





BMJ Open Emotion regulation intervention to promote well-being through a serious game (emoWELL): a study protocol for a randomised controlled trial in Spanish emerging adults

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ABSTRACT

Introduction Emerging adulthood is a new life stage characterised by identity exploration, instability, self-focus, a feeling of ‘being in-between’ and the perception of a range of possibilities. Emerging adults may experience difficulties in their well-being during this complex stage. Adaptive emotion regulation can improve levels of well-being. Previous studies have shown that new technologies can enhance social-emotional competencies in this population. The purpose of the study is to design and implement a serious game, *emoWELL*, which improves knowledge and the use of adaptive skills of emotion regulation to improve well-being during emerging adulthood.

Methods and analysis The participants will be 385 emerging adults aged 18–29 years. They will be randomly assigned to either the control or experimental group. The experimental group will complete the *emoWELL* serious game. The game takes place on a train ride with several stops where the player will learn about emotion regulation. To assess the effectiveness of *emoWELL*, psychological assessment instruments validated in the Spanish population will be used. The primary expected outcomes include characteristics of emerging adulthood, emotion regulation (emotion dysregulation, emotion regulation strategies and cognitive reappraisal and expressive suppression) and psychological well-being. The secondary expected outcomes are self-esteem, psychological distress, loneliness and optimism. The assessment will occur at two different time points: pretest (T1) and post-test (T2) to observe improvements in the variables of interest.

Ethics and dissemination The study has been approved by the Ethics Committee of the Universitat de València (2013883) and will follow the standards of the Declaration of Helsinki for data collection. The findings will be shared with the scientific community. The intellectual property registration number is as follows: UV-SW-202460R.

Trial registration number NCT06049407.

INTRODUCTION

Emerging adulthood is a new stage that occurs between the ages of 18 years and 29

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The incorporation of information and communication technology through a serious game and a mobile application allows for greater accessibility and engagement among participants, which can enhance adherence and the practical applicability of the emotion regulation intervention.
- ⇒ The study uses a variety of validated assessment questionnaires to measure relevant psychological constructs, ensuring comprehensive evaluation of the intervention’s impact on emotion regulation and related outcomes.
- ⇒ The study employs a longitudinal experimental design with an intersubject comparison, including pretreatment and post-treatment measures, which allows for robust analysis of the intervention’s effectiveness.
- ⇒ The recruitment strategy focuses on university students, which may limit the generalisability of the findings to the broader population of emerging adults, particularly those who are not enrolled in higher education.

years.¹ Although emerging adulthood is a time of experimentation and opportunity, it can also be a time of instability and feeling stuck between adolescence and adulthood. Among all the stages people go through in their lives, the journey to adulthood is a challenging developmental phase that can cause a negative impact on many aspects of well-being.^{2 3} Emerging adults may experience psychological difficulties like emotional symptomatology and serious risk factors like substance abuse, self-harm and interpersonal violence.^{4–9} Common experiences like separation, job loss, health problems, reduced social networks and disruption of social responsibilities^{2 10 11} can exacerbate these challenges, leading to increased isolation, uncertainty



about the future and mental health difficulties that may impact successful transition to adulthood, including labour market exclusion.¹²

Although emerging adults may encounter such events during this stage, they can rely on various resources to effectively manage this phase. One of the most noteworthy resources is the proper regulation of their emotions.¹³ Emotion regulation refers to 'the extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals'.^{14 15}

The theoretical mechanisms underlying the expected relationship between enhanced emotion regulation and improved well-being have substantial empirical support. Evidence consistently shows that emotional regulatory abilities correlate with elevated psychological well-being and associated outcomes.^{16 17} For instance, people who employ adaptive emotion regulation approaches typically demonstrate improved mental health outcomes, such as reduced stress levels and enhanced life satisfaction. Particularly, techniques like cognitive reappraisal show positive associations with well-being, whereas less adaptive approaches, such as emotional suppression, may correlate with poorer mental health results.^{17 18}

Current research positions emotion regulation as essential for effective coping, with direct effects on people's ability to handle and bounce back from stress.¹⁹ This protective function works via multiple pathways, encompassing enhanced resilience, facilitation of adaptive stress responses and psychological distress prevention.²⁰ Furthermore, related concepts like mindfulness and emotional awareness may amplify the beneficial effects of cognitive emotion regulation through fostering more comprehensive and balanced emotional experiences.¹⁸

Within the emerging adult population specifically, adaptive emotion regulation approaches both directly enhance well-being and may indirectly influence critical areas including learning motivation and stress management capabilities.^{21 22} In contrast, combining limited cognitive reappraisal abilities with elevated expressive suppression tendencies may diminish well-being through amplifying the detrimental effects of anxiety or depressive symptoms.^{23 24}

Due to the complexity of this stage and the challenges that may arise, psychological interventions may be necessary for many emerging adults.²⁵⁻²⁷ In recent years, interventions aimed at improving emotion regulation have been developed for emerging adults, delivered in person or via information and communication technology (ICT). Training in regulating emotions and using adaptive emotion regulation strategies has been shown to improve both well-being and psychopathological symptoms in this population.^{15 28-31}

With regard to ICT-based interventions, digital media health has the potential to reach new populations, address limitations and promote the prevention and modification of psychopathological trajectories.^{32 33} Current emerging adults are inherently linked to digital technology,

extensively using electronic devices for communication, information access, entertainment, socialisation and identity formation.³⁴⁻³⁶ This familiarity and predisposition toward technology support the acceptance of digital platform-based interventions in this population, not only due to their frequent engagement with these tools but also because of the ease of accessing such interventional resources.^{37 38} Serious games are games designed for a primary purpose beyond that of pure entertainment and promote learning and enable people to acquire knowledge and skills in various environments.^{39 40} Systematic reviews demonstrate the efficacy of serious games at both preventive and interventional levels across different platforms, including classrooms, workplaces and healthcare centres.⁴¹ These games have demonstrated positive results with different age groups, such as adolescents and emerging adults.⁴² In recent years, more serious games have been developed with the goal of learning and improving emotional intelligence and emotion regulation. Despite its great usefulness, they are primarily focused on children and adolescents.⁴³⁻⁴⁶

Aims

The development of emotion regulation is important for well-being in emerging adulthood. Serious games have demonstrated their usefulness in mental health. They enable learning and skill development in a dynamic way and are accessible at any time of the day. Therefore, the aim of the present study is to design and implement a serious game, *emoWELL*, that enhances knowledge and adaptive skills of emotion regulation to improve well-being and well-being indicators in people aged 18–29 years.

The study hypothesis is as follows: emerging adults participating in the programme will show an improvement in emotion regulation competences, well-being indicators and psychological well-being and less mental health difficulties than emerging adults in the control group.

METHODS AND ANALYSIS

Study design

A longitudinal experimental design with an intersubject comparison was employed, comparing first pretreatment measures between an experimental group (individuals receiving *emoWELL*) and a control group (those without treatment) and after at one post-treatment time point (figure 1) to assess the natural progression of emotion regulation and well-being in emerging adults. A quasiexperimental study, randomised clinical trial, will be conducted to test the effect of the serious game, *emoWELL*, on the improvement of emotion regulation in participating Spanish emerging adults. Representative samples of emerging adults (18–29 years) will be selected. According to the Standard Protocol Items: Recommendations for Interventional Trials statement,⁴⁷ the current study protocol describes the details of the study rationale,

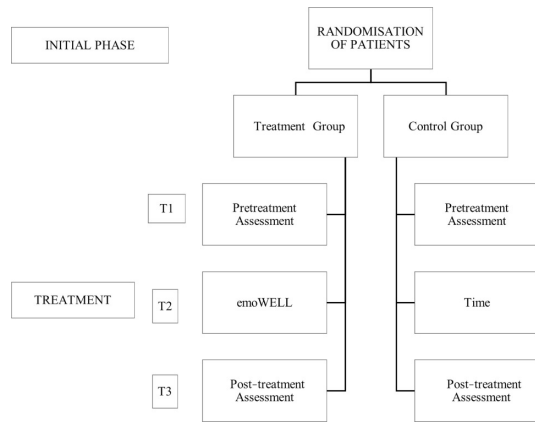


Figure 1 Study design of the serious game intervention.

objectives, interventions, methods and statistical analyses, organisation and ethical considerations.

Trial setting and participant timeline

The literature review, design of the psychological content of the intervention and technological design of the serious game and mobile application were conducted from October 2021 to the end of 2023. A pilot study will take place in the first half of 2024, during which some users will test both platforms to report improvements in the intervention content and technological bugs. The main study will take place from September 2024 until December 2025.

The intervention consists of three different phases (online supplemental table 1). The first phase is scheduled from September to October 2024. This phase has three main objectives: to contact interested emerging adults, to create a battery of questionnaires with the previously selected tools and to carry out an initial evaluation. First, contact will be made with professors from different faculties at the Universitat de València who have already communicated that their students would like to participate in a serious game intervention. In time, the contact will be extended to other Spanish university centres and other non-university groups of emerging adults in order to obtain a more heterogeneous and representative sample of this stage. In this first contact with the students of the Universitat de València, meetings will be held to establish contact with students interested in participating. Informed consent will be obtained from each participant, who may revoke it at any time. Prior to the start of the intervention, they will be asked to complete a series of questionnaires. Phase 2 aims to implement the programme. Follow-up via email and in-person reminders will be provided by university faculty to promote adherence to the intervention, and information will be collected on participants' decisions to withdraw from the intervention, should such instances occur. Three different files will be sent to the participants. The first file will be the emoWELL serious game, available for computers. The second file is a mobile application linked to the serious game, in APK format. The third file is a user guide with information on how to

download both platforms. The intervention is designed to be completed weekly at a leisurely pace, respecting the rhythms and schedules of each person. In this way, emerging adults will be able to participate autonomously in the intervention over a maximum period of 2 months (November to December 2024). In this second phase, the teachers will be able to mediate with the principal investigators in case of errors or difficulties. Students will also be able to contact the principal investigators or make appointments via email if necessary. Additionally, the technical team will have access to individual progress tracking data from the emoWELL platform, allowing them to monitor each participant's advancement through the game zones. This information will enable university faculty to identify participants who may need additional encouragement to continue with the intervention and provide personalised support to those experiencing difficulties or showing reduced engagement. Adherence will be operationally defined as completing at least five of the seven game zones during the 2-month intervention period. The main objective of Phase III is to analyse the effectiveness of the emoWELL programme. After completion, the variables assessed prior to implementation will be reassessed in December 2024 and January 2025. The next months will be dedicated to cleaning, analysing and disseminating the data.

Eligibility and recruitment criteria

Spanish people between 18 and 29 years are eligible to participate in the study. Individuals outside of this age range or who do not understand Spanish will be excluded. The opportunity to participate in the study will be communicated through various messaging channels and in Spanish universities. Prior to participation, emerging adult participants will receive information about the project and will be required to sign an informed consent form to voluntarily participate in the study.

Participants may withdraw from the study at any time without providing reasons and may revoke their informed consent. On withdrawal, participants retain the right to request deletion of their collected data. Data from participants who complete fewer than five of the seven game zones will not be included in the final analyses. When voluntarily provided, reasons for withdrawal will be documented for study improvement purposes.

Patient and public involvement

No participants were involved in the design of this study, nor will they conduct any part of the current research.

Interventions

The emoWELL programme comprises the serious game and an application. As new activities appear to the player in the game, they are unlocked in the mobile app for further practice.

The programme aims to improve emotion regulation, based on the *process model of emotion regulation*,⁴⁸ the instrumental account of emotion regulation⁴⁹ and working



Figure 2 Presentation of the emoWELL serious game and its aims.

on healthy emotion regulation strategies.^{50 51} The various activities are based on techniques from cognitive behavioural therapy and acceptance and commitment therapy.

Improvements in emotion regulation are expected to have a positive impact on psychological well-being. Through the strategies learnt, emerging adults will work on other competencies through emotion regulation, namely self-esteem, symptoms of depression and anxiety, perceived loneliness and optimism.

The game consists of a train adventure in which the player enters the train to learn and practise emotion regulation strategies. There are seven scenarios in total (figure 2).

The player begins the adventure at home (Zone 1, Home) (online supplemental figure 1), where they become familiar with self-care strategies as they walk through the various rooms of their house. Some of the activities include making the bed and cleaning a dirty

environment, selecting and listening to favourite music on the radio or cooking and feeding the character.

The player finds a mysterious ticket for a train leaving on the same day and decides to embark on the journey. In this area, the player then begins the journey (Zone 2, Train) (online supplemental figure 2), during which psychoeducation about emerging adulthood traits and emotion regulation is provided.

The train takes the player to a total of five emotion regulation intervention stops (Zones 3–7), where emotion regulation strategies are practised with the following aims: reflecting on the regulation strategies most used by the player and possible adaptive or maladaptive consequences of these strategies (Zone 3); reflecting on self-demands and using healthy emotion regulation strategies for self-care and self-esteem (Zone 4); identifying concrete stressors and daily life stressors that cause discomfort, anxiety symptoms or depressive symptoms, using adaptive emotion regulation strategies (Zone 5);

exploring perceived loneliness and working on bonding through emotion regulation (Zone 6); gathering and reviewing highlights in a final area (Zone 7). The five zones conclude with mindfulness practice.

In Zone 3 (*Zuria*) (online supplemental figure 3), the player meets the members of a snowy village. They experience unpleasant emotions in the cold and snow, such as fear and disgust. They employ maladaptive strategies of emotion regulation, such as rumination or self-criticism.⁵² The player is taught to identify maladaptive strategies of emotion regulation through a series of activities. One of these activities is similar to the metaphor of The Man in the Hole, in which the player falls into a snowy hole and keeps digging constantly. Another illustrative example is the sorting and catching of the adaptive and maladaptive strategies⁵² presented as dragons. The finalisation of this area is achieved by providing the village members with adaptive strategies of emotion regulation.

Zone 4 (*Gaia*) (online supplemental figure 4) is a mystical region set in the forests of Galicia (Spain), with the magic of the meigas. This territory has two zones: a shadow zone and a light zone. Both of these zones require work to integrate one's identity. The shadow zone is where one works with the witches of demand, criticism and guilt. Subsequently, one should proceed to the light area, where one works with acceptance and self-esteem, as well as diversity in gender and sexual identity. In one of the activities, a rag doll is broken, and the participant must then fill it with leaves, working on concepts related to gender and sexual orientation. This represents the processes of deconstruction and learning about diversity.

The character loses his train ticket and is forced to get off at the next stop: Zone 5 (*Acros*) (online supplemental figure 5), which brings us to ancient Greece. The player wants to enter the Oracle of Delphi, but in order to do so, he will first need to pass through the gymnasium and meet Chiron. Thanks to the oracle's pythonesse, the god Apollo gives him back his ticket. One of the activities involves the reordering of the list of priorities according to their level of importance or urgency.

The train derails in the sea, resulting in the character's displacement to a deserted island: Zone 6 (*Sargantana Island*) (online supplemental figure 6). He initiates a search for an exit to facilitate his return to the train. In one of the activities, the character, in a state of solitude, crosses the fourth wall and engages in a dialogue with the player. Through the selection of dialogue options, the player assists the character in validating his emotions, thereby practising interpersonal emotion regulation.

Once on the train, the character arrives in the empty area (Zone 7, Emptiness) (online supplemental figure 7). Through activities like rearranging train rails, players learn about managing experiences. The game concludes as the character finds a mysterious door leading to encounters with his past and future selves.

Sample size

The sample size is calculated considering the following parameters: confidence level=95%; margin of error=5%; total population of emerging adults in Spain according to data from the *National Institute of Statistics*⁵³ = 5 743 362 people. The representative sample size would be 385 participants. Participants will be randomly assigned to either the control or experimental group.

The total number of students enrolled in the Spanish University System in the academic year 2022–2023 was 1 722 247.⁵⁴ According to these data, with a confidence level of 95% and a margin of error of 5%, our sample should be at least 385 people. Therefore, our final sample of 385 university students is also representative of this sector of the population in Spain.

Assessment management and tools

The measures include aspects related to emerging adulthood, emotion regulation, well-being, self-esteem, psychological distress, loneliness and optimism. All instruments are completed by participants through an online platform at two time points: baseline (pretreatment) (T1) and post-treatment (T2) (online supplemental table 2). The assessment at T2 will also allow for the evaluation of possible adverse effects.

To ensure data security, a battery of questionnaires will be created using the LimeSurvey platform, which is linked to the university centres. The datasets will be downloaded, cleaned and coded by three individuals from the research group under the supervision of the principal investigators. The aforementioned individuals will have access to the analyses and results, with the principal investigators responsible for making the decision to terminate the trial.

Primary outcomes

Characteristics of emerging adulthood will be assessed using the Spanish version of the Inventory of Dimensions of Emerging Adulthood.^{55 56} The questionnaire consists of 31 items that are answered using a 4-point Likert scale (1=*strongly disagree*, 4=*strongly agree*). It is divided into six dimensions: identity exploration, experimentation/possibilities, instability/negativity, feeling in-between, self-focused and other-focused. Higher scores on these dimensions may indicate a greater presence of that characteristic in emerging adults. The original version of the questionnaire showed satisfactory psychometric properties ($\alpha=0.70-0.85$).⁵⁶ The Spanish validation showed similar reliability indices ($\alpha=0.55-0.80$).⁵⁵

Emotion regulation will be assessed using three instruments.

First, the Spanish version of the Difficulties in Emotion Regulation Scale (DERS)^{57 58} will assess emotion dysregulation. The 28 items in the DERS are grouped in five dimensions: lack of attention, confusion, rejection, interference and lack of control, and an overall global scale. Higher scores indicate greater emotion dysregulation. The items are answered on a



5-point Likert scale (1=hardly ever, 5=almost always). The original study⁵⁷ and the Spanish validation⁵⁸ showed similar internal consistency ($\alpha=0.93$ in both versions).

Second, the Spanish short version of the Cognitive Emotion Regulation Questionnaire will be used to explore cognitive strategies for emotion regulation.^{52 59} The test consists of 18 items that are grouped into nine strategy categories: self-blame, other-blame, rumination, catastrophising, putting into perspective, positive refocusing, positive reappraisal, acceptance and planning. The items are answered on a 5-point Likert scale (1=never, 5=always). In the original scale, internal consistency (Cronbach's alpha) of the different dimensions for the sample studied ranges from 0.62 to 0.90.⁵² The Spanish adapted scale indices showed a reliability between $\omega=0.52$ and $\omega=0.68$.⁵⁹

Third, the Spanish version of the Emotion Regulation Questionnaire^{60 61} will assess emotion regulation through 10 items. These items are grouped into two dimensions: cognitive reappraisal and expressive suppression. It is answered using a 7-point Likert scale (1=strongly disagree, 7=strongly agree). In the original scale, alpha reliabilities were averaged at 0.79 for reappraisal and 0.73 for suppression.⁶⁰ In the Spanish scale, Cronbach's α coefficients were $\alpha=0.79$ for reappraisal and $\alpha=0.75$ for suppression.⁶¹

Psychological well-being will be assessed by using the Spanish version of the Psychological Well-Being Scales.^{62 63} It has a total of 29 items that are rated on a 6-point Likert scale (1=strongly agree, 6=strongly disagree). A higher score on each scale indicates higher levels of psychological well-being in the following dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life and personal growth. The psychometric properties were found to be adequate in both the original version ($\alpha=0.78-0.81$)⁶² and the Spanish validation ($\alpha=0.70-0.84$).⁶³

Secondary outcomes

Self-esteem will be assessed using the Rosenberg Self-Esteem Scale.^{64 65} The scale consists of 10 items that are rated on a 4-point Likert scale (1=strongly disagree, 4=strongly agree). It has a single factor; a higher score indicates higher levels of global self-esteem. The original version showed satisfactory psychometric properties ($\alpha=0.85$).^{64 66} In the Spanish scale, Cronbach's α coefficient was $\alpha=0.84$.⁶⁵

Psychological distress will be assessed using the Spanish version of the Brief Symptom Inventory.^{67 68} The 18-item scale is grouped into three dimensions (somatisation, depression and anxiety) and the total score, the Global Severity Index, to assess general psychological distress. The questionnaire was rated on a 5-point Likert scale (0=not at all, 4=extremely). Both versions demonstrate satisfactory psychometric properties, with Cronbach's alpha for the general

population in the Spanish version ranging from 0.78 to 0.91.⁶⁷

Loneliness will be assessed with the Spanish version of the Three-item Loneliness Scale.^{69 70} This scale has a single factor, where greater scores indicate a greater perception of loneliness. It is composed of three items rated on a 3-point Likert scale (0=almost never, 2=frequently). The original version showed satisfactory psychometric properties ($\alpha=0.72$).⁷⁰ In the Spanish scale, Cronbach's α coefficient was $\alpha=0.89$.⁶⁹

Optimism will be assessed by using a Spanish questionnaire, *Cuestionario de Optimismo*.⁷¹ The scale has a single factor. The three items are given on a Likert scale rated ranging from 1 (strongly disagree) to 5 (strongly agree), where higher scores indicate greater levels of optimism. The scale has shown adequate satisfactory properties ($\alpha=0.84$).

Data monitoring

A data monitoring committee was not required due to the low-risk nature of the intervention and its short duration. The research team will monitor data quality and participant safety.

Data analysis

Reliability and validity analyses will be conducted prior to evaluating the effectiveness of emoWELL, by calculating Cronbach's alpha index, the compound reliability coefficient and the average variance extracted. Descriptive analyses will be carried out (measures of central tendency and percentages, correlations, regression analyses and Analyses of Covariance or ANCOVAS). In order to identify possible differences at the baseline (T1) between the experimental and the control group, multivariate analysis of variance (MANOVA) will be carried out. Multivariate analysis of covariance will help to identify changes after the intervention (T2). The impact of the serious game intervention will be analysed too through hierarchical regression analyses, where the dependent variables will be the change between T1 and T2 in the outcome variables. The reliable change index and X2 tests will be calculated. Conditional processes or analyses based on linear relationships to simultaneously analyse the moderating and mediating factors will be conducted, where the experimental condition will be the independent variable and the changes from T1 to T2 will be the dependent variables. Additionally, three further analyses will be conducted to complete the obtained results. Qualitative comparative analyses (QCA models) will be presented in order to complete the results obtained. This Boolean analysis allows us to identify which one of a series of identified factors is associated with the presence of a given result. Structural equation modelling and partial least squares models will be used to estimate the effect and the relationships among multiple variables. Finally, network

analysis allows us to analyse the interactions between the different nodes of the network and see how they influence each other. Therefore, statistical analyses will be done by means of the statistical packages SPSS (V.26), the PROCESS Macro for SPSS, Mplus (V.6.12), programme R Studio and Fs/QCA (V.3.0). The data will be entered electronically. Participants' files will be stored in a secure and accessible manner for a period of 10 years after completion of the study. The principal investigators and research team members involved will have access to the final trial dataset. Data will be shared with scientific journals if required for publication purposes, but will not be made publicly available in data repositories. Contractual agreements do not limit data access for investigators.

The LimeSurvey platform will be configured to require completion of all items within each questionnaire before proceeding to the next questionnaire or section. Therefore, isolated missing items are not anticipated; however, entire questionnaires may be missing if participants discontinue the assessment. Participants must complete at least 80% of the total questionnaire battery to remain in the sample. Despite the potential reduction in sample size and possible loss of information, missing data will be handled through listwise deletion rather than imputation methods. Missing data are anticipated to occur due to participants' internal states, such as fatigue, motivation or difficulty with questionnaires. Despite these limitations, excluding participants with missing data will mitigate bias due to these factors and avoid the risk of introducing bias through imputation by preventing the inclusion of potentially incorrect estimated values. Additionally, excluding missing data will simplify the analysis and data handling.

Outcomes

An experimental research methodology design was employed. It is expected that the implementation of the emoWELL psychological intervention protocol will result in statistically significant increases ($p \leq 0.05$) in variables such as adaptive emotion regulation strategies, self-esteem or psychological well-being, and a statistically significant reduction ($p \leq 0.05$) in psychological distress, perception of loneliness or emotion dysregulation. A comparative study of two samples will be conducted concerning their clinical and socio-demographic characteristics to analyse the beneficial impact and the efficiency and effectiveness of applying the emoWELL psychological intervention protocol. For this purpose, intersubject analyses will be performed at T1 and T2, comparing the data from the control group and the experimental group. In T1, no changes are expected in the health and well-being indicators for both groups in the studied variables. By T2, after the experimental group has received treatment, an improvement in this group is expected when

compared with the control group in health and well-being indicators in the studied variables.

ETHICS AND DISSEMINATION

The study has received approval from the Ethics Commission of the Universitat de València (registration number 2013883) and will adhere to the data protection law (Organic Law 15/1999 on the Protection of Personal Data). The study will be conducted according to local regulations and the Declaration of Helsinki of 1975, revised in 2008. The trial is registered with ClinicalTrials.gov (NCT06049407). All the information obtained in the study will be exclusively used for scientific purposes. Before data collection, the participants will be guided and sign the free and informed consent form after reading it. An alphanumeric code will be developed to link T1 and T2 (pre-evaluation and postevaluation), without identification of the participants to ensure anonymity. Important protocol modifications will be reported to relevant parties (investigators, trial participants, trial registries and journals). The results will be disclosed through publications in different high-impact, peer-reviewed scientific journals and scientific events. The results will also be presented to the funding organisation (Ministry of Science, Innovation and Universities MCIN/AEI /10.13039/501100011033; PID2020-114425RB-C21).

DISCUSSION

Serious games offer significant benefits for physical and mental health.⁴² For emerging adults specifically, this approach is particularly advantageous given their inherent familiarity with digital technologies and predisposition toward technology-based interventions through their extensive use of electronic devices.^{34–36} The proven efficacy of serious games across diverse intervention contexts⁴¹ supports the implementation of such technological frameworks in this population. The emoWELL programme, consisting of a serious game and mobile application, aims to improve emotion regulation competences, which is expected to benefit participants' psychological well-being and other areas of mental health. The anticipated improvement in well-being is grounded in prior evidence linking adaptive emotion regulation—for example, the use of cognitive reappraisal—to enhanced mental health outcomes, while also highlighting the detrimental effects of suppression.^{17–18} Emotion regulation has also been identified as a core mechanism for coping with challenges such as stress and for fostering resilience,^{19–20} with particular relevance in emerging adulthood.^{21–22}

The effectiveness will be assessed using MANOVA, multiple regression analysis, reliable change index

and other additional analyses. The data collection and analysis of this study could enhance the field of emotional education both theoretically and practically. On the theoretical level, this is particularly relevant for the formulation and implementation of effective programmes, as well as the identification of relevant variables that benefit from the development of emotion regulation. On a practical level, this project is a learning platform aimed at strengthening emotion regulation, which could be transferred and applied to other emerging adult settings. Therefore, it is expected not only to increase knowledge about emotional competences in emerging adulthood, but also to finally obtain a tool that promotes healthy emotional development at this stage.

Despite the contributions, this study still has limitations. The first screening will be conducted on a population of university students. The use of incidental sampling may hinder the generalisation of the programme's results. The recruitment strategy focuses on university students, which may limit the generalisability of the findings to the broader population of emerging adults, particularly those who are not enrolled in higher education. Additionally, the voluntary nature of participation may introduce self-selection bias, as participants who choose to engage in an emotion regulation intervention may already have higher motivation for psychological improvement or greater awareness of emotional difficulties compared with the general population of emerging adults. Furthermore, since the intervention will be conducted on an individual basis, there may be challenges associated with monitoring the study.

Thus, this study will contribute to the advancement of serious games for improving emotional competences. It may also pave the way for future development and validation interventions through ICT in emerging adulthood.

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Contributors IM-C: guarantor. SV-J and HS-S drafted and wrote the protocol manuscript. SV-J, MP-M and IM-C collaborated in the development of the game narrative and psychological content. J-AG-G contributed to the game narrative development and led the technical development of the serious game, including programming and gameplay optimisation. MP-M and IM-C obtained ethical approval, secured funding for the study, participated in variable selection, supervised the overall study design and critically reviewed the manuscript. All authors read and approved the final manuscript.

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