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RESEARCH ARTICLE

Development of a theoretically and empirically grounded emotion knowledge training for the young

[version 1; peer review: 2 approved with reservations]

Arpine Hovasapian[1], Veerle E.I. Huyghe[1], Katja Schlegel[2], Johnny R.J. Fontaine[1]

[1]Department of Work, Organization and Society, Ghent University, Henri Dunantlaan 2, Ghent, 9000, Belgium
[2]Institute of Psychology, University of Bern, Fabrikstrasse 8, Bern, 3012, Switzerland

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Abstract

Background: Digital mental health trainings can be an impactful and efficient way to promote well-being and prevent psychopathology during the sensitive developmental periods of adolescence and young adulthood. However, many online and app-based trainings are often not grounded in science or have low engagement rates due to poor usability. The aim of the current project was to tackle both of these issues in the development of an emotional competence skills training for youth (target age: 16-22). Given that deficits in emotional competence constitute a risk factor for poor mental health, we built a training that aims to increase knowledge and understanding of emotions and the processes that underlie them. Methods: As a theoretical base, we used the Component Process Model to teach youth to understand their emotional experiences as a dynamic process that involves the activation of appraisals, bodily reactions, expressions, action tendencies and subjective feelings. To avoid issues related to low engagement, we included youth across various stages throughout the development of the training program, which allowed us to make changes incrementally at each stage. Feedback from several focus groups, Youth Advisory Board meetings, and a pilot study resulted in the development of a gamified emotional knowledge skills training that teaches young people how to understand, recognize, and reflect on their emotions. Results: Results showed that when it came to digital mental health trainings, youth valued personalization, relatability, fast and colorful graphics, professional audiovisual elements, interactivity, ease-of-use, privacy protection and scientific legitimacy. Conclusions: In this paper, we describe and reflect on the process of developing the training and offer suggestions to help guide future researchers in building mental health trainings that are both supported by science and appealing to young users.

Keywords

mental health, app, adolescent, young adult, emotion skills, emotion competence, emotion knowledge, mHealth, online training

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1. **Sabina Hodzic**, Karl-Franzens-Universität Graz, Graz, Austria

2. **Moshe Zeidner**, University of Haifa, Haifa, Israel

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Corresponding author: Johnny R.J. Fontaine (Johnny.Fontaine@ugent.be)

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Plain language summary

This paper describes how a new e-health training was developed, of which the aim is to teach young people about emotions using scientific theory. Topics in the training include: 'What is an emotion?', and 'How can we recognize emotions?'. Learning about emotions can help youth understand their emotional lives, which can promote well-being and prevent psychological issues. The training was developed to be a scientifically grounded training that is engaging for users. We built this training for a non-clinical young audience (16–22), as this is a critical developmental life stage where having access to mental health knowledge is important. The training was built using a theory of emotion that conceptualizes emotions as reactions to a goal-relevant event and consisting of different components: thoughts, bodily sensations, gestures (expressions), actions one wants to take and subjective feelings. Feedback from youth was collected through focus groups, sessions of the Youth Advisory Board, and an anonymous survey. From their input we learned that young people find the following important in digital mental health trainings: personalization, relatability, fast and colorful graphics, professional audiovisual elements, interactivity, ease-of-use, privacy protection and scientific legitimacy. The resulting training consists of psychoeducation videos and content related questions, stimuli from which emotions are identified (i.e., photo and video expressions, and emotion vignettes) and reflection exercises. The content was organized in 10 'sessions' and these were categorized into four 'challenges': introduction, parts of an emotion, regulating emotions, recognizing emotions and a summary session. The sessions increase in difficulty and unlock as the user progresses. To conclude, we developed a new e-health training about emotions that is both scientifically grounded and takes the end-user into account.

Introduction

Our emotions serve as powerful tools for navigating our social world. Emotions are evolved mechanisms that can signal when to avoid (anxiety), when to be cautious (fear), when to affiliate (joy, love), and when to retreat and rest (sadness; Frijda & Mesquita, 1994; Keltner & Gross, 1999; Lerner & Keltner, 2001; Shiota *et al.*, 2004). These natural processes can go awry when signals are misinterpreted, or when reactions to these signals are misdirected or unregulated (Gross, 2008). Identifying and understanding our emotions and the underlying processes from which they unfold has important implications on our functioning (Castro *et al.*, 2016; Trentacosta & Fine, 2010). Additionally, such skills can be taught and learned (Hodzic *et al.*, 2018; Izard *et al.*, 2011; Trentacosta & Schultz, 2015), and digital psychoeducation programs have the potential to provide this type of training efficiently (Schlegel, 2021). The term 'emotion competence' (EC) has been used to describe the skill-based capacity to identify, understand, correctly use and regulate, or manage one's own and others' emotions (Fontaine, 2016). Emotion competence (or 'emotional intelligence' as it is also often referred to) has been linked to positive life outcomes, including health, well-being, and job-related success (e.g., Brackett *et al.*, 2011; Petrides *et al.*, 2016).

Deficits in emotion competence have been consistently found to be both a risk factor and core feature of psychopathology. For example, researchers have found emotion dysregulation (e.g., the excessive use of rumination or suppression) as well as deficits in the ability to accurately recognize other people's emotions to be related to mental health disorders such as bipolar disorder (Glenn & Klonsky, 2009), anxiety, depression, aggression, and eating pathology (Brockmeyer *et al.*, 2016; Dalili *et al.*, 2015; McLaughlin *et al.*, 2011). Mental disorders account for a large proportion of the disease burden in young people around the world (Patel *et al.*, 2007; Vigo *et al.*, 2018) and there is a global trend of earlier onset of mental disorders (Marcus *et al.*, 2012; Patton *et al.*, 2016). The incidence of anxiety and depression markedly increases starting mid-adolescence and peaks during the sensitive period of young adulthood (Kessler *et al.*, 2005). Moreover, the adolescent and young adult years are central in the development of capabilities related to health and well-being, such as EC (Halberstadt *et al.*, 2001; Patton *et al.* 2016). Yet, despite the need for mental health training and interventions, a large majority of young people do not receive or have access to them (McGorry *et al.*, 2013; Thornicroft, 2008). As a result, interest in mental health smartphone apps has surged as more people are seeking digital tools for self-improvement (Torous *et al.*, 2018). Given the importance of EC in adolescence and young adulthood, training these competencies via a digital platform can be an impactful preventative measure.

Digital interventions

Training emotional competence skills via a digital platform, e.g., as part of a mental health training app, has the potential to provide an effective and scalable way to improve well-being in the younger population (Newbold *et al.*, 2020). Digital mental health trainings are highly accessible, cost-effective, can receive high acceptability by youth, and can improve mental health outcomes (Lattie *et al.*, 2019; Price *et al.*, 2014). Furthermore, accessing mental health trainings digitally can allow young people to engage with their emotional lives in a confidential space outside of any stigma or discomfort linked to discussing their mental health (Levin *et al.*, 2018). Thus, mental health apps may engage young people who typically would not seek help through traditional routes.

Despite this tremendous potential and the increasing interest of health apps in the general public and scientific communities, there are two major issues that mental health apps face. First, the majority of mental health apps available for download are not theoretically grounded nor guided by scientific evidence during app development (Mani *et al.*, 2015; Neary & Schuellen, 2018; Nicholas *et al.*, 2015). For example, in a review of anxiety management apps, 67% of apps lacked any involvement from mental health professionals in their development (Sucala *et al.*, 2017). Moreover, many apps do not include the type of content that has been shown to improve mental health outcomes. To assess this, Wasil & colleagues (2019) coded 27 apps for empirically supported treatment elements. They found that although some popular treatment elements for depression and anxiety were common across apps (e.g., meditation, relaxation), they found that other core treatment elements were rarely included (e.g., exposure, restructuring). Kertz & colleagues (2017) also conducted a review of worry and anxiety apps and found that

only a quarter of the apps contained content that was consistent with evidence-based strategies for generalized anxiety disorder. Such findings suggest that there is a lack of scientific and clinical expertise during app development.

The second issue that mental apps face is that rates of app engagement are often surprisingly low. In a market study that measured app retention of 37,000 apps, it was found that 63% of users typically visit an app less than 10 times (Localytics, 2017). Ensuring app retention is particularly important in mental health apps, as loss of motivation is a common symptom of clinical and subclinical mental health issues (Dickson *et al.*, 2017; Winch *et al.*, 2015). One study found that only 14% of people who downloaded a Post-Traumatic Stress Disorder (PTSD) app used the app the day after they downloaded it (Owen *et al.*, 2015).

Researchers have identified poor usability and lack of user centric design as key factors that contribute to the low engagement rates of mental health apps. In a clinical review of user engagement in mental health apps, Torous & colleagues (2018) identified several themes underlying poor engagement of mental health apps. These included poor usability (apps were not designed with users in mind), distrust from users regarding privacy and scientific merit, and apps not solving problems users care about. In another study that asked about mental health app preferences, participants highlighted visual appeal, intuitiveness, simplicity in language and ease of use to be important preferences and were more likely to adopt an app if it was backed by research (Schueller *et al.*, 2018).

Hence, involvement of end-users in the design and development of apps has been identified as a crucial step in improving usability and adoption of mental health apps (Coyle *et al.*, 2007). Particularly in the mental health space, researchers have highlighted the importance of including young people in the development and design of an app in order to better match the needs and preferences of these users (Hetrick *et al.*, 2018).

Reflecting on these recommendations, we built an emotion knowledge skills training for youth that is firmly rooted in scientific theory and developed with the cooperation and input from end-users. This training is a part of a larger European research project 'Assessing and Enhancing Emotional Competence for Well-Being (ECoWeB) in the Young: A principled, evidence-based, mobile-health approach to prevent mental disorders and promote mental well-being' (Horizon 2020 Grant 754657; Newbold *et al.*, 2020). The aim of the ECoWeB project is to build and test the 'MyMoodCoach' app[1] which includes various training programs in emotion competence, one of which is the training described in this paper.

The challenge of creating a scientifically based training that is attractive and engaging to a young audience was taken on by combining a strong theoretical basis and including a diverse sample of young people in all stages of the process. This paper aims to describe the processes and learnings of building and testing a digital emotion skills training.

Theoretical background

As part of the ECoWeB project, we aimed to build a training focused on Emotion Knowledge as it is conceptualized by Scherer (2007) and Fontaine (2016). The contents of the new training adopt a well-developed ability model, the Emotional Competence Process model (ECP; Scherer, 2007) that draws on established findings about the mechanisms underlying emotional functioning (Mehu & Scherer, 2015). The ECP distinguishes various emotion competence abilities which are implicated in mental well-being in health, such as awareness, recognition, regulation, and understanding of emotion processes. More specifically, emotion knowledge involves the awareness of the personal and situational factors that determine the elicitation of a specific emotion, accurate recognition and perception of one's own emotions and the emotions expressed by others, empathic understanding and perspective taking for the emotional reactions of different people, and understanding emotion dynamics.

The ECP is based on an empirically validated theoretical process model of emotion called the Component Process Model (CPM; Scherer, 2009) which regards emotions as a dynamic process triggered when an individual encounters a goal-relevant event and that is set in motion by (low level) cognitive appraisals. The CPM is an emotion theory within the componential emotion approach, which regards emotions as a process that includes five components: appraisals (of the event), bodily reactions, expressions, action tendencies, and subjective feelings (Scherer, 2009; Fontaine *et al.*, 2013). Appraisals are cognitive evaluations of the event or object (e.g., that the event is controllable, predictable, violates one's norms). Bodily reactions refer to physiological changes that prepare individuals to respond to the emotion-evoking event (e.g., increased heart rate). Action tendencies are behavioral inclinations or motivational forces (e.g., wanting to hide). Expressions include observable facial, postural or vocal changes (e.g., frowned eyebrows). Subjective feelings refer to the conscious awareness of the emotion which allows for verbal communication about the emotion process. This componential approach to emotions has been supported by cross-cultural psycholinguistic research using 34 samples from 27 countries in 23 languages that consistently revealed that emotion words refer to changes in all five components (Fontaine *et al.*, 2013).

When applying the componential emotion approach to ability-based tasks, we operationalize emotion *understanding* as understanding the probable presence of the five emotion components in reaction to a relevant event, emotion *identification* as the ability to correctly identify an emotion process using information from all of the five emotion components, and emotion *regulation knowledge* as knowing how to modify one or more of these five components (Fontaine, 2016).

Basing the emotion knowledge training on this combined set of competencies has several strengths. First, using a model that

[1]For more information on the project, please see our trial website https://www.mymoodcoach.com/ and our ECoWeB project website http://www.ecowebproject.eu/

is based on normal functioning allows for creating content that can be useful for preventive and psychoeducational training for people regardless of any symptomology. Other mental health trainings are typically derived from clinical models and are targeted to those with known mental health symptoms (Parker *et al.*, 2018). Second, focusing on emotional processes that can be trained through standardized tasks allows us to later scientifically assess the efficacy of the training with ability-based assessment tools. Lastly, standardized training material benefits from being more easily scaled-up in digital formats and transferred to other languages.

Objective

To summarize, this paper describes the development of an emotion knowledge training that was designed to be delivered through the MyMoodCoach app for youth aged 16–22 within the ECoWeB research project. To avoid issues related to low engagement, we used an iterative approach (cf., section Study design) and involved youth in all stages of development. We aimed to build a training that was both firmly embedded in theory and engaging to a non-clinical young population.

Methods

Study design

We adopted an iterative approach in which the training content and design were developed incrementally and adapted over the course of the project. This allowed us to make changes at various steps of the process and be responsive to user feedback. It also allowed us to negotiate between ideals and the technological and ethical practicalities we faced. Training design elements were thus adapted to meet limitations of programming resources. In Table 1, characteristics of the focus group meetings are listed. In Table 2, characteristics of the Youth Advisory Board (YAB) meetings are listed.

Focus groups

Participants. Data from six focus groups (N = 29, unique participants N = 25) that were organized to build and test content during all stages of training development (i.e., deciding on the structure and framework of the training, making psycho-education scripts and animation videos, selecting stimuli, creating scenarios, listing response options, and refining materials) have been used. Detailed information regarding the focus group meetings is listed in Table 1. These focus groups were led by three female master's students (referred to in Table 1 as A, B and C). The age of participants we were looking for was 16 to 21 years old. Special focus was placed on recruiting participants from minority groups, as these young people tend to have even more issues with accessing mental health than in general (e.g., Lee-Tauler *et al.*, 2018). Specifically, we chose to recruit participants of Turkish origin as this is one of the largest minority groups in Belgium (cf., Wets, 2006). The master's students were instructed to recruit participants through their personal connections and social media. When a potential participant showed interest, they contacted the master student, after which the student emailed

Table 1. Characteristics of the focus group meetings with A, B, C referring to each of the three master student researchers.

Focus group date	Student	Sample size	Gender distribution participants	Age group participants	Ethnic origin	Main topic
24/07/2018	A	5	100% female	100% +18	Belgian	Script session 1 Emotion exercises
25/07/2018	B	4	100% female	25% +18	Belgian	Script session 1 Emotion exercises
12/08/2018	A	8	100% female	50% -18	Belgian	Voice recording tool Mood Tracking Video Styles
18/08/2018	C	3	66% female	100% +18	Turkish	Script session 1 Emotion exercises
29/08/2018	C	4	50% female	100% +18	Turkish	Voice recording tool Mood Tracking Video Styles
30/08/2018	B	5	100% female	40% +18	Belgian	Voice recording tool Mood Tracking Video Styles

Table 2. Characteristics of the Youth Advisory Board (YAB) meetings.

YAB Date	Researcher	Sample size	Gender distribution participants	Age group participants	Ethnic origin	Themes
25/09/2018	2nd author	5	60% female	60% 18+	Belgian	Graphics & avatar Gamification Target population & promotion app Emotion Knowledge Training Emotion Analyst Voice Recording
29/04/2019	2nd author	6	66% female	100% 18+	Belgian	App mock up
26/02/2020	2nd author	2	50% female	100% 18+	Belgian	Evaluation after test round of app

them more information, and asked about their age. This allowed the students to provide the passive parental consent in advance (cf., procedure). Participants could join multiple meetings or just one, and each meeting was open to new participants (there was a maximum of 10 participants per meeting). For student A, in the second meeting no participants from the first meeting returned. For student B, in the second meeting three participants from the first meeting returned, and two new participants joined. For student C, in the second meeting, one participant from the first meeting returned, and three new participants joined. No information on the relationship between the students and their participants was collected by the researchers. The authors of this paper did not establish a relationship with participants prior to study commencement. Participants were aware of the general goal of the focus group, namely, to collect feedback and opinions about training material and other general questions regarding the MyMoodCoach app. The message towards the focus groups was that the researchers were open for suggestions and improvements, creating an open atmosphere.

Procedure. The authors were already collaborating with master's students regarding the ECoWeB project due to the link of their master's thesis dissertations with the project. The students were informed, guided, and instructed by the authors to organize and run the focus group meetings. In addition, intermediate meetings between the students and the authors took place to closely follow up the course of events. The authors provided a script to the students which included information about the general goal of the larger project (i.e., 'improve emotional competencies - the capabilities to understand, recognize and regulate emotions in ourselves and others' and 'building an app made for young adults to help them learn about emotions') and the goal of the focus groups. The script also mentioned that participation is completely voluntary, participants can choose whether or not they answer questions and can leave at anytime. Participants were informed that the sessions were not meant to ask them about their personal emotions, that there were no correct or incorrect answers or any type of evaluation. It was also explained that participants of the focus groups need to keep the content of the focus groups confidential.

The master students were free to find a location (a formal room, not an informal location like a coffee bar etc.) or could ask the authors for a meeting room. After the general introduction, all participants received an Informed Consent form to sign before the meeting continued. The students handed in all informed consent forms to one of the authors after their meeting had taken place. Before the meeting took place, all participants younger than 18 were instructed by the students to inform their parent(s) about their wish to participate in the focus groups. The parents could sign and return a passive parental consent to let the students know in case they did not agree with their child's participation. In the Informed Consent form the statement 'I agree that the researchers will use my replies for further developments in the ECoWeB project' was included to clearly indicate the purpose of the collected data.

The focus group meetings took approximately one to two hours, during which the students took notes to use later for the minutes of the meeting. The participants could also take notes on the sheets with the assignments and were asked to not write their identification information on these. Students then wrote a summary of their focus group which was used by the first author to learn more about the training materials and the MyMoodCoach app for further improvements. All handwritten notes were either destroyed or submitted to one of the authors. The minutes were not returned to the participants for feedback or comments. The authors decided that discussing each focus group topic across three sessions would be sufficient to obtain reliable findings.

After focus group meetings ended, each participant received five euros. As advised by Seymour (2012), the amount of payment was carefully chosen to make sure it is not disproportional to the investment of participants, it is not coercing participation, and it does not influence the decision regarding risk taking as this participation is not likely to include any risks. This payment is not expected to decrease intrinsic motivation as five euros might be considered not worthwhile for participation. We assume this incentive is merely seen as a bonus for participation and possibly experienced as a form of appreciation (cf., Resnik, 2015).

Youth Advisory Board (YAB)

Participants. Five meetings with the Youth Advisory Board (YAB) took place (N= 25; unique participants N=12). Data from three of those sessions are within the scope of this paper and were included in analyses. Detailed information regarding these meetings is listed in Table 2. The second author of this study organized and chaired these meetings. The age of participants we were looking for was 16 to 22 years[2]. The second author, who has a master's in clinical psychology, was inexperienced in leading focus group meetings and hence used guidelines provided by ECoWeB team members and the first author. Guidance by ECoWeB team members was provided in the format of a PowerPoint presentation which included information about the project, the goal of the YAB meetings and the questions for the group. Recruitment took place through social media, the Ghent University Psychology department, and personal connections. Four out of the twelve participants were acquainted with the researcher through different contexts before the study and were encouraged to reply as openly as possible. When a potential participant showed interest, they needed to contact the second author. Following that, the second author provided more information and asked their age, after which a passive parental consent form was sent to this person in case they were younger than 18. Participants of the YAB were encouraged to come to several meetings. There were seven participants who came to more than one of the YAB meetings and five participants who joined only one meeting. Participants were aware that the second author was also a researcher in this project, and thus co-developer of the materials. The second author emphasized the importance of both positive and negative feedback.

Procedure. Participants in the YABs received, at the beginning of the first meeting, information regarding the ECoWeB project and the goals of the YAB. The participants were informed that no personal nor sensitive information would be sought. Participants could ask for more information and, after the introduction, they were invited to read and sign an Informed Consent form. For participants younger than 18 years, in addition to their own signed informed consent, passive parental consent was sought before the meeting. The parents could sign and return a passive parental consent to let the researcher know in case they did not agree with their child's participation. In the Informed Consent form, the statement 'I agree that the researchers will use my replies for further developments in the ECoWeB project' was included to clearly indicate the purpose of the collected data. An optional section in the Informed Consent form was regarding the audio-recording of the meeting, of which no participants opted out. The second author took notes during the meeting. After the meeting, these notes were digitalized in a summary and complemented with notes from the audio-recordings to form a report. The participants could also take notes on the sheets with the assignments and were asked to not write their identification information on these. The audio-recordings were deleted immediately after the reports were written. The reports were used by the first author to learn more about the training materials and the MyMoodCoach app for further improvements. The YAB summaries have also been taken into account in the larger ECoWeB project. The notes and reports were not returned to the participants for feedback or comments. Researchers decided that investigating each topic in one national YAB session would be sufficient to obtain reliable findings.

The YAB meetings took place in a faculty meeting room with only the researcher(s) and YAB participants present. The approximate duration of YAB meetings was two hours and participants received 20 euros for each session. For the Youth Advisory Boards, the incentives were similar across the different European countries in the ECoWeB study. After reflecting within the large consortium, it was decided that a reward of 20 euros was appropriate for this situation and the low level of risk since participants were not expected to share sensitive personal information, only their opinions regarding suggestions we make in the project (cf., Resnik, 2015; Seymour, 2012).

Pilot study

Participants. We collaborated with the Ghent University course 'Coaching Skills' for the pilot study of the newly developed Emotion Knowledge training. Ghent University students were chosen since this research is conducted by Ghent University researchers. This course was an ideal choice because emotional intelligence is a topic included in this course. The students who were enrolled in the 'Coaching Skills' course (N=94) completed the new Emotion Knowledge training in a web-based format as part of their course requirements. This web-based format was programmed by our team using Qualtrics. Another reason to collect feedback from students in this course is because they were accustomed to reflecting upon ways to educate people. Therefore, it was especially interesting to collect their insights about our developed training. Recruitment was done by inviting these students through the general student communication platform (Minerva) to complete an additional optional survey which was programmed in Qualtrics. A total of 17 people completed this additional optional survey. A copy of the survey can be found in the *Extended data* (Hovasapian *et al.*, 2022).

Procedure. Both the students and the instructors from this course received information on how the training would be accessible and what was expected from the students. Here we do not provide further details on the procedure for completing the training as these data are not included in the current study. The included data only refers to the voluntarily given feedback on an early version of the training. The feedback questions were the following: 'Overall, how did you feel about the difficulty of the questions?', 'Please answer the following questions about the videos you watched at the beginning of each session. - What did you like about these videos? - What did you not like about these videos?' 'These questions are about the two-answer questions that were asked after each video (e.g., "being

[2]This age range is slightly different than the age range in the focus groups because the maximum age within the ECoWeB project was changed from 21 years to 22 years old.

satisfied with the current situation is an example of which emotion?") - What did you like about these questions? - What did you not like about these questions?', 'These questions are about the figures where you had to guess which emotion was depicted. - What did you like about these questions? - What did you not like about these questions?', and 'These questions are about the reflection questions where you each had to give an answer about your experiences: - What did you like about these questions? - What did you not like about these questions?'. Students were informed that their feedback would be used to further improve the training.

Materials

Stimuli to create emotion recognition exercises included photos and videos from validated databases which were freely available to investigators for use in scientific research. For photos, we used the Amsterdam Dynamic Facial Expression Set (ADFES; van der Schalk *et al.*, 2011), which includes a standardized set of expressions for nine discrete emotions (joy, anger, fear, sadness, surprise, disgust, contempt, pride, and embarrassment). The set includes 10 male and 12 female models with 10 of them of Mediterranean descent and 12 of North European descent. Models were trained to express prototypical elements of emotion displays based on a body of research that links facial micro-expressions (called Action Units) to specific emotions (e.g., Ekman & Friesen, 1978; Keltner, 1995; Tracy & Robins, 2004).

For videos, we used the Geneva Multimodal Emotion Portrayals database, which includes portrayals of 18 emotions in different intensities (GEMEP; Bänziger *et al.*, 2012). Twelve emotions had been selected to evenly cover four quadrants of the emotional valence–arousal space: joy, amusement, pride—high arousal/positive valence; pleasure, relief, interest—low arousal/positive valence; anger, fear, despair—high arousal/negative valence; and irritation, anxiety, sadness—low arousal/negative valence. Actors were videotaped from their upper torso upward to display facial and postural emotion cues. They pronounced a sentence that did not have semantic meaning so that emotion cues could still be picked up by the voice, but not by specific words. Actors were instructed by a professional director to remember real-life scenarios related to each emotion to maintain authenticity of the expression.

Written emotion identification scenarios were collected and created to include in the training. In addition to the scenarios created by youth in focus groups, we collected scenarios from an existing data set of participants who filled out the Geneva Emotion Analyst, during which participants described an emotion experience they had (Scherer & Meuleman, 2013).

Training development process

The development of the training followed three general steps and included focus groups, a Youth Advisory Board and a pilot study. Table 3 lists examples of questions asked in focus group and YAB meetings throughout each of these steps.

Step 1: Training design and framework. The first step consisted of a search for theoretical frameworks and information from existing data in the creation of relatable content and scenarios for youth. We reviewed scientific models of emotion, namely, the Emotional Competence Process model (ECP; Scherer, 2007) and the Component Process Model (CPM; Scherer, 2009). Through our conversations within the ECoWeB consortium, we also considered how gamification theory (e.g. Zichermann & Cunningham, 2011) and user experience concepts (Pernice, 2016) can inform the design and testing of the training.

In line with the Emotional Competence Process model (ECP; Scherer, 2007), the focus of the training was to develop the skills related to the ability to perceive, understand, predict, and manage emotion processes in the self and in others. The aim was to develop a psychoeducation for young people about these different facets of the emotional experience using a strong conceptual model. By doing this, we advance the state-of-the-art by training emotion competence skills directly on a digital platform. Through this training, participants would learn to identify emotions from cues from each of the emotion components, to understand the interplay between the emotion components, and to understand how an emotion can be regulated by changing emotion components. To gather this information, we drew on empirical data from the GRID studies (provided to us by Klaus Scherer and Johnny Fontaine), emotion theory (cf., Fontaine *et al.*, 2013; Fontaine, 2016), gamification mechanics (Zichermann & Cunningham, 2011), advice from authors and collaborators from the ECoWeB consortium. We also obtained feedback from participants about their experiences with other mental health apps, hooks and barriers to mental health app usage, as well as their thoughts on recruitment, branding, and usability of apps.

Step 2: Content development. Following an iterative approach, we broke up content development into several steps and involved participant feedback in the created material. Several focus groups were conducted to provide feedback. These focus groups were held at the early stages of content development (cf., Table 1). Participants helped build content by providing scenarios that youth could relate to, reviewing psychoeducation video scripts, and answering questions related to what youth sought in well-being apps and the general perceptions to mHealth technology and privacy.

A Youth Advisory Board (YAB) met several times at different stages of the project (cf., Table 2). This group of participants was deeply involved and informed about the nature of the project and gave both broad level and specific feedback about design, content, and direction. At the earliest stages, participants in YAB meetings, as well as those in focus groups, commented on their use and interest in mental health apps, their motivations and barriers, topics of concern, and their interest in specific types of functionalities. This helped inform the design of training content. They also provided feedback on training design, earliest versions of psychoeducation video scripts, and video animation styles. Participants also took part in the development of the training itself, such as providing scenarios from daily life to include in emotion identification exercises.

Step 3: Pilot testing. The first phase of the full content of the training was programmed into Qualtrics (Table 4) to pilot test the content in terms of understandability, relatability and to

Table 3. Select questions from focus group and youth advisory boards.

Category	Prompts
Recruitment	What do you think is the best way to let a young person know about a well-being app?
	What information would you want to know about it before using it?
	Which types of advertising would work best with people in your age group?
	What are your general impressions of the recruitment materials?
Branding	What could we call the app to make it appealing to young people?
	Who would be interested in an app like this?
Motivation	Are there any well-being or mental health apps you currently use?
	What do you like about those apps?/ What do you dislike?
	What would make a mental health app attractive to you?
Barriers	What barriers or pain points would stop you from using a mental health app?
Feedback on training content	What are your general impressions of the training content?
	What do you like/not like about the exercises?
Voice recording and sensor usage	Would you agree to give an app permission to store or record voice data if it was secure?
	What do you think about sensors on a phone being used to help track activity anonymously?
Emotion tracking	What do you think about a tool that allows you to visualize your tracked emotions?
	If you were using mood tracker app, how many times a day/week would you complete the tracker?
Audiovisual preferences	What did you like/not like about this specific video style?
	What are your general impressions of the graphics and avatar presented here?
Gamification	What are your general impressions of using gamification in an app like this?
	Do you want to be able to access all features or is it ok to have parts that unlock with usage?
Usability	What features of an app would encourage usage?
	What are your general impressions of receiving notifications?
	How long did you use the app when you used it? At what point did you close the app?

determine duration of each session. Collecting data on how long it took for participants to fill in would allow us to estimate our expected dosage expectations. In this pilot study, participants completed a draft of the full training content before it was integrated into the app. Programming into Qualtrics allowed us to develop and edit content before the app platform was ready. Such low-fidelity prototyping is a recommended user research practice that involves testing basic models or examples of a product rather than testing on the full version of an app so that changes can be made more quickly, iteratively, and with fewer loss of resources (Pernice, 2016). Testing our training in Qualtrics reduced the number of edits that were done after it was already configured into the app. Participants completed all parts of the training and were subsequently asked if they wanted to participate in an online survey about their experience on a free and anonymous basis. Those who took part in the additional survey were asked to give feedback about each type of exercise (psychoeducation videos, content questions, scenario questions, video/photo questions). As a result of the feedback, refinements on the question instructions were made to improve the training experience. For example, in the reflection questions, some participants reported it was difficult to come up with emotion

Table 4. Structure of pilot tested Training Content.

Session #	Parts in session	Topic of Session
Session 1	Video	Introduction to Emotions
	Questions with two answer options	
	Scenario exercises	
	Reflection exercises	
	Recognition exercises with Pictures	
Session 2	Video	Emotion Components
	Questions with two answer options	
	Scenario exercises	
	Reflection exercises	
	Recognition exercises with Pictures	
Session 3	Video	Emotion Regulation
	Questions with two answer options	
	Scenario exercises	
	Reflection exercises	
	Recognition exercises with Pictures	
Session 4	Video	Twelve emotions – Part 1
	Questions with two answer options	
	Scenario exercises	
	Reflection exercises	
	Recognition exercises with Pictures	
Session 5	Video	Twelve emotions – Part 2
	Questions with two answer options	
	Scenario exercises	
	Reflection exercises	
	Recognition exercises with Pictures	

episodes from their own lives. Thus, we added instructions that better defined what constituted an emotion episode and gave examples they can draw on.

Results

Design: Integrating emotion theory, expertise, and gamification theory

After reviewing theoretical models and drawing on the expertise of authors and collaborators, we designed four types of exercises: 1) watching psychoeducation videos and answering content related questions, 2) recognizing emotions from photo and video expressions of actors, 3) identifying emotions and features of emotions from reading vignettes, and 4) reflecting on one's own emotion experiences to apply the skills to daily life.

To increase engagement in the training, we drew on gamification mechanics in the design stage. The gamification of the learning approach uses elements from gaming to motivate and engage users in learning environments (Kapp, 2012). We identified several gaming elements that would be realistically implementable given our programmers time and resources. These included: progress mechanics (badges, points), immediate feedback, opportunities for mastery and leveling up, and scaffolded learning with challenges of increasing difficulty (Zichermann & Cunningham, 2011).

When building the training, we took into account the feedback from focus group participants regarding motivations, hooks, barriers, and usability. Thus, after building the conceptual

model, we designed a training that includes a set of 10 gamified 'sessions' nested within four 'challenges' that each start with an animated psychoeducation video (Table 5). The four challenges covered different topics: introduction to emotions, parts of an emotion, regulating emotions, recognizing specific emotions and a wrap-up session which included blended emotions. The user navigates through each Challenge with the difficulty of questions increasing both within each session and across the 10 sessions. Mastery of the training is communicated through badges and the unlocking of new topics. Users first watch a psychoeducation video about the general topic. They then complete exercises about that topic. Users then identify emotions from scenarios, photo expressions and video expressions. Finally, they apply what they learn to their own life by reflecting on recent emotional experiences and answering questions about it. In this sense, the training educates users on the theoretical model, other awareness (identifying emotions in others) and self-awareness (reflecting on one's own emotional experiences).

Themes

The researcher (first author) who coded the focus group notes first identified larger themes, then specific comments within the themes, and the number of times each comment topic was brought up. Themes were derived by data and not identified in advance. No special software was used for this. During the content development and pilot testing stages, several themes were identified through participant feedback.

This feedback was incorporated incrementally at each step. Results below are organized by themes identified across focus group and Youth Advisory Board meetings, with quotes provided as specific examples. Feedback was only reported below when a group consensus was apparent in at least one focus group or meeting. For each quote, we identify in which of the focus groups (FG1-FG6) or YAB meetings (YAB1- YAB3) participants took part. Table 6 lists more specifics on how feedback was implemented or why it was not implemented.

Personalization. The relatability of content appeared to be an important consideration for young audiences. When reviewing training content, focus group and pilot study participants added that psychoeducation videos would be interesting to young audiences if there were ample examples from daily life and that these examples be specific, realistic, and relatable.

For example, when asked what they would look for in a mental health app, one popular suggestion was to use scenarios of real-life situations that youth could understand and relate to in their phase of life, such as about love and romantic relationships. [FG1]

When discussing aspects of apps that would make them attractive, participants often mentioned personalization of app features. Personalization came up across a number of topics. For example, participants in one focus group brought up the idea of being able to set one's own goals and one's own pace, such as is done in exercise apps. Regarding notifications, one participant said:

"Notifications and reminders are ok, but make sure users can set their own desired frequency and what notifications [they receive]." [YAB2]

Participants also felt that different types of users may have different interests. For example, those of age 16 would have different interests than those aged 21, and that an app should have different features depending their own struggles and problems. Personalization of graphics came up across multiple focus groups, with ideas to be able to personalize app colors and visual representations (avatars) in an app. In one YAB meeting, participants commented that one way to personalize an app would be to include their name in notifications or when entering the app.

Graphics and audiovisual elements. Across a number of topics, the importance of certain graphic features was raised. At two

Table 5. Structure of Training Content.

Name of Challenge		Session	Name of Session
Challenge 1	What is an Emotion?	1	What is an emotion?
		2	Parts of an emotion.
Challenge 2	Dealing with Emotions	3	Dealing with emotions Part 1
		4	Dealing with emotions Part 2
Challenge 3	How to Recognise Emotions	5	Anger, Surprise and Anxiety
		6	Joy, Sadness and Fear
		7	Pride, Shame and Disappointment
		8	Pleasure, Disgust and Contentment
Challenge 4	Emotions Wrap-up	9	Blended emotions
		10	Emotions wrap-up

Table 6. Implementation of Feedback.

Theme	Feedback	Implementation
Personalization	Relatable content	Scenarios included with relatable situations
	Including avatar that can be personalized	Not implemented because of programming complexity
	Changing features of the app	Notifications and app color are adjustable
	Choosing your own learning pace	Training divided into sessions that users do at their own pace
Graphics and audiovisual elements	Professional quality audio	Professional voiceover actors hired for videos
	Engaging and playful colors and tone	Videos were professionally animated
	Fast stimuli	Videos were limited to a few minutes at most
	Should not be too childish or academic	Youth were involved in building and testing content to avoid this
Interactivity	Personality type questionnaire	Not implemented because it is out of scope of the training
	Interactive story-telling	Not implemented because of programming complexity
	Having different levels of mastery	Training was divided into separate 'sessions'
	Unlocking features	Sessions in training are 'locked' until earlier sessions are done
	Too much gamification could be distracting	Implemented in training
	Rewards and badges for continued usage	Implemented in larger app
	Interest in tracking emotions	Implemented in larger app
Usability	Easy to navigate	Ease of use was tested before and after app implementation
	Script language may be too difficult for 16 year olds	Scripts were edited and scientific terms were defined and explained
	Users expect to use app for 10–20 minutes each time	Sessions were designed to take less than 20 minutes
Privacy	Password can be required to enter app	Passcode required in each log in for app
	Any voice recordings should be anonymous	Plan to pseudonymize voice recordings in larger app
	Concern that information is confidential	Strict data security measures adopted
Legitimacy	Users should know how training will help them	Explained in psychoeducation videos and marketing materials
	Important to know if content is approved by institutions	Scientifically grounded training developed by researchers

focus groups in the early stages of the project, we asked participants what apps they currently use and what they like about the apps. Both groups mentioned the colors and visualizations in the apps they use are graphically pleasing, professional looking, and 'not boring' [FG1]. When asked what would make an app attractive, participants mentioned that

graphics should be modern, with engaging colors, a fun layout and playful tone.

One participant summed up, "Graphics and fast stimuli are everything." [FG3]

To gauge specific preferences for audiovisual elements, we showed participants seven different psychoeducation videos we pulled from the internet and asked them what they liked and disliked about the videos. Participants showed a preference for short videos, nice animations, simplicity, professional voiceovers, and appealing designs. There was a consensus in this age group that there shouldn't be a 'childish' tone in educational videos. They also disliked videos that were too academic and that were too long.

Interactivity. In general, participants enjoyed interactive features of apps and training programs. This was brought up both spontaneously by participants and also when specifically asked about gamification features. When discussing features of apps they currently use, participants mentioned the ability to unlock parts of content and a progression of easy to difficult questions (such as those in language learning apps). Interestingly, there is a limitation to how gamified a self-improvement app should be, according to participants. Given that motivation to engage with the content is driven by a desire to gain knowledge and improve health, making the app completely gamified can be both unnecessary and detract from their aim.

As one participant put it, "Don't make it a real game. If we want to play a game, we will download a game." [YAB1, paraphrased].

Interactivity also came up in discussions regarding videos and usage reinforcement. When brainstorming ideas for video styles, one group discussed the idea of interactive stories where the user makes decisions throughout the story. Participants also believed rewards and badges would help encourage continuous usage, as it allows users to see their progress and reminds them of what they have accomplished in the app. Youth also liked the idea of getting insight and feedback from a training, akin to taking a personality test.

Usability. Across groups, usability was commonly reported as a desired characteristic of apps. Participants liked apps that were easily accessible, easy to use, and progressed quickly. For example, the complaint about a popular language app was that "sometimes it's too slow." [FG1] Another participant mentioned, "[i]t must be able to go quickly." [FG2]

Speed was also mentioned in reviews of psychoeducation videos. When asked how long they would engage in a mental health app training per day, participants indicated an average of 10–20 minutes. In terms of usage, participants reported using apps at night (before going to bed) or when in waiting periods (e.g., on public transport).

Privacy. Another theme brought up by participants was consideration of data privacy. When asked what would make a mental health app attractive to them, the topic of privacy was brought up (e.g., that the app should be password protected). We also specifically asked about potential app features such as voice recording or sensor tracking and whether they would give permission to store such data if it was completely secure. There were mixed reactions; while some participants didn't mind, others expressed distrust of privacy matters in general.

"The app creators can always say that the data are anonymized, but actually you simply don't know what they really do with the data." [FG4]

Another participant expressed security concerns from external sources, stating that, "you never know that the app gets hacked and that other companies can steal and use the information." [FG4]

Legitimacy. When it comes to mental health apps, a sense of legitimacy mattered to participants of this age group. When asked what information they would like to know before using a mental health training, participants mentioned an approval by official organizations, institutions or universities. Two groups also mentioned wanting to know how exactly the training would help them.

Pilot testing: feedback on training

Pilot study participants completed an early version of the training on Qualtrics and provided qualitative feedback on each type of training exercise (psychoeducation videos, content knowledge questions, emotion recognition exercises, and self-reflection questions). Specific feedback allowed us to make changes on our particular training materials. For psychoeducation videos, participants liked clarity and simplicity in explanations and enjoyed colorful fun animations. A few reported disliking a slow pace, childish animation, and audio quality. For knowledge questions, participants liked that "it made you think about [what you learned]" and clear, unambiguous questions but disliked that they didn't receive results on their performance (our low-fidelity prototype did not have feedback yet). For emotion recognition exercises, participants liked seeing diversity in faces in the photos, but reported that they needed clarification on certain emotions and disliked when multiple answers seemed possible. For self-reflection questions, participants generally liked the opportunity to reflect on their emotions with one participant saying, "The questions made you reflect on yourself and stimulated more self-insight." However, some reported difficulties in coming up with emotion-evoking events from their lives or difficulties describing how they felt.

Discussion

Principle findings

The aim of this project was to build a mental health training that was both supported by science and appealing to young users. To address the need for a scientifically grounded training,

we based the content on the Component Process Model (Scherer, 2009). We incorporated content and feedback given by youth to our theoretically guided design to ensure the training would be engaging to our 16–22 target user-base. We began with a conceptual model that integrated emotion theory and gamification concepts. We designed 10 sessions of content, nested into 'Challenges' that each began with an engaging, but short, psychoeducation video which was followed by emotion understanding, recognition, and identification exercises and ended in self-reflection questions. Sessions 'unlocked' and increased in difficulty. Youth in focus groups helped create some of the scenarios that were used in exercises so that they would be relatable and interesting to our age group.

In focus groups and Youth Advisory Board meetings, we obtained feedback regarding preferences in mental health trainings and apps. The most common themes that arose were personalization (being able to adjust features according to personal preference), relatability (content appropriate to age group), importance of graphics and audiovisual elements (colorful and fast), interactivity (rewards and feedback), usability (easy to use and accessible), privacy, and legitimacy (backed by institutions). We adjusted content iteratively throughout the project. In the pilot study where participants completed the training in a web-based space, we found that participants preferred clarity, unambiguous questions and answer choices, professional audiovisual quality, feedback on their performance, and the opportunity to self-reflect.

Reflecting on the process of developing the training, we found that working with a theoretical model (CPM) helped guide the structure of the training. Also, it was an easy and intuitive model from which to build an emotion-skills training, as it helped youth understand and dissect different parts of the emotion process. Because we developed the training with the participation and feedback of youth, we found it was possible to build a training that is both theoretically guided and appealing to users.

Considerations when developing a mental health training

The process of developing a mental health training for youth came with some lessons and challenges that can hopefully help guide future projects. First, despite the plethora of feedback in the very early stages regarding what young audiences want in a mental health app, there were clear limitations in the scope, timing and resources that prevented us in building a training that incorporated them all. Balancing the ideals and the realities will of course be specific to each project. It was nonetheless interesting and helpful to learn about preferences of our target audience at the very early stages of the process and we recommend this for future researchers.

Our age group included 16–22-year-old youth, who are at a particularly transitional life stage. This was reflected in their feedback, which in a few categories seemed paradoxical. Participants appreciated scientific and educational content but didn't want it to be too academic. They wanted scenarios to be relatable but not too childish and preferred mental health apps that were interactive but not completely a game.

Lastly, we found it very useful to work in an iterative process, collecting and incorporating feedback at various stages of the process. This allowed us to make changes in early stages when it was still flexible and easy. Once content was programmed into the app, it had already been reviewed by focus groups and pilot study participants. This was useful because changes in the app itself required more time and resources. When the app was programmed, we checked for specific pain points and usability issues.

This training is included in the MyMoodCoach app that is being scientifically tested in a larger Randomized Controlled trial (RCT) as part of the ECoWeB Project. In future studies, the trial will test the effectiveness of the training when combined with other emotion competence trainings in a personalized mobile app approach. The stand-alone version of the training is also being tested in our lab.

Data availability

Underlying data

OSF: Development of a theoretically and empirically grounded emotion knowledge training for the young. 10.17605/OSF.IO/QSYGW (Hovasapian *et al.* (2022))

This project contains the following underlying data:

- Focus groups 1–3.docx (Notes from the first three focus groups.)
- Focus groups 4–6.docx (Notes from the next three focus groups.)
- YAB 1 _Sep 25 2018.docx (Youth Advisory Board meeting notes.)
- YAB 2 _April 19 2019.docx (Youth Advisory Board meeting notes.)
- YAB 3 _February 2020.docx (Youth Advisory Board meeting notes.)
- Pilot data.xlsx (Responses from optional feedback survey on training content within pilot study)

Extended data

This project contains the following extended data:

- Pilot TestingFeedback Survey.docx (File with questions from optional feedback survey in pilot study)

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

Ethics and consent

Ethical Approval was granted by the Ethics Committee of the Faculty of Psychology and Educational Sciences at Ghent University (2018/38/Arpine Hovasapian).

Informed written consent was obtained from participants of the focus groups and YABs, which included the use of their anonymized data. Passive parental consent was used for participants under 18 years in addition to their own informed consent.

Due to the completely voluntary basis and anonymous data collection of the optional survey within the pilot study, no informed consent was needed for this data collection, analysis and usage.

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References

Bänziger T, Mortillaro M, Scherer KR: **Introducing the Geneva Multimodal Expression corpus for experimental research on emotion perception.** *Emotion.* 2012; **12**(5): 1161–1179.
PubMed Abstract | Publisher Full Text

Brackett MA, Rivers SE, Salovey P: **Emotional Intelligence: Implications for Personal, Social, Academic, and Workplace Success.** *Soc Personal Psychol Compass.* 2011; **5**(1): 88–103.
Publisher Full Text

Brockmeyer T, Pellegrino J, Münch H, *et al.*: **Social cognition in anorexia nervosa: Specific difficulties in decoding emotional but not nonemotional mental states.** *Int J Eat Disord.* 2016; **49**(9): 883–890.
PubMed Abstract | Publisher Full Text

Castro VL, Cheng Y, Halberstadt AG, *et al.*: **EUReKA! A Conceptual Model of Emotion Understanding.** *Emot Rev.* 2016; **8**(3): 258–268.
PubMed Abstract | Publisher Full Text | Free Full Text

Coyle D, Doherty G, Matthews M, *et al.*: **Computers in talk-based mental health interventions.** *Interact Comput.* 2007; **19**(4): 545–562.
Publisher Full Text

Dalili MN, Penton-Voak IS, Harmer CJ, *et al.*: **Meta-analysis of emotion recognition deficits in major depressive disorder.** *Psychol Med.* 2015; **45**(6): 1135–1144.
PubMed Abstract | Publisher Full Text | Free Full Text

Dickson JM, Johnson S, Huntley CD, *et al.*: **An integrative study of motivation and goal regulation processes in subclinical anxiety, depression and hypomania.** *Psychiatry Res.* 2017; **256**: 6–12.
PubMed Abstract | Publisher Full Text

Ekman P, Friesen WV: **Facial action coding system**. *Environmental Psychology & Nonverbal Behavior*. 1978.
Publisher Full Text

Fontaine JJR, Scherer KR, Soriano C: **Components of emotional meaning: A sourcebook**. Oxford University. 2013.
Publisher Full Text

Fontaine JRJ: **Comment: Redefining Emotional Intelligence Based on the Componential Emotion Approach.** *Emot Rev.* 2016; **8**(4): 332–333.
Publisher Full Text

Frijda NH, Mesquita B: **The social roles and functions of emotions**. In S. Kitayama & H. R. Markus (Eds.): *Emotion and culture: Empirical studies of mutual influence*. 1994; 51–87.
Publisher Full Text

Glenn CR, Klonsky ED: **Emotion dysregulation as a core feature of borderline personality disorder.** *J Pers Disord.* 2009; **23**(1): 20–8.
PubMed Abstract | Publisher Full Text

Gross JJ: **Emotion regulation.** *Handbook of emotions.* 2008; **3**(3): 497–513.

Halberstadt AG, Denham SA, Dunsmore JC: **Affective social competence.** *Soc Dev.* 2001; **10**(1): 79–119.
Publisher Full Text

Hetrick SE, Robinson J, Burge E, *et al.*: **Youth codesign of a mobile phone app to facilitate self-monitoring and management of mood symptoms in young people with major depression, suicidal ideation, and self-harm.** *JMIR Ment Health.* 2018; **5**(1): e9.
PubMed Abstract | Publisher Full Text | Free Full Text

Hodzic S, Scharfen J, Ripoll P, *et al.*: **How efficient are emotional intelligence trainings: A meta-analysis.** *Emot Rev.* 2018; **10**(2): 138–148.
Publisher Full Text

Hovasapian A, Huyghe V, Schlegel K, *et al.*: **Development of a theoretically and empirically grounded emotion knowledge training for the young**. 2022.
http://www.doi.org/10.17605/OSF.IO/QSYGW

Izard CE, Woodburn EM, Finlon KJ, *et al.*: **Emotion knowledge, emotion utilization, and emotion regulation.** *Emot Rev.* 2011; **3**(1): 44–52.
Publisher Full Text

Kapp KM: **The gamification of learning and instruction: game-based methods and strategies for training and education**. Wiley. 2012.
Reference Source

Keltner D: **Signs of appeasement: Evidence for the distinct displays of embarrassment, amusement, and shame.** *J Pers Soc Psychol.* 1995; **68**(3): 441–454.
Reference Source

Keltner D, Gross JJ: **Functional Accounts of Emotions.** *Cogn Emot.* 1999; **13**(5): 467–480.
Publisher Full Text

Kertz SJ, Kelly JM, Stevens KT, *et al.*: **A review of free iPhone applications designed to target anxiety and worry.** *Behav Inf Technol.* 2017; **2**(2): 61–70.
Publisher Full Text

Kessler RC, Berglund P, Demler O, *et al.*: **Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication.** *Arch Gen Psychiatry.* 2005; **62**(6): 593–602.
PubMed Abstract | Publisher Full Text

Lattie EG, Adkins EC, Winquist N, *et al.*: **Digital mental health interventions for depression, anxiety, and enhancement of psychological well-being among college students: systematic review.** *J Med Internet Res.* 2019; **21**(7): e12869.
PubMed Abstract | Publisher Full Text | Free Full Text

Lee-Tauler SY, Eun J, Corbett D, *et al.*: **A Systematic Review of Interventions to Improve Initiation of Mental Health Care Among Racial-Ethnic Minority Groups.** *Psychiatr Serv.* 2018; **69**(6): 628–647.
PubMed Abstract | Publisher Full Text

Lerner JS, Keltner D: **Fear, anger, and risk.** *J Pers Soc Psychol.* 2001; **81**(1): 146–159.
PubMed Abstract | Publisher Full Text

Levin ME, Krafft J, Levin C: **Does self-help increase rates of help seeking for student mental health problems by minimizing stigma as a barrier?** *J Am Coll Health.* 2018; **66**(4): 302–309.
PubMed Abstract | Publisher Full Text

Localytics: **24% of users abandon an app after one use**. 2017.
Reference Source

Mani M, Kavanagh DJ, Hides L, *et al.*: **Review and evaluation of mindfulness-based iPhone apps.** *JMIR Mhealth Uhealth.* 2015; **3**(3): e82.
PubMed Abstract | Publisher Full Text | Free Full Text

Marcus M, Yasamy MT, van Ommeren MV, *et al.*: **Depression: A global public health concern**. World Federation of Mental Health World Health Organisation. 2012.
Reference Source

McGorry P, Bates T, Birchwood M: **Designing youth mental health services for the 21st century: Examples from Australia, Ireland and the UK.** *Br J Psychiatry Suppl.* 2013; **54**: s30–s35.
PubMed Abstract | Publisher Full Text

McLaughlin KA, Hatzenbuehler ML, Mennin DS, *et al.*: **Emotion dysregulation and adolescent psychopathology: A prospective study.** *Behav Res Ther.* 2011; **49**(9): 544–54.
PubMed Abstract | Publisher Full Text | Free Full Text

Mehu M, Scherer KR: **Emotion categories and dimensions in the facial communication of affect: An integrated approach.** *Emotion.* 2015; **15**(6): 798–811.
PubMed Abstract | Publisher Full Text

Neary M, Schueller SM: **State of the Field of Mental Health Apps.** *Cogn Behav*

Pract. 2018; **25**(4): 531–537.
Publisher Full Text

Newbold A, Warren FC, Taylor RS, *et al.*: **Promotion of mental health in young adults via mobile phone app: study protocol of the ECoWeB (emotional competence for well-being in Young adults) cohort multiple randomised trials.** *BMC Psychiatry.* 2020; **20**(1): 458.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Nicholas J, Larsen ME, Proudfoot J, *et al.*: **Mobile apps for bipolar disorder: a systematic review of features and content quality.** *J Medical Internet Res.* 2015; **17**(8): e198.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Owen JE, Jaworski BK, Kuhn E, *et al.*: **mHealth in the wild: Using novel data to examine the reach, use, and impact of PTSD Coach.** *JMIR Ment Health.* 2015; **2**(1): e7.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Parker L, Bero L, Gillies D, *et al.*: **Mental health messages in prominent mental health apps.** *Ann Fam Med.* 2018; **16**(4): 338–342.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Patel V, Flisher AJ, Hetrick S, *et al.*: **Mental health of young people: a global public-health challenge.** *Lancet.* 2007; **369**(9569): 1302–1313.
PubMed Abstract | **Publisher Full Text**

Patton GC, Sawyer SM, Santelli JS, *et al.*: **Our future: a *Lancet* commission on adolescent health and wellbeing.** *Lancet.* 2016; **387**(10036): 2423–2478.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Petrides KV, Mikolajczak M, Mavroveli S, *et al.*: **Developments in Trait Emotional Intelligence Research.** *Emotion Review.* 2016; **8**(4): 335–341.
Publisher Full Text

Pernice K: **UX prototypes: Low fidelity vs. high fidelity.** NN/g Nielson Norman Group. 2016.
Reference Source

Price M, Yuen EK, Goetter EM, *et al.*: **mHealth: A Mechanism to Deliver More Accessible, More Effective Mental Health Care.** *Clin Psychol Psychother.* 2014; **21**(5): 427–436.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Resnik DB: **Bioethical Issues in Providing Financial Incentives to Research Participants.** *Medicoleg Bioeth.* 2015; **5**: 35–41.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Seymour K: **Using incentives: Encouraging and recognising participation in youth research.** Youth Studies Australia, 2012; **31**(3): 51–59.
Reference Source

Schueller SM, Neary M, O'Loughlin K, *et al.*: **Discovery of and interest in health apps among those with mental health needs: survey and focus group study.** *J Med Internet Res.* 2018; **20**(6): e10141.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Scherer KR: **Componential emotion theory can inform models of emotional competence.** In. G. Matthews, M. Zeidner, & R. D. Roberts (Eds.), *The science of emotional intelligence: Knowns and unknowns.* 2007; 101–126.
Reference Source

Scherer KR: **The dynamic architecture of emotion: Evidence for the component process model.** *Cognition & Emotion.* 2009; **23**(7): 1307–1351.
Publisher Full Text

Scherer KR, Meuleman B: **Human emotion experiences can be predicted on theoretical grounds: evidence from verbal labeling.** *PLoS One.* 2013; **8**(3): e58166.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Shiota MN, Campos B, Keltner D, *et al.*: **Positive emotion and the regulation of interpersonal relationships.** In Philippot P. & Feldman R.S. (Eds.), *The regulation of emotion* Lawrence Erlbaum Associates, Inc. 2004; 125–157.

Schlegel K: **The effects of emotion recognition training on interpersonal effectiveness.** *Basic and Applied Social Psychology.* 2021; **43**(2): 141–153.
Publisher Full Text

Sucala M, Cuijpers P, Muench F, *et al.*: **Anxiety: There is an app for that. A systematic review of anxiety apps.** *Depress Anxiety.* 2017; **34**(6): 518–525.
PubMed Abstract | **Publisher Full Text**

Thornicroft G: **Stigma and discrimination limit access to mental health care.** *Epidemiol Psichiatr Soc.* 2008; **17**(1): 14–19.
PubMed Abstract | **Publisher Full Text**

Torous J, Nicholas J, Larsen ME, *et al.*: **Clinical review of user engagement with mental health smartphone apps: evidence, theory and improvements.** *Evid Based Ment Health.* 2018; **21**(3): 116–119.
PubMed Abstract | **Publisher Full Text**

Tracy JL, Robins RW: **Show your pride: Evidence for a discrete emotion expression.** *Psychol Sci.* 2004; **15**(3): 194–197.
PubMed Abstract | **Publisher Full Text**

Trentacosta CJ, Fine SE: **Emotion knowledge, social competence, and behavior problems in childhood and adolescence: A meta-analytic review.** *Soc Dev.* 2010; **19**(1): 1–29.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Trentacosta CJ, Schultz D: **Hold Tight: Carroll Izard's Contributions to Translational Research on Emotion Competence.** *Emot Rev.* 2015; **7**(2): 136–142.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

van der Schalk J, Hawk ST, Fischer AH, *et al.*: **Moving faces, looking places: Validation of the Amsterdam Dynamic Facial Expression Set (ADFES).** *Emotion.* 2011; **11**(4): 907–920.
PubMed Abstract | **Publisher Full Text**

Vigo D, Thornicroft G, Atun R: **Estimating the true global burden of mental illness.** *Lancet Psychiatry.* 2018; **3**(2): 171–178.
Publisher Full Text

Wasil AR, Venturo-Conerly KE, Shingleton RM, *et al.*: **A review of popular smartphone apps for depression and anxiety: Assessing the inclusion of evidence-based content.** *Behav Res Ther.* 2019; **123**: 103498.
PubMed Abstract | **Publisher Full Text**

Wets J: **The Turkish Community in Austria and Belgium: The Challenge of Integration.** *Turkish Studies.* 2006; **7**(1): 85–100.
Publisher Full Text

Winch A, Moberly NJ, Dickson JM: **Unique associations between anxiety, depression and motives for approach and avoidance goal pursuit.** *Cogn Emot.* 2015; **29**(7): 1295–305.
PubMed Abstract | **Publisher Full Text**

Zichermann G, Cunningham C: **Gamification by design.** O'Reilly. 2011.
Reference Source

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Moshe Zeidner
Department of Counseling and Human Development, University of Haifa, Haifa, Israel

General

As noted by the authors, deficits in emotional competence constitute a risk factor for poor mental health, suggesting that digital mental health trainings can be an impactful and efficient way to foster emotional competency skills. A working assumption of this project is that scientific-based education about emotions can help youth understand their emotional lives, which can promote well-being and prevent psychological issues.

This informative and well-designed paper exhaustively describes and evaluates a pilot e-mental health training project designed to develop emotional competence skills for youth and early adolescence. The Component Process Model served as the theoretical framework undergirding this project. This theory of emotion conceptualizes emotions as reactions to a goal-relevant event, consisting of different components: thoughts, bodily sensations, gestures (expressions), actions one wants to take and subjective feelings.

Based, on this model, the project aimed at teaching youth to understand their emotional experiences as a dynamic process that involves the activation of appraisals, bodily reactions, expressions, action tendencies and subjective feelings Topics in the training include: 'What is an emotion?', and 'How can we recognize emotions?' Specifically, the project was designed to increase knowledge and understanding of emotions and the processes that underlie them, thus promoting well-being and prevent psychopathology during the sensitive developmental periods of adolescence and young adulthood.

The program included youth across various stages throughout the development of the training program. This allowed the researchers to make changes incrementally at each stage. Feedback from several focus groups, Youth Advisory Board meetings, and a pilot study resulted in the development of a gamified emotional knowledge skills training that teaches young people how to understand, recognize, and reflect on their emotions.

The training consists of psychoeducation videos and content related questions, stimuli from which emotions are identified (i.e., photo and video expressions, and emotion vignettes) and reflection exercises. The content was organized in 10 'sessions' and these were categorized into four 'challenges': (a) introduction to emotions, (b) emotion components, (c) recognizing emotions, (d), regulating emotions, and a summary session. The sessions increase in difficulty and unlock as the user progresses.
Results showed that when it came to digital mental health trainings, youth valued personalization, relatability, fast and colorful graphics, professional audiovisual elements, interactivity, ease-of-use, privacy protection and scientific legitimacy.

This projects aims to improve on existing projects by grounding its application on scientific knowledge, and considering its end-user, thus enhancing engagement rates among youth.

The authors reflect on the process of developing the training and offer suggestions to help guide future researchers in building mental health trainings that are both supported by science and appealing to young users.

Specific

The massive amount of material is quite overwhelming, and reads more like an interim report of an ongoing intervention project than a journal-based article.

The authors are advised to trim this paper down by at least 30%, focusing on the essentials. Often, for the forest, one fails to see the trees. In Aristotelian terms, one needs to focus on the essential and omit the accidental. The present version of the paper fails to do so.

Is the work clearly and accurately presented and does it engage with the current literature?
Yes

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

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

Are all the source data and materials underlying the results available?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Personality and emotions research

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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Sabina Hodzic
Karl-Franzens-Universität Graz, Graz, Austria

This study describes the process of development of a digital emotional competences (EC) training for youth between 16-22 years, based on the Emotional Competence Process model. The main contribution of the paper, according to the authors, is the development of the theoretically supported EC training through increased engagement of the target groups throughout the development process.

I find it very positive that in a sea of various commercial and non-commercial EC trainings and development programs, the authors of this paper aim to develop a theoretically backed-up training for a specific target group using the target group's input in developing it. As it is mentioned in the paper, the evaluation of the training is expected and I am curious to read about the effectiveness of the training.

Another very positive aspect of this paper is that it is very clearly written and explained, easy to read and with plenty of detail regarding the process of the training development (sometimes maybe too much detail, especially in parts about the focus groups or YAB meetings).

However in my evaluation I choose " Approved with Reservations" because of several reasons. My main concern or doubt is if the paper fits the research article requirements. The paper solely describes the development process of the training. There is no evaluation of the training, no hypotheses, no research questions. The results mainly refer to the one-author qualitative analysis of the input from the focus groups. Would it be better suited for a different type of article – maybe as a study protocol or method article or some other type of article that Open research Europe includes?

Besides this, I have some other more specific remarks that I hope can help the authors improve the paper:

- Can it be said that this is a mental health training? It is (still) not tested whether this training improves mental health. On various occasions in the paper the authors refer to the training as a mental health training. I believe it should be referred to as EC training.

- The authors call the training "emotion knowledge training" but actually the training teaches

abilities or skills, isn't it? In other occasions it is referred to as "emotion knowledge skill training' – this in my opinion sounds strange. Skills or abilities include knowledge about something, but knowledge does not necessarily include skill. I suggest consulting and including the papers by Moïra Mikolajczak and her colleagues about the Tripartite model of EI (for instance, https://psycnet.apa.org/record/2010-10941-004). I think it might be useful to include it in your paper as part of the theoretical introduction as well. I also suggest to be consistent with the terms used throughout the paper and distinguish clearly between knowledge, skill / ability, competence.

- There are other similar theoretical models of EI/EC for instance, Four-branch model of EI by Salovey & Mayer. Why did the authors focus specifically on the ECP model and not on some other EC model in the development of the training?

- There are also other EC trainings based on theoretical backgrounds (for instance Nelis et al., 2009). Besides the gamification aspect and the input from the focus groups, what are the main added values of this particular training program in comparison to others? I think this needs to be discussed in the discussion part.

- The structure of the paper was a bit confusing to follow – jumping from focus groups and YAB groups to pilot study and then again returning to those in the part about the training development process – maybe a better structure would be to follow Training development process structure as explained on page 8-9, and then add information on the focus groups, YAB meetings and pilot testing following this structure? This way some repetitive information about the participants and the procedure can be avoided and it would be much easier to follow the process of the training development.

- I am a bit confused about why exactly do we need detailed information on Characteristics of the focus group meetings and the YAB meetings? Is this relevant for the content or improvement of the training? In addition, procedures of focus groups and YAB meetings should be abbreviated in my opinion. I consider some information as not relevant to include – for instance the discussion about the incentives for the participants.

- Feedback from the pilot study participants: Only 17 students out of 94 gave feedback. What was the purpose of participation of all the other students? Did the rest provide any kind of relevant information for the improvement of the training? Also, are students the most suitable sample for the pilot study? Yes, they can reflect upon ways to educate people but this was not their task, correct? They were asked about their experience with the training? What were the results of the pilot testing? More information is provided for the focus groups analysis than the pilot testing. In my opinion the pilot testing should have been better conducted and the results presented in more detail. More precisely, how exactly was the feedback from pilot testing incorporated in the newer versions of the training?

- Page 11: when authors explain how they integrated gamification in the training they provide information on how exactly the training looks like. This is useful information and I think this should be presented in the training description.

- Page 11: Structure of the training Table 5 – it would be nice to add how do challenges mentioned correspond to the skills learned?

- Page 11: "The researcher (first author) who coded the focus group notes first identified larger themes, then specific comments within the themes, and the number of times each comment topic was brought up. Themes were derived by data and not identified in advance. No special software was used for this". – I would say this is an important limitation related to the reliability and validity of the obtained qualitative data.

- Additionally, the paper does not include a section on limitations , challenges or directions for future use or improvement of the training. I would suggest to include this.

- Page 14: We began with a conceptual model that integrated emotion theory and gamification concepts – what exactly were the gamification concepts?

- An illustration of the app or the sample of the videos or parts of the training as an illustration would be nice to include.

- On page 14, the authors say: "Because we developed the Training with the participation and feedback of youth, we found it was possible to build a training that is both theoretically guided and appealing to users." Do we know if it's appealing to users? I am not sure we can conclude this from the current study? The participants in the pilot study did not provide this information.

- Additionally, it was not clear to me what changes in the training were made based on the specific feedback from the pilot testing group. The authors say "Specific feedback allowed us to make changes on our particular training materials" – what changes exactly?

- Finally, is the training applicable to other sub-groups or age groups? It is designed with assistance from a specific sample. Can this training be used in other settings and with other groups? This should be discussed.

Is the work clearly and accurately presented and does it engage with 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?
Yes

Are all the source data and materials underlying the results available?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Emotional intelligence, EI trainings, stress and well-being, employability, flexible work.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.