main educational content is based on the IARC of Niven et al. (2009) and summarized findings from a literature search (Smith, 2021). In particular, the game contributes to learning iER through:

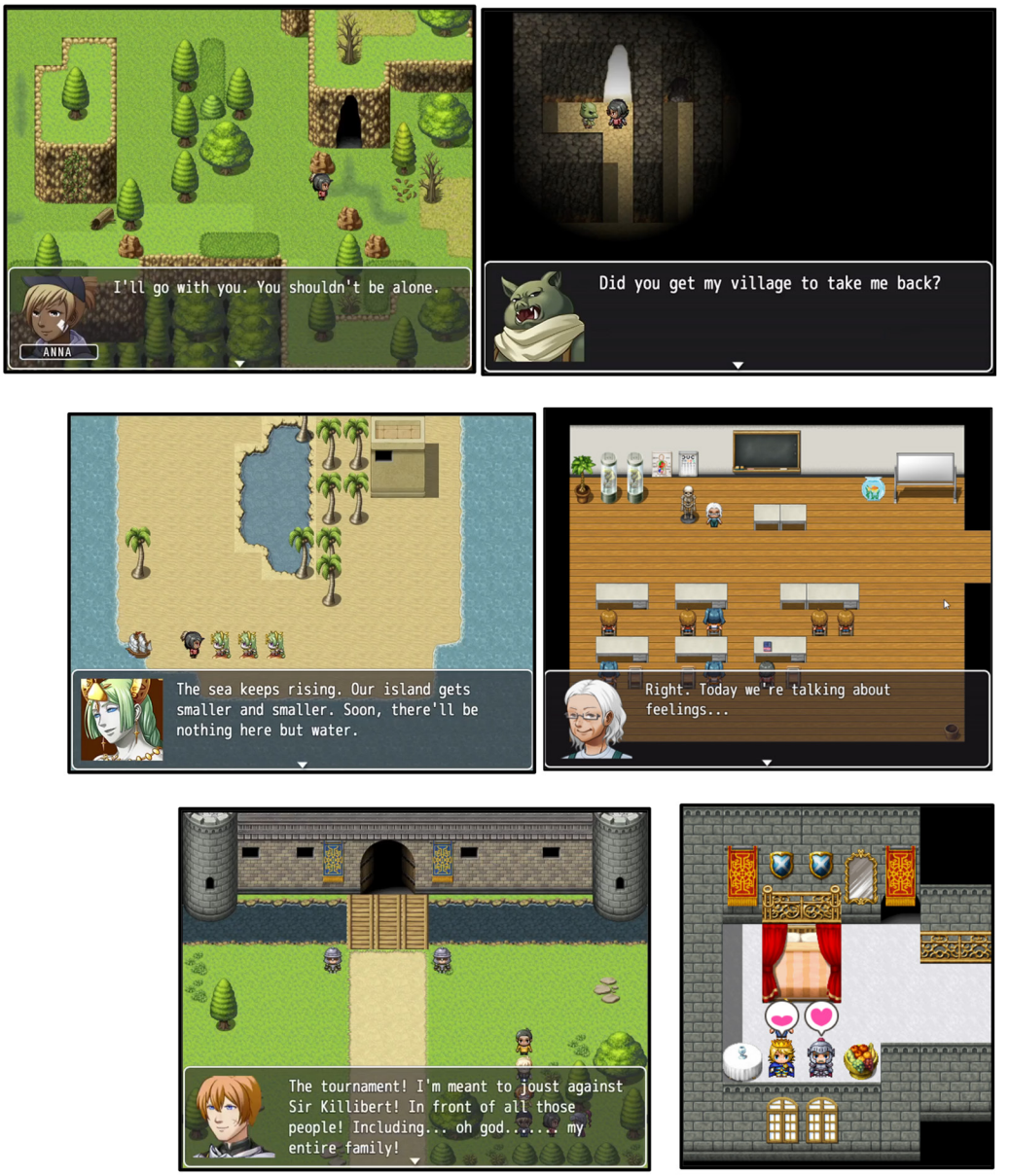
1. General themes and topics of the game: The general storyline in the game revolves around omnipresent topics during adolescence (Stiehl et al., 2023) that include strong emotional experiences.
2. The overarching storyline: In Level 1, the main theme is bullying and exclusion. The second level deals with growing up, facing new challenges, and exploring your sexuality. The third level is about perspective taking, especially when different groups are fighting each other.
3. Gameplay: Aligning with the nature of adventure games, a lot of gameplay revolves around helping other characters (e.g., by finding specific items for them) to be able to progress in the game.
4. Group members: Each of the four group members or friends joining the player on their adventure has a distinct character, which is mapped onto each of the clusters from the IARC (Figure 2).
5. Solving interpersonal problems: During gameplay, the player encounters 10 situations where they have to regulate another character's emotion by using an appropriate adaptive strategy from the IARC. For that, the player gets four options to choose from. Two of those options are adaptive and two maladaptive. From the two adaptive options, one is from the positive engagement cluster, one from the acceptance cluster. If the player chooses a maladaptive strategy, they have to repeat the situation until an adaptive strategy is picked, so the player always has to pick an adaptive strategy to be able to progress in the game. The different situations cover various strategies and emotions (e.g., fear, disappointment, sadness, or anger). For example, in the second level, a knight is scared of participating in his first tournament.
6. Happy the goldfish: After each level, the group meets Happy the goldfish. While Happy is there to help the player figure out the mystery of the story, they are also helping the player reflect on the last level, including giving some explicit explanations about different strategies and why these are good (Figure 3).

PILOT FEASIBILITY STUDY

Aims

In line with the Medical Research Council (Skivington et al., 2021), this feasibility study aimed to explore acceptability, usability, and feasibility of the game to better prepare for both a more rigorous

Figure 1. Gameplay screenshots of the game *School Can Be a Nightmare*



evaluation study and implementation. The main aim of the study was to examine player experience of the game *School Can Be a Nightmare*. As a second aim, we exploratively examined changes in the expected outcomes on ER. Considering that the game had a broad topic of emotions and situations in which characters have strong emotions, including the PC, we tested both personal ER (pER) and iER. Our research questions were: (a) How is the player experience for *School Can Be a Nightmare*? (b) Are there any changes in ER after playing *School Can Be a Nightmare*?

Figure 2. Companion characters in *School Can Be a Nightmare,* mapped onto (from left to right): Affective engagement, humor, cognitive engagement, attention

Figure 3. Happy the goldfish from *School Can Be a Nightmare*

Procedure and Participants

The study was approved by the Karl Landsteiner Commission for Scientific Integrity and Ethics (EK Nr: 1075/2020). Participants underwent a pretest and posttest design with two online questionnaires before and after playing *School Can Be a Nightmare*. Participants were not told that the goal of the game was to make characters feel better, make the setting as realistic as possible, and avoid effects like social desirability. Participants indicated their consent at the beginning of the pretest. Consent was necessary to start the study. All participants used a code for each part of the study, so all data were anonymous.

Resulting data came from workshops with five Austrian school classes. Schools were recruited via existing networks of the research group; the sample was therefore purposive. The pretest (sociodemographic questions, emotion regulation of others and self scale [EROS]) was filled out online in the week preceding the workshop. The game was then played in class for about three hours. In the same workshop, immediately after playing the game, the posttest (EROS, German version of the game user experience satisfaction scale [GUESS-GA-18]) was filled out online. The last part of the workshop was small-group and full-class discussion and reflection. Note that these qualitative discussions only took place if there was time left.

Five Austrian school classes participated in the workshops, with a total of 166 participants. The sample had 52.9% male participants and a mean age of $M = 12.15$ years (standard deviation [SD] =

1.36). Participants were included in the respective analysis if they had a complete pretest and posttest, a complete GUESS-GA-18 score, and had indicated their sex, which led to differing sample sizes in the respective analyses. Baseline statistics can be found in Table 1.

Materials

GUESS-GA-18

The GUESS-GA-18 for adolescents (Mittmann et al., 2023) was used to measure player experience. This scale has 18 items in total, covering nine subscales of player experience: usability/playability, narratives, play engrossment, enjoyment, creative freedom, audio aesthetics, personal gratification, social connectivity, and visual aesthetics. The highest or best score possible both for the total scales and the subscales is 5.

The EROS Scale

The EROS (Niven et al., 2011) was used to measure ER. The scale includes four factors of ER: intrinsic (personal) affect-improving, intrinsic affect-worsening, extrinsic (interpersonal) affect-improving, and extrinsic affect-worsening. The scale has 19 items in total; nine measure extrinsic (interpersonal) ER and 10 intrinsic (personal) affect-improving ER. The instructions ask to report the extent to which the person had used the strategy over the past four weeks to try to change their own or someone else's feeling on a 5-point Likert scale ("not at all," "just a little," "moderate amount," "quite a lot," "a great deal"). One example item is: "I listened to someone's problem." We used this measure as it was developed by the authors who also developed the IARC, and because no questionnaires for iER for adolescents exist in German. We adapted the EROS by, first, translating it into German and changing the wording slightly to make an adolescent version. Second, we changed the time frame that the questionnaire tackled from 2 weeks to 5 days. Importantly, we used this measure directly after playing the game to assess whether participants showed immediate changes in ER (i.e., that using the strategy in the game would make them give that strategy a higher rating in the questionnaire). This means we tried to find out whether the questionnaire would be suitable to assess the learning outcomes of the game, not behavioral changes in real life.

Discussions and Open Questions

After the game, young adolescents who finished earlier than others joined focus group discussions. These were very open and sought to get feedback on what they liked and disliked about the game as well as what they thought the intended learning outcomes were. We also created posters where young adolescents could pin different strategies to help people in real-life situations.

Analysis

Mean and SD were calculated for the variables age and GUESS-GA-18. Relative and absolute frequencies were calculated for variables sex, GUESS items, GUESS subscales, usability specifically in a school setting, and a control question "How much did you like the game?" for the study population and stratified for male and female. We used median and interquartile range for ordinal variables. To compare between males and females, t-tests were calculated for age and total score of the GUESS-GA-18. For the ordinal variables, Wilcoxon rank sum tests were calculated. To investigate if iER or pER changed between pretest and posttest, Wilcoxon signed rank tests for paired data were used. Alpha-error level used was 5%. The correlation between prevalues and postvalues and between the total GUESS-GA-18 score and gaming behavior was computed with Spearman correlations. The influence of the schools was only investigated graphically and not considered in the analyses.

Table 1. Baseline statistics

	Total	Female	Male	Neither	Don't want to say
n	83	39	41	1	2
age (mean (*SD*))	12.30 (1.32)	12.00 (1.32)	12.54 (1.31)	12.00 (NA)	13.50 (0.71)
EROS intrinsic pre-test (median [IQR])	3.00 [3.00, 4.00]	3.00 [2.00, 4.00]	3.00 [3.00, 4.00]	3.00 [3.00, 3.00]	2.50 [2.25, 2.75]
EROS intrinsic post-test (median [IQR])	4.00 [3.00, 4.00]	4.00 [3.00, 4.00]	4.00 [3.00, 4.25]	4.00 [4.00, 4.00]	3.50 [3.25, 3.75]
Difference EROS intrinsic (median [IQR])	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	1.00 [1.00, 1.00]	1.00 [0.50, 1.50]
EROS extrinsic pre-test (median [IQR])	4.00 [4.00, 4.00]	4.00 [4.00, 5.00]	4.00 [4.00, 4.00]	3.00 [3.00, 3.00]	4.00 [3.50, 4.50]
EROS extrinsic post-test (median [IQR])	3.00 [3.00, 4.00]	3.00 [3.00, 4.00]	4.00 [3.00, 4.00]	3.00 [3.00, 3.00]	3.00 [3.00, 3.00]
Difference EROS extrinsic (median [IQR])	0.00 [-1.00, 0.00]	-1.00 [-1.00, 0.00]	0.00 [-1.00, 0.00]	0.00 [0.00, 0.00]	-1.00 [-1.50, -0.50]
GUESS total (mean (*SD*))	3.00 (0.57)	2.95 (0.58)	3.03 (0.57)	2.89 (NA)	3.36 (0.75)

Note. SD=standard deviation, IQR=interquartile range, EROS=emotion regulation of others and self, GUESS=game user experience satisfaction scale.

RESULTS

Baseline statistics for all participants and questionnaires can be found in Table 1.

Player Experience

A total of 104 participants filled out the GUESS-GA-18. Overall results, and results for all subscales, can be found in Table 2. The mean of the total scale is $M = 3.01$ ($SD = 0.64$) (out of 5) for our sample. The highest rated subscales are usability / playability, personal gratification, and enjoyment, and the lowest rated subscales are social connectivity, creative freedom, and visual aesthetics. There are no sex differences in our sample concerning player experience. Only one item from the GUESS-GA-18 ("I think the game is fun" from the subscale enjoyment) shows significant differences, with girls rating this item higher than boys ($p \leq 0.01$, Wilcoxon rank sum test statistic $W = 1715.5$, $n1 = 48$, $n2 = 55$). Note that the overall subscale shows no differences. To our question whether early adolescents like playing such a game in school, 77% answer yes, 5% answer no, and 18% answer "I don't know." Feedback from the discussion groups is mostly positive, with early adolescents indicating how much they like playing a game during school time, even though some mention that the game lasts too long.

ER

A total of 127 participants had a valid pretest and posttest. For pER, the correlation between pre- and post-values is $r = .27$. The Wilcoxon test shows that there is a difference between prevalues and postvalues ($p \leq .001$, Wilcoxon signed rank test statistic $V = 297$, $n = 81$). The median increases from 3 to 4 (Table 1). For iER, the correlation between prevalues and postvalues is $r = 0.18$. The Wilcoxon test shows that there is a difference between prevalues and postvalues ($p \leq .001$, Wilcoxon signed rank test statistic $V = 979$, $n = 82$). The median decreases from 4 to 3 (Table 1).

Table 2. Results of the GUESS-GA-18 for *School Can Be a Nightmare*

Scale	Mean (*SD*)
Total scale, player experience	3.01 (0.64)
Narratives	3.00 (0.95)
Visual aesthetics	2.88 (0.89)
Usability / playability	3.69 (0.92)
Social connectivity	2.06 (1.24)
Personal gratification	3.52 (0.93)
Creative freedom	2.67 (1.00)
Enjoyment	3.27 (0.92)
Play engrossment	2.95 (1.00)
Audio aesthetics	2.95 (0.94)

Note. The maximum available score for all scales / sub-scales is 5.0.

DISCUSSION

This paper describes the development of the pilot usability and feasibility study of the serious game *School Can Be a Nightmare*, which aims to train iER in early adolescents. Player experience of the game is positive, even though some adaptations should be made for future studies and implementation. While results of ER show that these states change between pretest and posttest, with pER increasing and iER decreasing, these changes need to be viewed in light of several points:

Our results from player experience are promising. The total scale of the GUESS-GA-18 had a value of $M = 3.01$ (out of 5 max). It can be expected that the overall scale is not the highest value as it is composed of the different quite distinctive subscales. For example, our game is a single-player game, so the subscale about social connectivity would be expected to be low. Likewise, the second lowest rating is for creative freedom. Even though the game allows for exploration, the gameplay follows a strict storyline that must be played to proceed in the game, hence not allowing the player a lot of freedom in their gameplay. This is necessary to make sure that players receive all the psychoeducative content. Unlike those two, which were active design decisions in the development process, the lower rating of visual aesthetics shows that the style of the RPG Maker might not be the best choice for young adolescents. Most likely, the games they usually play do not display this kind of pixel art style (Mittmann et al., 2022). On the other hand, our high scores in usability / playability show that the game is easy to understand and navigate. The personal gratification scale shows that the reward systems worked, and the high rating of the enjoyment scale shows that young adolescents think the game is, overall, fun to play.

Our results about changes in ER partially point in an unexpected direction – pER increases after playing the game, while iER decreases. In terms of feasibility of measuring direct learning outcomes of the game, this might mean that the EROS questionnaire is not suited to assess actions done in a game, as participants do not consider that they would include strategies used in the game in their assessment during the questionnaire (as an example, they do not think that using "humor" in the game would suffice to say they have used this strategy in the questionnaire). While future research should be conducted to further evaluate, interpret, and improve those results, there are several other possible explanations for the unexpected direction of iER: As mentioned in the description of the game content, the game does not exclusively revolve around iER, but more generally about emotions, emotional content, and the fact that it is important to regulate those emotions. While the main options in interactions are strategies related to iER, young adolescents

might have been more open to absorbing the general topic of emotions and ER. Another possibility is that because the game is played alone, it may have been harder for the participants to grasp the interpersonal aspects of the content. Instead, they may have adapted the learning material to their personal lives, which could explain the increase in pER but not in iER. If this is the case, it could be challenging to improve iER through a single-player game alone, especially when content is taught rather implicitly. In-depth learning would require surrounding activities, reflections, and actual interpersonal interactions.

Another influencing factor might have been the methods used. The workshops conducted for this study lasted around three hours, meaning that the game was played in one sitting. We opted for these workshops due to the possibility of conducting a feasibility study in schools despite the fact that schools were still hard to reach due to COVID-19. Consequently, the setting was different from how the game is intended to be played, which should be more flexible during several sessions over a few days (Mittmann et al., 2021). We believe that this has major implications for our results, but also shows us that the initial idea of splitting playtime into several sessions might be the better procedure. Three hours was too long for young adolescents to concentrate on a single game and, at the end of this period, many early adolescents showed signs of tiredness and frustration. We believe that this also influenced how they filled out the posttest, as they were not motivated to spend time with the questionnaire. Another indication for this is that more data were missing for the posttest. Even though workshop facilitators actively tried to motivate students to fill out the whole questionnaire, participants did not want to spend time with it anymore, which the participants also openly communicated. In terms of feasibility of the study methods, this shows some important implications to be considered: First, for future studies and especially for implementation, it is vital to let young adolescents play the game at their own speed and with their own need for breaks. This would help with reducing fatigue and thus motivate them to fill out the postquestionnaire. Second, we now know that the way the EROS is phrased is probably not the best way to evaluate content of a video game. Our results suggest that we should either use this questionnaire with some delay after playing the game to give time for real-world interactions or use different methods to measure learning outcomes of the game posttest. An open-answer format, as suggested in the study protocol (Mittmann et al., 2021) might be the solution in a setting less prone to fatigue.

Another important point to make is that we do not expect that a short serious game is likely to change a state like iER in three hours, especially not for a long period. Yet, what we found is that it may be able to initiate thinking and fluctuance around the topic. Considering a general liking of young adolescents for the game and their enthusiasm for playing the game in school, this shows that *School Can Be a Nightmare* might be a good addition to traditional social emotional learning (SEL) programs. We want to emphasize that we believe the game should be presented with additional activities where early adolescents get the chance to reflect about the topic and have a chance to learn how the game contents translate into real life. An example for a successful face-to-face program that the game would benefit from is "You, Me and the Little Monsters" (Pollak et al., 2023), a school-based SEL program targeting social skills in early adolescents.

STRENGTHS AND LIMITATIONS

When applying a co-design approach, the target group is given the voice and the power to inform critical decisions throughout the development (Abma et al., 2019; Cornwall & Jewkes, 1995). Involving the target group of the serious game in the development has various advantages: It benefits the end product in a way that increases the feeling that it is "real" while empowering the people who are not from the development team or mental health professionals. For young people in particular, it has especially beneficial effects on their capacities and, indeed, well-being (Cahill, 2007; Oliver et al., 2006). Our co-design approach includes early adolescents during all stages of

the development. We believe that our interdisciplinary work including software developers, artists, writers, and psychologists as well as the co-development process with young adolescents are a major strength for the development of *School Can Be a Nightmare*.

We used an existing questionnaire that is intended to test iER over the phase of 2 weeks. First, we had to adapt the questionnaire slightly to make an adolescent version. Second, we had to change the time frame that the questionnaire tackled from 2 weeks to 5 days. We therefore used a version of the questionnaire that was not validated beforehand. One example for a different method would be using visual vignettes (as proposed in the study protocol for an RCT), where young adolescents write down as many iER strategies as they can think of for different situations. This would allow for subjective reflections of young adolescents about iER strategies. Importantly, to reliably measure differences between pretests and posttests (especially when assessing counts), young adolescents would need to be equally motivated while filling out the questionnaire, as the results depend on them being willing to think about the strategies and writing down their answers themselves (rather than just clicking a response on a predefined questionnaire). This highlights a limitation of the current methods, where young adolescents would have been less motivated to write down strategies themselves after playing the game due to the long session.

Finally, our experimental study consists of a pretest and posttest design without a control group and thus cannot inform on effects of playing the game, rather only on changes in relevant outcomes associated with playing. Furthermore, we only investigated short-term outcome changes. Further studies on this game should consist of a rigorous randomized controlled trial, including a control group and a third time point to examine potential long-term effects.

FUTURE DIRECTIONS

The next steps for *School Can Be a Nightmare* are: (a) a more rigorous evaluation implementing the results about feasibility obtained in this study, which means following a different approach for playing the game, including a control group to test whether the explorative (and unexpected) results for iER of this study still hold true, and exploring whether player experience might increase in a different setting; and (b) the implementation of the game in a more elaborate SEL program, including additional sessions either before and/or after playing the game, where young adolescents can learn about emotions and ER, reflecting on the game and how it translates to the real world.

CONFLICTS OF INTEREST

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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APPENDIX

List of Abbreviations

ER Emotion regulation
EROS Emotion regulation of others and self scale
GUESS-GA-18 German version of the game user experience satisfaction scale for adolescents
IARC Interpersonal affect regulation classification
iER Interpersonal emotion regulation
PC Playable character
pER Personal emotion regulation
SEL Social emotional learning
The game can be accessed via https://www.kl.ac.at/dotventure/.

Gloria Mittmann is a postdoctoral researcher and psychologist. Her main interests lie in mental health and new media, with a focus on video games and the development and evaluation of interventions and serious games.

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Beate Schrank is the Lead of the Research Centre Transitional Psychiatry.