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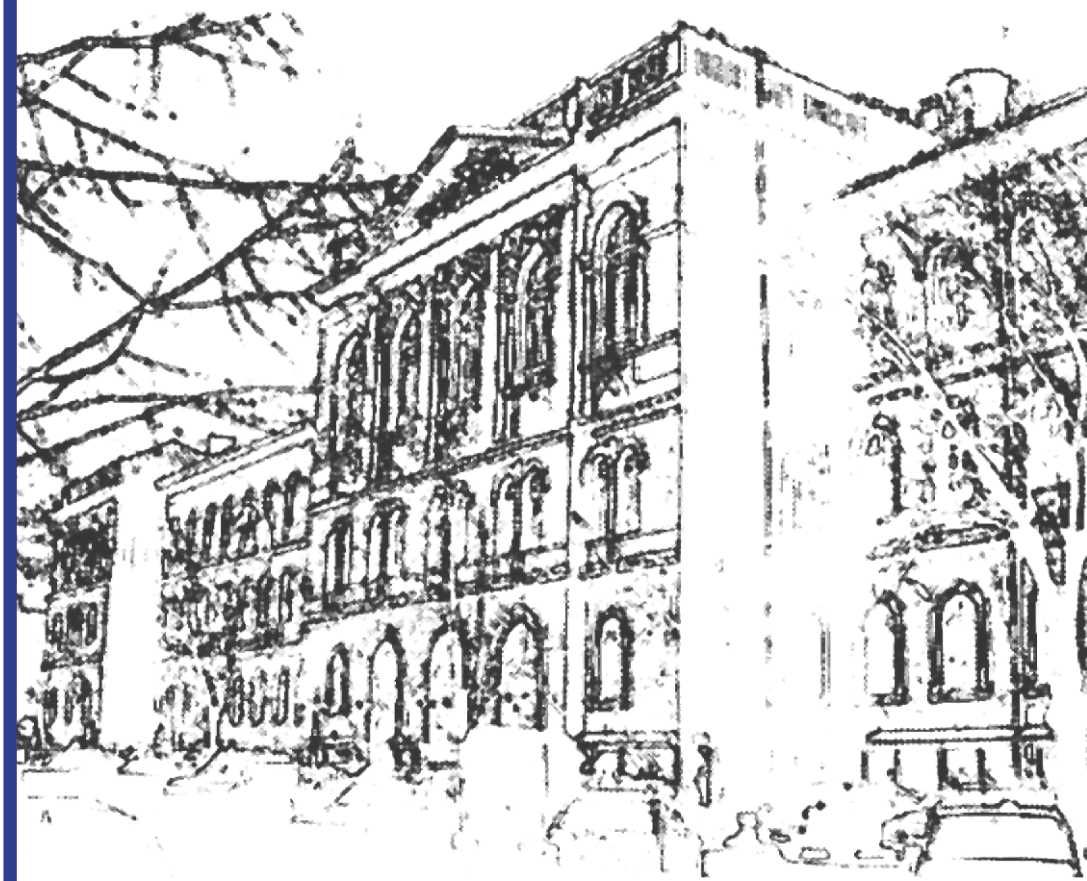

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Journal of Evidence-Based Psychotherapies is the successor of the Journal of Cognitive and Behavioral Psychotherapies (2001-2013) and is published biannually (in March and September) in one volume per year by the International Institute for the Advanced Studies of Psychotherapy and Applied Mental Health. The journal is devoted to the advancement of the clinical theory and practice of evidence-based psychotherapies (EBP) (e.g., evidence-based psychological assessments, evidence-based psychological treatments). The journal publishes original papers dealing with EBP and psychology, psychiatry, the medical and mental specialties, and allied areas of science. Submissions include (1) articles referring to clinical and experimental studies, discussions of theory, and systematic reviews for inclusion in Article Section, (2) articles referring to clinical discussions/developments for inclusion in the Clinical Forum Section, and (3) commentaries, letters to the editor, reviews and abstracts of books, tapes, and films, salient findings in EBP, and other information relevant to the journal's goal for inclusion in the Development and Resources Section. Finally, the journal seeks to publish special issues devoted to topics of particular interest, suggestions for which are welcomed by the Editor.
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The International Institute for the Advanced Studies of Psychotherapy and Applied Mental Health (IIAS of PAMH) is a research Institute of the Babes-Bolyai University (BBU), located in Cluj-Napoca, Romania. Babes-Bolyai University is one of the oldest, most prestigious, and influential academic settings in Romania and in the Eastern-Central Europe (http://www.ubbcluj.ro). It has been almost four centuries since the beginnings of this university of Cluj-Napoca. The first project to set up a higher education institution in Cluj-Napoca was recorded in 1565, and in 1581 it was set up an academic college, organized and run by Jesuits. Since then, Babes-Bolyai University has become a modern institution which acquired a remarkable fame by its long-time achievements at national and international level. The Institute will invite as affiliates/partners prestigious organizations involved in the development of psychotherapy and applied mental health interventions. IIAS of PAMH aims to promote advanced study and scholarship in applied mental health by research.

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Universitatea Babeş-Bolyai
Presa Universitară Clujeană
Director: Codruţa Săcelean
Str. Hasdeu nr. 51
400371 Cluj-Napoca, România
Tel./Fax: (+40)-264-597.401
E-mail: editura@editura.ubbcluj.ro
http://www.editura.ubbcluj.ro

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RE-THINKING CBT: PROVIDING STRATEGIES FOR A NEW WAY OF LIVING

Oana David[1]*, Dr. Azucena Garcia*[2]*, Arnold A.P. van Emmerik*[3]
(Co-Editors of the Special Issue)

[1] Babes-Bolyai University
[2] Universitat Jaume,
[3] University of Amsterdam

Journal of Evidence-Based Psychotherapies (JEBP) is publishing in conjunction with the European Association for Behavioural and Cognitive Therapies (EABCT) the Special Issue dedicated to the main theme of EABCT's 2022 Annual Congress in Barcelona – *RE-thinking CBT: providing strategies for a new way of living*. Authors of keynotes, symposium contributions, open papers and posters accepted for presentation at the conference and focused on investigating innovative CBT approaches and techniques were invited to submit to this Special Issue. Thus, our purpose for this special issue is to bring into the spotlight new developments in the field of CBT that can be effective in approaching current global concerns in terms of mental health.

The special issue begins with three articles focused on examining the effects of different cognitive-behavioral intervention models in approaching anxiety in adolescents.

The article of Chikaze Sugiyama and colleagues from J. F. Oberlin University from Japan is presenting a study aiming to investigate the effects of a school-based intervention, aimed at increasing coping skills and improving coping flexibility, on helping adolescents to manage their anxiety during the COVID-19 pandemic.

The second article of Diana Vieira Figueiredo from University of Coimbra, Portugal, and her colleagues is testing the applicability of Clark and Wells' model in explaining maintenance factors for social anxiety disorder in adolescents.

In the third article, Cláudia P. Pires from University of Coimbra, Portugal, and colleagues describe a case study to illustrate the application of the manualized online AcAdeMiC Program (Acting with Acceptance, Mindfulness and Compassion to overcome Test/Exam Anxiety) aimed at treating test anxiety and boosting well-being, compassion, acceptance and mindfulness in a secondary school student.

The following two articles are presenting the use of virtual reality and mobile technologies in CBT. The fourth article authored by Sven van Kuik from PsyQ, Netherlands, and colleagues is presenting a pilot study that investigated the

acceptability and efficacy of Virtual Reality Imagery Rescripting compared to conventional Imagery Rescripting for PTSD due to Childhood Sexual Abuse.

The fifth article authored by Veerle Ross from UHasselt in Belgium is presenting the user involvement in a new smartphone application and dashboard based on cognitive behavioral therapy, named 'plaTfOrm using evidence-based inTervEntions for (Mental) health' (TOTEM).

The next two articles are focused on mechanisms of psychopathology based on various CBT approaches. In the sixth article, Daniel Seabra from the University of Coimbra and colleagues focus on examining the role of self-compassion and social support in the case of sexual minority individuals as moderators in the relationship between shame and psychopathology.

The seventh article of Joanna Urbańska and Anna Słysz from Adam Mickiewicz University, Poland, is aiming to determine the role of early maladaptive schemas in the change in general mental health and well-being during the COVID-19 coronavirus pandemic in a retrospective study.

We consider, that taken together, the papers selected for this Special Issue are able to illustrate important developments of CBT, in terms of intervention techniques, models, technologies and applications.

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EXAMINING THE EFFECTIVENESS OF A COPING SKILLS INTERVENTION FOR ANXIETY FOR JUNIOR HIGH SCHOOL STUDENTS AMID THE COVID-19 PANDEMIC

Chikaze Sugiyama[1,2], Shunsuke Koseki[3], Rina Kishino[4]*

[1] Ph.D., Department of International Humanities and Social Sciences, Graduate School of International Studies, J. F. Oberlin University, Machida, Tokyo, Japan
[2] Japan Society for the Promotion of Science, Research Fellowship for Young Scientists
[3] Ph.D., College of Arts and Sciences, J. F. Oberlin University, Machida, Tokyo, Japan
[4] M.A., Master of Arts in Psychology, J. F. Oberlin University, Machida, Tokyo, Japan

Abstract

This study implemented a school-based intervention aimed at improving coping flexibility, and to determine the intervention effects on coping and anxiety in children during the COVID-19 pandemic. A total of 692 first and second year of junior high school students (347 boys, 320 girls, and 25 neither) participated. Of the 19 classes first and second year of junior high school, 10 participated in the intervention in July 2021 and nine participated in January 2022. The results showed that the intervention program effectively reduced students' anxiety. With regard to coping, there was no change in "seeking support," a decrease in "problem avoidance," and an increase in "positive interpretation and recreation." The current intervention, which aimed at improving coping flexibility, was effective in reducing anxiety and promoting coping among junior high school students during the COVID-19 pandemic. In future it may be necessary discussed to reduce the burden on schools to accept outside experts by using information-technology equipment and other means to conduct the intervention remotely.

Keywords: COVID-19, school-based intervention, anxiety, coping, children.

The COVID-19 pandemic has had a considerable psychological impact on children and adolescents worldwide, including increasing the rates of depression, anxiety, and post-traumatic stress disorder (PTSD) symptoms (Marques de Miranda et al., 2020). As of March 2020, 99% of Japanese public primary and junior high schools (in Japan, this refers to schools operated by prefectural and municipal

* Correspondence concerning this article should be addressed sent to Chikaze Sugiyama, Department of International Humanities and Social Sciences, Graduate School of International Studies, J. F. Oberlin University, Machida, Tokyo, Japan.
Email Id: snsn.500mf@gmail.com (CS)

governments) and 100% of national primary and junior high schools (in Japan, this refers to state-run elementary schools) were temporarily closed (Ministry of Education, Culture, Sports, Science and Technology, 2020).

Subsequently, as of February 2022, the number of schools with temporary closures decreased significantly to 0.1% in public elementary and junior high schools, respectively (Ministry of Education, Culture, Sports, Science and Technology, 2020). However, the situation remains unpredictable, with 15.4% of public elementary schools and 7.6% of public junior high schools reporting temporary grade or class closures (Ministry of Education, Culture, Sports, Science and Technology, 2022). In a survey in Japan, 30%–40% of junior high school students reported responding to the pandemic with depression, insomnia, difficulty concentrating, and grief or fear (National Center for Child Health and Development, 2022). In a survey conducted during the declaration of a state of emergency in 2020, 43.7% of teenage respondents reported that they were worried about life after school resumes (Hashimoto, 2020). This suggests that the number of students who were anxious about school life increased after the COVID-19 pandemic.

One psychological support strategy to improve the health and well-being of students exposed to unusual situations has been school-based interventions (e.g., D'Amico et al., 2017; Powell & Holleran-Steiker, 2017). Multiple meta-analyses have confirmed the effectiveness of school-based intervention programs in reducing or preventing depression, anxiety, and PTSD symptoms among students (Fu & Underwood, 2015; Werner-Seidler et al., 2017). Many of these programs collaborate with school staff as well as with external psychologists. However, owing to safety considerations to prevent the spread of the disease during the COVID-19 response period, it has become difficult for external partners to provide specialized mental health assistance in school settings.

The same coping method is not always effective in stressful situations, and it is necessary to use different coping methods depending on the situation (Lazarus & Folkman, 1984). The ability to use different coping strategies depending on the situation is defined as "flexibility of coping" (Westman & Shiron, 1994). Kato (2012) categorized practices approaching coping flexibility into (1) repertoire, (2) variation, and (3) fitness. The repertoire approach focuses on the range of coping strategies used by individuals. However, it examined the type of coping strategy rather than the number of coping strategies used, and was not able to examine the actual use of that type of coping. The variation approach focuses on varying coping strategies in response to stressful situations. However, these strategies do not always produce the desired results. Therefore, the fitness approach focuses on selecting the appropriate coping strategy according to cognitive evaluation of the situation to facilitate the desired outcome. Cognitive evaluation is a concept proposed by Lazarus and Folkman (1984). Cognitive evaluation and coping influence the magnitude of stress reactions that vary from individual to individual, even when faced with the same stressor (Lazarus & Folkman, 1984). Cognitive evaluation includes two types of evaluations: threatness, which is how much something affects you; and copeability,

which is how much you can cope with it (Lazarus & Folkman, 1984). Prior studies have estimated that problem-solving coping is effective when the controllability of cognitive evaluation is high, and emotion-focused coping is effective when it is low (Park et al., 2001; Zakowski et al., 2001). Furthermore, Kato (2012) noted the need for meta-coping as a new perspective needed for coping flexibility. Meta-coping is the perspective of monitoring coping by assessing the situation and evaluating the results of the coping process. Considering these findings, we believe that the improvement of coping flexibility can be achieved by selecting appropriate coping strategies according to the controllability of cognitive evaluation and to evaluate the results of the selected coping strategy.

For those who need to cope with unusual stressors that they have not experienced before, interventions that focus on coping flexibility are expected to facilitate adaptation. Examples include patients with chronic diseases (Schwarts & Rogers, 1994), patients with functional dyspeptic disorders (Cheng et al., 2007), and Chinese working adults (Cheng et al., 2012). In these practices, the goal is to select appropriate coping according to the controllability of cognitive evaluation and to evaluate the results of the selected coping. Since COVID-19 is a novel stressor, we thought that interventions aimed at improving coping flexibility could be expected to decrease anxiety in elementary school students. Interventions focusing on coping flexibility in Japan have not been practiced with children but have been practiced with university students (Nakamura, 2015). Coping flexibility is also associated with stress and depression among Japanese undergraduates (Kato, 2001).

The purpose of this study was to implement a school-based intervention aimed at improving coping skills, and to clarify whether the intervention lowers anxiety in children during the COVID-19 pandemic by improving coping skills. We expect that after the intervention, participants will have increased scores on the Tri-axial Coping Scale-24 (TAC-24) subscales — "seeking support," "problem avoidance," and "positive interpretation and recreation"—as well as reduced anxiety scores would decrease.

Method

Participants and Procedure

Participant flow is illustrated in Figure 1. A total of 692 students (12–14 years, M = 12.78, SD = 0.65; 347 boys, 320 girls, and 25 unknown) participated in the first and second year of junior high school. In implementing the intervention program for this study, the second author contacted the principal of the middle school to request participation. Snowball sampling was employed. All participants could read and write in Japanese and were born and raised in Japan.

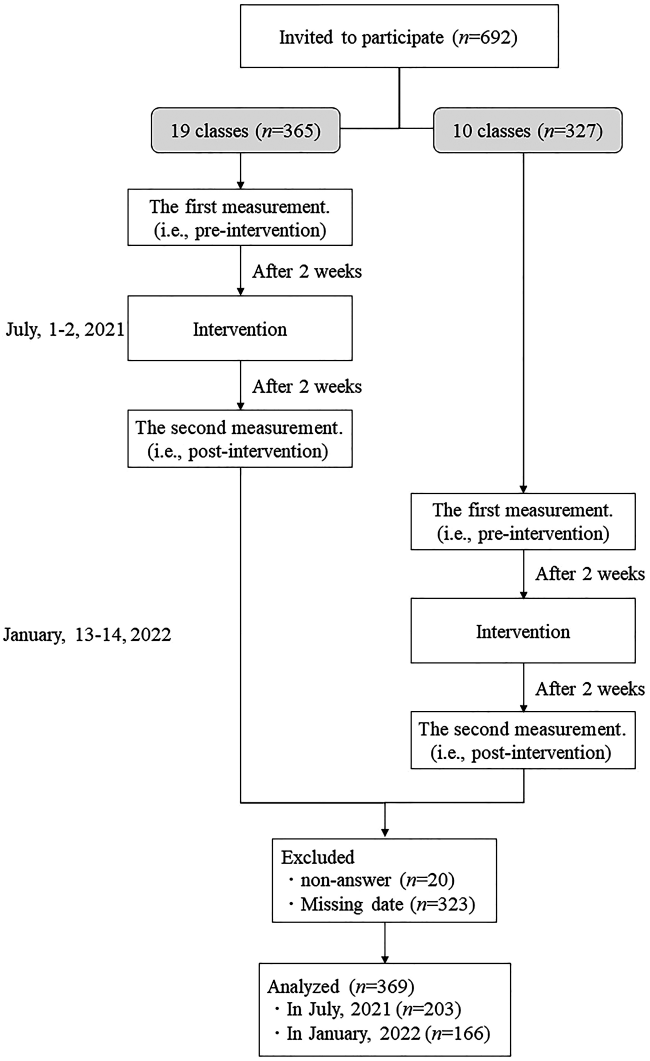

Figure 1. Participant flow diagram

In this study, some classes participated in July 2021, while others participated in January 2022. When participants received the intervention was randomly assigned on a class-by-class basis. Of the 19 first- and second-year classes in junior high school, 10 participated in the intervention in July 2021 and nine participated in January 2022. All participants completed the first measurement two weeks before the intervention (i.e., pre-intervention) and the second measurement two weeks after the intervention (i.e., post-intervention). Participants were randomly numbered so that responses to the first measurement could be matched with responses to the second measurement.

In the prefectures where the targeted schools were located, the rate of infections per 100,000 people was approximately 4.0–4.1 on the intervention day in July 2021 and 69.8– 89.9 on the intervention day in January 2022. The government subcommittee determined that when the number of infected persons per 100,000 people was ≥ 25, it corresponded to the most serious stage of the infection. The number of cases of "15 or more" corresponds to the stage in which the number of infected persons is rapidly increasing.

All participating students, their parents/guardians, and school principals provided informed consent prior to completing the first questionnaire. The questionnaire was anonymous and did not include personal information. The study protocol was approved by the ethics committee of the institution of the first author. No participant had received psychotherapy or pharmacotherapy before the study.

Intervention Program

The intervention was conducted in a single 50-minute session involving five steps. It was conducted by a graduate student majoring in clinical psychology, who received adequate training from a university teacher with national certification as a clinical psychologist in Japan.

Step 1 (10 minutes) consisted of psychoeducation concerning the mechanism of anxiety. Specifically, to reduce their resistance to dealing with anxiety in this intervention, students were informed that their feelings of anxiety were not bad and that everyone had these feelings. The interventionist explained that cognitive evaluation and coping influenced the degree of anxiety. Using examples of stressors that children may experience in their daily lives, he explained the mechanism of stress reactions based on the theory of Lazarus and Folkman (1984).

In Step 2 (10 minutes), a more detailed explanation of the cognitive assessment and types of coping was provided. The interventionist informed participants that cognitive evaluation is the ability to assess controllability and that compatibility with stress coping changes depending on controllability. In short, we explained that emotion-focused coping for stressors with low controllability and problem-solving coping for stressors with high controllability were effective in reducing anxiety and stress reactions. We tried to make explanations easy to understand by transforming psychological concepts into characters and using examples of stressors that children may experience in their daily lives. For example, we provided an example of school closure owing to COVID-19 infection control. The interventionist told the following story: "COVID-19 outbreaks and school closures are stressors that are unlikely to be controllable. If you spend a lot of time alone at home, you may feel anxious. One example of coping might be, 'It might be a relief if we knew when COVID-19 will subside! Let's look it up on the Internet!' This type of coping is problem- solving coping. As a result, we have a lot of uncertain information and a great deal of anxiety. With stressors that are less controllable, problem-solving coping is not very effective in reducing anxiety and stress reactions. Let's consider combining this with other coping strategies. In the other type of

coping, I decided to try reading a favorite book to refresh my mood. As a result, the cause of COVID-19 and school closures will not change, but we can expect to have a good time and reduce anxiety and stress reactions."

In Step 3 (15 min), participants were asked to reflect on stressors experienced in their daily lives and to consider the combination of cognitive evaluation and effective coping strategies. Once one combination was considered, participants were asked to predict the outcome after coping and the change in their feelings of anxiety. If the results or feelings of anxiety were not positive, participants were encouraged to revisit the cognitive evaluation or consider combining it with another coping strategy.

In Step 4 (five minutes), we instructed some of them to present their work and share their opinions with other classmates.

In Step 5 (10 minutes), as a supplement, we explained that the effect is likely to be higher if one chooses "coping" that can be performed by oneself. The intervener explained the following parables: "There was a person coughing nearby without a mask (stressor), which made me feel more anxious. So, I asked them to put on a mask. This is the first type of coping. But I was told that the person couldn't wear a mask because of [these] circumstances. I was convinced, but I was still worried about infection; so, my anxiety increased. So, as a second type of coping, I took precautions against infection by washing my hands and disinfecting myself with alcohol. Then, my anxiety decreased. Coping that you can do yourself is likely to be highly effective!"

The class was completed by explaining that the content of the class can be used in various situations in daily life and by citing specific scenarios.

Measurement

Anxiety was measured using the Japanese version of the Spence Children's Anxiety Scale-Short Version (SCAS; Ishikawa et al., 2018). The self-report questionnaire consisted of eight items rated on a 4-point Likert scale: 0 ("never"), 1 ("sometimes"), 2 ("often"), and 3 ("always"). The scores were summed and ranged from 0 to 24. Higher total scores indicate higher levels of anxiety. Ishikawa et al. (2018) reported excellent reliability and validity of the SCAS in the general population of Japanese children.

Coping was measured using the TAC-24 (Masuda et al., 2010). The self-report questionnaire consisted of 24 items rated on a 5-point Likert scale with four response options: 1 ("I never did (think) that. Never again"), 2 (Sometimes I do (think) that way. There will not be many in the future"), 3 ("Sometimes I do (think) that way. I will probably do it from time to time"), 4 ("I often do (think) that. I will often do so"), and 5 ("I have always thought that way. It will continue to do so"). The scores were summed and ranged from 24 to 120 points. A higher total score indicates more types of coping strategies learned. Masuda et al. (2010) reported excellent reliability and validity of TAC-24 in the general population of Japanese children.

An impression sheet created by the first author of this study was used to examine participants' evaluations of the intervention program. For the open-ended questions, participants were asked to write freely about what they thought, their overall impressions, and what they learned during the intervention.

Data Analysis

All analyses were performed using IBM SPSS Statistics version 28.0 (Japan IBM, Tokyo, Japan). The analyses in our study comprised descriptive statistics for all pre- and post-intervention measurements, t-tests for examining intervention effects, and calculating the Cohen's *d* effect size post-intervention with pre-intervention as a baseline. The t-test included time (pre- or post-intervention) as the independent variable and TAC-24 "seeking support" score, "problem avoidance" score, and "positive interpretation and recreation" score and SCAS score as the dependent variables.

Results

Excluding 20 participants who did not respond and 323 who had incomplete answers, 369 participants (186 boys and 183 girls) were included in the analysis (Table 1).

Table 1. Descriptive statistics and t-test results

		pre-intervention	post-intervention	*t* (368)	*d*
SCAS					
Total scores	*M*	7.16	6.28	5.50***	0.29
	SD	5.66	5.78		
TAC-24					
seeking support	*M*	26.40	26.39	0.04 *n.s.*	0.00
	SD	7.16	7.52		
problem avoidance	*M*	13.00	12.56	2.45*	0.13
	SD	4.54	4.80		
positive interpretation and recreation	*M*	29.72	32.47	9.83***	-0.51
	SD	6.19	7.72		

*: $p < .05$, ***: $p < .001$

Descriptive statistics of the SCAS scores were pre-intervention ($M = 7.16$, $SD = 5.66$) and post-intervention ($M = 6.28$, $SD = 5.78$). The SCAS score factor showed a significant decrease post-intervention compared to pre-intervention ($t(368) = 5.50$, $p < .001$, $d = 0.29$).

Descriptive statistics of the TAC-24 "seeking support" score were as follows: pre- intervention (M = 26.40, SD = 7.16) and post-intervention (M = 26.39, SD = 7.52). The "seeking support" score showed no significant difference pre- and post-intervention ($t(368) = 0.04$, $p = .97$, $d = 0.00$).

Descriptive statistics of the TAC-24 "problem avoidance" score were as follows: pre- intervention (M = 13.00, SD = 4.54) and post-intervention (M = 12.56, SD = 4.80). The "problem avoidance" score showed a significant decrease post-intervention compared to pre- intervention ($t(368) = 2.45$, $p = .02$, $d = 0.13$).

Descriptive statistics of the TAC-24 "positive interpretation and recreation" score were as follows: pre-intervention (M = 29.72, SD = 6.19) and post-intervention (M = 32.47, SD = 7.72). The "positive interpretation and recreation" score showed a significant increase post-intervention compared to pre-intervention ($t(368) = 9.83$, $p < .001$, $d = -0.51$).

The following were the most common statements on the impression sheet: "I better understand cognitive evaluation and coping," "I found that feeling anxiety was not bad," "It was content that I could actually use in daily life," "I want to take this class again," and "It was easy to understand the examples of daily life."

Discussion

The purpose of this study was to implement a school-based intervention aimed at increasing coping skills and improving coping flexibility, and to determine the intervention effects on coping and anxiety in children during the COVID-19 pandemic. The results showed that the intervention program was effective in reducing anxiety among junior high school students during the COVID-19 pandemic. School intervention is expected to be an effective form of psychological support to prevent prolonged and chronic stress reactions that are currently experienced by children.

Regarding coping, the results showed no change in "seeking support," a decrease in "problem avoidance," and an increase in "positive interpretation and recreation." It is possible that the students tried different coping strategies and found that "positive interpretation and distraction" helped them feel better when living with anxiety regarding a disease like COVID-19, over which they had no control. It is important to use different coping strategies depending on the stressor, and coping skills interventions for anxiety can be beneficial for junior high school students to manage the distress associated with the pandemic. However, the intervention content may have been the reason for the decrease in "problem avoidance." "Problem avoidance," as measured by TAC -24, is coping such as putting off tasks that need to be done, blaming others for failures, and making excuses. Participants were asked to consider a combination of cognitive assessments and coping, and then to predict the outcome and the degree of anxiety. "Problem avoidance" can temporarily alleviate negative feelings; however, the outcome is less likely to be a good prediction, and

therefore, anxiety is less likely to change. Through this work, participants may have learned that "problem avoidance" is not an effective coping strategy, leading them to choose a different coping strategy. As the aim of this intervention was to select coping strategies that reduce anxiety according to the controllability of the stressor, we believe that this result is not necessarily negative.

The content of the review sheets suggests that the children had a good understanding of the intervention. The use of daily life examples and characterization of psychological concepts was thought to have promoted children's understanding. In addition, many people commented that they would like to receive it again, suggesting that although it was a group intervention, they could participate with little resistance. Although the intervention was implemented during the pandemic, it is possible that the children were less resistant to receiving the intervention in classrooms with classmates.

In the future, it will be important to conduct self-monitoring of homework to see whether the flexibility of coping acquired through the intervention allowed the participants to select appropriate coping strategies in their daily lives and to appropriately assess their effectiveness. This procedure will allow us to confirm the degree of generalization of the intervention effects to daily life and to clarify more detailed effects on anxiety related to COVID-19.

Limitations and Future Directions

This study had some limitations. Since only one intervention was conducted and no control group could be established, it is difficult to say that an intervention effect was fully revealed. The results need to be examined further, as they may have been influenced by other factors. In addition, 323 participants with incomplete responses were excluded. The reason for the high number of incomplete responses may have been because it was a paper-based survey. In the future, this problem may be remedied by utilizing tablets or other electronic devices.

Psychoeducation to promote an understanding of coping potential and effective combinations of coping types was implemented in this study with the aim of improving coping flexibility. However, the generalizability of the results requires further examination. Coping flexibility is assumed to involve several cognitive processes (Kato, 2012; Park et al., 2001; Zakowski et al., 2001). For example, recalling the coping being acquired, appropriately recognizing one's situation, making cognitive evaluations of the stressor, and evaluating whether meta-coping skills produce the desired outcome for coping. Future research should examine more detailed mechanisms of what cognitive processes in coping flexibility contribute to reducing stress reactions and promoting adaptation in helping children cope with unusual stressors such as the COVID-19 pandemic. This would help to clarify the core elements of intervention programs focused on coping flexibility.

In sum, the intervention conducted in this study, which aimed to increase coping skills and improve coping flexibility, was effective in reducing anxiety and

promote coping among junior high school students during the COVID-19 pandemic. Although the children showed little resistance to participating in the intervention, it may be necessary to reduce the burden on schools to accept outside experts by using information-technology equipment and other means to conduct the intervention remotely.

Authors' note

Declaration: This is an original work that has not been submitted nor published elsewhere. All of the authors have read and approved the paper, and meet the criteria for authorship.

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Conflict of interest: None.

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WHAT EXPLAINS SOCIAL ANXIETY IN ADOLESCENTS WITH SOCIAL ANXIETY DISORDER AND HEALTHY CONTROLS? THE APPLICABILITY OF THE CLARK AND WELLS' MODEL

Diana Vieira Figueiredo[1], Paula Vagos[1,2], Ana Ganho-Ávila[1], Maria do Céu Salvador[1], Luiza Nobre-Lima[1], Daniel Rijo[1]*

[1] University of Coimbra, Center for Research in Neuropsychology and Cognitive and Behavioral Intervention (CINEICC) Faculty of Psychology and Educational Sciences

[2] Universidade Portucalense Infante D. Henrique, Instituto de Desenvolvimento Humano Portucalence

Abstract

Clark and Wells' model for social anxiety proposed several maintenance factors for social anxiety (SA), which is assumed to exist in a continuum from normative to pathological levels (i.e., Social Anxiety Disorder – SAD). Based on these premises, we used a cross-sectional design to investigate pathways linking those maintenance factors to SA, in adolescents (M_{age} = 16.02, SD = .97) with SAD (n = 30) and healthy controls (n = 23), who filled in self-report questionnaires about those variables. Separate moderation models were tested using the same dependent variable (i.e., SA) and different independent variables (i.e., Negative Social Thoughts and Beliefs, Self-focused Attention, and Safety-seeking Behaviors); group was the moderating variable. All variables were significant predictors of SA, explaining between 80% (i.e., Self-focused Attention) and 83% (i.e., Safety-seeking Behaviors and Negative Social Thoughts and Beliefs) of its variance. Group was never a significant moderator. These results favor Clark and Wells' model for explaining SA along its continuum. The pervasiveness of negative cognitions, safety-seeking behaviors, and self-focused attention in adolescents with SAD seems to contribute to a more disrupting experience of SA. As such, addressing these maintenance factors may be useful, as a preventive and remedial approach to SA in adolescence.

Keywords: Social Anxiety; Clark and Wells model; Adolescents; Clinical and Non-Clinical.

* Correspondence concerning this article should be addressed to Diana Vieira Figueiredo, University of Coimbra, Center for Research in Neuropsychology and Cognitive Behavioral Intervention – CINEICC, Faculty of Psychology and Educational Sciences, 3000-115 Coimbra, Portugal. https://orcid.org/0000-0002-4538-1199.
Email: diana.v.figueiredo@fpce.uc.pt

Experiencing mild levels of social anxiety is a common human experience, particularly when facing new, unfamiliar, or social-evaluative situations (Clark & Beck, 2011). Nonetheless, difficulties may arise when a variety of daily social situations are endured with intense anxiety causing multiple symptoms (e.g., mental blanks, blushing, refusing to participate in social gatherings) that associate with significant impairment. At this extreme of the social anxiety continuum lies Social Anxiety Disorder (SAD). SAD is characterized by a marked and persistent fear of social and/or performance situations in which one may be exposed to the scrutiny of others (American Psychiatric Association, 2013). Adolescence is a particularly sensitive period for the development of SAD (Haller et al., 2015). As such, SAD has its usual onset during that life period (Knappe et al., 2015; Stein et al., 2017) and it is highly prevalent among adolescents, with point-estimated prevalence rates between 1.29% (Jystad et al., 2021) and 9.4% (Alves et al., 2022). SAD is a highly debilitating condition that is associated with significant impairments in multiple areas of the adolescents' lives, such as romantic relationships (Hebert et al., 2013), friendships (Erath et al., 2007), and academic performance (Soohinda & Sampath, 2016). Additionally, research shows that adolescents with SAD are at a higher risk of presenting other mental health difficulties (Jystad et al., 2021; Mohammadi et al., 2020), and that, if not receiving specialized intervention, of SAD frequently persisting throughout life (Stein et al., 2017).

Given that adolescence is a crucial phase of social learning and that social interactions play a key role in adolescents' development (Leigh & Clark, 2018), experiencing SAD may hinder the acquisition of competencies that are crucially developed during that development phase, thus negatively impacting adult life (Masten & Cicchetti, 2010). Nonetheless, adolescence may as well be an opportunity to deliver effective intervention given that the increased plasticity associated with this developmental phase may facilitate emotional and social learning (Haller et al., 2015). Therefore, understanding the psychological processes that might explain the experience of social anxiety within adolescence is paramount.

Cognitive-behavioral models of social anxiety have emphasized the role of cognitive (e.g., beliefs, negative thoughts) and behavioral (e.g. avoidance, safety-seeking behaviors) processes in explaining social anxiety (Beck et al., 1985; Clark & Wells, 1995; Rapee & Heimberg, 1997). Particularly, Clark and Wells' (1995) model offers a strong theoretical background for understanding the maintenance of social anxiety that has gathered extensive evidence, though more so for adults than for adolescent samples (see below). According to this model, dysfunctional beliefs about oneself and one's social world lead individuals to interpret social situations in a negative and threatening way. This appraisal of the social situation then triggers a chain of self-perpetuating cognitive, affective, and behavioral responses that prevent the disconfirmation of negative beliefs and thoughts, maintaining the individuals' distress (Leigh & Clark, 2018). Specifically, these responses include in-situation

processes such as excessive self-focused attention and safety-seeking behaviors (Clark, 2001).

About self-focused attention, Clark and Wells (1995) proposed that attention is shifted inwards so that individuals closely monitor themselves and how they are coming across. This shift in attention prevents individuals from noticing how others truly respond to them and increases awareness of internal information (e.g., anxiety symptoms). In turn, this internal information is interpreted as a confirmation of the individuals' own negative social thoughts and beliefs. In line with this model (Clark, 2001), individuals also engage in a variety of safety-seeking behaviors that aim to prevent or minimize anticipated feared outcomes. These strategies are unhelpful for several reasons, namely: they prevent individuals from realizing that feared outcomes were unlikely or not as catastrophic as expected if they do occur; they enhance the focus of attention on oneself; they can increase anxiety symptoms and draw attention to those symptoms; and they can impair social interactions/ performances and elicit fewer friendly responses from others (Leigh and Clark, 2018).

Empirical evidence supports the adequacy of Clark and Wells' (1995) model to explain social anxiety in adults (e.g., Canvin et al., 2016; Clark, 2001; Wells et al., 2016,). Regarding younger ages, a recent systematic review pointed to associations between social anxiety and social beliefs, safety-seeking behaviors, and self-focused attention in adolescence (Leigh & Clark, 2018) and a network analysis by Vogel and collaborators (2021) found that cognitive variables (particularly, dysfunctional cognitions) are central to social anxiety in children and adolescents. Concerning negative social thoughts and beliefs, higher levels of social anxiety have been associated with a higher frequency of negative social cognitions (Hodson et al., 2008, Schreiber et al., 2012). Moreover, adolescents with clinical and sub-clinical SAD were found to report more negative thoughts (Ranta et al.,2013) and engaged more frequently in negative self-talk than healthy controls (Alfano et al., 2006). Rudy and colleagues (2014) also reported a significant effect of negative self-referent cognitions on social anxiety in their study with children and adolescents.

Regarding self-focused attention, evidence suggests that adolescents with higher levels of social anxiety report experiencing more self-focused attention in comparison to their lowly socially anxious counterparts (Blöte et al. 2014; Hodson et al., 2008; Schreiber et al. 2012). Fontinho and Salvador (2012) found that adolescents with SAD scored significantly higher in self-focused attention in comparison to adolescents with other anxiety disorders and with adolescents without psychopathology. The independent predictive role of self-focused attention on social anxiety has been supported in samples of younger ages, (from 11 to 14 years old; Hodson et al., 2008), but not in samples of older adolescents (ages between 13 and 20; Fontinho, & Salvador, 2012; Schreiber et al., 2012).

In what concerns safety-seeking behaviors, findings suggest that adolescents with higher levels of social anxiety resort to safety-seeking behaviors more frequently than adolescents with low anxiety levels (Schreiber et al., 2012). Accordingly, safety-seeking behaviors were found to be more frequent in

adolescents with a clinical and sub-clinical diagnosis of SAD than in adolescents without a diagnosis (Ranta et al., 2013). Hodson and colleagues' (2008) study with young people (participants aged between 11 and 14 years old) also showed that, compared to a low socially anxious group, the high socially anxious group scored significantly higher in a measure of safety-seeking behaviors. Similar to findings regarding self-focused attention, research on the predictive effect of safety-seeking behaviors on social anxiety is inconsistent: safety-seeking behaviors independently and significantly predicted social anxiety in clinical and non-clinical samples of older adolescents (from 13 to 20 years old; Fontinho, & Salvador, 2012; Schreiber et al., 2012) but the same effect was not found for younger ages (from 11 to 14 years old; Hodson et al., 2008). Moreover, Leigh and colleagues' (2021) findings from an experimental study supported the causal role of self-focused attention and safety-seeking behaviors in adolescents' social anxiety. A longitudinal study with adolescents further pointed to the predictive independent role of social beliefs, safety-seeking behaviors, and self-focused attention on prospective levels of social anxiety (Chiu et al., 2021).

Taken together, this evidence supports the suitability of Clark and Wells' (1995) model to explain social anxiety in adolescents, though relying mostly on studies focusing on associations between variables within that model and social anxiety. Research addressing the predictive role of safety-seeking behaviors and self-focused attention on social anxiety is contradictory and lacking, as is limited the research into the pathways linking negative social thoughts and beliefs, self-focused attention, and safety-seeking behaviors to social anxiety, when considering adolescents with SAD and normative adolescents. Knowing the (dis)similarity of these pathways across normative and pathological levels of social anxiety may better inform what distinguishes and should be considered in intervention efforts for adolescent SAD.

The current study aimed to narrow this research gap by examining the moderating role of the presence of SAD/ absence of clinical diagnosis in the pathways linking the maintenance factors of Clark and Wells' (1995) model (i.e., negative social thoughts and beliefs, self-focused attention, and safety-seeking behaviors) to social anxiety. As a preliminary analysis intending to validate the quantitative between-group differences, we compared adolescents with SAD and healthy adolescents in measures of social anxiety and of the above-mentioned maintenance processes; following previous findings (e.g., Fontinho, & Salvador, 2012; Ranta et al.,2013) we expect the first to present higher scores. As for our main goal, considering previous research on the associations between negative social thoughts and beliefs, self-focused attention and safety-seeking behaviors, and social anxiety in non-clinical (e.g., Chiu et al., 2021) and clinical (e.g., Fontinho & Salvador, 2012; Ranta et al., 2013) samples of adolescents, we expected that all maintenance variables would predict social anxiety and that similar paths would emerge in both samples of adolescents.

Method

This work concerns outcomes taken form the research project *TeenSAD*: Changing the Course of Social Anxiety in Adolescence (PTDC/PSI-ESP/29445/2017; ClinicalTrials.gov Identifier: NCT04979676).

Participants

Participants were 53 adolescents aged between 15 and 18 years old (M_{age} = 16.02, SD = 0.97) of which 36 were girls (67.9%), and 17 were boys (32.1%). Regarding socioeconomic status (SES) estimated based on parents' occupation[*], 49.1% of the participants came from low SES households (n = 26), 37.7% from medium SES households (n = 20), and 13.2% from high SES households (n = 7). Thirty participants (56.6%) presented a diagnosis of SAD (i.e., clinical group), and 23 (43.4%) presented no mental health diagnosis (i.e., non-clinical group). No significant differences were found between the clinical (M_{age}=16.20; SD=.81) and non-clinical (M_{age}=15.78; SD=.90) groups regarding age ($t_{(51)}$ = 1.78, p = .08); participants in those groups were homogenously distributed by gender ($\chi^2_{(1)}$ = .05; p =.82) and SES ($\chi^2_{(2)}$ = 2.591, p =.274).

Procedures

This work was conducted within the research project *TeenSAD*: Changing the Course of Social Anxiety in Adolescence (PTDC/PSI-ESP/29445/2017; ClinicalTrials.gov Identifier: NCT04979676) that proposes to investigate the efficacy of three diverse intervention conditions on adolescent SAD, against a waitlist control condition. As a secondary goal, this project intended to investigate the courses of social anxiety in adolescence by comparing participants in the waitlist control condition with normative peers. The current work is taken from that secondary goal. As such, a priori sample size determined using G*Power (two conditions across four assessment moments) was set at a minimum of 50 participants (i.e., 25 per group), with power analysis placed at .95, an expected effect size of 0.25 and an expected correlation between repeated measures placed at 0.30. In the present work we only considered the first assessment moment for the normative and the clinical groups. To ensure the comparability between the two groups regarding sample size, a random subsample of 30 participants was selected from the initial clinical group.

The sample was collected from Portuguese high schools after the study's procedures were approved by the ethics committee of the host institution and consent

[*] Socioeconomic status (low, e.g., laborers in manufacturing; medium, e.g., sales workers, high, e.g., health professionals) was assessed based on Simões' classification (1994).

from executive boards of the schools was granted. Further written and informed consent was requested from the guardian or legal representative of students under the age of 18 years old. All potential participants were informed about the goals and procedures of the research and the confidentiality and anonymity of their responses was guaranteed. Students were asked to voluntarily participate in the study and their informed assent was requested.

Schools were asked to screen all 10th and 11th graders with the Portuguese version of the Social Anxiety Scale for Adolescents (SAS-A; Cunha et al., 2004). Adolescents scoring more than one standard deviation above or below the mean found for a large normative Portuguese sample on the SAS-A (Cunha et al., 2004) were invited for an individual interview, resorting to the Portuguese Version of the MINI-KID (Mini-International Neuropsychiatric Interview for Children and Adolescents; Sheehan, et al., 2010; Portuguese Authorized version by Rijo et al., 2016). Specific inclusion and exclusion criteria for integration in the clinical and non-clinical groups were assessed during that interview. Inclusion criteria were being aged between 15 and 18 years old and having a primary diagnosis of generalized Social Anxiety Disorder (for inclusion in the clinical group) or having no clinical mental health diagnosis (for inclusion in the non-clinical group). The exclusion criteria were having indication of educational specific needs or psychotic symptoms, and/or currently attending psychological counseling services. Adolescents included in the study were requested to fill in a set of self-report questionnaires assessing the variables under study (cf. measures). The research protocol was sent to the adolescents to be answered online, using the LimeSurvey platform.

An initial pool of 1,495 adolescents were screened. Of these, 1108 were eligible for individual diagnostic assessment, of which 388 were referred to the clinical group and 720 were referred to the non-clinical group. One of nine masters in psychology with specific training on the application of the Mini-KID (Sheehan, et al., 2010; Portuguese Authorized version by Rijo et al., 2016) conducted interviews with 209 and 58 of the adolescents eligible for the clinical and the non-clinical group, respectively. Regarding the clinical group, 140 adolescents met all inclusion criteria and 92 were available to continue their participation in the research project; of these, a subsample of 30 participants was randomly selected to be considered in the present work. In what concerns the non-clinical group, 29 adolescents met all inclusion criteria of which 23 accepted to continue their participation in the research project and were included in the current work.

Measures

Instruments for sample recruitment

Social Anxiety Scale for Adolescents (SAS-A; La Greca, & Lopez, 1998; Portuguese version by Cunha et al., 2004). The SAS-A is a self-report questionnaire comprised of 22 items (e.g., "I worry that others don't like me") that assess adolescents' social anxiety experiences in social situations. Each item is answered

on a 5-point Likert-scale according to how much the item "is true for you" (ranging from 1 = 'not at all' to 5 = 'all the time'). Higher scores on the SAS-A reflect higher levels of social anxiety. Besides the total score, the scale comprises three other subscales. In the current work only the total score was considered for selecting participants who scored one standard deviation above or below the mean, who were then called for an individual clinical interview.

Mini-International Neuropsychiatric Interview for Children and Adolescents (Mini-KID; Sheehan et al., 2010; Portuguese version by Rijo et al., 2016). The Mini-KID is a structured diagnostic interview for the assessment of DSM-V diagnoses that are most common in children and adolescents. This interview is a downward extension of the adult version of the interview, that has been validated against other diagnostic interviews (i.e., Structured Clinical Interview for DSM-III-R and the World Health Organization designed Composite Internal Diagnostic Interview; Sheehan et al., 2010). The Mini-KID presents screening questions answered in a yes/no format for the evaluation of specific diagnostic criteria for each clinical diagnosis. In its original version, interrater reliability was excellent across diagnoses except for dysthymia (Sheehan et al., 2010). The Portuguese version of the Mini-KID resulted from a careful translation and backtranslation process and has been previously used as a method for the assessment of clinical diagnoses (Rijo et al., 2016). Clinicians that applied the Mini-KID to assess adolescents for integration in the clinical and non-clinical groups received specific training, including role-play exercises, and went through an initial observation phase of experienced evaluators applying the interview before conducting interviews themselves.

Data collection measures

All participants completed a **socio-demographic questionnaire** assessing age, gender, school year and parents' profession. This information was used solely for sample characterization.

Social Anxiety and Avoidance Scale for Adolescents (SAASA; original version by Cunha et al., 2008). The SAASA is a self-report questionnaire comprised of 30 items in its adapted version that was particularly tailored for older adolescents (Vagos et al, 2013); that version was the one used in the current work. The SAASA seeks to assess the degree of anxiety and frequency of avoidance in social situations representative of the most frequent social fears in adolescents. It features two subscales, namely, Anxiety and Avoidance. In the current work, only the anxiety subscale was used. Its items (e.g., "Going to a party given by a colleague") are answered on a five-point Likert scale (ranging from 1 = 'none' to 5 = 'very much'). Each subscale is comprised of six factors: interaction with the opposite sex, assertive interaction, observation by others, interaction in new social situations, performance in social situations, and eating and drinking in public. The SAASA has presented good internal consistency values, with Cronbach's alpha values over .87 for the total score and subscales for the original version (Cunha et al., 2008), and over .70 for its 30-item version (Vagos et al., 2013). The SAASA has also shown good test-retest

reliability, convergent and divergent validities, capacity to discriminate adolescents with SAD from adolescents with other anxiety disorders and from adolescents without psychopathology (Cunha et al., 2008), and sensitivity to treatment results (Salvador, 2009). In the present study, only the total score for the anxiety subscale was used and it attained an excellent internal consistency with a Cronbach's alpha value of .97.

Social Thoughts and Beliefs Scale (STABS; Turner et al., 2003; Portuguese version for adolescents by Vagos et al., 2010). The STABS is a self-report instrument that consists of 21 items rated using a 5-point Likert scale (ranging from 1 = 'not at all characteristic of me' to 5 = 'always characteristic of me'). It assesses the degree to which a particular thought or belief is typical of the respondents' thinking when anticipating or participating in social situations. In its original version for adults, a two-factor solution fitted the data, referring to Social Comparison and to Social Ineptness, which presented excellent internal consistencies with Cronbach's alpha values of .95 and .93, respectively. The total score also achieved an excellent internal consistency, with a Cronbach's alpha of .96 (Turner et al., 2003). The STABS also presented a highly reliable temporal stability and a high degree of accuracy to discriminate between individuals with SAD, with other anxiety disorders and those with no psychopathology (Turner et al., 2003). The Portuguese version for adolescents also achieved a two-factor structure that nonetheless referred to different constructs. They were Discomfort in Social Interaction (e.g., "When I am in a social situation, I appear clumsy to other people") and Discomfort in Public Performance (e.g., "My mind is very likely to go blank when I am talking in a social situation"), with Cronbach's alpha values of .93 and .91 respectively, and a value of .82 for the total score (Vagos et al., 2010). In the present study, only the total score of the STABS was used. It presented an excellent internal consistency with a Cronbach's alpha value of .97.

Self-focused Attention Scale (SFA; Bögels et al., 1996; Portuguese version for adolescents by Fontinho & Salvador, 2012). The SFA is a self-report questionnaire that comprises 11 items answered on a 5-point Likert scale (from 0 = 'nothing' to 4 = 'totally') to assess the focus of attention in social situations. Items are distributed across two factors: focus of attention in one's behavior (SFA-behavior; e.g., "In the presence of other people I'm constantly focusing on whether I'm sufficiently socially skilled") and focus of attention in one's physiological arousal (SFA-arousal; e.g., "In the presence of other people I'm constantly focusing on whether I blush, tremble, or sweat"). In its original version (Bögels et al., 1996), the SFA achieved acceptable to good internal consistencies with Cronbach's alpha values of .88 for the total score, .86 for SFA-arousal, and .78 for SFA-behavior. The Portuguese version for adolescents revealed good test-retest reliability and convergent validity in relation to measures of social anxiety and self-focused attention. It showed good to excellent internal consistencies, with Cronbach's alpha values of .91 for the total score, .86 for SFA-arousal, and .88 for SFA-behavior (Fontinho & Salvador, 2012). In the present study, only the total measure of the SFA

was used and it presented with a Cronbach's alpha value of .95 denoting excellent internal consistency.

Safety Behaviors in Social Situations Scale for Adolescents (SBSSS-A; Silva & Salvador, 2010). The SBSSS-A is a self-report questionnaire comprised of 20 items (e.g., "You look at the ground while you walk") rated on a 4-point Likert scale (from 1 = 'Never' to 4 = 'Almost Always'). It assesses the frequency of practicing safety-seeking behaviors in social situations. The adult version was able to discriminate individuals with generalized SAD from individuals with non-generalized SAD, with other anxiety disorders and without psychopathology (Pinto-Gouveia et al., 2000). When applied to adolescents, the scale revealed a unifactorial structure, good internal consistency and temporal stability, and a moderate convergent validity (Silva & Salvador, 2010). Additionally, the SBSSS-A has been shown to be sensitivity to treatment results (Salvador, 2009). In the current study, the SBSSS-A achieved an excellent internal consistency with a Cronbach's alpha value of .94.

Data analysis

Statistical analyses were conducted using IBM SPSS Statistic 22 (Statistical Package for the Social Sciences version 22; IBM Corp.). Concerning our preliminary analyses intending to investigate group mean-level differences in variables relevant to the Clark and Wells (1995) model (i.e., negative social thoughts and beliefs, self-focused attention, safety-seeking behaviors), and social anxiety, Mann Whitney U tests were conducted. To convert the *z*-score into an effect size estimate, *r*, the following equation was used: $r = z/\sqrt{N}$ (Rosenthal, 1991). Non-parametric tests were used given that Mardias' multivariate test of normality conducted on computed measures of all study variables revealed non-compliance with multivariate normality (Mardias' skewness z = 32.44, $p < .05$; Mardias' Kurtosis z = 0.57; $p = .57$). To achieve the present study main aim (i.e., better understand (dis)similarity of pathways linking Clark and Wells maintenance variables to social anxiety, across groups of adolescents presenting normative versus pathological levels of social anxiety) we opted for moderation analysis. Moderation analysis focuses on understanding the conditions under which the relationship between two variables is stronger or weaker (i.e., the "when" or "for whom"; Hayes, 2018). So, moderation analyses align with our goal of knowing for whom (i.e., the diagnostic group considering SAD versus Healthy Controls) would the relationship between Clark and Wells maintenance variables and social anxiety be applicable. Thus, three separate simple moderation models ("model 1") were estimated using SPSS version of the PROCESS Macro (Hayes, 2018). Each moderation model had one of the Clark and Wells proposed maintenance factors (i.e., (1) negative social thoughts and beliefs, (2) self-focused attention, and (3) safety-seeking behaviors) as the independent

variable; all models had social anxiety as the dependent variable, and group (clinical versus non-clinical) as the moderator. We used the following formula to convert r^2 values into the Cohen f^2 effect size: $f2 = r2/1 - r2$.

Results

Mean-level comparisons across the clinical and non-clinical groups

Means, standard deviations, medians, and mean ranks for all measures by group are presented in Table 1. Significant differences between the clinical and the non-clinical groups were found for all measures. Specifically, the clinical group scored significantly higher in all study variables in comparison with the non-clinical group (cf. Table 1).

Table 1. Means, standard deviation, medians, and mean ranks for all scales

	Clinical group (n = 30)			Non-clinical group (n = 23)			U	*z*	*r*
	M (SD)	Mdn	M rank	M(SD)	Mdn	M rank			
Social anxiety									
Interaction with the opposite sex	13.33 (4.54)	13.50	36.83	6.17(2.19)	5.00	14.17	50.00***	-5.36	-0.74
Assertive interaction	19.80 (5.13)	19.50	37.20	9.78(3.50)	9.00	13.70	39.00***	-5.50	-0.76
Observation by others 6	21.77 (7.08)	22.50	36.70	9.91 (3.45)	9.00	14.35	54.00***	-5.24	-0.72
Interaction in new social situations	14.67 (3.73)	15.00	37.25	7.04 (2.27)	7.00	13.63	37.50***	-5.53	-0.76
Performance in social situations	14.73 (4.11)	14.50	36.92	6.87 (3.27)	6.00	14.07	47.50***	-5.35	-0.73
Eating and drinking in public	4.17 (1.53)	4.00	35.12	2.30 (0.56)	2.00	16.41	101.50***	-4.59	-0.63
Total Score	88.47 (20.34)	91.50	37.90	42.09 (11.42)	40.00	12.78	18.00***	-5.87	-0.81
Negative social thoughts and beliefs									
Discomfort in Public Performance	26.27 (5.82)	26.50	37.35	14.87 (3.44)	16.00	13.50	34.50***	-5.59	-0.77
Discomfort in Social Interaction	43.63 (8.27)	43.00	37.88	20.00 (6.69)	18.00	12.80	18.50***	-5.87	-0.81
Total Score	69.90 (13.60)	70.00	37.82	34.87 (8.32)	34.00	12.89	20.50***	-5.83	-0.80
Self-focused attention									
SFA-Arousal	12.97 (6.40)	14.00	34.98	4.39 (5.72)	3.00	16.59	105.50***	-4.31	-0.59
SFA-Behavior	12.87 (4.38)	14.00	36.45	5.00 (3.50)	5.00	14.67	61.50***	-5.10	-0.70
SFA Total Score	25.83 (9.55)	27.50	35.93	9.39 (8.57)	8.00	15.35	77.00***	-4.81	-0.66
Safety-seeeking behaviors	52.63 (10.81)	54.00	37.58	32.39 (5.27)	32.00	13.20	27.50***	-5.71	-0.78

Note. M= Mean, SD=Standard Deviation, Mdn=Median, M rank= Mean Rank. Social anxiety was measured using the Social Anxiety and Avoidance Scale for Adolescents. Negative social thoughts and beliefs were measures using the Social Thoughts and Beliefs Scale. Self-focused attention was measured using the Self-focused Attention Scale. Safety-seeking behaviors were measures using the Safety Behaviors in Social Situations Scale for Adolescents.

*** $p < .001$

Self-focused attention, negative social thoughts and beliefs, and safety-seeking behaviors as predictors of social anxiety across the clinical and non-clinical groups

All three models under consideration were statistically significant: $F_{(3.49)}$ = 78.20, $p < .001$, R^2=.83, Cohen f^2 = 4.78 when considering Self-focused Attention as the independent variable; $F_{(3.49)}$ = 63.58, $p < .001$, R^2=.80, , Cohen f^2 = 3.90 when taking Safety-seeking Behaviors as the independent variable, and $F_{(3.49)}$ = 82.00, $p < .001$, R^2=.83, Cohen f^2 = 5.02 when the Negative Social Thoughts and Beliefs was put as the independent variable. Also, the independent variables always had a statistically significant effect: higher levels of Self-focused Attention, Safety-seeking Behaviors and Negative Social Thoughts and Beliefs significantly predicted higher levels of Social Anxiety. Alternatively, the effect of the group as the moderator was not statistically significant in any of the models (Cf. Table 2), indicating that the path linking each of the maintenance variables under scrutiny to social anxiety is similar for individuals within the clinical and the non-clinical groups.

Table 2. Linear models of predictors of social anxiety and conditional effects of the focal predictor

	β	*SE*	*t*	95% CI	
				Lower	Upper
Model 1					
Constant	104.96	6.82	15.39***	91.26	118.66
Self-focused Attention	2.25	0.57	3.97***	1.11	3.39
Group	-27.53	4.76	-5.79***	-37.09	-17.97
Self-focused Attention x Group	-0.71	0.39	-1.82	-1.49	0.07
Model 2					
Constant	104.66	9.29	11.27***	85.99	123.33
Safety-seeking Behaviors	2.02	0.71	2.84**	0.59	3.44
Group	-27.75	7.50	-3.70**	-42.82	-12.69
Safety-seeking Behaviors x Group	-0.70	0.59	-1.19	-1.88	0.48
Model 3					
Constant	82.06	9.39	8.74***	63.19	100.94
Negative Social Thoughts and Beliefs	1.13	0.45	2.50*	0.22	2.03
Group	-9.89	7.41	-1.34	-24.78	5.00
Negative Social Thoughts and Beliefs x Group	-0.05	0.35	-0.15	-0.76	0.65

Note. Social Anxiety was assessed with the SAASA-Anxiety Total Score; Self-focused Attention was assessed with the SFA Total Score; Safety-seeking Behaviors was assessed with the SBSSS-A; Negative Social Thoughts and Beliefs was assessed with the STABS Total Score. *p<.05; **p<.01; ***p<.001.

The graphical representations of the relationship between the predictors (i.e., Self-focused Attention, Safety-seeking Behaviors and Negative Social Thoughts and

beliefs) and Social Anxiety across groups (i.e., clinical versus non-clinical) are presented in Figure 1.

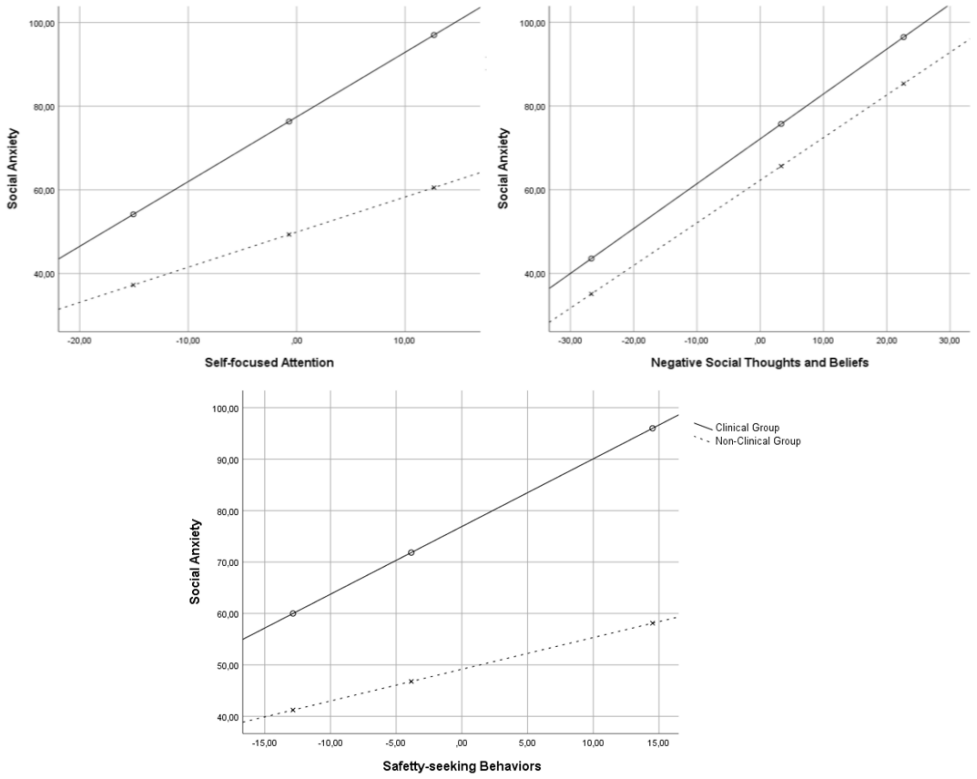

Figure 1. Graphical depiction of moderation models

Note. Social Anxiety was assessed with the SAASA-Anxiety Total Score; Self-focused Attention was assessed with the SFA Total Score; Safety-seeking Behaviors was assessed with the SBSSS-A; Negative Social Thoughts and Beliefs was assessed with the STABS Total Score.

Discussion

Social anxiety, concerning the discomfort felt in a variety of social events, may present differently based on the pervasiveness and/or intensity of symptoms. Nevertheless, research tends to focus on its more impacting form (i.e., SAD), neglecting the importance of understanding mental health difficulties along the spectrum in which social anxiety presents in individuals (Skocic et al., 2015). As such, comprehending the processes that are associated with the presentation of social anxiety in normative and clinical samples of adolescence seem to be critical research concerns, which may come to be applied to tailor intervention efforts. Such

comprehending has not been wholly undertaken before. Thus, the current work aimed to study the applicability of the of the Clark and Wells' (1995) model of social anxiety to adolescents, by investigating the (in)variance of the paths proposed by that model to sustain social anxiety, when comparing adolescents with SAD and mentally healthy adolescents.

As a preliminary analysis, we found that adolescents with SAD scored significantly higher in social anxiety felt across a diversity of social events, in thinking themselves discomfortable in social events and in public performance, in self-focused attention directed at ones' behavior and at ones' own physiological arousal, and in practicing safety-seeking behaviors. These findings align with previous literature with adolescents (e.g., Fontinho & Salvador, 2012; Ranta et al.,2013) and with adults (e.g., for a review see Clark, 2001). As such, they not only validate the more impaired status of our clinical group, but also reinforce the relevance of the Clark and Wells' (1995) model for social anxiety in defining variables that allow for a clear distinction of SAD from healthy controls based on pervasiveness or intensity of symptomatology, also in adolescents (for a review see Leigh & Clark, 2018). Such distinction in the experience of adolescents with and without SAD is quantitively clear and sustained by robust evidence.

Moreover, these variables proposed by Clark and Wells (1995) to explain and sustain the experience of social anxiety were significant and relevant predictors of social anxiety when considering the complete sample, explaining between 80% and 83% of its variance. Findings concerning negative social thoughts and beliefs align with the pivotal role that has been attributed to cognitive variables – such as interpretation bias, dysfunctional cognitions, and negative expectations – in several cognitive models of social anxiety (e.g., Beck et al., 1985; Clark & Wells, 1995). Such role has been supported by research with adolescents (e.g., Chiu et al., 2021 Miers et al., 2013), including with clinical samples (e.g., Vogel et al., 2021). Our findings also indicate that being self-focused on ones' own behavior and physiological arousal may sustain feeling socially anxious. These findings concur with previous evidence that, similarly to the current work, revealed a significant effect of self-focused attention in explaining social anxiety though in younger community samples (Hodson et al., 2008). Alternatively, self-focused attention was found not to impact significantly on social anxiety by Fontinho and Salvador (2012) and by Schreider et al. (2012). The first considered a solely clinical sample and self-focused attention on ones' physical arousal only; the latter considered a solely non-clinical sample and attention focused inwardly. Because we considered a combined measure of self-focused attention, and a combined sample of clinical and non-clinical participants, the effect of this variable, as proposed by Clark and wells (1995) may have become apparent. Concomitantly, working to change the focus of attention alone seems beneficial to diminishing ones' social anxiety levels (Warnock-Parkes et al., 2017). Finally, concerning safety-seeking behaviors, our findings are in line with previous studies with clinical (e.g., Fontinho, & Salvador, 2012) and non-clinical (e.g., Schreiber et al., 2012; Leigh et al., 2021) samples of adolescents,

suggesting that adolescents who use safety-seeking behaviors more frequently tend to experience higher levels of social anxiety. Current results do not align, however, to those of Hodson and colleagues' (2008). We used an older sample and considered the independent effect of mainly avoidance safety-seeking behaviors, unlike Hodson et al. (2008), who considered both impression management (e.g., rehearsing what to say) and avoidance behaviors (e.g., avoiding eye contact). Though both types of safety-seeking behaviors may impact on social anxiety, it seems that Impression management behaviors, which are more frequent in older adolescents (Evens et al., 2021), hold for a more evident intrapersonal (Twaites & Freeston, 2005) and interpersonal negative impact (Evans et al., 2021). Such specific impact may be reflected in our findings.

Taken together, findings from the current work validate the premises underlying the Clark and Wells' (1995) model of social anxiety to adolescent populations. Specifically, the predictive pathways linking negative social thoughts and beliefs, self-focused attention, and safety-seeking behaviors were held irrespective of adolescents presenting with or without SAD. So, even though the relevant cognitive and behavioral constructs proposed by Clark and Wells (1995) seem to be heightened in adolescents SAD, their explicative role for social anxiety does not seem distinctive of SAD in adolescence. In other words, differences on the experience of social anxiety between clinical and non-clinical adolescents seem to be quantitative rather than qualitative. These quantitative and qualitative experiences may interact to sustain social anxiety over time. Negative social experiences (e.g., bullying; Coelho et al., 2022) might heighten subjective social fears and related constructs, which are then reinforced and sustained cyclically as proposed by the Clark and Wells' (1995) model. As such, when initially high levels of social anxiety are present, they may remain stable, whereas initially moderate or low levels of social anxiety tend to decrease throughout adolescence (Miers et al., 2013). The interplay between contextual and psychological processes has been proposed as particularly useful to explain the maintenance of social anxiety in adolescence (Miers & Masia-Warner, 2023); based on our findings, we would suggest that contextual variables may potentiate quantitative differences in social anxiety and related-constructs, which then are sustained by psychological processes that are widespread but more pervasive because more frequently activated by a priori intense social fears.

Hence, addressing Clark and Wells (1995) proposed pathways to explain the maintenance social anxiety may be useful as a preventive and remedial approach to social anxiety in adolescence., particularly if one considers these processes may be more malleable than previously experienced negative contextual experiences. Concerning, Cognitive Therapy as a remedial approach to adolescent SAD, it has been recently shown to be effective (Ganho-Ávila et al., 2022; Leigh et al., 2021b; Leigh & Clark, 2022; Leigh & Clark, 2016). Nevertheless, if the same processes apply to sustaining social anxiety along its continuum, it might be helpful to consider cognitive strategies as preventive ones to be applied when social anxiety is at its

earlier and less generalized interference level. Specific one-session intervention strategies have been studied as effective in SAD adult samples, namely when changing safety-seeking behaviors or making the focus of attention more flexible (McManus et al., 2009; Warnock-Parkes et al., 2017). It might be useful to investigate the impact that those strategies may perhaps have in community and/or moderately socially anxious adolescents, particularly those who may exhibit intrapersonal vulnerability factors (e.g., behavioral inhibition; Spence & Rapee, 2016).

The current work holds for some limitations that should be taken into consideration. We relied on a cross-sectional design, so conclusions on the casual role of our predictive variables on social anxiety cannot be drawn. Our overall sample size can also be a limitation. Concerns apply to the generalizability of the findings, even if G*Power post hoc calculation considering our sample size (n = 53), effect sizes (see results section), two predictors for each dependent variability, and α error probability set at 0.05, place the power of our analyses at 1.00. Moreover, our sample size prevented us from exploring the complexity of the Clark and Wells' (1995) model for social anxiety (i.e., multiple interlinks between our predictive variables and social anxiety). We were also not able to examine whether negative social thoughts and beliefs, self-focused attention, and safety-seeking behaviors are specific to social anxiety compared to other mental health disorders. Investigating differences in the pathways linking Clark and Wells' (1995) proposed variables to social anxiety between adolescents with SAD and adolescents presenting other clinical conditions could add to existing research (e.g., Hodson et al., 2008; Schreiber et al., 2012) and help clarify their specificity to social anxiety in adolescents, further validating the applicability of the model. Moreover, not all Clark and Wells' (1995) proposed maintenance factors were considered in this study, namely pre- and post-event processing or the multitude of specific type of safety-seeking behaviors that may be characteristic of social anxiety in diverse age groups (Evans et al., 2021; Leigh & Clark, 2018). Future research should aim to replicate current findings with larger samples of adolescents, and more diverse concerning both clinical status and different age groups within this developmental phase, as well as consider simultaneously various variables proposed to sustain social anxiety, thus allowing for more robust theoretical conclusions and better tailored treatments.

Nonetheless, the present work supports the applicability of Clark and Wells (1995) model to explain social anxiety in adolescents along its continuum, further encouraging the use of Cognitive Therapy for adolescent social anxiety, both at preventive and remedial levels.

Social anxiety frequently goes unnoticed until its impact is unavoidable, which may happen when normative processes underlying social anxiety become too pervasive in ones' life. As such, and in alignment with the goal of promoting mental health outcomes for all in a preventive and early on perspective that is still not fully

achieved (O'Connor et al., 2017), our findings may be informative and supportive of interventions informed by a comprehensive understanding of social anxiety along its continuum, thus promoting healthy and adaptative developmental trajectories throughout adolescence.

Authors' note

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THE EFFICACY OF A COMPASSION, ACCEPTANCE AND MINDFULNESS-BASED PILOT INTERVENTION FOR ADOLESCENTS' TEST ANXIETY: A CASE STUDY USING THE ACADEMIC PROGRAM

Cláudia P. Pires[*1], *Stefan G. Hofmann*[2], *David W. Putwain*[3], *Maria do Céu Salvador*[1]

[1] University of Coimbra, Portugal, Faculty of Psychology and Education Sciences, Center for Research in Neuropsychology and Cognitive Behavioral Intervention
[2] Philipps-University Marburg, Germany, and Boston University, USA, Department of Psychological and Brain Sciences
[3] Liverpool John Moores University, UK, School of Education

Abstract

Test anxiety (TA) is one of the most common difficulties for secondary school students, with a negative impact in performance, mental health and well-being, and involving high levels of shame, self-criticism, and experiential avoidance. TA may also be conceptualized through an evolutionary and contextual approach to human suffering. To the best of our knowledge, no study has covered this conceptualization, nor has any previous TA treatment been simultaneously manualized, psychotherapeutic, and co-integrated compassion, acceptance and mindfulness-based practices. Moreover, studies on the efficacy of individual treatments directed to TA in adolescents are scarce, and case studies provide a comprehensive, detailed, and useful input about new models and treatments to both researchers and practitioners. The AcAdeMiC Program (*Acting with Acceptance, Mindfulness and Compassion to overcome Test/Exam Anxiety*) is a manualized 12-session online individual psychotherapeutic intervention, aiming to decrease test anxiety and boost well-being, compassion, acceptance and mindfulness. This is the first study presenting the treatment of an adolescent with high levels of test anxiety using this program. The Reliable Change Index (RCI) showed improvement, and maintenance or increase of gains over time, across all targeted symptoms and processes. The AcAdeMiC was also qualitatively and quantitatively perceived as useful and effective at posttreatment. This clinical case study provides a first glance at

[*] Correspondence concerning this article should be addressed to Cláudia P. Pires, Centro de Investigação em Neuropsicologia e Intervenção Cognitivo Comportamental (CINEICC), Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Rua do Colégio Novo, 3000-115 Coimbra, Portugal.
E-mail: claudia.pnpires@gmail.com

the conceptualization and treatment of TA with the new AcAdeMiC program.

Keywords: test anxiety, adolescents, intervention, case study, compassion, acceptance, mindfulness.

Many adolescents experience anxiety symptoms in the school context, especially when their performance is being examined (American Psychiatric Association, 2022). In test/exam situations, this is defined as *test anxiety* (TA), an intense fear or worry of negative evaluation when facing a formal evaluation of performance, that can result in unpleasant behavioural, physiological, and emotional responses (Zeidner, 1998). Up to 55% of adolescent students report feeling highly anxious for a test, despite the degree of preparation (Organisation for Economic Cooperation and Development; OECD, 2017; Putwain & Daly, 2014; Putwain & Symes, 2018), which carries consequences like impaired performance (Steinmayr et al., 2016), concentration, memory and attention (Owens et al., 2014), increased depression, anxiety and stress (Akinsola & Nwajei, 2013; Putwain et al., 2021; Wuthrich et al., 2021), and reduced life satisfaction and well-being (Steinmayr et al., 2016; World Health Organization, 2016). Academic achievement is, in fact, extremely valued, both in secondary education and at university (Feld & Shusterman, 2015), when TA becomes the primary reason for seeking specialized psychological support (Melo et al., 2006). This demands a broader understanding of the TA phenomenon, and the development of targeted and structured early interventions.

Test anxiety conceptualization and treatment efforts

TA remains unclassified in the DSM-5 (APA, 2022), which may account for the little attention it has received, especially in terms of novel clinical interventions. Conceptual models are either cognitive and/or affective-physiological with elements like test-irrelevant thoughts, confidence or perceived competency (e.g., Spielberger & Vagg, 1995; Zeidner & Matthews, 2005), or biopsychosocial, with contextual and social components like fear of social humiliation, influences of family, school, or community (e.g., Lowe et al., 2008; Segool et al., 2014). Treatment interventions for adolescents' TA in the last two decades have also pointed to either cognitive-behavioural conceptualization and techniques, or solely to academic skills training. Although varying in format and duration (see Soares & Woods, 2020; von der Embse et al., 2013, for reviews), none encompassed a structured psychotherapeutic program, which predicts stronger treatment outcomes (Cummings et al., 2013). Furthermore, they mainly pursued the reduction of TA levels, not targeting other mechanisms. It is paramount that new interventions follow a contemporary concept of recovery and mental health, conceived as a more "*dynamic state of internal*

equilibrium", which includes emotional regulation, empathy, flexibility and ability to cope with adverse events (Galderisi et al., 2015).

New directions

The notion that meaningful therapeutical change is more than just symptom reduction (e.g., changing the content of negative automatic thoughts in cognitive-behavioural therapy) is not new (Stott, 2007). Developing more flexible and adaptive responses to difficult environments, and coping with the affective experiences that co-occur, is crucial to said change (Gilbert, 2010). This requires developing and experiencing feelings of reassurance and safeness, through the access to certain neurophysiological systems that enable emotional regulation (Gilbert, 2010). In the last few years, new treatment advances have emerged in this direction. While also focusing on improving well-being, these approaches defend the need to develop a different relationship with our internal experience and with ourselves. Mindfulness has been widely studied as a way to learn to pay attention with flexibility, openness, and curiosity, to consciously connect with and engage in whatever is happening in the moment (internally and/or externally) to allow for a wise choice of actions (Harris, 2009; Kabat-Zinn, 1994). The development of this competency is included in several new approaches such as Compassion Focused Therapy (CFT; Gilbert, 2010), and Acceptance and Commitment Therapy (ACT; Hayes et al., 1999).

CFT originates in the understanding that, to regulate emotional states, humans may turn to three emotion regulation systems: the *threat system* (whose role is to quickly detect and protect from threats); the *drive system*, focusing on seeking out resources to survival and prosperity; and the *soothing system*, focusing on settling into states of safeness, rest and digest (Depue & Morrone-Strupinsky, 2005; Gilbert, 2010, 2022). Additionally, humans are evolutionarily programmed to value the way they exist in the mind of others (Gilbert, 2010), to be accepted and chosen (Gilbert, 1998). When perceiving that this is not the case, the feeling and experience of *external shame* arises, which can also become *internalized* (*internal shame*) (Gilbert, 2007; Kaufman, 1996) and is a by-product of the threat system. Our social nature also allows us to have a relationship with ourselves, and often, when things go wrong or do not correspond to what we wanted, self-criticism may emerge, in a form of a hostile internal relationship also wired in the threat system (Gilbert & Irons, 2005).

Shame and self-criticism are linked to psychopathology in general (Gilbert, 2010; Matos et al., 2020) and to TA in adolescents in particular (Cunha & Paiva, 2012; Pires et al., 2020). In fact, and similarly to other anxiety disorders (Welford, 2010), TA may be a result of an unbalance of the three emotion regulation systems. On one hand, there is an overactivation of the threat system, before, during, or after tests, and when grades were not as good as expected. This may be shown in the form of (often self-critical) thoughts about failure and social comparison (e.g., "I cannot do anything right", "I will not get into university", "My parents/ teacher/ classmates will think less of me"), and defensive emotions (e.g., anxiety). Many students may

try to regulate those threats by turning to the drive system (e.g., work too hard to avoid the perceived failure), originating the threat-drive loop (Gilbert, 2014). In turn, there is a difficulty to access the soothing system and more helpful forms of emotion regulation.

This is central in CFT (Gilbert, 2010), namely, the fostering of (self-)compassion, a motivation rooted in the soothing system that orientates to "(…) a sensitivity to suffering in self and others with a commitment to try to alleviate and prevent it" (Gilbert & Choden, 2014, p. 98), and an alternative internal relationship to self-criticism (Gilbert, 2010). Therapists compassionately guide patients to realize that our functioning is not our fault (Cowan et al., 2016), while providing training (Compassionate Mind Training; CMT; Gilbert, 2010) on specific practices that speak to the triggers of the threat system and boost the soothing system, hence balancing the three emotion regulation systems (Gilbert, 2019). There is empirical evidence of CFT and other compassion-based interventions in reducing psychopathology, shame, and self-criticism, and improving well-being (Kirby, 2017; Leaviss & Uttley, 2015), particularly with adolescents (Bluth et al., 2016; Figueiredo et al., 2021), and of the protective role of self-compassion in test anxiety (O'Driscoll & McAleese, 2022).

Cultivating compassion also involves developing more flexible responses that may be more helpful for the person's life journey (Gilbert, 2010, 2022), which is consistent with the contemporary concept of therapeutic change and mental health (Galderisi et al., 2015). This flexibility means focusing on "what matters", taking perspective regarding our actions, thoughts and emotions, with a wise sensitivity to the context. In fact, one of the main key risk factors for psychopathology (e.g., anxiety) is cognitive, emotional, and behavioural rigidity (Beck et al., 1985), defined by the Acceptance and Commitment Therapy model (ACT; Hayes et al., 1999) as *psychological inflexibility*, that is, the inability to act according to valued ends while in the presence of unpleasant thoughts, emotions, or physical sensations (Hayes, 2004), causing suffering. Psychological inflexibility combines six interrelated processes. The first, *cognitive fusion*, means overidentifying with uncontrollable internal events (e.g., thoughts, memories), taking them and reacting to them as if they were what they represent – reality itself (Hayes, 2004). This overidentification takes the name of *conceptualized self* (2) when occurring with unhelpful thoughts about ourselves (Harris, 2009). This fusion then leads to *experiential avoidance* (3), the unwillingness to experience internal unpleasant events, resulting in efforts to avoid, change, or control them (Hayes et al., 1999). These processes also reflect the overactivation of the threat system: when entangled in our minds and avoidance strategies, our attention is narrowed (and future-directed, in anxiety problems) to process those perceived perils (Gilbert, 2010). This *loss of contact with the present moment* (4) refers to a sense of not being "fully present" in life (Hayes et al., 1999). Particularly in TA, the notion that attention is shifted from the task to interfering thoughts about failure goes way back (Sarason, 1984). Thus, individuals not only do not act on what is important (*lack of committed action*) (5), as sometimes they lack

clarity about what is really important (*weak values clarification*) (6) (Hayes et al., 1999). This state of psychological inflexibility is the case for adolescents with TA (Cunha & Paiva, 2012; Pires et al., 2020), and may be conceptualized as a *cognitive fusion* with failure related thoughts or self-judgments (*conceptualized self*), diverting the student's attention from the task (*loss of contact with the present moment*). Consequently, this leads to *experiential avoidance* of those thoughts or feelings in important situations, resulting in a *lack of committed action* with *values* that might also be weakly clarified, such as learning or spending quality time with friends and family.

It is possible to say that, in this state of psychological inflexibility, people get stuck in threat processing, resulting in an unbalance of the three emotional regulation systems.

The ACT model presents the alternative six processes of *psychological flexibility* (Hayes et al., 1999). *Contacting with the present moment* (1) refers to the previously described competency of *mindfulness* (Harris, 2009). This allows for *cognitive defusion* (2), that is, learning to detach from our thoughts, images, and memories, while becoming an *observing self* (*self-as-context*) (3), a viewpoint from which we observe our internal experiences (Harris, 2009). This is done with *acceptance* (4), an openness and willingness to experience private events as they are, without struggle (Hayes et al., 1999). The aim is to wisely change to or persist on behaviours that are aligned with our *clearly defined values* (5), called *committed action* (6) (Hayes et al., 1999). Boosting the soothing system permits this state of flexibility, as self-compassion smoothly bonds all these components. For adolescents with TA, this might mean acknowledging their human nature, context, and avoidance patterns, while choosing to access a stillness of mind and the courage to act wisely, even in the presence of difficult inner experiences.

ACT interventions have been effective in reducing psychopathology and in increasing psychological flexibility (Twohig & Levin, 2017), particularly in adolescents (e.g., Livheim et al., 2015). Parallelly, some were proved effective in reducing test anxiety in elementary school (Bozorgi et al., 2018) and university students (Miri & Mansouri, 2018).

Overall, the efficacy of interventions that foster compassion, acceptance and mindfulness in adolescents, as well as the pertinence of using these components to conceptualize TA, invite to their further exploration in this condition.

A psychological intervention that is structured, manualized and empirically validated finds support to its appropriateness and scientific relevance, inspiring its use from clinical practitioners, but also to replication and expansion of its findings by researchers (Sanderson, 2016). Additionally, as the history of the research-practice alliance has shown, a more descriptive and expositive input is a suitable and rather valuable first step to the building of the knowledge that will ultimately guide practice. A case study, for instance, holds that heuristic value, and properly embodies that primary effort of putting theory into (more) research and practice (Crowe et al., 2011; Davison & Lazarus, 2007; Schwandt & Gates, 2018). Case studies grant a

more complex and in-depth comprehension that does not fit in larger quantitative studies (Crowe et al., 2011; Davison & Lazarus, 2007; Schwandt & Gates, 2018). This bears special significance in this study, considering that, to the best of our knowledge, TA has never been conceptualized through the lens of the evolutionary and contextual approach to human functioning and suffering, nor has an intervention for adolescents' TA been simultaneously structured, manualized, with a psychotherapeutic setting, focusing beyond symptom reduction, and boosting compassion, acceptance, and mindfulness competencies combined.

Therefore, the current paper aims to present a case study, whose conceptualization and intervention were based in the mentioned approach, as well as describe and present the first qualitative and quantitative results of a novel intervention for adolescents with TA. By presenting the story and therapeutic process and progress of this teen, this case study seeks to be the first glimpse to this new interventions' adequacy and efficacy, and the scientific gate for broader advances in the field of TA intervention, to ensure informed and improved practices with teens with similar struggles.

The AcAdeMiC Program

The AcAdeMiC: *Acting with Acceptance, Mindfulness and Compassion to cope with Test/Exam Anxiety* (ClinicalTrials.gov Identifier: NCT04850872) was developed from the aforementioned theoretical background, in the context of a larger study with a larger sample, by a research team with experts in the fields of anxiety disorders, adolescent psychology, CFT and/or ACT, most of them with clinical experience in the assessment and treatment of individuals with TA. The team performed an extensive literature search and had advanced training on compassion, acceptance, and mindfulness-based approaches with a special focus on adolescents with anxiety difficulties. The program was initially to be applied in-person; however, due to the 2020-2021 pandemic context constraints, its format changed to online. Online mental health interventions are generally well-received by adolescents and represent a cost-effective and accessible treatment alternative (Sweeney et al., 2019).

A manualized draft of the AcAdeMiC was developed and tested individually with a small group of adolescent students with TA. Qualitative and feasibility data led to content and structure related changes that resulted in the final version.

This program has some similarities with other compassion, acceptance, and/or mindfulness-based programs, such as Compassionate Mind Training (Gilbert, 2010), Youth DNA-V (Hayes & Ciarrochi, 2015), Mindful Self-Compassion (Germer & Neff, 2019), and Making Friends with Yourself (Bluth et al., 2016), but sticks out by addressing the specific difficulties and experiences of adolescents with TA.

The AcAdeMiC is a manualized online psychotherapeutic program for adolescent students that encompasses 12 90-minute individual weekly sessions, delivered by a trained therapist. The main goals are to decrease TA levels, increase general well-being, and foster competencies of self-compassion, acceptance and

mindfulness. Participants receive a workbook to follow the sessions, comprising summaries, exercises, and visual aids that portray the program's key skills. The structure follows a progressive strategy of change, including four modules that cover the following main topics: i) Psychoeducation regarding the mind's nature in general, and anxiety and TA in particular, using an evolutionary and contextual approach to human experience and suffering; ii) Psychoeducation on key concepts and competencies, such as mindfulness, acceptance, cognitive defusion, values, committed action, and self-compassion; iii) Mindfulness exercises to cultivate present moment awareness and a non-judgmental attitude towards one's experiences, particularly concerning TA and academic performance; iv) Promotion of an adaptive attitude towards learning, studying and evaluative situations, namely through academic behaviour focused on values and committed action, rather than one exclusively focused on performance and results (which serves anxiety, the threat and/or the drive system, and experiential avoidance); v) Acceptance of difficult internal experiences (feelings, body sensations), and cognitive defusion skills to reduce avoidance patterns; vi) Promotion of a relationship with oneself based on self-compassion, to counteract a relationship based on shame and self-criticism. Table 1 displays an overview of the AcAdeMiC's modules, sessions and key messages.

Table 1. Brief Overview of The AcAdeMiC Program.

Module	Session	Theme	Key messages of the session
1. How our mind works and the role of test anxiety	1	The tricky brain	Humans have a tricky brain, a result from the interaction of its old and new parts
		Emotion regulation systems	Anxiety is an evolutionarily inherited human emotion, focused on our survival
		Test anxiety and the threat system	We have three emotion regulation systems: The threat system (where test anxiety is mostly coded), the drive system and the soothing system
		Common humanity	All humans experience suffering, which can be particularly challenging in adolescence. We are not alone.
	2	Emotion regulation systems (cont.)	The threat system, and sometimes the drive system, are recruited when we experience test anxiety; the soothing system is deactivated
			We can learn how to cope with our test anxiety when it is not useful, through balancing the three systems, especially through activating the soothing system
2. Awareness of avoidance and motivation to change	3	Life values	Values are qualities or ways we choose to act that are important to us and can guide our goals and actions
			Values clarification can help us balance our emotion regulation systems and activate the soothing system
	4	Creative hopelessness	Many of us try to avoid or control our test anxiety trough several strategies that, in addition to not helping reduce it, on the long term, can drive us away from what is valuable to us
		Overview of the competencies to develop in the Program	These sessions aim to boost several competencies that can be more useful in managing test anxiety and moving towards what's important to us
3. Coping with test anxiety	5	Mindfulness: definition, in daily life, in test anxiety	Humans function mainly in "automatic pilot" mode, coded in the threat system and focused on our protection and survival
			This "automatic pilot" can be useful or not, depending on whether we use it to follow our values
			When not useful, we can learn to kindly pay attention to the present

Module	Session	Theme	Key messages of the session
			moment, without judgement, to choose what we do wisely – mindfulness –, hence stimulating our soothing system
	6	Shame and self-criticism Learning to soothe the inner critic	Feelings of shame and a harsh inner critical voice (both from the threat system) may often emerge in the context of test performance, aiming to "keep us from failing" However, despite not having a bad intention, this inner critic is not very effective as it makes us even more anxious, frustrated, sad and often hopeless Activating our soothing system is key to calm this inner critic
	7	Self-compassion: definition, resistances, practice	Self-compassion means treating ourselves the same way we would treat a dear friend It is a part of us that can reassure both the critical and the criticized parts It is a helpful resource that can take the form of a "compassionate friend" that we can count on when we are going through a rough moment, that wisely comforts, accepts and encourages us
	8	Compassionate cognitive defusion	Our mind is always producing thoughts, some of them in the form of self-evaluations or "stories" about us. Not all our thoughts are useful or help us go in the direction of our values. We can be mindfully aware of them, activating our soothing system to compassionately recognize our mind's good intention of protecting us, and deciding to do what's best for us
	9	Compassionate acceptance	It is not possible to control thoughts or feelings, despite us trying hard to do so – this is called *resistance* (a defence of the threat system) and it increases suffering A more helpful strategy is to be willing to experience our thoughts and feelings, however unpleasant – *Acceptance*. This means openly allowing the presence of unwanted internal experiences, in order to fully commit with our values, which inherently requires compassion
	10	Self-compassion: practice (cont.)	There are several practices which can help us activate our soothing system, that recruit self-compassion, mindfulness, acceptance and defusion, all competencies that allow actions committed with our values and greater well-being We can, for instance, vividly imagine and describe our compassionate friend, and imagine what and how they would talk to us in a difficult moment
	11	Self-compassion: practice (cont.) Loving-kindness: definition, practice	The compassionate part of us can always respond with wisdom, assertiveness and kindness to the critical part To meet difficult emotions, we can label them, be aware of them in the body, and then soften them, soothing ourselves and allow us to feel them Loving-kindness is a friendly attitude and a wish that us and others may be happy, and can be developed for everyone, starting with a loved one
4. On the road to well-being. Reviewing gains and relapse prevention	12	Loving-kindness: practice (cont.) Gratitude Self-compassion: practice (cont.)	Loving-kindness can also be directed to ourselves Gratitude means appreciating and being thankful for the good things in life, however small they may seem. It allows us to be in and enjoy the present moment and to focus on what matters to us Gratitude extends even to what we learned in or from the subjects in school that trigger us greater anxiety Self-compassion may materialize in an empowering and encouraging compassionate letter to our future self

Therapist and patient were required to secure their privacy during sessions. The setup for both included a laptop, a web camera, a headset (preferable), and a

stable internet connection. The sessions were delivered using the *Zoom* program (Zoom Video Communications, Inc., 2020 [Computer software]).

Case introduction

Daniel (D.; pseudonym) is a 17-year-old boy in the 11th grade in a secondary school in Centre Portugal. Written consent from D. and his education guardian was obtained, and anonymity and confidentiality were guaranteed. At baseline, D. completed the assessment protocol, scoring 101 on the Reactions to Tests for Adolescents (RTT-A; Pires et al., 2022a), which was one standard deviation above the mean, representing high test anxiety. He was additionally diagnosed with Social Anxiety Disorder (cf. Assessment). Other variables collected at baseline, post-treatment and 3-month follow-up are further presented in the Assessment section and in Table 2.

Table 2. Daniel's Scores from Baseline to 3-month Follow-up and Clinical Improvement

Measures (M, SD)	T0	T1	T2	RCI 1	RCI 2
RTT-A – Reactions to Tests for Adolescents (69.02, 17.53)	101	94	65	-1.47	-7.55
Tension (18.63, 6.16)	24	21	17	-1.61	-3.76
Worry (20.45, 5.82)	35	33	24	-0.71	-3.91
Test Irrelevant Thinking (19.28, 6.53)	31	30	16	-0.35	-5.27
Bodily Reactions (10.66, 3.75)	11	10	8	-0.35	-1.06
SAS-A – Social Anxiety Scale for Adolescents (40.77, 17.64)	68	51	52	-3.04	-2.86
Fear of Negative Evaluation (18.01, 10.18)	29	19	19	-3.70	-3.70
Social Anxiety and Distress-New (15.70, 7.01)	26	25	24	-0.39	-0.77
Social Anxiety and Distress-General (7.06, 4.94)	13	7	9	-3.06	-2.04
EISS – External and Internal Shame Scale (8.87, 5.26)	13	7	4	-1.79	-2.67
FSCRS-A – Forms of Self-Criticizing and Reassuring Scale for Adolescents					
Inadequate Self (13.30, 8.54)	26	12	11	-4.54	-4.86
Hated Self (2.32, 2.28)	4	0	1	-1.56	-1.17
DASS-21-A – Depression, Anxiety and Stress Scales for Adolescents					
Depression (4.33, 4.37)	14	10	3	-1.45	-3.98
Anxiety (3.28, 3.60)	6	2	0	-1.19	-1.79
Stress (5.19, 4.27)	16	9	2	-2.18	-4.35
SCS-A – Self-Compassion Scale for Adolescents (78.99, 14.62)	67	84	106	+2.20	+5.04
TA-AAQ-A – Test Anxiety Acceptance and Action Questionnaire for Adolescents (61.56, 16.17)	26	42	46	+2.90	+3.62
CAMM – Child and Adolescent Mindfulness Measure (24.28, 5.89)	18	27	25	+2.75	+2.14
MHC-SF – Mental Health Continuum-Short Form					
Emotional Well-Being (11.76, 2.70)	8	8	11	0	+1.61
Social Well-Being (13.48, 5.50)	9	9	9	0	0
Psychological Well-Being (19.68, 6.13)	16	21	25	+1.46	+2.63

Note. T0 = Pre-treatment, T1 = Post-treatment, T2 = 3-month follow-up; RCI 1 – improvement from T0 to T1; RCI 2 – improvement from T0 to T2. RCI values of ±0.84 correspond to significant clinical change within 80% CI, ±1.28 within 90% CI, and ±1.96 within 95% CI. M = mean of the general sample; SD = standard deviation of the general sample.

Presenting complaints

D. reported feeling high TA for approximately six years, although "it feels like forever". This anxiety was greater in Math and Chemistry, subjects to be "tested in national exams" that year and that would count to his university admission.

D. felt anxious especially before and during tests. He reported always studying hard, "at least one week beforehand". When feeling anxious during studying, he described sensing his heart racing, and coping by "continuing my task to follow my schedule, I only allow myself to stop after dinner". During tests, he used to think that "I am totally 'freaking out'" and "I am not getting it". To cope, he would "try to isolate myself in a bubble and would not get out until I finished", doublecheck his answers several times, and in open-ended questions he would write more than was needed "to make sure the teacher counts it all". At times, he had mental blocks, thinking that he "needed to quit" and would start to cry. He would either not move to the next question until he remember the answer, or finished the test as soon as he could for it "to just be over". After tests, although he admitted he would like to discuss the answers with his classmates, he would "run away" to avoid being with "the risk of being wrong".

D. acknowledged these strategies were not effective in reducing his anxiety and had brought him negative consequences in concentration, learning and interaction with classmates, and less time to finish the tests. Although he generally has "good grades", that year he started to have negative ones in Chemistry. D. fears what his teachers, tutors, and parents might think if he has a "bad grade" ("I do not want them to think I did not put an effort"). He also does not want his classmates "to think I know less than them". When he has a "bad grade", he thinks "I did not study enough", "I should have prepared myself more", and "I will not get into university", triggering more anxiety.

D. also felt anxious in oral presentations: "When I am in my seat, I know what I have to say, but in front of the class I get blocked, I just read and do not take my eyes off the paper, which influences my grade". Furthermore, he fears and avoids social interactions (with adults and adolescents), except with two or three close friends. He avoids "going to parties unless I know who is going", "talking to strangers or people I do not know well", and "when I have to participate, I try to rehearse what I am going to say". In public places, he is usually on his phone or drawing, "to not attract attention".

History

D.'s personal history was obtained from the baseline assessment using semi-structured interviews (cf. Assessment). D.'s development occurred as expected, with no significant concerns. He grew up in a city in Centre Portugal. He always had a

shy temperament; he had a few friends at school but always preferred solo activities. At 7-8 years old, he suffered bullying from peers, who mocked him about being very quiet and always drawing. He believed this event exacerbated his difficulty in making friends.

He lived with both his parents and his younger brother up until the age of 13, when his parents got divorced. He had a good relationship with both his parents, although better with his father, since "we have the same interest in art" – D. loves drawing in his free time, an activity they used to enjoy together. His father was a calm and reserved person. When he left home, D. had "a hard time" accepting the divorce, not only because he missed his father but also "my mom got a boyfriend way too fast", and he came to live with them shortly after. This event happened around the same time D. changed schools (in the 7th grade), leaving his (few) closest friends. He was showing depressive symptoms, as he felt tired, sad and angry "all the time", lost appetite and had trouble sleeping. At this time, "only the computer games helped me escape". His mother got concerned and took him to a clinical psychologist, which helped him "accept the situation and get better".

D. also stated not feeling comfortable at home, due to not having that much in common with his mother, stepfather, or brother. He sees his father occasionally but regrets not being more often, as he lives far. He likes to spend time with friends who share the same interests, such as drawing, comic books, and videogames. He says it is easier for him to spend time alone, although he would like to be "more extroverted". He values staying focused in school "to get into the course I want [Computer Engineering]". While he loves drawing, "I see it most as a hobby" and does not consider following it professionally. Despite not experiencing pressure from his parents to excel academically, he said he always cared about school and his grades ("my main motivation").

D. describes himself as a "pleasant person, who values to cheer others up", and "to discuss interesting ideas". He does not like to talk or show much about himself, he prefers to "blend in". When upset, "I always try to appear cool and calm about it, I do not tell what I am really feeling". At the start of the intervention, he was living with his mother, stepfather, and brother, who was 13 at the time. He was preparing for the upcoming tests that school period, and was starting to feel anxious about it.

Assessment

Semi-structured clinical interview

At baseline, D. was assessed online with the *Mini-International Neuropsychiatric Interview for Children and Adolescents* (MINI-KID; Sheehan et al., 2010; Portuguese Authorized Version by Rijo et al., 2016), 2 weeks before the start of the program. The MINI-KID is a short and accurate structured clinical

diagnostic interview to assess a wide range of Axis I disorders in children and adolescents, according to DSM-5 (APA, 2022) criteria, impairment and duration of symptoms. It is organized into diagnostic sections, with "yes/no" questions, each section starting with 2 to 4 screening questions before the additional symptom questions. During the interview, D. presented a low voice and a timid posture, although having disclosed easily to the interviewer. Apart from TA, his primary difficulty (not covered by the DSM-5 or MINI-KID), D. met the criteria for Social Anxiety Disorder (current), and Major Depressive Episode (in the past). Information on D.'s personal history at this moment was also collected.

Test anxiety

As TA has no diagnostic criteria, thus not being included in the existing instruments, a semi-structured interview specifically created by the authors (*Comprehensive Test Anxiety Interview*; Authors, 2022) was used to understand the level and nature of D.'s TA, at baseline. This interview is divided in six main topics: a) Descriptive information and preparation method (e.g., area of study, avoidance strategies during study); b) General description of TA (e.g., level of perceived TA and brief history); c) Anxiety and functioning before, during and after tests (e.g., thoughts, physical sensations, and safety behaviors); d) Grades perception and fear of negative evaluation; e) Impairment perception and expectations motivation to treatment; f) Previous treatment seeking.

Also, D. filled out the Reactions to Tests for Adolescents (RTT-A; Sarason, 1984) by Pires et al. (2022a), a 34-item scale with higher scores indicating higher levels of TA, in four factors: *Tension*, *Worry*, *Test-Irrelevant Thinking* and *Bodily Reactions*. Comparing D.'s scores at baseline with the mean values for Portuguese boys, it was possible to say that the cognitive dimensions were particularly prominent (1 and 2 standard deviations above the mean for *Test Irrelevant Thinking* and *Worry*, respectively), in contrast with the affective-physiological dimensions.

Other variables

Test anxiety is highly related to social anxiety (Bögels et al., 2010; Pires et al., 2019), therefore, it would be relevant to explore the impact of the latter in the program's efficacy. The Portuguese version of the Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998) by Pechorro et al. (2016) was used, with 22 items and higher scores indicating higher levels of social anxiety. It comprises three subscales, *Fear of Negative Evaluation* (FNE), *Social Avoidance and Distress-New* (SAD-New), and *Social Avoidance and Distress-General* (SAD-Gen). D.'s scores were 1 standard deviation above the mean for Portuguese adolescent boys (Pechorro et al., 2016) in the total scale and the three dimensions.

Since the AcAdeMiC targeted feelings of shame, and an inner relationship based on self-criticism, D. filled out the External and Internal Shame Scale (EISS;

Ferreira et al., 2020; adolescent version by Cunha et al., 2021), and the Forms of Self-Criticizing and Reassuring Scale for Adolescents (FSCRS; Gilbert et al., 2004) by Silva and Salvador (2010). Higher scores indicate higher levels of the measured dimensions. The EISS has 8 items and simultaneously assesses *internal* and *external shame*, while the FSCRS has 22 items and assesses the way people self-criticize (subscale *Inadequate Self*), self-attack (subscale *Hated Self*), or self-reassure (subscale *Reassured Self*) in the face of failure or setbacks. Noteworthy were D.'s *inadequate self* scores, 1 standard deviation above average.

As the program also aims to generalize therapeutic gains to life in general, it was important to measure D.'s levels of general mental health (i.e., depression, anxiety and stress), namely, with the Portuguese version for adolescents (Pires et al., 2022b) of the Depression, Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995). Higher scores on these separate three scales indicate greater symptomatology. At baseline, D. revealed depression and stress scores 2 standard deviations above the mean for Portuguese boys (Pires et al., 2022b).

Self-compassion, acceptance and mindfulness were measured, respectively, with the Self-Compassion Scale for Adolescents (SCS-A, 26 items; Neff, 2003; Cunha et al., 2016), the Test Anxiety Acceptance and Action Questionnaire for Adolescents (TA-AAQ-A, 12 items; Pires et al., 2020) and the Child and Adolescent Mindfulness Measure (CAMM, 10 items; Greco et al., 2011; Cunha et al., 2013). Higher sores indicated higher levels of each competency. While self-compassion was within the range for Portuguese boys, mindfulness and acceptance were, respectively, 1 and 2 standard deviations below.

Finally, D.'s levels of general well-being were measured with the Mental Health Continuum-Short Form (MHC-SF; Keyes, 2002; Portuguese version for adolescents by Matos et al., 2010). It comprises 14 items and the subscales *Emotional Well-Being*, *Social Well-Being*, and *Psychological Well-Being*. Although D.'s emotional well-being levels were 1 standard deviation below average (Matos et al., 2010), he was in a general moderate mental health state at baseline.

D.'s scores per measure at baseline (T0) can be found in Table 2.

Case conceptualization

Although D. also presented diagnostic criteria for Social Anxiety Disorder (APA, 2022), this case formulation will focus on his test anxiety, target of the AcAdeMiC. This conceptualization follows integrated principles of both CFT (Gilbert, 2010) and ACT (Hayes et al., 1999).

D. presents the typical manifestations of test anxiety, namely, negative thoughts regarding failure or his competency before and during tests, along with physiological activation. He seems to value learning at school, looks forward to getting into an undergraduate course of Computer Engineering, and values spending

quality time with his family and friends. However, in D.'s history and present functioning, there are some barriers that complicate a fully committed action to these values.

In addition to a predisposition of humans to be sensitive and reactive to social cues of rejection and perceived incompetence (Gilbert, 2000) and apparently having some genetic proclivity to being a shy kid (like his father), D. did not seem to have developed a sense of safeness in his relationships. At 8 years of age, he had already suffered several shame experiences, as he was constantly bullied by his peers, which might have become central to his identity (Matos et al., 2020).

In addition to his parents' divorce being a significative life event to any child, in D.'s case it occurred right in at the start of adolescence (13), when the brain is at a permeable state and the sense of identity starts to consolidate (Konrad et al., 2013), making D. more vulnerable to environmental influences. Also, his father was the person he was closer to and to whom he could relate more. Around the same age, he had to accept the presence of his mother's new partner, changed schools and classmates, and left friends behind, which were additional stressors contributing to his isolation. He did not have much of a sense of safeness or belonging at home, as he felt isolated and unappreciated by his family, and did not see his father much. Therefore, he preferred to focus on his schoolwork and performance ("my main motivation").

The combination of these evolutionary, genetic and environmental factors influenced the development of a hypersensitive and vigilant threat system. In parallel, D.'s soothing system got under stimulated. He seems to have become reliant on schoolwork to feel a sense of purpose and self-worth, as a way of feeling safe in the world, which translates the overactivation of the drive system serving the threat system.

Before or during tests, his threat system is activated, with thoughts about failure (e.g., "I did not study enough", "I will not be able to get into university"), fear of negative evaluation ("I do not want them to think I did not put an effort"), and even social comparison (e.g., "I do not want my classmates to think I know less than them"), along with feelings of anxiety and physiological activation. In these situations, he gets fused with these thoughts and judgments about himself (*conceptualized self*) or his performance (*cognitive fusion*), diverting his attention from the present moment and from important tasks and situations (*loss of contact with the present moment*).

To address these worries and in an attempt to regulate his threat system, D. avoids his feelings and thoughts (*experiential avoidance*). He does not allow himself to stop studying, engaging in excessive study. During tests, he always doublechecks his answers and writes longer than necessary answers. In contrast, he also blocks, forgets the material, stops and simply starts to cry, shifting between being fused with his thoughts of evaluation of his competency (e.g., "I am not getting this") or his emotional experiences (e.g., "I am freaking out"), and quickly finishing the test in

mindless mode. After tests, he would avoid his classmates, to avoid being confronted with "the risk of being wrong".

These behaviours suggest the dysregulation and hyperactivation of his threat system, but also of his drive system. These two systems seem to be functioning on a loop, where the latter is constantly trying to respond to the (also constant) danger detections of the former. The possibility of finding a solution that denotes *psychological flexibility* (e.g., take study pauses, doing a brief mindful compassionate practice to get grounded, and resume the test more concentrated) is hardly accessible due to the analogous under activation of the soothing system. As a sense of safeness is not reached, more self-criticism arises, aggravating the threat-drive loop. Nevertheless, although unhelpful, in the light of an evolutionary and compassionate approach, these behaviours can be conceptualized as D.'s best efforts to be seen as valuable and competent and to feel safe, considering his experiences and environmental influences.

However, these safety strategies not only end up having unintended consequences but become a problem themselves. They cause impaired concentration during studying and tests, less time to finish tests (resulting sometimes in negative grades), less opportunities to discuss the material with his classmates, and less quality time with his friends and family. This, in turn, creates a vicious cycle, reinforcing D.'s core fears of negative evaluation (e.g., being perceived as incompetent), and working against his *committed action*, as he valued to spend time with his family and friends.

Course of treatment and assessment of progress

D.'s therapist in the program was a clinical psychologist with advanced training in compassion, acceptance, and mindfulness-based approaches. D.'s treatment progressed smoothly through the four AcAdeMiC's modules and the 12 sessions (whose contents are summarized in Table 1 for a conjoined comprehension of his therapeutic process). All modules included both expositive and experiential (and interactive) techniques and exercises. The last three sessions occurred when D. was ongoing the annual school exams phase (June 2021).

Module 1 (Sessions 1-2)

This initial module was dedicated to psychoeducation regarding the mind's nature in general, and anxiety and test anxiety in particular. D. initiated the program with curiosity and interest but a little reticence, which was easily comprehensible given his social anxiety difficulties. He was attentive and responsive to the explanation of the nature of the mind, the three emotion regulation systems and the function of test anxiety in this evolutionary frame. He was "relieved" to acknowledge that feeling anxiety was not his fault, and that it was not only a by-product of his

evolutionary and genetic influences, but also of his developmental and contextual circumstances. He understood that his history led him to feel reliant on schoolwork to "feel in control" and that his mind was doing its best to keep him safe. One of the exercises in session 2 was to formulate (through a schematic drawing) his model of test anxiety across the three emotional regulation systems, in which D. used an example of a study situation: overactivation of the threat system and the drive system, while the soothing system remains under activated. He drew the circle of his threat system quite big, including examples of *thoughts* (*The test will be very difficult*), *body sensations* (*heart racing*, *feeling hot*), and *emotions* (*anxiety*). He drew his drive system similarly big, also with examples of *thoughts* (*I must study harder*), *body sensations* (*general agitation*), and *behaviours* (*studying for several hours*). He understood the exercise and it made sense to him; the visual aid to conceptualize his test anxiety and his particular the threat-drive loop was quite helpful.

The common humanity approach seemed to have resonated with him, as he told the therapist that "It is good to know that other people feel like me". At the end of session 2, he commented "I really enjoyed this explanation of our mind, it is easy to understand and makes me see that anxiety can be normal". He seemed curious about the soothing system and how he could stimulate it, as he was motivated "to learn to cope with my anxiety". He was also surprised to realise that he did not have to "turn off" his threat and drive systems completely in order to do that, as he could learn to keep on doing his tasks in a more safe and relaxed state.

Module 2 (Sessions 3-4)

This module focused on helping gain awareness of the avoidance strategies that come from the threat and drive systems, and to clarify what values are, as a motivation to start letting go of those strategies and investing on committed action (doing what is important). This allows for a more positive attitude towards learning, studying and evaluative situations, and recruits the soothing (and, sometimes, the drive) system.

In this module, D. continued responsive and motivated to the intervention. In the values clarification exercise, he was able to define his values and this practice was really important to him, as he was feeling "lost" as for why he was actually trying hard to do his best at school. He was not surprised to acknowledge he valued being "creative" (related to his interest in drawing), but he also discovered he valued being "kind" and "a friend to myself", and he even defined as a valued aim for the following week to try soothing himself during studying, with words that made sense to him (even before he learned about self-compassion): "You are feeling nervous, it is okay. You will get this".

He also became mindful of his anxiety avoidance strategies, including avoiding discussing the material after tests with classmates, rules about organising his room before and during studying, thoughts about perceived incompetence (e.g.,

"I should have paid more attention and not treated study like a 'vulgar' thing", "I will not be able to understand this in time for the test", "I just cannot do this"), and studying without pauses. He then realised the costs of these avoidance behaviours, as anxiety not only was not reduced, but he also got more tired, lost concentration, and lost quality time with his friends, which means his actions were not consonant with his values. At the end of session 4, there was a brief summary of the competencies that would be boosted throughout the remaining sessions, and D. revealed curiosity and motivation to get to know and practice them, as they would help him "follow my values".

Module 3 (Sessions 5-11)

The third module is the more interventive and therapeutic phase of the AcAdeMiC, for in these sessions are presented and practiced the main competencies that help cope with test anxiety, according to the evolutionary and contextual approach to human functioning and suffering, namely, mindfulness, self-compassion, and acceptance. Before introducing self-compassion, the role of shame and self-criticism was also covered. Through the course of these sessions, there was a psychoeducation on the concepts, and experiential practices and exercises. Among these, there were a few meditations, some of which sent in audio guided format, to help boost the three core competencies of the program outside the sessions.

The concept of mindfulness made sense to D., mainly the fact that he could choose to use it "when I need it", that is, when he needed to pay attention to the present moment or task (e.g., studying). There was an introductory meditation to focus on breathing, that he saw as a "moment when I could just stop". "The more I concentrated I was on my breathing, the more I could feel my heart beating slow. Most of the time, I felt like there was nothing around me and nothing to worry about." At the beginning, he noticed "some thoughts, for instance, while noticing my breathing, I started wondering how the respiratory system works, and that I had learned it in Biology". This was used as an additional psychoeducation moment, to reinforce the curious and wandering nature of our mind, and that we can simply notice it and gently return to the present moment (in this case, to noticing his breathing). In other practice that invited to notice the present moment with the five senses, "I was able to feel more connected to where I was and what was around me". In a meditation that asked to recall an anxiety-triggering test situation, "I felt my hands trembling and I was nervous again like in that time. After a while, as I focused on my breathing", he was able to redirect his attention to the task, "and as I was imagining me doing the test, I noticed I was less nervous".

Although being receptive to all concepts and exercises, it was when D. learned about self-criticism itself and self-compassion as an alternative way of relating to himself that his improvement started to be more apparent. When he acknowledged the presence of his inner critic in an exercise, he described it as a black silhouette, with no face, that intimidated him in a low but imposing voice ("it

starts touching me in my shoulder and tells me that I have not studied enough"). He was also able to start stimulating his soothing system and ease this inner critic through a soothing touch exercise, which he discovered to be merely resting his hands on his lap. He said he started to use this touch whenever he felt distressed or anxious, during studying or tests. He asserted how much he liked to learn about self-compassion and the related practices. In an exercise that invited to imagine the compassionate friend (the part of us, wired in our soothing system, that soothes and encourages us in difficult moments), as he loves drawing, he drew it as a character he purposedly created, with a name and the message "My compassionate friend can help me when I need and to notice the present moment". His compassionate friend granted him the courage and wisdom he needed to start learning to accept his anxiety and his failure related thoughts. Particularly, in the session more dedicated to compassionate acceptance, after a meditation that invited to notice and let a difficult emotion be, he recognized that "my anxiety is still there, but now I know I can simply notice it, understand where it comes from, and leave it here with me. I do not have to banish it". The exercise that D. resonated the less with was a compassionate defusion exercise, that invited to observe, detach from and compassionately thank our mind for a thought. He felt it "did not work too well for me", as he preferred other practices.

In this module, he also learned about and practiced loving-kindness, a feeling of kindness that does not necessarily involve suffering (like self-compassion practices), and also wired in the soothing system, that he could also grow in his everyday life to enhance his well-being. He enjoyed the practice that asked to wish loving-kindness to a loved one, and found this to be a "good alternative to see life".

At the end of this module, D. was entering a phase of exam preparation and was feeling additional levels of stress. However, as the treatment progressed, D. was getting more open and participative.

Module 4 (Session 12)

The last module, which corresponded to the last session, was dedicated to loving-kindness, gratitude, self-compassion, generalization of therapeutic gains and relapse prevention. There were some last practices, the contents of the program were summarized, and techniques and exercises were remembered, with the aim of maintaining change and well-being over time.

Therapeutical change in D. was evident in this last session. Although he was going through a phase of exam preparation (with added stress), and his shy temperament was still evident, his facial expressions and non-verbal language were open and curious. He continued to practice loving-kindness, and in this last session he directed this feeling to himself, with phrases he created in another exercise, such

as “may I be able to enjoy my own company”, “may I get the courage to soothe myself and be with myself”, and “may I find peace and happiness”.

He integrated the gratitude practices as really meaningful to him, and he seemed keen on wanting to keep using them, as “even small things might mean happy feelings”. He even discovered some things he was grateful for in one of the subjects he felt most anxiety (Chemistry), such as the kindness of the teacher and the helpful way he prepared the class for the exam. In the compassionate letter exercise, which invited him to write a letter as his compassionate friend to his future self, he wrote “It is not easy to be with your anxiety and follow your values, I know. But remember, you can overcome the pain. I trust you and I am always here to help you”. This was touching for him, and he said he felt “comfort and acceptance”.

At the end, he said he was thankful for the intervention “and for the opportunity to learn alternatives to deal with my anxiety”, and concluded with “It’s good to know that when I feel sad or alone, I have someone to help me in those difficult moments”, referring to his compassionate friend.

Complicating factors

D.’s intervention course followed as expected and no major complicating factors to therapy emerged. This is substantiated in D.’s clinical improvement scores reported in Section 10 (*Treatment outcomes*). Still, some minor hampering factors can be referred. First, as the AcAdeMiC was an online intervention, there was no opportunity for in-person contact. This could have been a particularly important aspect of compassionate committed action regarding (new) social contact, considering D.’s social anxiety. Although it did not affect the course of the intervention or the therapeutic relationship, it could have been an enhancer factor in D.’s improvement. Second, the last 3 sessions were conducted during D.’s period of annual exams, which he considered a stress factor. However, as the content of the sessions specifically focused on this topic, it was rather an opportunity to address it in the intervention.

Access and barriers to care

D. accessed the sessions from his home. He presented practically all the conditions needed to be involved in the intervention, such as access to internet connection, headset, webcam, and privacy. Occasionally, as he had some difficulties with the quality of the internet connection, the sessions got a little cut off, but were nevertheless resumed a few minutes later and delivered appropriately.

Treatment outcomes

Posttreatment assessment (T1) was conducted right after Session 12, and the follow-up assessment (T2) twelve weeks after that, both using the measures described in Section 5 (*Assessment*). To compute D.'s improvement from T0 to T1, and from T0 to T2, across all dimensions, the Reliable Change Index (RCI; Jacobson & Truax, 1991) was employed to each scale (and subscale when applicable). The RCI is considered a reliable indicator to test the efficacy of a particular therapy or program and can show whether an individual improves or deteriorates in comparison to pretreatment. The threshold for significant improvement at $p < .05$ corresponds to a difference score of ±1.96 (difference scores of ±0.84 or ±1.28 indicate, with a confidence interval of 80% or 90%, respectively, that real, reliable, and significant change has also been verified; Wise, 2004). To determine whether the detected change is in fact reliable, the RCI also considers normative data and the measurement error of the scale (Jacobson & Truax, 1991). Thus, the RCI is computed using the formula:

$$\mathrm{RCI} = \frac{x2 - x1}{\sqrt{2(SD0\sqrt{1-\alpha})^2}}$$

where $x2$ represents the results of the individual in the posttreatment/follow-up, $x1$ represents the results of the individual in the pretreatment, $SD0$ represents the standard deviation of the variable in a normative sample, and α represents the internal consistency of the scale in that same sample. To compute the RCI, data of the normative/community samples for each variable was used.

Table 2 reports D.'s improvements, which were verified in all the assessed dimensions. Overall, the treatment seemed to be effective (pre-post; RCI 1) and gains were maintained and/or increased over time (three months following program completion; RCI 2) regardless of the scores being normative or above the population's average at T0. Particularly noteworthy is the increased clinical improvement in test anxiety across all components, especially at 3-month follow-up. It is important to remember that at posttreatment D. was still in the exams phase, which can explain the greater consolidation of this improvement at T2. D.'s social anxiety levels also significantly generally improved, except in the factor *Social Avoidance and Distress-New*. This can be explained by the fact that the program did not target social anxiety symptoms, and although other components of social anxiety got better, this is the one where D. had the most difficulty (getting to know and interacting with strangers).

The improvement also occurred in D.'s shame and self-criticism levels. The competencies targeted by the AcAdeMiC seem to have resonated with D., as his levels of self-compassion, acceptance and mindfulness grew. Interestingly, self-

criticism (*inadequate self*) and self-compassion held the most significant changes, especially at 3-month follow-up, which is aligned with what D. manifested in the sessions. It was truly helpful for him to learn to soothe his inner critic with his compassionate friend.

His general symptomatology (depression, anxiety, and stress) also got better, along with his general well-being, a possible reflection of the boosting of the core competencies of the program, as well as loving-kindness and gratitude.

At posttreatment, D. was also asked to evaluate the sessions quantitative and qualitatively. First, he was asked to rate various aspects of the Program on a 5-point Likert scale from 0 (*nothing*) to 4 (*extremely*). On questions regarding perceived efficacy, D. considered the sessions *extremely* (4) important to him, *a lot* (3) helpful in aiding to cope with test anxiety, and with difficult thoughts and feelings, and that the relationship with the therapist was *extremely* (4) important to the success of the treatment. Moreover, he stated the following regarding the sessions:

In these sessions I learned a lot about anxiety and how to control it, I also learned about compassion and how to use it with myself and with others. I thought the sessions were really informative and really helped me learn how to cope with my anxiety.

This information provided by D. further reinforces the efficacy and relevance of the AcAdeMiC in his case.

Treatment implications of the case

This case study demonstrates the efficacy of the AcAdeMiC in an adolescent of 17 years of age, in what concerns the quantitative assessment of test anxiety, shame, self-criticism, self-compassion, acceptance, mindfulness, well-being, and additional variables such as general psychopathology and social anxiety (cf. Table 2). The intervention impact observed across the program by the therapist, and the usefulness and efficacy perceived by the adolescent also add to the promising results. In detail, reliable clinical changes in all the assessed variables were verified, at posttreatment and/or 3-month follow-up, even for those that laid within normative range at baseline. Exceptions in these improvements were social anxiety in new situations and social well-being, and the first was not a target of the intervention.

The COVID-19 pandemic context compelled service requesters and providers to adopt new ways of mental health services delivery, which despite having a few limitations, also brought some benefits such as increased accessibility to services and more cost-effective interventions. This was the case for D., who otherwise would not have been able to receive the intervention if it was conducted in-person, because of geographical distance from the therapist.

Moreover, it is important to still note that despite the possibility of the therapeutic relationship in an online intervention being more intrinsically

challenging, it was successfully established and may also have been key to D.'s improvement, as in fact was appraised by him. Evidence has shown that online therapy can indeed make a good therapeutic alliance possible (Backhaus et al., 2012).

Some limitations must also be considered. Although this program is part of another larger study, with this particular case study it is difficult to clearly determine whether D.'s improvements were due to the AcAdeMiC or other external variables. Thus, future studies should use a more representative sample with an experimental and a control group. Also, all assessments occurred while D. was still in high school, making it difficult to assure if his clinical improvements will be maintained in the transition to university, a critical phase to adolescents with test anxiety difficulties (Feld & Shusterman, 2015). Future studies should follow an extended longitudinal design.

Overall, as an individual intervention, and even though the core aims and design are maintained, the AcAdeMiC can be easily adjusted for each adolescent, offering a targeted and structured treatment alternative to group programs and to less guided psychotherapeutic approaches to test anxiety.

Recommendations to clinicians and researchers

The results from this case study provide preliminary support for the conceptualization of test anxiety through the evolutionary and contextual approach to human functioning and suffering, as well as for the adequacy and efficacy of the AcAdeMiC in reducing test anxiety and improving self-compassion, acceptance, mindfulness and well-being. Nevertheless, future empirical data is needed to extend these findings, namely through a clinical trial design, since findings from case studies sometimes fail to be replicated in controlled trials (CONSORT; Moher et al., 2010). Also, and as previously stated, it would be important to track the progress of adolescents as they transition to university, to minimize the risk of relapse. A further interesting note would be the relevance of testing this intervention in university students, and elementary school students, as test anxiety is highly prevalent on students of all ages (Putwain & Daly, 2014; Segool et al., 2013; Thomas et al., 2017).

The AcAdeMiC was built to be delivered through videoconferencing, so all technical tools to ensure a proper conduction of the sessions should be ensured. To conclude, as the online setting holds limitations and does not allow for in-person contact, it might be particularly challenging to efficiently detect non-verbal and emotional cues on the patient. The therapist should therefore be especially mindful and compassionate, towards the patient but also themselves, for which training and personal practice on ACT and CFT-based approaches might be helpful assets.

Authors' note

Consent of patient: Both the patient and their legal guardian have given their consent for treatment and for inclusion of their information in this manuscript.

Consent of ethics: All procedures considered the ethical standards of the Ethics and Deontology Commission of the Faculty of Psychology and Education Sciences of the University of Coimbra, Portugal, and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The patient and their legal guardian were informed about the study aims, confidentiality, voluntary participation, and written informed consent.

Conflict of interest: The authors declare no conflict of interest.

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EFFICACY AND ACCEPTABILITY OF VIRTUAL REALITY IMAGERY RESCRIPTING FOR PTSD DUE TO CHILDHOOD SEXUAL ABUSE: A MULTIPLE BASELINE STUDY

Sven van Kuik[1], Arnold A.P. van Emmerik[2], Willem-Paul Brinkman[3], Elizabeth Uduwa-Vidanalage[2], Cliff Schouten[2], Arnoud Arntz[2]*

[1] PsyQ, Purmerend, The Netherlands
[2] University of Amsterdam, Amsterdam, The Netherlands
[3] Delft University of Technology, The Netherlands

Abstract

This study piloted the efficacy and acceptability of Virtual Reality Imagery Rescripting (VR-ImRs) compared to conventional Imagery Rescripting (ImRs) for PTSD due to childhood sexual abuse (CSA). Eight adult patients with clinician-rated PTSD due to CSA as their primary diagnosis participated, of whom six completed the full treatment. A non-concurrent multiple baseline design with cross-over elements was used, with randomly assigned baseline lengths and treatment conditions. After baseline and a 5-session 'education and exploration' phase, six sessions of either ImRs or VR-ImRs were given, followed by another six sessions of the opposite treatment condition and a 5-week follow-up without treatment. The primary outcome was PTSD symptoms (PCL-5), and secondary outcomes were negative and positive emotions (added PCL-5 items), anxiety and depressive symptoms (HADS) and trauma-related cognitions (PTCI). Data were analyzed with mixed regression. Results showed a significant linear reduction of trauma symptoms and negative emotions only during ImRs. No significant treatment effects on positive emotion, anxiety and depressive symptoms were found for both treatment conditions. Both treatment conditions showed significant positive effects on trauma-related cognitions. This study does not support the efficacy of VR-ImRs in reducing PTSD symptoms. Possibly VR-ImRs keeps people from reprocessing their memories, making it less effective.

Keywords: Posttraumatic stress disorder; Childhood sexual abuse; Virtual reality; Imagery rescripting; Cognitive behavioral therapy; Clinical trial.

[*] Correspondence concerning this article should be addressed to Arnold A. P. van Emmerik, Nieuwe Achtergracht 129-B, 1018 WS Amsterdam, The Netherlands.
E-mail: A.A.P.vanEmmerik@uva.nl

Posttraumatic stress disorder (PTSD) is a debilitating condition causing severe distress to individuals (American Psychiatric Association, 2013). Being exposed to actual or threatened death, serious injury, or sexual violence may lead to PTSD. Patients suffering from PTSD continue re-experiencing the traumatic event(s) in various ways, such as unwanted upsetting memories, nightmares or flashbacks, and in addition display symptoms of avoidance, negative changes in cognitions or mood, and increased arousal or reactivity. Fortunately, there are various evidence-based treatments available such as exposure-based therapies, Eye Movement Desensitization and Reprocessing (EMDR), and conventional imagery rescripting (ImRs). ImRs is a treatment technique that has been used in PTSD since the late twentieth century (see for example Smucker et al., 1995). Recently, the interest in this treatment has increased rapidly due to the growing body of evidence suggesting that ImRs is an effective psychological intervention for PTSD (for a review, see Arntz, 2012; Morina et al., 2017). With this growing evidence, the possibilities for its application also broadened. For example, Jung and Steil (2013) showed that ImRs reduced feelings of being contaminated in patients with PTSD due to childhood sexual abuse, and Kunze et al. (2017) showed that ImRs helped in reducing nightmares. A recent study showed that ImRs is as effective as EMDR in reducing PTSD symptoms arising from childhood trauma, with approximately 60 percent of these childhood traumas being sexual abuse (Boterhoven de Haan et al., 2020). In brief, in ImRs the therapist instructs patients to vividly imagine the traumatic memory, followed by an alternative script which is either made up by patient or therapist, depending on the phase of the treatment. The alternative script usually starts at the most difficult part of the memory, the so-called the hotspot, and ends in a scenario that better meets the patient's emotional needs. For an extensive explanation of the background, rationale, and treatment protocol see Arntz (2012, 2015) and Arntz and Weertman (1999).

However, as with all therapeutic interventions, not all patients benefit (sufficiently) from ImRs (Boterhoven de Haan et al., 2020). First, some patients find it difficult to generate an alternative trauma scenario (Arntz & van Genderen, 2009). For example, avoidance, dysfunctional beliefs, or certain personality characteristics may hinder the formation of such alternative trauma scenarios and thus the effectiveness of ImRs. Other hindrances may include patients not being able to identify and activate a relevant memory, the intervention being perceived as unrealistic, patients not being able or willing to take the child perspective (Arntz & Weertman, 1999; Arntz & van Genderen, 2009), or patients not wanting to close their eyes during the process (Arntz, 2015). Second, as in cognitive therapy, in some patients functional and realistic cognitions and helpful alternative trauma scenarios are clearly there, but lack conviction ("I know it, but it doesn't feel that way"), thus making it difficult for them to engage emotionally (Stott, 2007; Cresswell & Waite, 2009).

For patients experiencing these difficulties, virtual reality imagery rescripting (VR-ImRs) may be an experientially powerful alternative technique to rescript traumatic memories and the meaning these memories have for them. Virtual reality (VR) could help these patients to visualize the traumatic event and engage with it emotionally (Botella et al., 2015; Maples-Keller et al., 2017). Furthermore, VR may allow more control over the experience since the therapist controls depicting the images (Maples-Keller et al., 2017). There is growing research suggesting that VR-based therapies can be useful in treatments for a large variety of mental disorders (Low et al., 2020; Maples-Keller et al., 2017; Morina et al., 2015; Opriş et al., 2012; Gerardi et al., 2010; Beck et al., 2007). There is also growing consensus that VR-based therapies can be helpful in treating PTSD, although the evidence is largely limited to war veterans (Van Meggelen, 2022; for a review, see Botella et al., 2015; but see Reger et al., 2016 for findings that imaginal exposure was superior to VR-exposure at 12- and 26-week follow-up).

Given the increasing evidence for ImRs (i.e., non-VR), identifying methods that could further strengthen its effects for specific patient groups is an important next step. Therefore, this exploratory proof-of-concept study was conducted as a first test of VR-ImRs in eight patients with PTSD due to childhood sexual abuse. We used a non-concurrent multiple baseline cross-over design testing effectiveness of active treatment against time and nonspecific attention, with a comparison of VR-ImRs and ImRs, with the aim of obtaining preliminary quantitative and qualitative data on the efficacy and acceptability of VR-ImRs. In addition, we also evaluated the feasibility of VR-ImRs in routine care.

Method

Participants

Participants were eligible if they met the criteria of PTSD due to childhood sexual abuse (as index trauma) that took place before the age of 16. Additional inclusion criteria included: (1) sufficient fluency in Dutch to complete research procedures; (2) able to attend sessions twice a week during the treatment period; (3) agree to abstain from medication changes or other psychological therapies for the duration of the study (i.e., until five weeks post-treatment). Exclusion criteria included: (1) PTSD due to trauma that occurred within the past six months; (2) acute suicide risk; (3) comorbid psychotic disorder; (4) comorbid bipolar disorder type 1; (5) comorbid alcohol or drug dependence; (6) IQ < 80; (7) neurological problems (e.g., dementia); (8) medication changes or PTSD-focused therapy within the past three months; (9) benzodiazepine medication (unless abstinent for two weeks). Potential participants were fully informed, both verbally and in writing, about the study before agreeing to participate and providing written informed consent. Of the 15 patients that were screened for eligibility, eight participants were included and

randomly allocated to the various baseline lengths and intervention orders (see Figure 1 for the complete patient flow). Table 1 describes the characteristics of the participants. The study protocol was approved by the ethical committee of the Faculty of Social and Behavioural Sciences and pre-registered in the Netherlands Trial Register (ID: NTR7029).

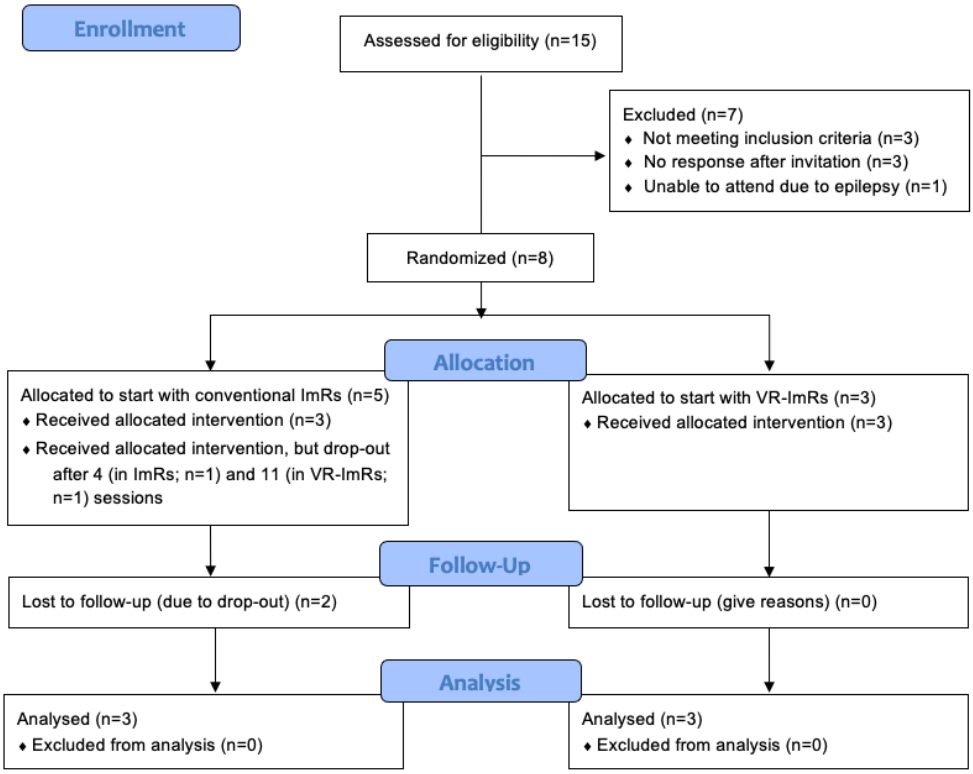

Figure 1.

Table 1. Demographic and Clinical Characteristics of Participants (N = 8).

Variable		Mean (SD)/Number (%)
Age (in years)		38.0 (12.1)
Gender	Female	5 (63%)
	Male	3 (38%)
Relationship status	With partner	7 (88%)
	No partner	1 (13%)
Living situation	Alone	3 (38%)
	With partner	4 (50%)
	With parents or other family members	1 (13%)
Living with children		5 (63%)
Education (highest)	Elementary school/primary education	3 (38%)
	Lower secondary education	1 (13%)

Variable		Mean (SD)/Number (%)
	Higher secondary education	1 (13%)
	Post-secondary vocational education	1 (13%)
	University for applied sciences	2 (25%)
PTSD duration (months)		191.6 (165.2)
Current use of medication	Anti-depressant	3 (38%)
Previous treatment	Individual therapy	8 (100%)
	Group therapy	3 (38%)
	Partner relationship/family therapy	1 (13%)
	Day treatment	1 (13%)
Comorbid disorder	Mood disorders	4 (50%)
	Anxiety disorders	4 (50%)
	Bulimia Nervosa	1 (13%)
	ADHD	1 [a] (13%)
	Elder-child relationship problem	1 [a] (13%)
	Circadian rhythm-sleep wake disorder; all subtypes	1 [a] (13%)
Number of comorbid disorders		2.0 (1.6)
Alcohol or substance use		5 (62.5%)

Note. [a] Disorders diagnosed by trained clinicians.

Study design

A non-concurrent multiple baseline case series design with cross-over elements was used, with a baseline varying in length between five, six, or seven weeks to differentiate between time effects and experimental effects (Arntz et al., 2013). The baseline phase started with a pretest and then involved twice-weekly process measurements of patients' PTSD symptoms that continued throughout the study until the end of the follow-up phase. The baseline phase was followed by a 5-session education and exploration phase consisting of twice-weekly sessions that served to (1) build a therapeutic relation, (2) provide education about the upcoming treatment, and (3) obtain the information about the original traumatic scenarios, and the information that was needed to devise an alternative, helpful rescripting scenario, since the VR-ImRs worlds needed to be prepared in advance. The education and exploration phase also served (4) as a control phase for non-specific treatment factors such as attention, understanding, and focus on trauma, and (5) to familiarize patients with the VR-equipment in a non-emotional way. After the education and exploration phase, participants were randomly allocated to one of two treatment orders: (1) six treatment sessions of VR-ImRs followed by six treatment sessions of ImRs, both given twice a week, or (2) six treatment sessions of ImRs followed by six treatment sessions of VR-ImRs, both given twice a week. Finally, both 6-week treatment phases were followed by a 5-week no intervention follow-up phase to examine the treatment's long-term effects, after which regular treatment was offered if needed (see Figure 2 for a schematic presentation of the study design, including assessment moments).

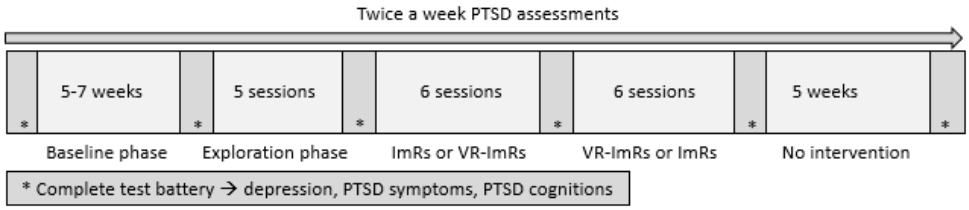

Figure 2.

Primary outcome

Self-reported PTSD symptoms were assessed with the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013b). This is one of the most commonly used measures of PTSD in both clinical and research settings and has excellent psychometric properties (e.g., internal consistency (α = .94), test-retest reliability (r = .82), and convergent (r = .74 to .85) and discriminant (r = .31 to .60) validity; Blevins et al., 2015). The time frame in the instruction of the PCL-5 was changed from "in the past month" to "since the previous assessment", and within the treatment phase to "since the last session", since participants were asked to complete the PCL-5 twice a week, making the total number of PCL-5 assessments 37, 39 or 41 depending on baseline phase length. PCL-5 items are rated 0 ('Not at all') to 4 ('Extremely') resulting in a total score that ranges between 0–80, with higher scores reflecting greater symptom severity.

Secondary outcomes

Seven items were added to the PCL-5 to assess shame, anger, guilt, disgust, sadness, anxiety, and happiness (Boterhoven de Haan et al., 2020). These items were not included in the PCL-5 total score, but were analyzed separately as two factors (negative emotions and positive emotions).

Changes in severity of PTSD symptoms were also assessed by trained independent research assistants, that were blind for treatment condition, with the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5), a structured interview that assesses PTSD symptoms during the last month (Weathers et al., 2013a). The CAPS-5 yields a dimensional total severity score ranging from 0 to 80, with higher scores reflecting greater PTSD symptom severity, a dimensional score per symptom cluster (intrusion symptoms, avoidance symptoms, negative alterations in cognitions and mood, and alterations in arousal and reactivity), and an assessment of diagnostic status. The CAPS-5 has excellent psychometric properties in various populations (e.g., internal consistency (α = .80 to .90) and interrater reliability (κ = .90 or higher); Weathers et al., 2001).

The Hospital Anxiety Depression Scale (HADS) was used to measure self-reported depression (HADS-D) and anxiety (HADS-A) (Zigmond & Snaith, 1983). It consists of 14 items, of which seven measure depression (e.g., "I still enjoy the things I used to enjoy") and seven measure anxiety ("Worrying thoughts go through

my mind"), with scores ranging from 0 (not at all) to 3 (most of the time). Total scores can range from 0 to 42. It showed excellent internal consistency (HADS-A: α = .68 to .93 (mean α = .83); HADS-D: α = .67 to .90 (mean α = .82); Bjelland et al., 2002).

The Post Traumatic Cognitions Inventory (PTCI) is a 33-item self-report questionnaire used to assess cognitions associated with posttraumatic psychopathology. It consists of three subscales that measure negative cognitions about self (21 items; e.g., "Nothing good can happen to me anymore"), negative cognitions about the world (seven items; "You can never know who will harm you") and self-blame (five items; "The event happened because of the way I acted"), with all items rated from 1 ('totally disagree') to 7 ('totally agree'). The PTCI includes a total score (range: 33 to 231) with excellent internal consistency (α = .97) (Foa et al., 1999).

Finally, in-depths interviews were held after the follow-up phase (see Appendix 1: Qualitative assessment in VR-ImRs for the complete interview). The interviews focused on the perspectives of patients on the treatments, with a special focus on the acceptability and feasibility of VR-ImRs.

Procedure

Participants were recruited within a mental health care institute in the Netherlands from May 2018 to June 2020. PTSD was diagnosed with the CAPS-5 (Weathers et al., 2013a) and comorbid disorders were diagnosed with the use of the Mini International Neuropsychiatric Interview (M.I.N.I.-plus; Sheehan et al., 1998). After inclusion in the study, and again at the pre-education and exploration, pre-treatment (both conditions), post-treatment and follow-up (5-weeks post-treatment) assessments, the complete set of outcome measures were completed through Qualtrics. In addition, the primary outcome measure (PCL-5) was completed twice a week throughout the complete trial.

Computerized randomization of participants occurred after the inclusion of the first participant and was executed by an independent person. Participants were randomized to baseline length and treatment order. If a participant dropped out, the allocation of that participant was put back in the pool and the remaining allocations were randomized again. Traumata treated per treatment condition were divided based on theme (e.g., sexual abuse, violence, emotional abuse) and severity so that both treatment conditions were approximately comparable in terms of trauma exposure of participants, but with at least one session per condition targeting the index trauma (always childhood sexual abuse). The participants and therapist (first author) were not informed about the outcome of the randomization until the last session of the education and exploration phase.

Treatment and therapists

Treatment consisted of 12 90-minute treatment sessions, preceded by five sessions of preparation (education and exploration phase). All treatment sessions were video recorded. Two licensed psychologists (one of them the first author) were involved, both with experience in ImRs, and in PTSD treatment in general. The therapists received training in the study protocol and treatment supervision throughout the study from an ImRs expert (fifth author), using video recordings of sessions. The ImRs protocol developed by Arntz and Weertman (1999) formed the basis for both treatment conditions. Deviations from this protocol resulted from the fact that in VR-ImRs, it was necessary to select the upcoming trauma target prior to the next session since the VR-ImRs worlds including the rescripted scenarios needed to be prepared in advance. For the same reason, each session addressed only one trauma memory. Furthermore, in each condition patients received three sessions in which the therapist intervened in the rescripting part followed by three sessions where the patients themselves rescripted. Finally, in both the ImRs and VR-ImRs conditions, trauma reprocessing immediately began in the first session since the usual "practice rescripting" was already done in the preceding education and exploration phase. A research assistant attended the VR-ImRs sessions to assist with controlling the VR-equipment.

Treatment integrity was assessed by two blind, independent raters who viewed randomly selected video tapes of 18 sessions out of a total of 96 available tapes, evenly divided over participants and phases (i.e., six tapes per treatment phase, and six for the education and exploration phase, which served as control for the two treatment phases). Each tape was rated using the ImRs Adherence and Competency Scale, where each item is rated 0–4 (Boterhoven de Haan et al., 2020). Items addressed the presence and order of specific ImRs techniques and the competence with which they were conducted. The mean rating for ImRs was 3.44 and the mean rating for VR-ImRs was 3.27, which indicates satisfactory adherence for both treatment conditions. The mean rating for tapes from the education and exploration phase was .12, which was expected because no active treatment was supposed to be given in this phase. Treatment integrity was thus supported by a significant difference between the education and exploration phase versus the treatment phases as determined by a one-way ANOVA ($F(2,15) = 470.971$, $p < .001$), with Tukey post hoc tests showing higher treatment integrity during the treatment phases compared to the education and exploration phase (p's $< .001$) and no significant difference between both treatment phases ($p = .372$).

Equipment and software

The VR equipment included an Alienware laptop, an Oculus Rift Virtual Reality headset with integrated headphones, and an Xbox One controller. The Virtual Reality headset was capable to detect and translate head movement into movement

within the virtual world. The research assistant navigated in the environment using the Xbox controller. Online environments and scenarios were constructed using pre-built objects (i.e., walls, floors, closets, beds), buildings (i.e., courthouse, prison) and characters (man, woman, boy, girl) (see Brinkman et al., 2022 for a visual presentation of actual footage used in the present study).

When patients entered the virtual world, they were presented with a scene that presents their memory of the trauma. These personalized 3D worlds were predesigned, using a program called 3D WorldBuilder (Tielman, 2017), based on information given by the patient. Patients took a first person perspective, and the avatar used for the patients resembled the patient as much as possible, although there were only limited choices. When the child perspective was taken, the child representation of the given character was chosen. Patients were unable to move around the world by themselves, instead their avatars were directed through the virtual world by the therapist or research assistant scene by scene.

Statistical analysis

Since this is a proof-of-concept pilot study it is exploratory in nature. Based on an a priori power analysis, due to the within-Ss repeated measures design, a total of 6 participants was required to detect a difference with a large effect size of f=0.3 between the linear trends of VR-ImRs and ImRs over six weeks (with a power [1-β] of .80, at $p < .05$, 12 repeated assessments, assuming a correlation of 0.7 between repeated measures). If this difference is detected and is in favor of ImRs, this suggests superiority of ImRs over VR-ImRs and little support to further investigate VR-ImRs, at least in its present form. In contrast, a difference in favor of VR-ImRs suggests superiority of VR-ImRs over ImRs and identifies VR-ImRs as a promising intervention that is worthy of further study. Differences with an effect size that is smaller than f=0.3 may require more nuanced conclusions regarding the usefulness of further studies of VR-ImRs.

Statistical analysis was done with SPSS, version 27 for Windows. Based on similar prior research, within and between effects of the treatments were assessed using mixed regression analysis (Arntz et al., 2013; Vlaeyen et al., 2010). Specifically, differences in means and slopes in the development over time of PCL-5 scores between the education and exploration phase, treatment conditions, and follow-up phase were examined in comparison with the baseline phase. The fixed model part consisted of (1) a general linear time effect starting with time = 0 when the first assessment of a participant was conducted ("Date within phase"), (2) a phase variable containing each phase ("Phase"), but with baseline as reference phase (thus contrasting each phase to baseline) and (3) five centered time-within-condition covariates (e.g. "Time within ImRs"), one for every phase to assess time by phase interactions, that is, linear time effects per phase (cf. Vlaeyen et al., 2001). Due to

the cross-over design, (4) the order of the treatment conditions ("Order") and all interactions between order and the above-mentioned fixed effects were added to the fixed part to control for effects of treatment order.

The random model part consisted of a random intercept for participant to capture between-subject outcome variation, plus ARMA11 for the within-subject covariance structure. Random slopes to allow interindividual variation in time and condition effects lead to reduced fit of the model or convergence problems and were therefore not included. The analytic strategy was to first assess a general time effect, next to assess the full model with all predictors entered, and then to delete in backward fashion the effects involving order, and time within phase effects that were non-significant. If the main time effect was non-significant, it was deleted at the last step. If time effects (i.e., linear trend) within VR-ImRs and ImRs were significant, they were tested against each other. If however one (or both) trend would be nonsignificant, a direct comparison was considered obsolete. Cohen's *d* effect sizes were calculated for the change of a phase with respect to baseline: *d* = the mean outcome difference between baseline and current phase, derived from the fixed part of the mixed regression, divided by the *SD* of the baseline assessments.

Since scores on the PCL-5 differed substantially between participants a bias in the analysis was observed, resulting in estimated means differing from the actual observed means. Due to this bias we decided to calculate person-centered variables for the PCL-5 scores by subtracting the mean score per participant from each measurement point. This solved the problem. We report estimated means and figures of back-transformed estimated scores.

For the secondary measures of the PCL-5, the seven added items, an exploratory factor analysis was carried out, in line with previous research (Watson & Tellegen, 1985). This exploratory factor analysis indicated that the six added PCL-5 items that measured negative emotions (shame, anger, guilt, disgust, sadness, and anxiety) loaded strongly on one factor, while the item that measured happiness did not load on this factor. A new variable was therefore computed as the mean score of these six items, while the score on the happiness item was retained, making it possible to analyze negative and positive emotions separately. The same analytic strategy was used as for the primary outcome.

The secondary measures HADS and PTCI were also analyzed with mixed regression (AR1 had the best fit), without modelling of slopes within phases as only single assessments per phase were available. CAPS-5 scores were analyzed with Wilcoxon Signed Ranks Test for difference in total scores and McNemar Test for remission from PTSD. Additionally, a thematic content analysis was carried out on the qualitative assessments of acceptability and feasibility.

Results

PCL-5

Compared to baseline, visual inspection of the individual PCL-5 total scores of the six participants suggests a decrease of these scores during ImRs and lower scores during follow-up. During VR-ImRs, PCL-5 total scores appeared to improve in only three participants (1, 5 and 6) and to increase in the other three (2, 4 and 8) (Figure 3; see Supplementary Figure 2 for the negative and positive emotion items that were added to the PCL-5).

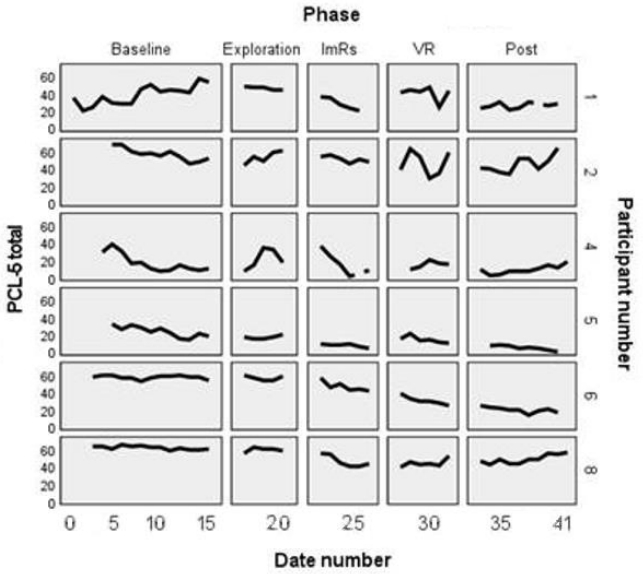

Figure 3.

Note. Participants 1, 4 and 5 were randomly assigned to order VR-ImRs – ImRs, thus receiving VR-ImRs before ImRs. Participants 2, 6 and 8 were assigned to order ImRs – VR-ImRs. Date within phase: each data point represents roughly half a week as measures were assessed twice a week. PCL-5 = PTSD Checklist for DSM-5.]

Table 2 presents the results of the mixed regression analysis. The education and exploration phase had no effect on the PCL-5 scores, but the main effects of both treatment conditions (i.e., the change halfway each treatment condition compared to baseline) were significant, as was the main effect of follow-up (as compared to baseline). This shows that overall, the treatments were effective in reducing PTSD symptoms and this was maintained at follow-up. The time effect within ImRs was significant, whereas the time effect within VR-ImRs failed to reach significance and was therefore deleted from the model. Effect sizes of ImRs vs baseline, and follow-

up vs baseline were large, while VR-ImRs vs baseline showed a medium to large effect size (Table 2). After the effect sizes were calculated we also calculated the additive Cohen's *d* to see to what extent each phase contributed to the total effect. Additive Cohen's *d*'s showed that ImRs was responsible for 73 percent of the total effect, while VR-ImRs was only responsible for 17 percent.

Supplementary Figure 1 depicts the predicted means from the analysis. When all predictors were entered the linear effect of time, order, order by phase, all centered time-within-condition effects, and all order by centered time-within-condition effects were non-significant (p's > .18) except for the highly significant effect of time-within-ImRs (p = .001). After stepwise deleting, the effect of time-within-ImRs remained the only significant time effect (p < .001) showing a steep decrease of PTSD symptoms within this treatment condition. Order and order by phase effects were also non-significant, but were kept in the model to control for order effects, as described in the method section. These results showed that ImRs had a far greater effect on the decrease of self-reported PTSD symptoms than VR-ImRs did, and that the order in which the treatments were given did not affect these outcomes.

For the negative emotion items that were added to the PCL-5, the same results were found as for the PCL-5 total scores: education and exploration had no effect on the negative emotions scores, but the main effects of both treatment conditions were significant, as was the main effect of follow-up (Table 2). When all predictors were entered, again all of the above-mentioned predictors were non-significant (p's > .11) except the highly significant effect of time-within-ImRs, which remained significant after stepwise deleting (p < .001). After stepwise deleting, the effect of VR-ImRs by order also became significant, suggesting that it mattered which condition was offered first (see Supplementary Figure 1). Effect sizes of ImRs compared to baseline and of follow-up compared to baseline were large, while VR-ImRs showed a medium to large effect size. Additive Cohen's *d*'s showed that ImRs was responsible for 69 percent of the total effect and VR-ImRs for 19 percent.

For the happiness item that was added to the PCL-5, the only significant main effect was found for the ImRs treatment condition. This effect did not last however, because at follow-up the main effect was not significant anymore. Of all the above-mentioned predictors entered none was significant (p's > .10), except for the effect of VR-ImRs by order which became significant after stepwise deleting the other non-significant effects (Table 2). Effect sizes were small to medium for all phases, even though the additive Cohen's *d*'s showed that only the treatment conditions contributed to the total effect, while the negative additive Cohen's *d* for follow-up showed that the effect of the treatment phases loses some of its effect over time.

Table 2. Results of mixed regression analyses of PCL-5 total, negative, and positive emotions scores.

	Parameter	ß	SE	Df	*t*	*p*	Effect size Cohen's *d*[a]	Additive Cohen's *d*
PCL-5 Total	Intercept	8.59	2.26	10.05	3.78	.003		
	Order	-5.09	4.48	10.77	-1.14	.28		
	EE	-1.29	2.21	124.16	-.58	.56	.07	.07
	ImRs	-9.99	2.89	41.12	-3.46	.001	.90	.70
	VR-ImRs	-12.40	2.89	40.33	-4.30	<.001	.67	.16
	Follow-up	-17.87	3.26	15.88	-5.48	<.001	.96	.03
	Time within ImRs	-2.69	0.76	111.66	-3.56	<.001		
	EE * order	-.62	4.39	127.76	-.14	.89		
	ImRs * order	.88	5.72	47.07	.15	.88		
	VR-ImRs * order	11.98	6.04	38.45	1.98	.05		
	Follow-up * order	8.74	6.23	21.01	1.40	.18		
Negative emotions	Intercept	.58	.14	13.58	4.05	.001		
	Order	-.40	.289	14.52	-1.39	.19		
	EE	-.01	.15	131.50	-.07	.94	.009	.009
	ImRs	-.66	.19	45.99	-3.50	.001	.92	.76
	VR-ImRs	-.81	.19	45.17	-4.31	<.001	.68	.21
	Follow-up	-1.34	.21	18.86	-6.36	<.001	1.11	.13
	Time within ImRs	-.18	.05	125.73	-3.49	<.001		
	EE * order	.18	.29	134.58	.60	.55		
	ImRs * order	.18	.38	51.27	.47	.64		
	VR-ImRs * order	1.07	.40	41.26	2.70	.01		
	Follow-up * order	.48	.40	24.59	1.19	.25		
Positive emotions	Intercept	-.26	.15	15.33	-1.78	.10		
	Order	.39	.30	15.33	1.32	.21		
	EE	-.11	.20	98.02	-.57	.57	-1.00	-1.00
	ImRs	.47	.22	37.82	2.11	.04	.42	.36
	VR-ImRs	.44	.22	36.99	1.97	.06	.39	.37
	Follow-up	.45	.22	19.41	2.04	.06	.40	-.23
	EE * order	-.63	.39	98.02	-1.61	.11		
	ImRs * order	-.001	.45	37.82	-.003	1.00		
	VR-ImRs * order	-1.03	.45	36.99	-2.29	.03		
	Follow-up * order	-.53	.44	19.41	-1.20	.25		

Note. EE = education and exploration; PCL-5 = PTSD Checklist for DSM-5. Predictors were coded as follows: Phase coding for Baseline (4), EE (3); ImRs (2), VR-ImRs (1), and Follow-up (0) so that Baseline was the reference category; Time-within-Condition: 0 for measurements outside the condition, centered time (with half-week as unit) for measurements within condition (e.g., -2.5, -1.5, -.5, .5, 1.5, 2.5 for a 3- week condition); Order coding for ImRs-VR (-.5), and VR-ImRs (.5) to correct for the order of the treatment conditions. Beta's for main effects of phase represent the time point halfway the phase, not the end.

[a] Effect size Cohen's *d* = effect/SD, with SD derived from the baseline assessments as explained in the Method section, and effect equal to the beta's of the Mixed Regression model. Positive values denote improvement. Effect sizes represent effect at the end of the intervention, and were corrected for order.

HADS

For both the anxiety and depression scores on the HADS, mixed regression showed that education and exploration had no main effect, and that the main effects

of both treatment conditions were non-significant (Table 3). The only significant main effect was the effect of follow-up (as compared to baseline) for the HADS anxiety scores. Since HADS scores were only assessed once after each phase we could not account for effects within phases (slopes), so the only predictors entered were order, and order by phase. Of these predictors, order was significant for the HADS depression scores, showing that these scores decreased more when offered ImRs as the first treatment condition (see Supplementary Figure 4). For both treatment conditions medium to large effect sizes were found for anxiety scores, and for depression scores a small to medium effect size for conventional ImRs and a medium to large effect size for VR-ImRs. Additive Cohen's *d*'s showed that VR-ImRs had a slightly larger contribution to the effect on anxiety and depression scores than conventional ImRs. Individual scores and predicted means for secondary outcomes are depicted in Supplementary Figure 3 and 4.

Table 3. Results of mixed regression analyzes of HADS Anxiety and Depression scores.

	Parameter	ß	SE	Df	*t*	*p*	Effect size Cohen's *d*[a]	Additive Cohen's *d*
Anxiety	Intercept	14.50	1.63	11.97	8.87	<.001		
	Order	-7.00	3.27	11.97	-2.14	.05		
	Post baseline	-1.33	1.43	18.06	-.93	.36	.25	.25
	Post EE	-1.33	1.82	23.07	-.73	.47	.25	<.001
	Post ImRs	-3.33	2.08	22.83	-1.60	.12	.62	.31
	Post VR-ImRs	-4.17	2.08	22.83	-2.00	.06	.78	.40
	Post follow-up	-4.83	2.21	18.87	-2.19	.04	.90	-.06
	Post baseline * order	-.67	2.86	18.06	-.23	.82		
	Post EE * order	.67	3.64	23.07	.18	.86		
	Post ImRs * order	-.67	4.16	22.83	-.16	.87		
	Post VR-ImRs * order	5.00	4.16	22.83	1.20	.24		
	Post follow-up * order	-.33	4.41	18.87	-.08	.94		
Depression	Intercept	12.50	1.87	8.44	6.69	<.001		
	Order	-9.67	3.74	8.44	-2.59	.03		
	Post baseline	-.83	1.23	19.22	-.68	.51	.14	.14
	Post EE	-.33	1.65	22.35	-.20	.84	.06	-.09
	Post ImRs	-2.17	2.00	23.97	-1.08	.29	.37	.23
	Post VR-ImRs	-3.83	2.00	23.97	-1.92	.07	.65	.40
	Post follow-up	-2.83	2.22	22.16	-1.28	.22	.48	-.20
	Post baseline * order	.33	2.47	19.22	.14	.89		
	Post EE * order	.67	3.29	22.35	.20	.84		
	Post ImRs * order	1.67	4.00	23.97	.42	.68		
	Post VR-ImRs * order	5.67	4.00	23.97	1.41	.17		
	Post follow-up * order	3.00	4.45	22.16	.68	.51		

Note. EE = education and exploration; ImRs = conventional ImRs; HADS = Hospital Anxiety Depression Scale. Predictors were coded as follows: Phase coding for Start baseline (5), Post baseline (4), Post EE (3); Post ImRs (2), Post VR-ImRs (1), and Post follow-up (0) so that Baseline was the reference category; Order coding for ImRs-VR (-.5), and VR-ImRs (.5) to correct for the order of the treatment conditions.

[a] Effect size Cohen's *d* = effect/SD, with SD derived from the baseline assessments as explained in Method section, and effects equal to the beta's of the Mixed Regression model. Positive values denote improvement. Effect size represents effect at the end of the intervention, and were corrected for order.

PTCI

Mixed regression of PTCI total scores showed that after the education and exploration phase, participants already had a significantly lower score in comparison to the assessment at the start of the baseline (Table 4). Education and exploration had no main effect on the PTCI scores, but the main effects of both treatment conditions were significant, as was the main effect of follow-up (as compared to start of baseline). Since PTCI scores were also only assessed once after each phase we could not account for effects within phases (slopes), so again the only predictors entered were order, and order by phase, which all were non-significant. The direct comparison between VR-ImRs and ImRs failed to reach significance. For both treatment conditions medium effect sizes were found, although additive Cohen's *d*'s showed that VR-ImRs contributed two and a half times as much to the effect than conventional ImRs did.

CAPS-5 PTSD Severity

The median score on the CAPS-5 decreased from pre-treatment (*Md* = 37) to post-treatment (*Md* = 5), although the effect was non-significant, likely due to the fact that two participants actually experienced a higher severity score at the end of treatment (Table 5). A Wilcoxon Signed Rank Test showed a statistically non-significant reduction in severity of PTSD symptoms according to the CAPS-5 following the complete treatment (both conditions), $z = -1.57$, $p = .116$, with a medium effect size ($r = .45$).

Table 4. Results of mixed regression analyzes of PTCI total scores.

	Parameter	ß	SE	Df	*t*	*p*	Effect size Cohen's *d*[a]	Additive Cohen's *d*
Total	Intercept	109.00	17.85	4.80	6.11	.002		
	Order	-85.33	35.70	4.80	-2.39	.06		
	Post baseline	-12.83	5.99	19.63	-2.14	.05	.23	.23
	Post EE	-11.33	8.36	20.69	-1.36	.19	.20	-.03
	Post ImRs	-27.83	10.81	22.13	-2.57	.02	.50	.14
	Post VR-ImRs	-33.50	10.81	22.13	-3.10	.005	.60	.34
	Post follow-up	-29.83	12.70	23.13	-2.36	.03	.53	-.14
	Post baseline * order	2.33	12.00	19.63	.20	.85		
	Post EE * order	4.00	16.71	20.69	.24	.81		
	Post ImRs * order	-15.67	21.63	22.13	-.72	.48		
	Post VR-ImRs * order	13.00	21.63	22.13	.60	.55		
	Post follow-up * order	8.33	25.34	23.13	.33	.75		

Note. EE = education and exploration; ImRs = conventional ImRs; PTCI = Post Traumatic Cognitions Inventory. Predictors were coded as follows: Phase coding for Start baseline (5), Post baseline (4), Post EE (3); Post ImRs (2), Post VR-ImRs (1), and Post follow-up (0) so that Baseline was the reference category; Order coding for ImRs-VR (-.5), and VR-ImRs (.5) to correct for the order of the treatment conditions.

[a] Effect size Cohen's *d* = effect/S.D., with S.D. derived from the baseline assessments as explained in Method section, and effects equal to the beta's of the Mixed Regression model. Positive values denote improvement. Effect size represents effect at the end of the intervention, and were corrected for order.

Table 5. Clinician Administered PTSD Scale scores pre- and post-treatment per participant

Participant	Pre-treatment	Post-treatment
1	37 – 13*	3 – 1
2	39 – 16*	48 – 15
4	26 – 9*	7 – 2
5	25 – 11*	3 – 0
6	37 – 13*	2 – 0
8	45 – 16*	52 – 18*

Note. The first number indicates the severity of the PTSD symptoms (range 0 – 80). The second number indicates the number of PTSD symptoms present, i.e. with ratings > 1 (range 0 – 20). * Indicates the presence of a clinical diagnosis of PTSD.

Remission from PTSD

Out of the six participants who finished the complete treatment and were assessed with the CAPS-5 at follow-up, five did not meet the criteria of PTSD anymore. A McNemar Test showed a significant effect (p = .031, 1-tailed).

Additional findings

There were three main topics (expectations, satisfaction, complaints) that were assessed in qualitative interviews to evaluate the relative acceptability and feasibility of the treatments. Concerning expectations, all participants stated they did not have any specific expectations regarding conventional ImRs versus VR-ImRs. Some participants however indicated that they were particularly hopeful about VR-ImRs due to positive statements on the internet. Half of the interviewed participants said they had expected more advanced VR functionalities.

Concerning satisfaction about the extent to which both treatments helped to achieve their goals, two participants said that both treatments helped, and that a combination of both treatments had their preference. They would also recommend this to others even though one participant noted that for people with difficulties imagining VR-ImRs would be more helpful, otherwise conventional ImRs was recommended. One participant found it difficult to say which treatment helped the most because the VR images replaced the original trauma images, but this participant still preferred VR-ImRs over conventional ImRs and would also recommend VR-ImRs to others, because the images were tailored to a specific patient's story. However, the other three participants said conventional ImRs was the only intervention that helped, and they would prefer to receive conventional ImRs when given the choice and recommend other to do the same.

To assess for realisticness of the scenarios, participants were asked after each VR-ImRs session to what extent they found the presented scenarios realistic (range: 0 to 100). Almost all sessions were rated between 80 – 100, with only three sessions rated lower than 70 (M = 82.3; SD = 10.5). Bouchard et al. (2004) found

that this is a reliable way to measure presence in a virtual world in a minimally intrusive manner.

A complaint expressed by almost all participants was the faltering technique of VR-ImRs. One problem was that the software sometimes changed perspective while this was not intended (e.g., from victim to perpetrator, or victim to helicopter view). Furthermore, it was impossible to create a VR scenario that exactly replicated the participants' trauma memories. This made some participants use their own imagination to make the scenario more similar to their own memory. One participant found the soberness of the images pleasant because it made the scenario less aversive. All participants found VR-ImRs less aversive than conventional ImRs, except for one participant who admitted that she sometimes closed her eyes during the VR-ImRs sessions. Some participants experienced headaches during VR-ImRs, while others became nauseous, but it cannot be ruled out that this was because of anxiety. Also, the VR-goggles tended to fog up and the foam around the goggles became wet when participants were emotional, making it uncomfortable to wear.

A finding not reported by the participants but observed by the therapist during the VR-treatments is that VR-ImRs seemed to provoke more bodily enactments of the scenarios, such as moving the chair backwards to get away from an image, pushing a perpetrator away, and pushing against the table thinking this would help keeping a virtually presented door closed.

Regarding feasibility, the main finding was that building a VR-scenario took around two hours of preparation time per session. The VR-ImRs session itself took a little less time than ImRs, making the total time invested per participant around 18 hours for VR-ImRs and around nine hours for ImRs.

Discussion

This proof-of-concept pilot study constitutes the first exploratory comparison of ImRS and VR-ImRs as a treatment for PTSD due to childhood sexual abuse. We used a non-concurrent multiple baseline cross-over design testing effectiveness of both active treatments and comparing VR-ImRs to ImRs. The findings suggest an absence of significant changes during VR-ImRs, whereas changes were significant during ImRs. Superiority of ImRs over VR-ImRs in reducing PTSD symptoms as assessed with the total score of the PCL-5, can be concluded. We did not observe any improvement of depressive symptoms as assessed with the HADS. With regard to anxiety symptoms, we did not find any improvement during the treatment phases, although there was a main effect on anxiety scores at follow-up. However, due to the design of the study, these long-term effects can only be attributed to combined effect of the two treatments conditions. As far as reduction of trauma-related cognitions is concerned, both treatment conditions resulted in improved trauma-related cognitions while the conditions did not differ significantly from each other.

When looking at the primary outcome, mixed regression analyses showed that for the education and exploration, follow-up, and VR-ImRs phases, there was no evidence for significant time-within-condition effects. For ImRs however the time-within-condition effect was strong, indicating that only ImRs contributed to a decrease in PTSD symptoms during the treatment itself. Since there was no general time effect, mere passage of time can be ruled out as an alternative explanation, in concordance with earlier ImRs research (Arntz et al., 2013). The order of the treatment conditions did not contribute to the effect on the PCL-5 total score.

In sum, we found support for the efficacy of ImRs in reducing PTSD symptoms due to childhood sexual abuse, but not for VR-ImRs. Both conditions seemed ineffective in immediately reducing anxiety and depressive symptoms, but both ImRs and VR-ImRs were effective in reducing negative trauma-related cognitions.

The majority of our participants indicated that they preferred ImRs or a combination of both treatments to VR-ImRs alone. Research on underlying mechanisms suggests that activation of perceptual trauma memories is needed before change in the meaning of the traumatic experience can take place through ImRs (Arntz, 2012; Arntz, 2015). Probably the present VR environment was unable to sufficiently activate participants' fear structure because it was difficult to virtually recreate the exact 'hotspots' in the trauma scenarios accurately enough. Reger et al. (2016) already suggested this as an explanation for the larger effect of prolonged exposure at 12- and 26-week follow-up compared to VR exposure.

The lack of effect of VR-ImRs could also be due to the design of the present study, that required several modifications to the original ImRs protocol. The original protocol consists of six successive sessions in which the therapist intervenes in the traumatic scenario, followed by six sessions in which the patient intervenes him- or herself. We changed the protocol slightly to three sessions in which the therapist intervened followed by three sessions in which the patient intervened. Although this did not appear to hinder the efficacy of ImRs, it is unclear if this was also the case for VR-ImRs. Also, one could argue that the fact that VR-ImRs scenario's had to be prepared before each session and could not be changed during sessions, limited our flexibility during the actual rescripting if the scenario did not fit with the traumatic memories of the participant and/or the direction of the rescripting as it developed during the session. However, Ehlers et al. (2005) found that preparing a new scenario beforehand was also effective in itself, although in that study these preparations also included modifying negative appraisals through cognitive therapy techniques (e.g., Socratic questioning) before rescripting took place.

Even though the treatments resulted in large reductions of PTSD symptoms at follow-up, earlier studies showed a much larger effect size for ImRs (Arntz et al., 2013; Boterhoven de Haan et al., 2020; Morina et al., 2017). An explanation for these smaller effect sizes could be that in contrast with these earlier studies, participants in the present study only received six instead of the typical 12 sessions of ImRs. This could also explain the lack of effect of ImRs on the secondary outcomes, again in

contrast to earlier research (for depression, see Arntz et al., 2013; Boterhoven de Haan et al., 2020; for anxiety, see Morina et al., 2017).

A possible criticism could also be that the present study had a high drop-out rate (25%) in comparison to other studies of ImRs, that had drop-out rates of 8.1% and 0%, respectively (Boterhoven de Haan et al., 2020; Arntz, 2012). However, the present drop-out rate is in line with a meta-analysis of trauma-focused therapy for survivors of childhood abuse, which found an average dropout rate across studies of 22.3% (Ehring et al., 2014). The reasons given for drop-out in the present study were not directly linked to VR-ImRs; one participant had little belief that ImRs in general could help and one participant dropped-out due to logistic problems at the treatment facility (e.g., not warned when the therapist was ill, and not sent new directions when the treatment location was changed).

Another criticism might be that the participants who finished the full treatment were all treated by the same therapist, who is also the first author. We tried to overcome this by involving a second therapist in the study, but unfortunately both drop-outs were treated by this second therapist.

A strength of the present study is that we used an online questionnaire tool that kept the therapists blind to the outcome data and ensured that the ratings were not influenced by the presence of the therapist. Also, therapists and participants were blind to treatment condition up to the very last session of the education and exploration phase (of course, the use of VR-equipment made it impossible to blind participants and therapists to treatment condition).

In summary, the present study suggests that ImRs is superior to VR-ImRs in the tested form. The human imagery capacity might not be so simple to improve upon by artificial virtual reality. Despite the difficulties described above, there were some promising observations during VR-ImRs, such as the bodily re-enactments of the trauma scenarios that suggest the potential for intensive reliving of these scenarios in some patients. To give VR-ImRs a fair chance, studies of VR-ImRs using more advanced and user-friendly software are much needed. Possibly, adding multisensory experiences and actual pictures of the perpetrator to the avatar in the VR scenario would aid the activation of the fear structure. As Ma et al. (2021) point out, VR technologies are evolving rapidly so these and other changes are likely already possible with the newest equipment.

Maples-Keller et al. (2017) state that the use of VR treatment eliminates a potential barrier for people with difficulties imagining or visualizing. They also found that some people are willing to use VR treatment, but not to talk to a counselor in person. We found that within our small sample of patients with PTSD due to childhood sexual abuse however, none of them had difficulties imagining these aversive memories, which could have contributed to the effect of ImRs while by-passing the potential benefits of VR-ImRs. Using VR-ImRs in patients that have difficulty imagining or that are highly avoidant may be needed to unlock the full potential of VR-ImRs.

Authors' note

Declarations: Sven van Kuik is now at PsyQ, Amsterdam, The Netherlands. Arnoud Arntz has published on Imagery Rescripting and occasionally gives workshops on the Imagery Rescripting. The remuneration for these workshops goes to the University of Amsterdam to support research. No other interests declared.

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Appendix 1: Qualitative assessment in VR-ImRs

The overall goal of the present interview is to evaluate how the patient experienced VR-ImRs compared to conventional ImRs.

Theme: Expectation
Initial question:

What did you expect from the VR-ImRs therapy? What did you expect from the ImRs therapy?

Follow up question:

How logical did VR-ImRs seem to you? How logical did ImRs seem?

Theme: Satisfaction
Initial question:

To what extent has VR-ImRs rescripting been useful (or not) in achieving your objectives / in reducing PTSD symptoms? To what extent has ImRs been useful?

Follow up questions:

1. How would you describe your overall experience with VR-ImRs compared to ImRs?
2. Did you encounter any difficulties with VR-ImRs? If so, what difficulties? / How about with conventional ImRs? If so, what difficulties?
3. How did you experience that within the VR treatment it was not always possible to recreate every detail of your story? Was this lack of flexibility a problem? Did you add any imagery to the VR-ImRs? Was it beneficial to add imagery to VR-ImRs?
4. Did it matter that the VR worlds did not represent 100% your real memory?
5. Was imagining a problem in ImRs?
6. To what extent did you find VR-ImRs aversive? To what extent did you find ImRs aversive?

Theme: Preference
Initial question:

After experiencing both treatments, if you had to choose your own treatment plan what would you select from the following? And why?

a.) VR-ImRs
b.) conventional ImRs
c.) combination of VR-ImRs and conventional ImRs (in what order?)
d.) a totally different treatment

Follow up questions:

(*Based on what the patient answered above choose one of the following*)

1. In what aspects did you find VR-ImRs better than ImRs/Why did you prefer VR-ImRs over conventional ImRs?
2. In what aspects did you find ImRs better than VR-ImRs/Why did you prefer conventional ImRs over VR-ImRs?

3. Why did you prefer the combination?
4. What made you choose a totally different treatment?

Theme: Recommendation
Initial question:

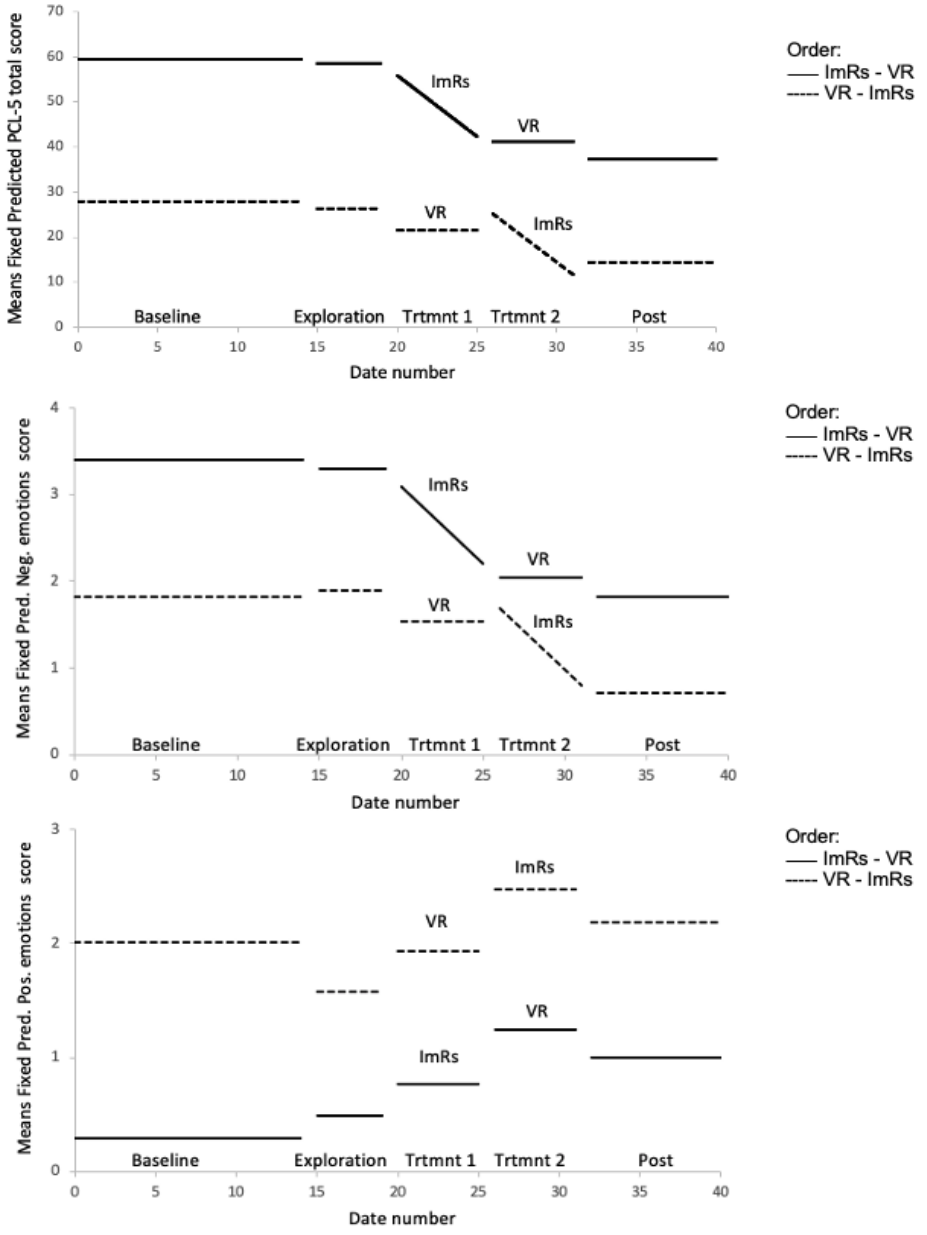
How confident would you feel in recommending VR-ImRs to a friend who experiences similar problems? How about ImRs?

Follow up questions:

1. Can you indicate anything related to the treatment received that could be useful for future improvements?/ Do you have any ideas as to what worked or did not work with VR-ImRs and ImRs therapy?
2. Is there anything else you would like to add?

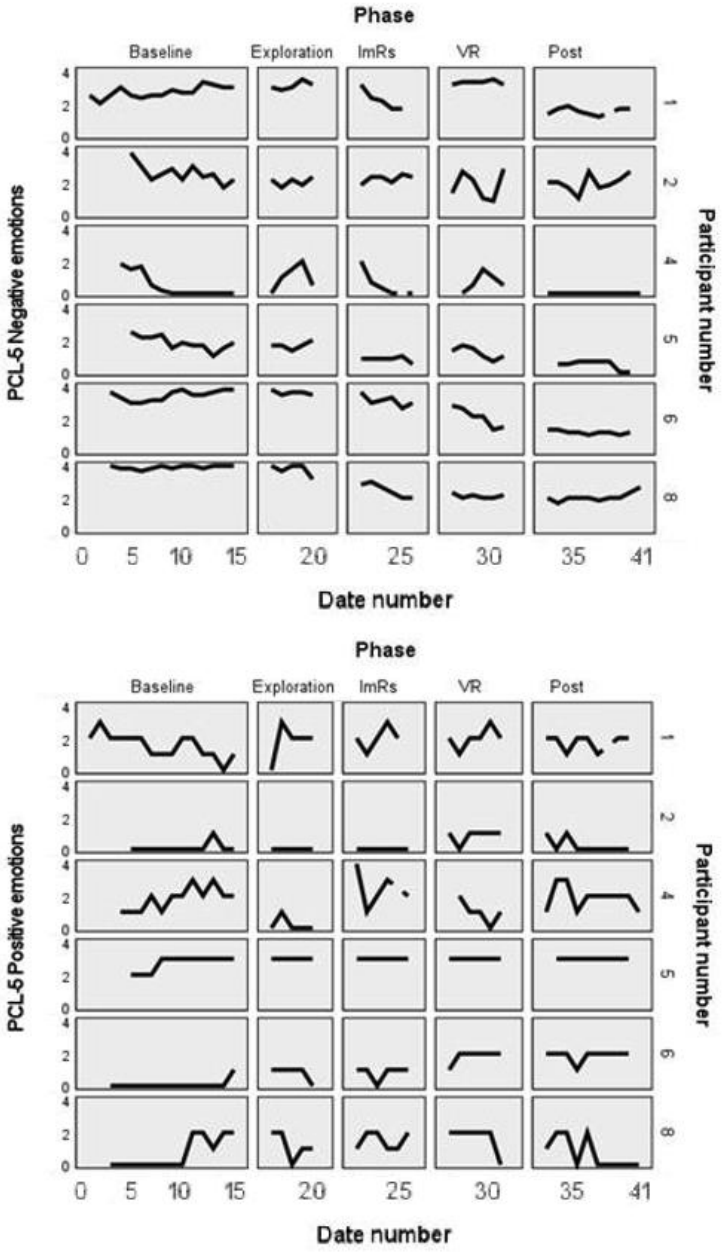
Appendix 2: Supplementary Figures

Supplementary Figure 1. Predicted estimated means of PCL-5 by the mixed regression model



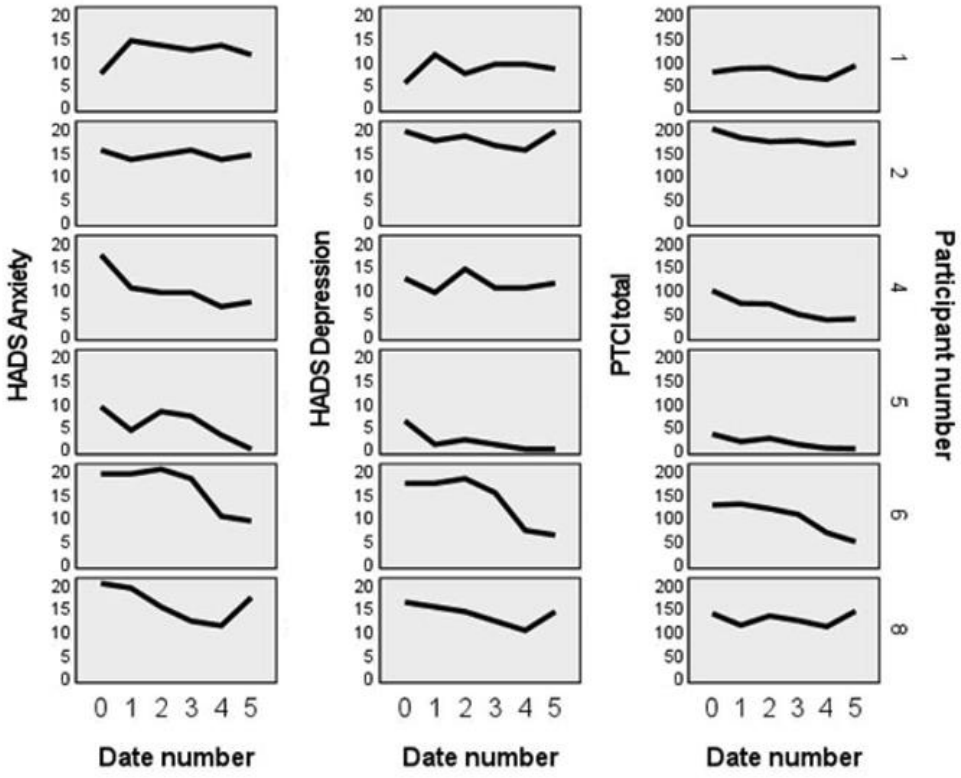
Note. PCL-5 total (upper panel), PCL-5 Negative emotions (middle panel) and PCL-5 Positive emotions (bottom panel).

Supplementary Figure 2. Individual PCL-5 negative and positive emotions scores



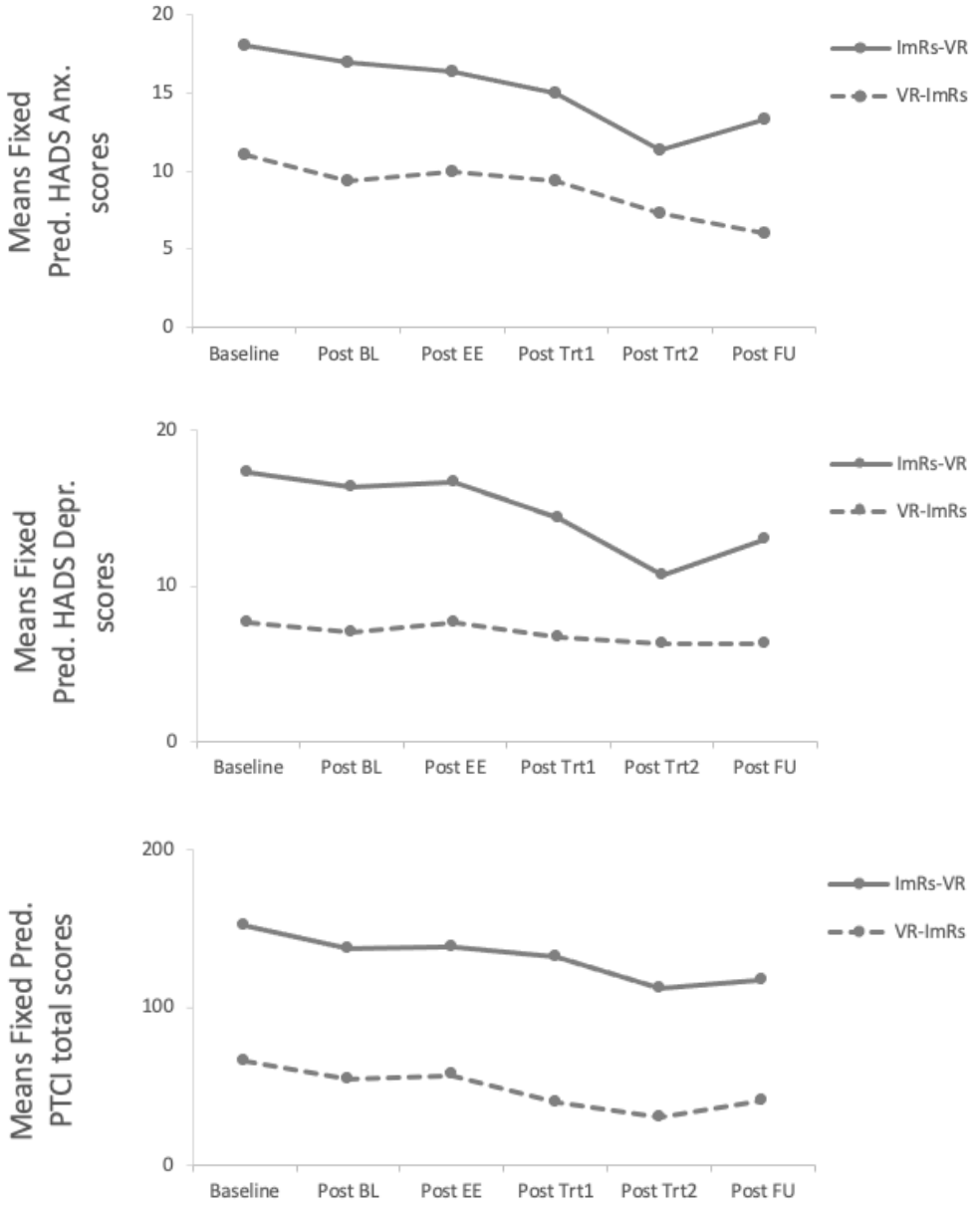
Note. Upper panel: Individual PCL-5 negative scores; bottom panel: Individual positive emotions scores. Participants 1, 4 and 5 were randomly assigned to order VR – ImRs, thus receiving VR-ImRs before getting ImRs. Participants 2, 6 and 8 were assigned to order ImRs – VR. Date within phase: each data point represents roughly half a week as measures were assessed twice a week.

Supplementary Figure 3. Individual HADS Anxiety, HADS depression and PTCI total scores



Note. Date numbers were coded as follows: Start baseline (0), Post baseline (1), Post education and exploration (2), Post ImRs (3), Post VR-ImRs (4), and Post follow-up (5). Participants 1, 4 and 5 were randomly assigned to order VR – ImRs, thus receiving VR-ImRs before getting ImRs. Participants 2, 6 and 8 were assigned to order ImRs – VR.

Supplementary Figure 4. Predicted estimated means of HADS and PTCI by the mixed regression model



Note. HADS Anxiety (upper panel), HADS Depression (middle panel) and PTCI total (bottom panel).

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EARLY CLIENT INVOLVEMENT IN THE DESIGN OF A BLENDED SMARTPHONE APPLICATION AND DASHBOARD FOR DEPRESSION (TOTEM)

Veerle Ross[1,2], Kris Brijs[1], Hélène Dirix[1], Geert Wets[1], An Neven[1], Yves Vanrompay[1], Neree Claes[3,4,5], Nele Jacobs[2,6]*

[1] UHasselt, School of Transportation Sciences, Transportation Research Institute (IMOB), Martelarenlaan 42, 3500 Hasselt, Belgium.
[2] FARESA Evidence-Based Psychological Centre, 3500 Hasselt.
[3] UHasselt, Faculty of Medicine and Life Sciences, Agoralaan, 3590 Diepenbeek, Belgium
[4] vzw Stijn dienstencentrum Sint-Gerardus, 3590 Diepenbeek, Belgium
[5] vzw Wit-Gele Kruis Limburg, 3600 Genk, Belgium
[6] VUB, Brussels School of Governance, Pleinlaan 2, 1050, Brussels

Abstract

Technological developments can optimize therapy for depression. However, early client or user involvement is crucial. The smartphone application and dashboard 'plaTfOrm using evidence-based inTervEntions for (Mental) health' (TOTEM), based on cognitive behavioral therapy and behavioral activation, is being developed together with clients from the start. Objective monitoring (e.g., activity/travel-related behavior) and human-in-the-loop AI machine learning allow tailored blended care, combining face-to-face therapy with online modules and Just-in-Time Adaptive Interventions. As a first co-creation step, clients with (prior) depression or depressive complaints and psychologists evaluated the usefulness of an existing Health for Travel Behaviour (HTB) application and feedback report developed for cardio patients, which monitors and improves travel-related physical activity. Online semi-structured interviews followed an HTB demonstration. In total, 16 interviews (14 clients and 2 psychologists) were transcribed and analyzed. Participants perceived the application as user-friendly, relevant, useful, attractive, and a supplement to standard care. It encourages people to engage in activities. The feedback report was also perceived as transparent, useful, and relevant. Emotional aspects are underemphasized (e.g., assessment of feelings and mental health-related psycho-education). When tailored to depression (with attention for different recovery phases), monitoring and improving travel-related physical activity was considered helpful in supplementing standard care for depression.

* Correspondence concerning this article should be addressed to Veerle Ross, UHasselt, School of Transportation Sciences, Transportation Research Institute (IMOB), Martelarenlaan 42, 3500 Hasselt, Belgium.
Email: veerle.ross@uhasselt.be

Keywords: Depression; digital mental health; digital therapeutics; smartphone applications; machine learning, just-in-time adaptive interventions; co-creation.

Depression is a leading cause of avoidable suffering worldwide. Nevertheless, the impact of depression on societal and economic development is not receiving sufficient attention, nor are adequate efforts being undertaken to avert and mitigate the negative consequences of depression (Herrman et al., 2022). Investments in mental health care have been reported to be scarce worldwide (Chisholm et al., 2016). When people suffering from a mental health condition such as depression want to seek help, they face important barriers, such as the stigma related to seeking help, shortage of well-trained clinicians, and issues with accessibility (Chisholm et al., 2016; Teepe et al., 2021). Pharmacotherapy is an important treatment for handling depression (Shinohara, 2019), which is considerably cheap (Richards et al., 2016; Shinohara et al., 2019). However, pharmacotherapy (e.g., anti-depressants) often comes with adverse side effects. For instance, relapse risk, emotional numbing, feelings of detachment, drowsiness, or even suicidality (Read & Williams, 2018; Richards et al., 2016). Moreover, a substantial part of the depressive population is unresponsive to anti-depressants, with estimations as high as 20-30% for major depressive disorder (MDD) (Gillain et al., 2022). The choice for drug treatment should not be taken lightly, only after applying well-established evidence-based therapies, and people not responding sufficiently (e.g., Cognitive Behavioral Therapy (CBT)). Unfortunately, waiting lists for such treatments can be long (Pedrelli et al., 2019), leading to too many untreated cases of depression and other mental health problems. The lack of appropriate support has detrimental consequences for the individual and their loved ones. Considering depression in young adults and adults, employers, insurers, health insurance and the government are affected as well (e.g., reduced productivity or job employment, increased expenses) (Chisholm et al., 2016). Therefore, existing therapy must be optimized to reach more people more effectively, with fewer resources.

How Technology Can Help To Optimize Therapy For Depression

Recent technological developments can optimize existing therapy by increasing access to care and reducing stigma since there is no need for physical attendance, with lower costs than face-to-face therapy (Baumel et al., 2020; Messner et al., 2019). However, technology for mental healthcare without a human component is challenged by issues with engagement, uptake, and adherence (Bevan Jones, 2020). Therefore, technology should not be used to replace but to supplement

standard care in the form of blended care, i.e., combining face-to-face therapy with online tools. Blended care allows therapists to reduce the number of face-to-face sessions, while clients can self-manage faster and more, increasing cost-effectiveness (Chandrashekar, 2018; Messner et al., 2019; Van der Vaart et al., 2014). As clients use the mental health applications between sessions, they need to be motivated to engage in using the application in an adequate/sufficient manner, especially at times without direct contact with the therapist. The strength and quality of the motivation for technology adoption can be stimulated by using real-time prompts, notifications, or gamification (Chandrashekar, 2018). Moreover, technology-enabled care allows digital phenotyping, i.e., an ecological form of information collection based, for instance, on app usage, screen time, sensors (e.g., GPS, accelerometer, wristband) and/or a digitized experience sampling method (ESM). This type of data collection allows inclusion of the daily life context of the client under treatment and his/her thoughts/feelings in that particular context (Daniëls et al., 2019; Insel, 2018; Mulvenna et al., 2021). As a result, detailed information about the client's complaints and possibilities and opportunities are available for analysis. Use of such information in between therapy sessions increases the effectiveness of an application, since treatment can be personalized and embedded in the daily life context, for instance in the form of micro-interventions that increase engagement with little burden on the client. Micro interventions are also referred to as just-in-time-adaptive-interventions in case they are based on decision rules that specify which intervention should be provided at which time, based on time-, user-, and/or environment-based information. These JITAI provide the needed type of support in real-time at the moment when it is most needed by monitoring vulnerability (i.e., the right time) and receptivity (i.e., availability) (Baumel et al., 2020; Hardeman et al., 2019; Nahum-Shani et al., 2018; Teepe et al., 2021). Importantly, JITAI should be evidence- and theory-based (Nahum-Shani et al., 2018). A recent review showed that the use of JITAI in applications for depression is still largely overlooked, therefore not allowing these applications to reach their full potential (Teepe et al., 2021).

Finally, to foster user involvement, or facilitate better user experience, co-creation throughout the design process is essential (Jones et al., 2020; Mansson et al., 2020; Van der Vaart et al., 2014). Co-creation or co-design refers to a process of partnership between users and stakeholders, allowing the technology development to match the needs and preferences of the target population. This process should apply to all technology-related aspects (e.g., content, accessibility, privacy, implementation), and in different phases, from a scoping or discovery phase to prototype evaluation, with opportunities for iteration (Jones et al., 2020).

'Platform Using Evidence-based Interventions For (Mental) Health' (TOTEM)

The online 'plaTfOrm using evidence-based inTervEntions for (Mental) health' (TOTEM) is developed to tackle a number of the above-described barriers to seeking and accepting care: accessibility (availability, affordability, acceptable time investment), low degree of self-management, and fear of stigmatization (Mojtabai et al. 2011). TOTEM combines a smartphone application and dashboard for people suffering from depression[†]. TOTEM is based on CBT principles, a collaborative, individualized, psychological therapy with long-term effects, that is empirically well-supported for a range of psychological issues, including depression (Hofmann et al., 2012; Richards et al., 2016). According to CBT, maladaptive cognitions contribute to maintaining emotional distress and behavioral problems. To address these maladaptive cognitions, CBT combines a variety of cognitive, behavioral, and emotion-focused techniques (e.g., cognitive restructuring) (Hofmann et al., 2012). One fundamental principle of CBT is behavioral activation (BA). BA aims to increase positive experiences by activity scheduling, including responsibility-related and recreational activities. These activities can produce both primary (e.g., enjoyment) and secondary benefits (e.g., extension of social support system). BA was effectively applied in depression, with indications that BA can be as effective as full CBT, even though it is easier to provide and with lower costs (Hopko et al., 2004; Jacobsen et al., 1996; Ly, Carlbring, & Andersson, 2012; Richards et al., 2016). Both CBT and BA have already been successfully offered via the internet or smartphone (Ly et al., 2012; Thase et al., 2020). The Intervention Mapping (IM) approach, a well-established framework for the planning of theory- and evidence-based interventions (Eldredge et al., 2016; Van Agteren et al., 2021), serves as a guide for: 1) the development of target variables that need to be monitored and changed to reach the health-promoting goals (e.g., think flexibly), 2) the selection of methods and techniques that need to be implemented to reach these targets and how they can be applied in the platform, and 3) the implementation and evaluation of the platform. As can be seen in Figure 1, the primary health outcome (i.e., depression severity) is believed to depend upon a set of health promoting goals (i.e., how flexible people act, feel and think) which require the performance of specific actions (e.g., travelling in a physically active manner, expressing emotions, observing thoughts). These so-called performance objectives (i.e., PO: what you need to do to attain the desired outcome) in turn,

[†] TOTEM is not designed for patients with severe depression who struggle with suicidal thoughts, as they require more intense face-to-face follow-up.

can only be achieved if the appropriate underlying determinants (e.g., attitude, skills, knowledge) are changed in the desired direction, which is what the term 'change objectives' refers to (i.e., CO: what needs to be accomplished to reach the PO). The Theoretical Domains Framework (TDF) was used as a guide to determine the more precise change objectives (Cane et al., 2012) while the Behaviour Change Techniques Taxonomy v1 (Michie et al., 2013) served as an evidence-based system for the selection of suitable behavioral change techniques.

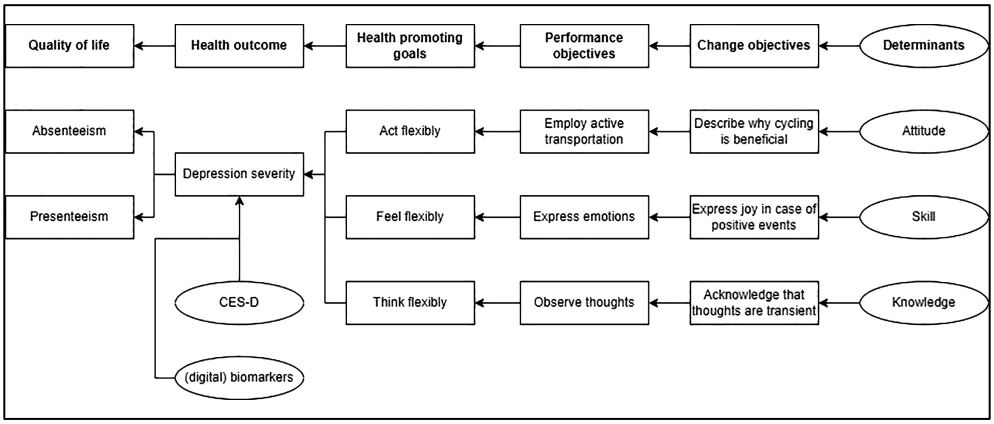

Figure 1. An Illustration of a Model of Change According to the IM Protocol

See Figure 2 for an illustration of the TOTEM platform. Inside TOTEM, the 'Profiler Unit': 1) collects (to-be-determined) (digital) biomarkers (i.e., quantifiable behaviors) that are derived from a set of features registered by the smartphone and sensors (e.g., how often the smartphone screen was on/off, GPS, accelerometer wristband). 2) monitors the current 'state' of the user (e.g., increased sedentary behavior or acute stress), and 3) predicts depression severity (Abdullah et al., 2016; Van Ballegooijen et al., 2014) by means of Ensemble learning, i.e., classification technique resulting in better predictive performance and higher accuracy than single algorithms (Aleem et al., 2022; Peng et al., 2017). Profiler Unit output serves as input for the therapist, e.g., to supplement his/her observation and judgment with contextualized information obtained via the smartphone (i.e., behavior/activities), sensors (e.g., indications of stress), and ESM (i.e., assessing thoughts and feelings). Additionally, output from the Profiler Unit serves as input for the 'Intervention Planner Unit'.

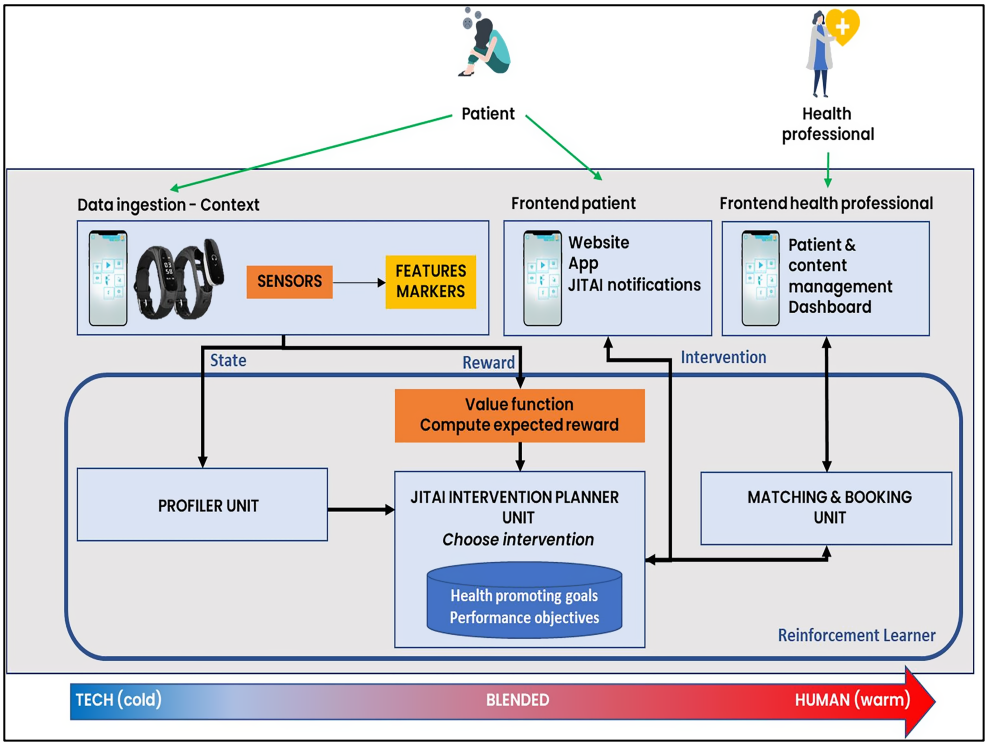

Figure 2. TOTEM Platform

The Intervention Planner Unit intelligently manages an 'Intervention Repository' which contains different types of intervention formats, ranging from more classic psycho-education modules or homework assignments, to so-called JITAI (i.e., compact prompts triggered by and tailored to momentary needs detected by the Profiler Unit). Selection of the most appropriate intervention format starts from a set of specific decision points and -rules (Nahum-Shani et al., 2018) that are initially based on expert opinion. Through reinforcement learning an algorithm discovers which combination of interventions works best, per user and context, by finding which activity output is the most rewarding over time (Akanksha et al., 2021). In terms of intervention selection and execution, a blended constellation uses both the Profiler Unit output and the therapist's judgment. As such, the therapist, or 'the human-in-the-loop', can follow up on the interventions and overrule propositions made by the algorithm that are considered inappropriate. In other words, the Intervention Planner Unit operates on input from both the Profiler Unit and the therapist in order to set up a knowledge base, serving future users and therapists as well. Finally, the TOTEM platform comes with a 'Matching and Booking Unit' that assists the therapist in planning of face-to-face sessions and online modules.

The combination of these sources of information allows the therapist to map the evolution of the depression severity and provide highly tailored blended care. For instance, based on the (detected narrowing of the) activity pattern, it can be determined that the client would benefit from following a module on behavioral activation. However, the information can also be used for face-to-face sessions. For example, the therapist can comment that high-stress levels are experienced during a particular activity, as indicated by smartphone and sensor data. Suppose the ESM data also suggests that the client reports negative thoughts during this activity. In that case, it is necessary to pay attention to this (after all, biological stress can also be positive). Perhaps it is possible to fill this activity differently, more positively. Or the platform could send tips or an encouraging message to the client before the activity. These JITAI can also encourage clients to complete their homework.

Aims

This study describes the first step of a co-creation development process in which end-users (i.e., clients with depression/depressive complaints) and experts (e.g., psychologists) evaluated the usefulness of an existing smartphone Health for Travel Behaviour (HTB) application and feedback report. The HTB app was initially developed for cardiac patients and allows monitoring and improvement of travel-related physical activity, which aligns with the principles of behavioral activation via transport-related behavior from the TOTEM platform (Batool et al., 2018, 2022). The clients with depression/depressive complaints and psychologists assessed the usefulness of active transportation to increase activity levels in depression. Special attention was given to topics such as usability, gamification as a behavioral change technique, and different phases of recovery in depression (i.e., onset, improvement, and recovery).

Methods

Interviews and Procedure

After signing a consent form, participants filled a demographics questionnaire and a standard questionnaire for depression diagnosis (i.e., Center for Epidemiologic Studies Depression Scale (CES-D), score ≥16; ICC≥.70) (Devins et al., 1988; Vilagut et al., 2016). Due to the COVID-19 pandemic, it was not possible to have the application actively tested by participants. Therefore, online presentations demonstrating the HTB application and feedback report were held instead. The presentation included the following sections: (1) an introduction (e.g., background information and goals), (2) the HTB application (e.g., example screens, information about the functionalities, required actions, etc.), and (3) the feedback report (e.g., discussion per section, complete overview, etc.). After the presentations,

semi-structured interviews were conducted. A prospective perspective was used because participants did not formulate their opinions based on actual user experience.

Sample

Two participant groups were recruited through criterion and convenience sampling to obtain a purposive sample. The first group (n = 14) consisted of clients who had previously received treatment, or were currently under active treatment, for depression or depressive symptoms by a psychologist from an ambulant private clinical practice. The following inclusion criteria were set: 1) Must have or have had depressive symptoms in the past six months, 2) Over 18 years of age, 3) Ongoing or completed treatment with a psychologist, 4) No serious suicidal risk, and 5) No bipolar diagnosis.

The second target group that was included consisted of psychologists, experts, and/or therapists (n = 2); only one inclusion criterion was used: currently working with depressive clients as a psychologist/therapist.

The primary focus of the study was on the client population. No exact number of participants that needed to be included was prespecified. Interviews were conducted until no new themes or topics emerged (i.e., data saturation). Therapists were recruited to provide additional opinions on the app and feedback report because of their relevant expertise.

Table 1. Overview of the Depression Group's Demographics

	Depression group (n = 14)	**Males (n = 4)**	**Females (n = 10)**
Age group, n (%)			
18 – 30 years old	3 (21.4%)	-	3 (30%)
31 – 45 years old	3 (21.4%)	2 (50%)	1 (10%)
46 – 60 years old	8 (57.2%)	2 (52%)	6 (60%)
Living situation, n (%)			
Alone	3 (21.4%)	-	3 (30%)
With partner, no children	4 (28.6%)	-	4 (40%)
With partner and children	2 (14.3%)	1 (25%)	1 (10%)
With parents	4 (28.6%)	2 (50%)	2 (20%)
Other	1 (7.1%)	1 (25%)	-
Work situation, n (%)			
Student	2 (14.3%)	-	2 (20%)
Part-time	1 (7.1%)	1 (25%)	-
Full-time	6 (42.9%)	3 (75%)	3 (30%)
Temporary sick leave	2 (14.3%)	-	2 (20%)
Permanent sick leave	2 (14.3%)	-	2 (20%)
Other	1 (7.1%)	-	1 (10%)
CES-D score			
Range	3 – 45	11 – 33	3 – 45
Mean score (X ± SD)	23.5 (11.148)	21.25 (9.032)	24.4 (12.123)

Table 2. Overview of Signs and Symptoms Experienced by Participants during Depressive Episodes

	Group	Males	Females
Drowsiness	13 (92.9%)	3 (75%)	10 (100%)
Loss of interest	9 (64.3%)	3 (75%)	6 (60%)
Feeling worthless and hopeless	12 (85.7%)	3 (75%)	9 (90%)
Sleep issues	11 (78.6%)	3 (75%)	8 (80%)
Weight change	4 (28.6%)	1 (25%)	3 (30%)
Panic and anxiety	11 (78.6%)	3 (75%)	8 (80%)
Easily irritable	9 (64.3%)	2 (50%)	7 (70%)
Restlessness or tardiness	12 (85.7%)	2 (50%)	10 (100%)
Indecisiveness	10 (71.4%)	2 (50%)	8 (80%)
Feeling guilty	9 (64.3%)	2 (50%)	7 (70%)
Memory and/or concentration issues	8 (57.1%)	2 (50%)	6 (60%)
Neglect of social contacts	9 (64.3%)	1 (25%)	8 (80%)
Suicidal thoughts	6 (42.9%)	1 (25%)	5 (50%)
Emotional outbursts	7 (50%)	1 (25%)	6 (60%)
Fatigue and low energy	11 (78.6%)	4 (100%)	7 (70%)

Health for Travel Behaviour (HTB) Application and Feedback Report

The HTB application (Figure 3) monitors travel behavior by collecting: 1) GPS-based location data of the trips and activities performed throughout the day, 2) Duration, start- and end-time of the activities and trips that are executed throughout the day, 3) Detection of the used transport mode: motorized transport, cycling, and walking (but unable to correctly distinguish between different types of motorized transport modes, such as car, bus, or motorcycle), and 4) Covered distance during the trips. Moreover, three additional parameters are manually provided by the patient: 1) activity type (e.g., home, work, shopping), travel partner (e.g., spouse, friends), and motorized transport mode (e.g., car driver, car passenger) (Batool et al., 2022).

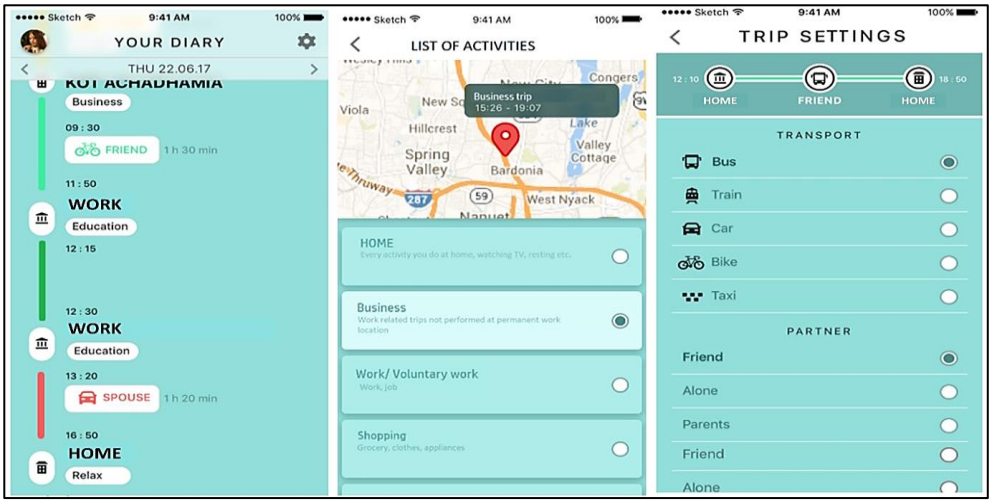

Figure 3. HTB Interface

A feedback report is generated based on monitoring data of each individual for three weeks, summarizing the duration, distance, and weekly frequency of active transportation mode trips (i.e., walking and cycling). The Active Travel Score (ATS) is reported as well, defined as the physical activity gained by using active transportation modes. Physical activity is defined as the energy cost or amount of oxygen consumed during rest (i.e., Metabolic Equivalent (MET)). The ATS is based on the standard recommendation of 150 min/week of moderate-intensity physical activity spread over 5 days. Calculated for a week, the ATS ranges from 7.5 to 15 Kcal/w*kg. The algorithm allocated each patient to one of the following categories: 1) inactive, 2) low active, 3) sufficiently active, 4) active, and 5) highly active. The report also compares the category allocation with that of peers, allowing the user to check if they perform below or above average. Furthermore, the report included the simple home-based trips (i.e., home-activity-home) executed as driver or passenger, taxi or motorcycle, that could be replaced by active transport, together with the impact on the ATS (Batool et al., 2018, 2022). For more detailed information on the calculation of the ATS score and the definition of simple home-based trips, we refer to (Batool et al., 2022).

The content of the feedback report was based on the transtheoretical model of change (TTM), containing Stages of Change (SOC) and Processes of Change (POC). The included SOC referred to: Pre-contemplation (i.e., when people are still unaware and thus do not acknowledge any problem), Contemplation (i.e., people realize what the benefits of behavior change can be, but the costs of change are considered as being too high), Preparation (i.e., the decision for future change is made, together with small steps towards the set goal), Action (i.e., people are now actively changing their behavior or acquiring desired behavior) and Maintenance (i.e., the required behavior change is not only established but also maintained over time) (Prochaska & DiClemente, 1983). The POC refer to strategies used for changing behavior while progressing through the SOC. Experiential processes are typically considered successful in the earlier SOC and refer to perceptions, thoughts, or feelings concerning the behavior (e.g., thinking about consequences). Meanwhile, behavioral processes are considered successful in the later SOC and refer to observable situational and social strategies (e.g., controlling environmental cues). In the current version of the HTB feedback report, the POC are included without considering the respective SOC. This approach was followed to check whether people in certain SOC indeed prefer the POC as suggested by literature. However, it is also possible to measure their respective SOC and only include POC based on the respective stage. Besides containing information that should support the SOC (e.g., facts concerning the benefits of active transportation and support for setting goals), the HTB feedback report included some fixed parts that include psycho-education concerning the health benefits of travel-related physical activity. The remaining sections related to user's individual performance: physical activity level from active transport, encouraging comments linked to their ATS score, and the impact of trips that could potentially be replaced with active transport (Batool et al., 2018, 2022).

Analyses

A topic list was drafted containing all themes considered relevant for the further development of the application and the feedback report in relation to depression disorders. Based on this topic list, a semi-structured interview guideline (Appendix 1) was prepared to ensure that all predetermined topics were covered during the interview.

The interviews were analyzed using the deductive thematic analysis method. The thematic analysis method allows for identification, analysis, and reporting of themes in one's data (Braun & Clarke, 2008). Themes can be analyzed in two ways, deductively (e.g., Merriman et al., 2021) and inductively (e.g., Herrick et al., 2020). The deductive thematic analysis is a top-down coding approach that starts from a predetermined set of codes because one expects to find information about them in the data (Saldana, 2013). Accordingly, the topics predetermined at the start of the study were used as an initial set of codes during the analyses. Even though the original codebook changed during the coding (i.e., some codes were restructured, some codes were removed, and new codes were added), the codebook still reflected the data structure, which is considered very important (Si & Hubbard, 2021).

After the interviews, data processing was based on the thematic analysis method of Braun & Clarke (2008): 1) Data familiarization: transcribing and reading the data, writing down non-verbal clues, 2) Generating initial codes: code larger sections with a broad code name and write down notes, 3) Searching for themes: merge different codes into one potential theme, 4) Reviewing themes: check if the themes still relate to the initial coding and study purpose, 5) Final themes: decide on the final themes and matching names, and 6) Producing the report: preparing a report disclosing the findings, related to the research questions.

After conducting the qualitative analyses, some descriptive statistics were calculated (e.g., age, gender, living situation, etc.). These statistics are included in the results section to allow readers to assess the generalizability of the findings (Gibbs et al., 2007).

Results

This section first presents the results for the client group, followed by those for the therapists. For both groups, the following themes will be discussed: (1) application-related topics, (2) depression-related topics linked to the application, (3) modifications to the application in function of depression-related characteristics, (4) feedback report-related topics, (5) depression-related topics linked to the feedback report and (6) modifications to the feedback report in function of the depression-related characteristics. Each theme is then further divided into subthemes like user-friendliness, perceived usefulness, etc.

Client

Application

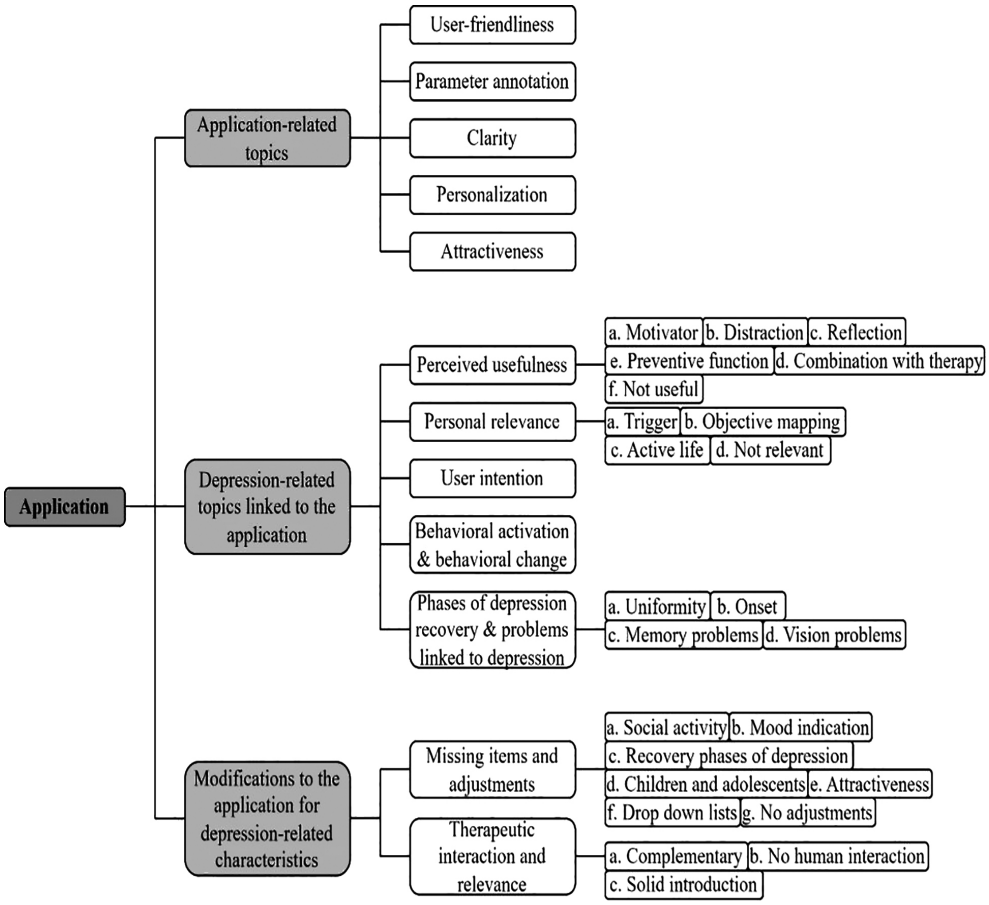

Figure 4. Schematic Overview of Application Themes – Clients

At the beginning of each interview, participants were asked to score the application between 0 and 10. All scores ranged from 6 to 10, averaging 7.75/10. Participants stated that the app gave a professional impression but is currently focusing heavily on the physical aspect. Some participants also noted that in the beginning, it would not be easy for them to use the app because of their limited technological knowledge.

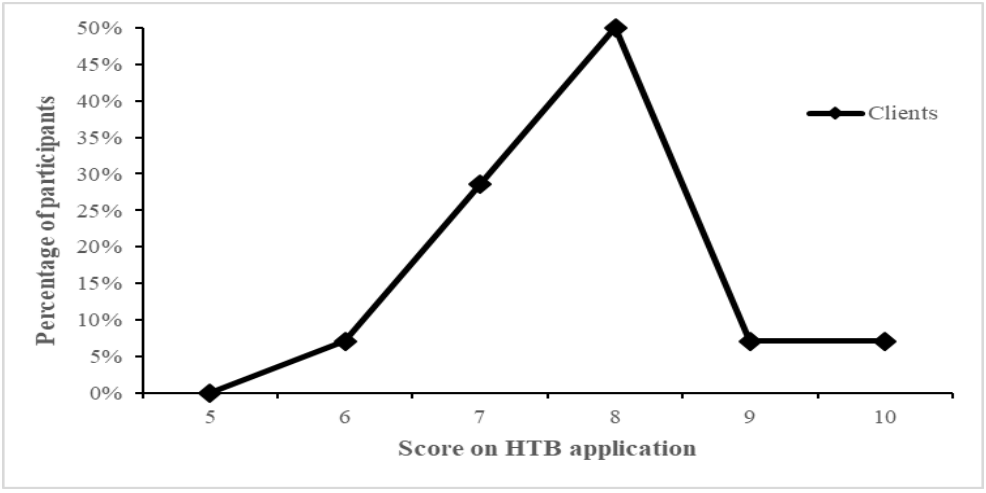

Figure 5. Overall Score on the HTB Application

Note. This graph demonstrates the percentage of client participants for each given score out of ten on the HTB application (n = 14).

Application-related topics

User-friendliness. All participants stated that the app looks user friendly. The two most prominent reasons to support this were: (1) the daily trip- timeline is already created automatically, and (2) there is not much to enter yourself. Furthermore, the app also appears to be quite learnable. A few older participants commented that it might take them some more time to use the application properly.

Parameter annotation. When the daily trip-timeline needs to be completed, participants can select most of the information from drop-down lists which limits the average completion time to a few minutes per day, which was appreciated. Some also indicated that it would make them more likely to fill in the timeline, even in the beginning or onset phase.

Some participants were somewhat concerned that the timeline could only be completed the day after since memory problems are a common depression symptom. On the one hand, people might forget completing the timeline, on the other hand, correctly reconstructing trip history from the day before can be challenging. Participants would prefer more flexibility in terms of when to fill out the trip timeline.

Clarity. All participants perceived the application as clear and well-organized. It immediately provides a clear representation of the timeline, and there is no need to search for relevant items which makes the application accessible to all persons (i.e., those with much or little knowledge of technology). Suppose the application is to be modified to suit Participants recommend that, for people with

depression as the targeted users, not too many elements should be added to maintain the current level of clarity.

Personalization. None of the participants considered personalization a decisive factor for using the application in the future. About half of the participants did not think it was necessary at all while the other half would appreciate an option to adjust color, icons, and/or font to personal preference. A few commented they would not be interested in personalizing the app in the early phases of recovery since it would cost too much energy.

Attractiveness. Opinions in terms of appeal were divided with half of them stating they found the application sufficiently attractive, the majority of these being participants saying personalization was not necessary. Others indicated the application could be a bit more colorful and with additional visual elements to avoid it looks a bit monotonous.

Depression-related topics linked to the application

Perceived usefulness.

Motivator. The application may have a motivating function in an individual's recovery process because it can objectively show a person's progress. Moreover, one might want to travel more actively because the app records it. However, some indicated that there is a high possibility that the application would lack of a sufficient motivating effect in the initial phase of recovery.

Distraction. Having to fill out the application can distract from somber thoughts as it requires thinking about what one did yesterday or the previous days. It also helps one to come up with ideas on how to travel more actively.

Reflection. It can be helpful for individuals to see what they have been doing recently. On the one hand, this can be confrontational and will encourage changes in behavior. On the other hand, the app can show improvement and correct biased opinions in the case happening.

Combination with therapy. Some participants indicated that the app would only be helpful if used in treatment, especially in the onset. The data should be further discussed with the therapist, and the treatment adjusted accordingly.

Preventive function. The application can be helpful in recovery. When a person is already in the recovery phase, the application can detect relapses more quickly, meaning it can also have a preventive function.

Not useful. two participants indicated that they did not see the application's usefulness.

Personal relevance.

Trigger. Many participants indicated that the application could motivate them to go outside on difficult days and also remind them that it is vital to keep doing things, yet, to a lesser extent in the early phases of depression recovery according to some of the respondents.

Objective mapping. Some participants would use the app to objectively map themselves because they tend to view everything more negatively. The app could support them to drift less likely into negative thoughts.

Active life. Some participants are already highly active, exercising, counting their steps, etc., all activities they would also like to track in the app. Others indicated that walking was an outlet during their depression and that the app fits well with that too.

Not relevant. The two participants who did not consider the application useful also indicated that the application would not be relevant to them. However, they were open to revising their opinions in the event of future modifications.

User intention. The majority of the participants would want to use the application, should it be currently available for download. Even in the recovery phase, some would still be inclined to use it as it can be a certain form of control. Others, in turn, were not convinced to use the application for various reasons, such as not using applications much, being too lazy, or not seeing the use of it.

Behavioral activation and behavioral change. According to most participants, the application can be behavior-activating because it may motivate and trigger clients to travel more actively. Furthermore, it clearly maps out where there is still room for improvement. However, participants indicated that there are also some prerequisites for using the app and to achieve behavioral activation such as a sufficient amount of notifications and reminders, therapist involvement in the follow-up, and avoidance of people overdosing themselves with too much and/or too heavy challenges.

Phases of depression recovery & problems linked to depression.

Uniformity. Most participants felt the app should not be tailored in function of the recovery phase. A uniform app creates a familiar environment, and participants felt that was more important. Many indicated that it is important not to start with the application independently, especially in the beginning, but to always do so in consultation with a therapist. When entering recovery, guidance can be adjusted accordingly.

Onset. some participants indicated it would be best to keep the application as simple as possible, certainly in the beginning to prevent people would drop out due to worries in terms of time and effort needed to complete the travel diary correctly and regularly.

Memory problems. Memory difficulties are an often-reported problem among people with depression. The majority of the participants believed it crucial that notifications remind them to complete their timeline.

Vision problems. Persons with depression may also experience temporary problems with their vision. The ability to adjust text size could for instance be helpful in this regard.

Modifications to the application for depression-related characteristics

Missing items and adjustments.

Social activity. An exclusive focus on active traveling may not be sufficiently recovery-enhancing for persons with depression problems, social contacts are also important. The application should allow collection of information about what activity one did and with whom, and this data should also be incorporated into the feedback report.

Mood indication. Individual mood should be questioned one or several times a day, for instance requesting individuals to give a score on a scale (e.g., 7-point Likert scale) in terms of how they feel. The option of adding additional information would be helpful, but not be made mandatory.

Recovery phases of depression. For some participants, it should be possible to adjust how much information should be entered into the app, depending on the phase. If the application cannot be adapted, it is recommended to start by partly filling out the application and to systematically build this up (e.g., first week: one displacement, second week: two, etc.).

Children and adolescents. Two participants commented that it might be interesting to create two versions of the app, one for adults and one for children and adolescents. Most of them are technology-minded, so that the app could be a valuable addition to their treatment.

*Attractiveness. S*ome participants would appreciate opportunities to customize certain aspects of the app, such as color, layout, font, etc. Also, more graphical elements could be added to increase its attractiveness.

Drop-down lists. Some participants commented that not all modes of transportation are currently included in the drop-down lists. However, this may be relevant for the monitoring of social activities are (e.g., airplane, scooter, etc.). Thus, the application should provide an option where users can add options to the drop-down lists.

No adjustments. Two participants considered the app useful in its current form and did not need additional modifications.

Therapeutic interaction and relevance.

Complementary. Most participants indicated that the application should always be combined with therapy. Several reasons are given for this: (1) the app is not going to be used enough without a therapist, (2) human interaction is essential for recovery from depression, and (3) the application can be a good starting point for conversation.

No human interaction. Some participants are more in favor of separating face-to-face therapy from the application because not everyone needs therapeutic interaction to the same extent. Since the app may also have a preventive function, there is a possibility that people may not be in therapy when using the app. However,

if wanted or needed, a user can still decide to provide the report to the therapist after some time and start working with it.

Solid introduction. Some participants felt it is the therapist's job to explain the application clearly and help them get started, if not, some people might quickly stop using it.

Feedback Report

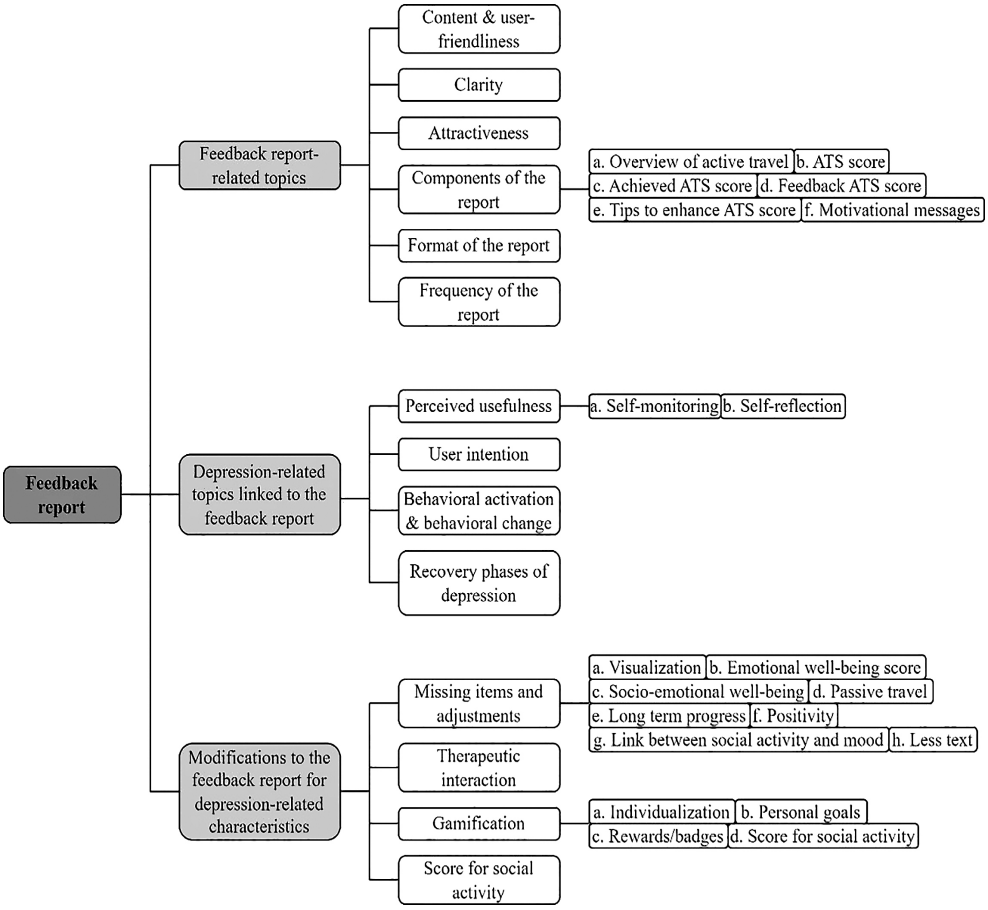

Figure 6. Schematic Overview of Feedback Report Themes – Clients

Participants gave the feedback report an average score of 7.3 out of 10. The primary focus of the report was on the physical implications of increased activity levels with little emphasis on social activities or emotional aspects of depression. This will probably have affected the evaluation of the feedback report.

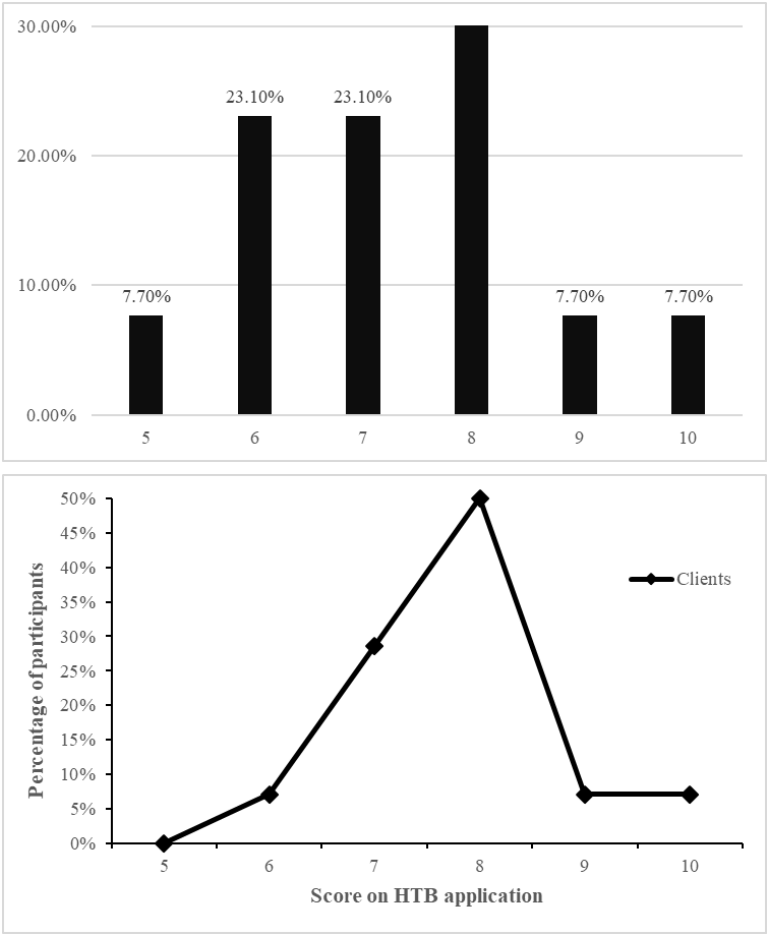

Figure 7. Overall Score on the Feedback Report

Note. This graph demonstrates the percentage of client participants for each given score out of ten on the feedback report (n = 14).

Feedback report-related topics

Content & user-friendliness. The overall impression was that the report currently focuses too much on the physical aspect of recovery, without attention for the mental, emotional and social aspects. Nevertheless, the report is clear according to most participants and contains suggestions that can be implemented immediately.

Clarity. Most participants felt that the report is clear and well-organized. It clearly shows what is important and uses well-known icons. Furthermore, subdivision into different sections was positively evaluated since it improves searchability of information. Also in terms of accessibility, the reported scored well,

albeit some participants indicated that it contained too much text sometimes which generated a loss of interest.

Attractiveness. All but two participants indicated that the visuals included in the report could be further improved for instance, through the addition of color and graphics in combination with less textual information. These comments explain why some participants felt that the report was not that appealing.

Report structure.

Overview of active travel. Opinions were strongly divided. Some found it pleasing that only the active trips were included in the overview, while others found that the passive trips should also be included. After all, these can also contribute to recovery; for example, a passive trip can serve a social function.

ATS score. Has a clear structure and is also nicely presented from a visual point of view. Moreover, it may motivate people to travel in a physically more active way. However, the score range was considered too narrow. As a result, improving the score may sometimes be difficult, resulting in the score being demotivating rather than motivating. Furthermore, the current score is only about active travel, which might be a too narrow approach in the context of depression treatment.

Achieved ATS score. Participants unanimously agreed that the group score should not be included in the report as it can be confrontational and stressful for clients. It felt too much like a competition.

Feedback ATS score. Formulation of feedback on the ATS score is described as too negative. In the early phases of depression recovery, it can be tough to do anything that will prevent a person from achieving a high ATS score. Nonetheless, positive reinforcement is highly important during that time.

Tips to enhance the ATS score. Participants were enthusiastic about this part of the report, especially about the usefulness of tips on how to get started. Furthermore, this section was attractive because it contains more visual elements and concisely conveys the message.

Motivational messages. Currently, the motivational messages focus too much on the physical aspect and not enough on the mental and social aspects of depression. Participants did agree that the motivational messages should continue to have a prominent place in the report, although increased levels of personal tailoring would be appreciated.

Format of the report. Participants are satisfied with the report being sent by email because it allows them to choose with whom they want to share the report, and they can do so easily. An important condition, however, is the dosing of those messages, i.e., how regularly these mails are sent.

Frequency of the report. The vast majority of participants felt that users should be able to decide for themselves how often they want to receive a report. The volume should be determined based on personal preference and depression severity. Moreover, there should be a minimum number of days between each report so that sufficient progress can be made.

Depression-related topics linked to the feedback report

Perceived usefulness.

Self-monitoring. The report may motivate persons with depression to keep doing things or to begin doing things again. It clearly demonstrates where improvement is needed and possible and may help people regain control. Using the scores and statistics, the report also allows individuals to see progress over time which can be an additional motivating factor.

Self-reflection. The report may help people see why engaging in physical activity is important and make them reflect on their actions.

User intention. Most participants would like to make active use of the feedback report. Some indicated that they would read the report in its entirety each time, while others would only read the entire report the first time and, from then on, only those parts they consider relevant. Three people indicated they had no intention of using the feedback report in its current version. However, they would use it when tailored more towards depression.

Behavioral activation and behavioral change. According to most participants, the feedback report can be behaviorally activating as it may motivate and trigger clients to travel more actively and achieve better scores. However, it is important to add more explicit links with the emotional and social aspects of depression. As a result, a person's self-awareness can be increased, which may increase intervention effectiveness. Finally, some participants mentioned that the feedback report could stimulate behavioral activation and change but to a more limited extent in the onset phase where even small progress requires big effort.

Recovery phases of depression. Half of the participants believed the report should not be tailored in function of recovery phases. Similarity creates uniformity and support. Depending on the current situation, people could choose to ignore some report sections. The other participants felt the report should be adapted in the beginning because it can be overwhelming, with too many distracting factors. According to them, it is better to progressively add report sections report instead of providing all the information at once.

Modifications to the feedback report for depression-related characteristics

Missing items and adjustments.

Visualization. The report contains too much text and not enough visuals and color. By adding these elements, people may find the report more appealing and work with it more.

Emotional well-being score. Collection of mood-related data and calculation of an emotion-related score included in the feedback report would be an essential addition..

Socio-emotional well-being. The report should also account for users' socio-emotional well-being and elaborate on this, for example, in the tips and motivational messages. Participants mentioned they would be willing to work on this particular aspect, if it would be possible to follow up on it via the feedback report.

Passive travel. Passive traveling for social purposes should be included in the feedback report as it may help to promote recovery.

Long-term progress. Currently, the report only shows the ATS score of the past period. To remain motivated, it is recommended to show progression over a more extended period (e.g., three months, a year, etc.). Most participants indicated that this progress is best shown as a graph so it can be understood at a glance.

Positivity. The tone of voice of the report is currently rather negative. Messages should be rephrased in a friendlier and more encouraging manner. Less or slower progress should also be positively endorsed. Areas for improvement should be communicated as well, but always in a positively reinforcing frame.

Link between social activity and mood. Inclusion of the correlation between activities and mood states would give clients more insight into their functioning and feelings, which may stimulate behavioral change.

Less text. The report currently contains too much textual information. Less text and more graphics would increase willingness to engage with the feedback report.

Therapeutic interaction. Most participants agreed that discussing the report with their therapist would be best. This allows the client to gain more insight into his/her own functioning by putting things in the proper perspective. Furthermore, the therapist can help determine which parts of the report may be relevant at that moment, and personal goals can be linked to the report. Finally, all participants agreed that the report should only be sent to the client and that the client should be able to choose whether or not to share it with the therapist.

Gamification.

Individualization. Opinions were strongly divided for gamification features. Autonomy on the side of users in terms of which features to use and which not was important.

Personal goals. According to participants, personal goals should not be mandatorily imposed and be discussed with the therapist so that they are adequately tailored to the individual. Poorly aligned goals may lead to increased stress and pressure, which may negatively affect the recovery process.

Rewards/badges. Opinions on receiving rewards or being able to collect badges are divided. Some participants did not see the added value while others thought it could be symbolically motivating. Badge collection should not be stressful, but encouraging.

Ranking and group goals. Most participants agreed that adding rankings and group goals is not suited in the context of a depression recovery process. It may demotivate people if they perform worse than other group members and create pressure to perform.

Online forum. An online forum can make clients feel less alone, enable them to get in touch with peers, and exchange tips and tricks. Essential for this to be successful is that such a forum must be strictly monitored so that no unwanted or

false messages can be posted and that users do not begin to take on a therapeutic role.

Score for social activity.

For the majority, it was unsure what this should look like. Additionally, most thought it would not be easy to score social activity since the need for it differs between persons. Some participants suggested that instead of assigning a score, it would be better to focus on the relationship between social activity and mood. Therapeutic conversations could then be based on these relationships, and the treatment plan could be adjusted accordingly.

Therapists

Application

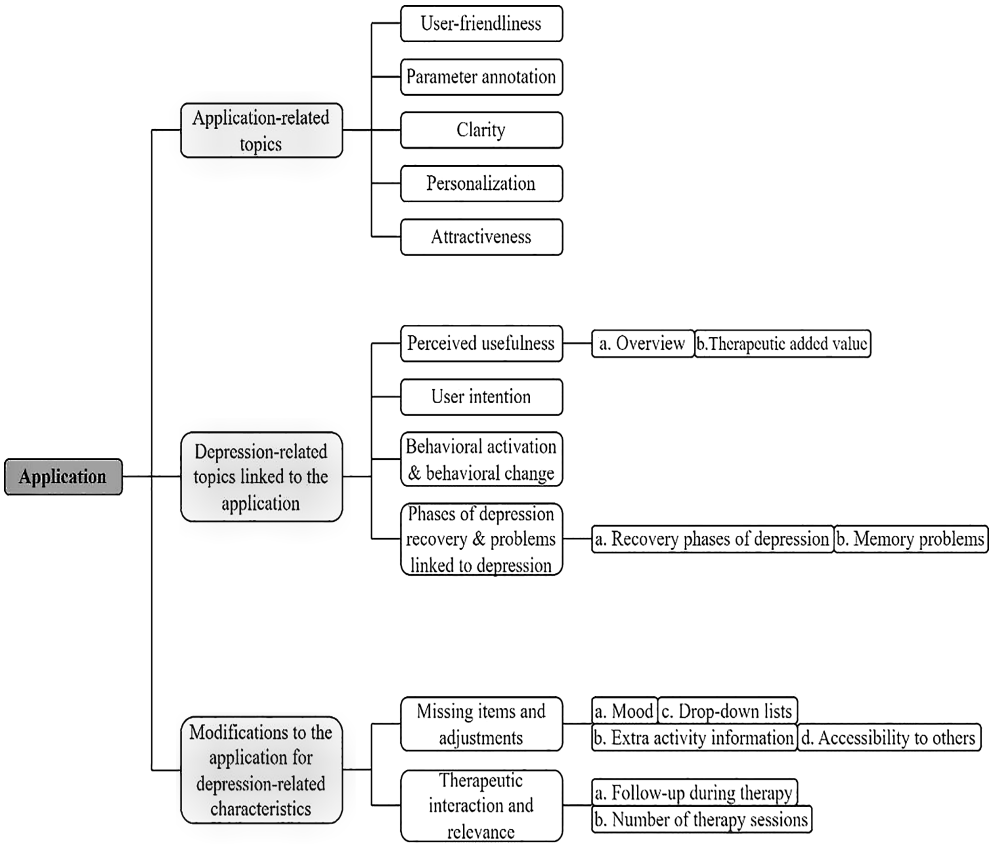

Figure 8. Schematic Overview of Application Themes – Therapists

Immediately after the presentation, participants were asked to score the application in its current form from 0 to 10. The therapists gave an average score of

7.5 out of 10 as the application may be useful, but only targets a partial portion of depression.

Application-related topics

User-friendliness. The app is very user-friendly. It contains a lot of information and is very easy to use as you do not need to add much information next to the drop-down menus.

Parameter annotation. Clients need to spend a few minutes per day to update their timelines. The primary use of drop-down menus was positive because it significantly facilitates the process. However, it might be problematic for clients with memory problems that the timeline can only be completed one day later.

Clarity. Both therapists reported that the application was very clear. Only the color coding was not entirely clear to one therapist, and should be explained better.

Personalization. At the moment, the application is not customizable. According to the therapists, it would be nice to configure some aspects to the client's preferences, such as color and font. However, it was certainly not a necessity.

Attractiveness. According to both therapists, the application contains a good balance between simplicity and attractiveness. Since color and shapes are used, it is sufficiently appealing. If changes are made to the application in the future, it is critical to carefully monitor the balance between simplicity and attractiveness to avoid overstimulating clients.

Depression-related topics linked to the application

Perceived usefulness.

Overview. The application clearly displays all active movements at a glance. This may be helpful to clients as it allows to maintain better overview, achieving greater self-awareness.

Therapeutic added value. Nowadays, clients are often asked to monitor their entire day with pen and paper. However, the application is much more efficient and discrete. Afterward, the information from the application could be a starting point during therapy to ask specific questions and tailor therapeutic interventions to a person's activities.

User intention. Both therapists were open to using the application in therapy. If the application were available, they would recommend it to their clients.

Behavioral activation and behavioral change. The app itself will not result in behavioral activation and/or behavioral change, but will instead have a supportive function. Nevertheless, in case the therapist asks questions about the data in the application, it may result in increased self-awareness on behalf of the client, which in turn may positively affect behavioral activation. The application requires a certain level of commitment. As a result, the clients are more involved in the recovery process and can regain control over their situation.

Recovery phases of depression & problems linked to depression.

Recovery phases of depression. To preserve uniformity, the therapists believed that it is unnecessary to adapt the app to the phases. However, the use of the application should differ depending on the phase. For example, initially, only complete one activity per day. Put differently, the counseling that accompanies the application should be adapted to the phases.

Memory problems. Memory problems are common in persons with depression. Therefore, they need optional reminders and notifications, reminding them to complete the required information. Otherwise, many could forget to complete their timeline.

Modifications to the application for depression-related characteristics

Missing items and adjustments.

Mood. Once or several times a day, the application should assess how a person feels or has felt throughout the day. With this information, therapists can tailor their questions. Over time, it may be possible to see connections between activities and state of mind. The therapists disagreed on whether adding additional, optional information to this assessment should be possible. On the one hand, it may provide further clues during therapy; on the other hand, it may lead to internal speculation in the client, which can hinder the recovery process.

Extra activity information. The app should permit adding more details to the completed activities. Currently, it monitors where a person travels to and with whom. It also monitors the type of activity (e.g., working, social activity, etc.). However, it does not specify what activity specifically was undertaken (e.g., shopping, eating out, etc.), not with whom. Not only physical activity but also social activity is vital for recovering from depression, and linking these two together would, therefore, make the app much better suited for the target group.

Drop-down lists. Participants should be able to add locations, etc., in addition to the drop-down lists. This increases the ease of use of the application.

Accessibility to others. The application may contain sensitive information about a person, which can lead to suspicion from the users. In addition, it is possible that clients do not want their partner, family, etc., to be able to see what is being entered in the application. It should be made possible to make certain data, or the application itself, inaccessible to others.

Therapeutic interaction and relevance.

Follow-up during therapy. The application and the therapy are complementary but cannot replace each other. The data from the application can be used to guide the therapy. At the start, clear agreements about the follow-up need to be set, to avoid unrealistic expectations (e.g., the therapist cannot monitor every client daily outside the therapy sessions).

Number of therapy sessions. Although the app cannot replace therapy, individuals may need fewer therapy sessions at a later recovery phase, due to self-monitoring via the app.

Feedback Report

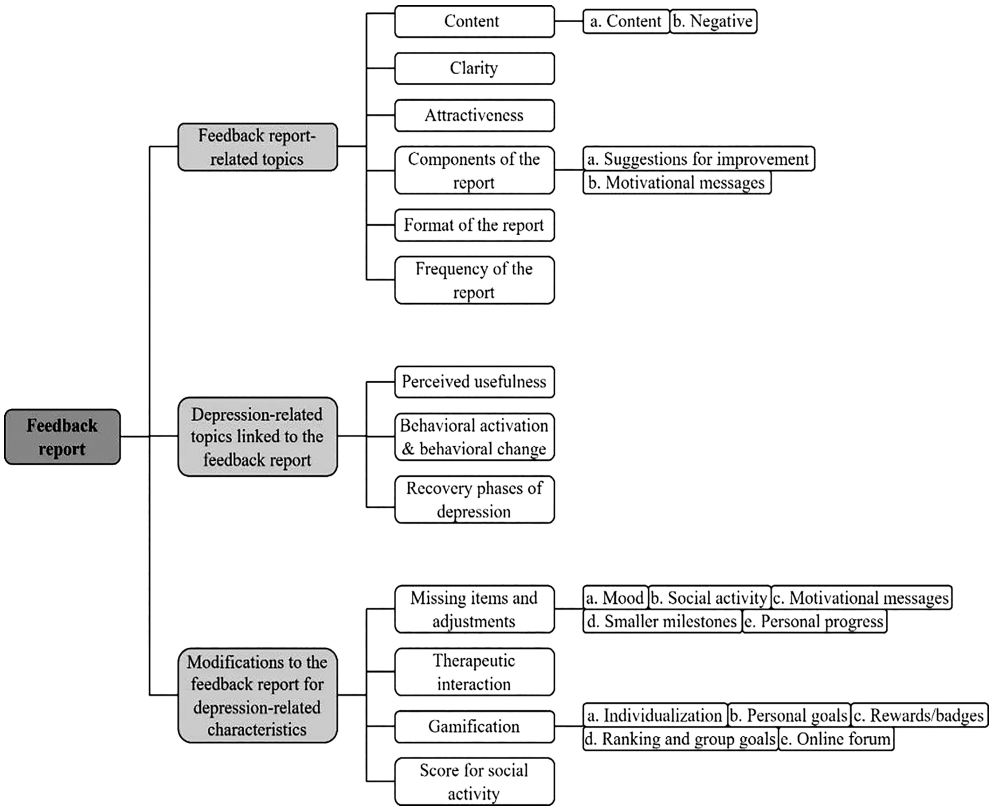

Figure 9. Schematic Overview of Feedback Report Themes – Therapists

As with the overall score for the application, therapists also give an average score of 7.5/10 on the feedback report. Adjustments are needed as physical activity is only a part of depression.

Feedback report-related topics

Content.

Content. The therapists found that the report insufficiently focused on depression-related characteristics, as physical activity is only a part of depression.

Negative. The messages in the report are being conveyed too negatively. In the recovery process from depression, positive reinforcement is essential, which is not sufficiently included in the report.

Clarity. The report in its current form is straightforward, both visually and content-wise. It presents everything quickly and clearly without much distraction.

Attractiveness.

The report is supported by pictograms and different colors, making it visually appealing. Yet again, caution must be taken with report modification, so that clients are not overstimulated.

Components of the report.

Suggestions for improvement. This section is very useful according to the therapists; clients can immediately get started with this, which lowers the barrier to getting started.

Motivational messages. Currently, these do not adequately address emotional and psychological aspects of depression. Changing these messages is necessary.

Format of the report. It was good that the report is sent to the client via email. In fact, if the report is only available in the application, it could be overlooked. Furthermore, a PDF document is larger and easier to read. Lastly, the report is easy to forward via email, making it more convenient for the client to provide it to the therapist.

Frequency of the report. The therapists disagreed with each other on the frequency of the feedback report. One liked to receive the report on a weekly basis. In contrast, the other thought that it should be adapted to the current recovery phase a person is in. Someone in the later recovery phase needs less intensive follow-up, and thus less frequent reports.

Depression-related topics linked to the feedback report

Perceived usefulness. The feedback report currently lacks some essential sections to make it sufficiently useful for persons with depression issues. Meaningful and social activities, combines with state of mood also need to be addressed.

Behavioral activation and behavioral change. In its current form, the report will not lead to behavioral activation and/or change. However, it has a supportive role. Clients themselves need to put less effort into keeping track of everything and will also be stimulated by the report to think about their own recovery. Combined with therapy, this may lead to behavioral activation and/or change. Again, it should be noted that the report would be much more effective when more attention is being paid to a person's mood and activities.

Recovery phases of depression. As with the application, the therapists preferred a uniform report that is not adapted to the phase a person is in. Again, the therapist can discuss with the client how and to what extent the report will be used, adjusting therapy accordingly.

Modifications to the feedback report for depression-related characteristics

Missing items and adjustments.

Mood. The report should also include some sort of mood score based on the – yet to be included – assessments in the app (i.e., an average score of all the measures, not a score calculated based on the person's activities). In the slightly longer term, the report could then also include correlations between mood and activity (e.g., if someone performs this activity, it is notable that their score for mood on those days is significantly lower than on other days).

Social activity. Not only physical activities are important, social activities can be recovery-enhancing. When clients have to add what and with whom they performed activities in the app, the report can give an overview of this. This overview should include the activities linked to active travel and those related to inactive travel (e.g., driving to a friend's house to go shopping, in which shopping is a social activity).

Motivational messages. Motivational messages should focus more on the psychological, emotional, and social aspects of depression. Furthermore, messages may be conveyed more positively to enhance recovery.

Smaller milestones. The report currently works with big milestones. For example, the range of the ATS score is relatively narrow, so one already has to put in quite a lot of effort to improve their score. By taking a smaller-step approach, people will have more successful experiences, making them more likely to be motivated to keep using the report.

Personal progress. Graphs should be used to visualize long-term evolution. This can be both confrontational and motivational for clients. Based on this, personal goals can be established together with the therapist.

Therapeutic interaction. Therapeutic involvement is essential when interpreting the feedback report. Through conversation, the results can be discussed in more depth and detail, next treatment steps can be determined, and clients can reach increased self-awareness.

Gamification.

Individualization. Overall, care should be taken when adding gamification principles, as this could have positive and negative effects. It could motivate clients to perform better. However, it could be an additional stress factor that hinders recovery. Therefore, it is essential to evaluate for each client whether or not it is good to work with gamification elements.

Personal goals. It should be possible to define personal goals in the application, which are then addressed in the feedback report. However, these goals should always be set in consultation with the therapist so that they can be sufficiently individualized.

Rewards/badges. It is unnecessary to include rewards or badges. It may even hinder the therapeutic process since recovering from depression is not as easy as achieving a badge. Getting a compliment or motivational words upon achieving a goal are worthy alternatives.

Ranking and group goals. Both are more prone to have a negative effect because clients may start comparing themselves to each other, which can potentially be demotivating. Furthermore, this causes intrinsic motivation to diminish, making relapse more likely.

Online forum. This could be interesting, but the therapists were wondering to what extent it will be feasible. After all, such a forum must be heavily monitored and moderated to prevent the spreading of negative and/or false information.

Score for social activity. Both therapists agreed that a score for social activity is a delicate matter. On the one hand, it may lead to stress because one wants to get as high a score as possible, which can negatively influence recovery. On the other hand, just because someone has had many social contacts does not mean that they were enjoyable or meaningful. Therefore, currently, it seems better to refrain from such a score in the report.

Discussion

The current study served as a first step in the co-creation development process of TOTEM, in which clients with depression and psychologists evaluated the usefulness of the HTB application and feedback report aimed at increasing travel-related physical activity for depression. Participants were enthusiastic about the application and perceived the app as user-friendly, relevant, clear, useful, and attractive. Among others, it was indicated that the application should supplement standard care (e.g., weekly consultations). It would encourage people to engage in more activities, and most individuals would be interested in using the app as an external motivator. However, emotional aspects were currently underemphasized in the app (e.g., assessment of feelings). Increased tailoring and appropriately dosed push notifications would be useful as well. Most participants were also quite enthusiastic about the feedback report. Participants did indicate that the report should be better tailored to depression. For example, the psycho-education currently offered too much physical aspects instead of mental health and social activities. Nevertheless, participants perceived the feedback report as clear, useful, and relevant. About half of the participants thought that the feedback report could take phases of depression recovery into account, e.g., too much information for the early phases. Similarly, experts also stressed that in case the application and feedback report would be used in therapy, the counseling should be tailored towards different phases of depression recovery.

The results mainly hinged toward the usefulness of TOTEM as an external motivator. That being said, functionalities offered in the platform are aimed at developing intrinsic motivation over time (e.g., goal-setting, scaffolding, choice options, therapeutic alliance, opportunities for social activities), targeting the needs forwarded by the self-determination theory (SDT). This theory posits a continuum

of motivation, ranging from extrinsically controlled types of motivation to self-directed or 'intrinsic' motivation. Intrinsic motivation is driven by self-awareness and elicits inherent satisfaction, resulting in more sustained behavior change. In contrast, extrinsic motivation is more driven by an instrumental orientation, resulting in less stable behavior change (Kushnir et al., 2016), for detailed categories and a test of the continuum structure, see Howard et al. 2017 (Howard et al., 2017). In addition to motivational profiles, SDT posits three basic intrinsic needs that operate as motivational resources: 1) Need for competence: feelings of success and efficiency, 2) Need for autonomy: psychological (or decision) freedom and volition, acting without pressure or enforcement from an external source (or task meaningfulness), and 3) Need for social relatedness: belonging, attachment, and care with respect to significant others or a group (Sailer et al., 2017). Indeed, TOTEM is an elaborate extension of HTB. For instance, by allowing clients to add planned social activities and the person(s) that accompanied them during that activity. Moreover, it will proactively encourage clients to perform social activities, e.g., in the form of JITAI. Actual user experience with the HTB application and feedback report, as a component of TOTEM, could have offered the opportunity for candidate users to experience the potential for increasing developing and/or increasing levels of intrinsic motivation as well, besides external motivation.

By demonstrating the potential of increasing travel-related physical activity as an addition to standard care for depression, the current study showed promise for the use of TOTEM, which builds further on this by incorporating principles of CBT and behavioral activation, digital phenotyping, and JITAI into a blended care format. In its current form, TOTEM is especially applicable for (young) adults with an affinity for technology. Although this group is highly relevant due to its presence in the labor market, other target populations may benefit less from the platform in its current format. For instance, with coming age, elderly are prone to (mental) health issues and require enhanced support that may go beyond the care that health care professionals can provide (Lara et al., 2020; Messner et al., 2019). Therefore, once established in its current format, TOTEM should also target the older adults, for instance, by using different designs or incorporating technology training. Another relevant group that could be targeted is people with low health literacy, who are more likely to delay or forsake appropriate care (Levy & Janke, 2016).

TOTEM is currently aimed at secondary care, with psychologists, among others, using the application to supplement their current practice. A challenge for wider implementation of TOTEM in secondary care consists of sufficient adoption by the practitioners. Therefore, future research on the effectiveness of TOTEM is essential. The same goes for general practitioners, who would now serve as gatekeepers that guide patients with depressive symptoms to respective caretakers that implement the platform, instead of relying on psycho-pharmacology as the first line of defense. However, TOTEM could be used for primary care as well, when it would be widely distributed as a standalone application for mild depressive symptoms that goes beyond standard psycho-education. General practitioners would

then recommend the platform directly, without intervention by a therapist. Nevertheless, care should be taken in case that those requiring additional support (i.e., with indications of moderate to severe symptoms) would still be referred to a clinician for help. Although not entirely ruled-out for the future, plans for use in tertiary care are not being made so far.

Limitations

The current study consists of a first step in the development process of TOTEM, which is subjected to co-creation and extensive future testing. Current ideas, efforts, and results are preliminary, and more theorizing, development, and research should be implemented before the contribution of TOTEM to standard care receives the required empirical support. Due to Covid-19, we made use of online interviews. Although a recommended method during lockdowns (Moises & Torrentina, 2020), which was already becoming mainstream before that time (O'Connor & Madge, 2017), there are some downsides to it (e.g., technical issues, more distance between interviewee and researcher) (O'Connor & Madge, 2017). Moreover, we used a semi-structured interview guide covering predefined topics, which could have hindered participants from spontaneously providing new topics (Dirix et al., 2022).

Conclusions

Both end-users and experts considered an application with a feedback report to monitor and improve travel-related physical activity as a valuable addition to standard care for depression. Clearly, the application needs to be tailored towards people with depression (e.g., more focus on other activities than physical activities) and cannot be used as a standalone application. Ecological momentary assessment could increase attention for feelings and emotions. The current insights will be applied to the TOTEM platform that additionally incorporates principles of CBT and BA, together with digital phenotyping and JIAI, after which it will be subjected to further co-creation before implementation.

Authors' note

Veerle Ross https://orcid.org/0000-0002-7830-7892
Kris Brijs https://orcid.org/0000-0002-1542-5496
Hélène Dirix https://orcid.org/0000-0001-7652-1070
Geert Wets https://orcid.org/0000-0002-5485-9705

An Neven https://orcid.org/0000-0003-0165-1799
Yves Vanrompay https://orcid.org/0000-0002-4208-5925
Neree Claes https://orcid.org/0000-0003-2887-380X

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Attachment 1. Semi-structured Interview Guide

Topic List

1) General: first impression after the demonstration
2) HTB-app
3) Feedback report
4) Closing questions

General Questions

Before we start the interview about the app and the feedback report, I'm going to give you some information and ask some general questions.

- Remember that you have signed an informed consent. You have the right to stop the interview at any time. Can you verbally confirm if you agree to the use and processing of your data, anonymously of course.
- The interview will be about the app and the feedback report of which you just got a presentation. Was everything clear in the presentation? If you have any questions, you can ask them now or during the interview. There are no right or wrong answers to the questions. If you want to give a negative answer about the app in the feedback report, this can be done. We learn the most from honest answers. This will not affect anything such as the therapy, availability of the app in the long term, etc.
- Can you briefly introduce yourself? Do you use the smartphone a lot, do you know anything about apps, what do you use the smartphone for, etc.
- What is your reason/motivation for participating?
- What do you hope the app could have done for you during your depression? (if difficult question, it will be asked again later on in the interview).

Questions related to the Health & Travel Behavior (HTB) application and feedback report

Questions related to the application. This part of the interview is mainly focused on the HTB app, so try to answer the questions from this perspective as well. The feedback report will be discussed in a subsequent section. If during the interview you suddenly come up with something about the feedback report, this can of course be mentioned and you do not have to wait until the next part. (show slide 9)

- Overall, what is your first impression about the app?
  - Score between 0 and 10?
  - What is the reason for giving this particular score?
- If the app is available, would you like to use the app yourself? Why/why not?
- What would be the main reason(s) for you to start using the app?
- When do you have expectations for a human interaction? When do you think this is desirable? Or do you prefer to keep this anonymous and independent.
- You just saw some sample screens of the app in the presentation. Did you find this attractive enough? Did they speak to you?
- While seeing the images, did the app seem clear to you? What was clear/what was unclear?
- Is the app clear?
- After an initial introduction, how user-friendly does the app seem to you?

- Do you think it's okay that you still have to fill in things yourself and that this can only be done a day later?
- Is it necessary to adapt the layout to people with depression? Because of cognitive complaints. Do you have tips?
  - May also depend on the phase of recovery from depression: onset, improvement, recovery
- Does it seem realistic to you to fill in all the requested information? Depending on the phase you are in: start, improvement, recovery.
- Do you think that the app can be useful for people with depression? Why/why not?
- Behavioral activation is difficult with depression, how could the app help?
  - Would a buddy system be useful for that activation (therapist, fellow patient, …)? If so, who should that buddy be?
- This app was originally developed for cardio patients and is therefore also designed from this perspective. When we now look at depression from the point of view, are there things that you think are missing or that need to be adjusted?
- The recovery from depression follows a certain course: onset, improvement, recovery. Do you have the feeling that you need different things from the app in the different phases? For example: in an initial phase where there are still many complaints or in a subsequent phase where you already know some recovery but still need guidance.
- Which useful therapist interventions do you think could be digitized?
- Did you find the app sufficiently customizable to personal preferences? Why/why not?
- Do you have any comments to improve the app?

Questions related to the feedback report. This part of the interview focuses mainly on the feedback report, so try to answer the questions from this perspective as well. If during the interview you suddenly come up with something about the HTB app, this can of course be mentioned, so it does not matter that we are already went over this part.

- Overall, what is your first impression about the feedback report?
  - Score between 0 and 10?
  - What is the reason for giving this particular score?
- What do you think of the content of the feedback report?
- Would the feedback report motivate you enough to increase the number of physical activities that you perform?
- Behavioral activation is difficult with depression, how could the feedback report help?
  - Would a buddy system be useful for that activation (therapist, fellow patient, …)? If so, who should that buddy be?
- If you used the app, would you actively use the feedback report? For example: follow the recommendations, read quotes, etc. Do you have suggestions that could motivate?
- You saw some examples from the feedback report in the presentation. Did you find this attractive enough? Did they speak to you?
- When you saw the images, did the report seem clear to you? What was clear/unclear?

- Do you think that the use of the feedback report can be useful for people with depression problems? Why/why not?
- If not useful, what should be changed to make the report useful for people with depression?
- As already mentioned, everything was originally developed for people with heart problems and is therefore also based on this approach. Looking now from the standpoint of depression issues, are there things that you think are missing or need to be changed from the feedback report?
- The recovery from depression has a certain course: beginning, improvement, recovery. Do you feel that you need different things from the feedback report in the different phases? For example: in an initial phase where there are still many complaints or in a post-phase where you already know some recovery but guidance is still needed.
- Nowadays, a lot of attention goes to the concept of 'gamification'. Gamification is the application of game principles and techniques in a non-gaming context. I am now going to give some examples that could possibly be used in the future, you can then indicate what you think of each example:
  - Possibility of rewards (financial, material, badge, points, …)
  - Challenges
  - Leaderboard (anonymous)
  - Personal progress: graph with evolution over time
  - Working around group goals
  - Tips and advice that can be exchanged through a forum.
- The ATS score concerns movement. To tackle depression, the focus should not only lay on being physically active but also about being socially active. This currently receives little attention in the app. The 'pointer for exercise', what would this look like for social activity?
- Currently, the feedback report is being sent by e-mail. Are you satisfied with this or would you like to see an adjustment?
- How often would you like to receive a feedback report?
- Do you have any comments to improve the feedback report?

Closing section

We have arrived to the end of the interview. Are there any topics or things we haven't discussed about the app or the feedback report? Or are there other things you would like to mention?

'Briefly summarize the interview, thank the participant and ask for feedback on the interview.'

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SHAME EXPERIENCES AND PSYCHOPATHOLOGY: THE MEDIATING ROLE OF SELF-COMPASSION AND SOCIAL SUPPORT IN SEXUAL MINORITY INDIVIDUALS

Daniel Seabra[1], Jorge Gato[2], Nicola Petrocchi[3,4], Maria do Céu Salvador[1]*

[1] University of Coimbra, Center for Research in Neuropsychology and Cognitive and Behavioural Intervention (CINEICC), Portugal
[2] Faculty of Psychology and Education Sciences and Centre for Psychology, University of Porto, Portugal
[3] Department of Economics and Social Sciences, John Cabot University, Rome, Italy
[4] Compassionate Mind ITALIA, Rome, Italy

Abstract

Sexual Minority (SM) individuals who are victims of stigma have reported higher levels of traumatic shame experiences and psychopathology symptoms (depression and social anxiety) when compared to heterosexual individuals. Self-compassion and social support have been described as protective factors. This study aimed to explore the mediating role of self-compassion and social support in the relationship between shame felt in traumatic experiences and psychopathology symptoms in a sample of SM individuals. The sample was composed of 264 adult SM individuals who reported traumatic shame experiences (56% men, 36% women, and 8% nonbinary). Correlations between variables were significant and ranged from very weak to moderate. Two models were performed, one for each dependent variable (depression and social anxiety symptoms). The mediating models revealed different results: compassionate actions was a significant mediator in the relationship of shame in traumatic experiences with depression symptoms and social anxiety symptoms, social support from friends had the same role on the prediction of depression, and social support from the family was a significant mediator on the prediction of social anxiety symptoms. These results suggest the importance of cultivating compassionate actions and promoting social support in intervention programs with SM individuals with early traumatic shame experiences, to target depression and social anxiety symptoms.

* Correspondence concerning this article should be addressed to Daniel Seabra, Centro de Investigação em Neuropsicologia e Intervenção Cognitivo Comportamental (CINEICC), Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Rua do Colégio Novo, 3000-115 Coimbra, Portugal.
Email address: daniel_seabra_@hotmail.com

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Shame experiences are often traumatic and related to psychopathology in later life (Matos & Pinto-Gouveia, 2010). Among Sexual Minority (SM) individuals, more shame and traumatic experiences have been reported, in comparison to their heterosexual peers (70.5% vs. 44.2% in a Portuguese sample; Seabra et al., 2021a). Research has also consistently shown that stigmatized SM individuals are more vulnerable to psychopathology symptoms Meyer, 2003, 2015), such as depression (Wittgens et al., 2022), social anxiety (Mahon et al., 2022) and shame (Santos, 2021). In fact, due to living in a heteronormative and heterosexist environment that invalidates their sexual identity (Herek, 1990; Warner, 1991; Worthen, 2020), SM individuals experience chronic stress, which may help to explain the observed mental health disparities (Cardona et al., 2022; Meyer, 2003).

Chronic social stress is experienced from an earlier age by individuals who self-identify or are perceived as belonging to a SM; for instance, they are often victims of homophobic bullying in school (Gato et al., 2020; Mulvey et al., 2018). These young victims seem to resort to shame-avoidance strategies (e.g. minimization of homophobia; McDermott et al., 2008) and shame appears to mediate the relationship between homophobic discrimination and depressive symptoms among SM adults (Seabra et al., 2021b). Shame is a self-conscious and intense emotion involving feelings of inferiority, social unattractiveness, defectiveness, and powerlessness (Tracy et al., 2007) and is associated with general psychopathology (Cândea & Szentágotai, 2013).

Over time, researchers and clinicians have explored protection factors that buffer against the impact of stigma among SM individuals, and decrease their levels of psychopathology (Meyer, 2003, 2015). The role of individuals' protection factors such as resilience, openness to emotions, positive self-esteem, mental and physical self-care, hope and proactive coping strategies (Craig et al., 2014; Dickinson & Adams, 2014; Kwon, 2013; Meyer, 2015) has been considered. Self-compassion has recently merited research's attention as a possible buffer for stigma among SM individuals. In fact, meta-analytical studies found the self-compassion as a mediator in the relationship between minority stress and psychopathology (Helminen et al., 2022), and that higher levels of self-compassion seem to be associated with less psychopathology and internalized stigma, as well as, with more well-being and social support among SM individuals (Carvalho & Guiomar, 2022). Regarding the association between self-compassion and shame, there are few studies in SM. One study with people living with HIV found a negative and moderate association between self-compassion and internalized shame (Williams et al., 2019) and another one with gay men also find a negative and moderate association (Matos et al., 2017).

Social support also recurrently appears as a protective factor for the mental health of SM individuals. Family support has an important role in decreasing

depression in SM men of colour (Boyd et al., 2021) and support from friends helps to attenuate the impact of daily stress on the mental health of Caucasian gay men (Fingerhut, 2018). The specific effect of each source of social support is not yet clear and seems to depend on the stage of life (e.g. in transition for parenthood, social support is important for SM that are close to the family of origin and detached from SM community; Leal et al., 2021).

Considering the necessity to clarify the protective role of individual and social protection factors for the mental health of SM individuals, this study aimed to explore the mediating role of the components of self-compassion (compassionate engagement and actions) and different perceived social supports sources (from family and friends) in the relationship between shame felt in traumatic experiences and psychopathology (depression and social anxiety symptoms) in a sample of SM individuals.

Method

Sample

The sample was composed of 264 adult SM individuals who reported having had traumatic shame experiences of any type (e.g. humiliation, homophobia, abuse). All participants were Portuguese, and most were cisgender, single, and did not have children. The sample characteristics are described in Table 1.

Table 1. Sociodemographic Characteristics of Participants

Sociodemographic variables	Sample	
	n	%
Gender		
Female	95	36.0%
Male	148	56.1%
Non-binary	21	8.0%
Gender identity		
Cisgender	236	89.4%
Transgender	21	8.0%
Other	5	1.9%
Sexual orientation		
Gay	126	47.7%
Lesbian	45	17.0%
Bisexual	53	20.1%
Pansexual	31	11.7%
Asexual	3	1.1%
Other	6	2.3%
Residence		
Rural	42	15.9%
Urban	222	84.1%
Highest educational level		

Sociodemographic variables	Sample	
	n	%
Basic	2	0.8%
Intermediate	34	12.9%
Post-intermediate non graduated	18	6.8%
Graduate	98	37.1%
Master	101	38.3%
PhD	8	3.0%
Post-PhD	3	1.1%
Employment		
Student	63	23.9%
Work-student	28	10.6%
Full-time employed	124	47.0%
Part-time employed	24	9.1%
Unemployment	25	9.5%
Marital status		
Single	232	87.9%
Married/living together as a couple	26	9.8%
Divorced/widowed	6	2.3%
Children [a]	11	4.2%
Previous psychological treatment [a]	62	23.5%

Note. $N = 264$. Participants were on average 28.4 years old ($SD = 7.7$).
[a] Reflects the number and percentage of participants answering "yes" to this question.

Procedures

Data for the present cross-sectional study were collected between January and October 2020, after approval of the Ethic Commission of the host institution. Data were collected using a web-based survey in the context of larger research ($N = 375$), selecting the participants who reported having had traumatic experiences. Confidentiality and voluntary participation were assured. After reading a page with information about the study, participants gave their free and informed consent and completed the research protocol. Inclusion criteria were: self-identification as a SM, being Portuguese, age between 18 and 65 years old, and full completion of the questionnaires. There was no financial compensation for participation.

Measures

Sociodemographic Information. Participants were asked about sociodemographic characteristics such as age, gender, gender identity, sexual orientation, residence, educational level, employment status, marital status, if they had children, and if they were receiving psychological treatment at the time of the study. All sociodemographic information is described in Table 1.

Trauma-Related Shame Inventory (TRSI) (Original version: Øktedalen et al., 2014; European Portuguese version: Cid, 2012). This scale has 24 items to assess

the negative evaluation of the self in the context of trauma with a painful affective experience, and a behavioural tendency to hide and withdraw from others to conceal one's own perceived deficiencies. The TRSI has a total score and two subscales (external and internal shame). Items are rated on a 4-point Likert scale from *Not true of me* (0) to *Completely true of me* (3). Higher mean scores indicate higher levels of shame felt in the traumatic experience. In this study, only the total score was used. The Cronbach's alpha was .97 in this study.

Compassionate Engagement and Action Scales (CEAS) (Original and European Portuguese Version: Gilbert et al., 2017). This scale assesses three different flows of compassion: compassion for others, compassion from others, and compassion toward the self. Each section has eight items about competencies that facilitate turning towards and engaging in suffering (compassionate engagement) and another five items about competencies that facilitate actions to alleviate and prevent suffering (compassionate actions). In this study, only the subscale *compassion toward the self* was used (e.g., "I notice, and am sensitive to my distressed feelings when they arise in me" and "I direct my attention to what is likely to be helpful to me"). Participants report their answers on a 10-point Likert scale from *Never* (1) to *Always* (10). Higher mean scores indicate higher levels of self-compassion. In our sample, the compassionate engagement toward the self presented a Cronbach's alpha of .71 and compassionate actions toward the self presented a Cronbach's alpha of .93.

Multidimensional Scale of Perceived Social Support (MSPSS) (Original version: Zimet et al., 1988; European Portuguese version: Carvalho et al., 2011). This scale has 12 items to assess subjective social support from three sources: Family, friends, and significant other. In this study only the family (e.g., "My family really tries to help me") and friends (e.g., "I can count on my friends when things go wrong") subscales were used. Items are rated on a 7-point Likert scale from I *very strongly disagree* (1) to *I very strongly agree* (7). Higher mean scores indicate higher levels of subjective social support from family or friends. The Cronbach's alphas were .94 for both in this study.

Depression, Anxiety and Stress Scales, 21-Item Version (DASS-21). (Original version: Lovibond & Lovibond, 1995; European Portuguese version: Laranjeira, 2009). This scale has 21 items divided into three subscales: depression, anxiety, and stress symptoms. Items are rated on a 4-point Likert scale from *Did not apply to me at all* (0) to *Applied to me very much or most of the time* (3), with higher scores indicating greater negative affect. In this study, only the depressive symptoms (symptoms usually associated with negative mood, e.g. "I could see nothing in the future to be hopeful about") subscale was used. The Cronbach's alpha was .93 in this study.

Social Interaction Anxiety Scale (SIAS). (Original version: Mattick & Clarke, 1998; European Portuguese version: Pinto-Gouveia & Salvador, 2001). This scale has 19 items and assesses fears of general social interaction (e.g. "When mixing socially, I am uncomfortable."). Items are rated on a 5-point Likert scale from *Not at all characteristic or true of me* (0) to *Extremely characteristic or true of me* (3), with higher total scores indicating higher levels of social anxiety. The Cronbach's alpha was .92 in this study.

Data analyses

All data analyses were conducted with the IBM Statistical Package for the Social Sciences version 27 (SPSS; IBM, 2020) and the PROCESS Macro for SPSS 4.1 (Hayes, 2022). The normality of data distribution was examined using Skewness (*Sk*) and Kurtosis (*Ku*) values. Only values above $|3|$, $|10|$ for *Sk* and *Ku*, respectively, were considered to represent severe violations of normal distribution (Kline, 2016; Marôco, 2014). Pearson's correlation coefficients (*r*) were used to examine the association between variables. The correlations were interpreted according to Pestana and Gageiro (2014): correlation below .20 means a very weak association, between .21 and .29 means a weak association, between .30 and .69 means a moderate association, between .70 and .89 means a strong association, and above .90 means a very strong association. For mediation analyses, model 4 of PROCESS Macro was used. Two models have been tested: shame felt in traumatic experiences was always the independent variable, compassionate engagement, compassionate actions, perceived social support from family, and perceived social support from friends were used as mediator variables, depressive symptoms was the dependent variable in model one, and social anxiety symptoms was the dependent variable in model two. Pairwise contrasts between indirect effects were explored to detect possible significant differences between indirect effects (Hayes, 2018).

Results

Preliminary results and correlations between variables

No severe violations of normality were found ($|Sk| < 1$; $|Ku| < 5$). Fifteen outliers were found (5.7%) in shame felt in traumatic experiences, compassionate engagement, perceived social support from family, and depressive symptoms. However, as these outliers showed up in the SPSS boxplots as mild outliers (and not extreme), and to ensure ecological validity, the authors decided to keep them in the sample. There was no missing data across the questionnaires. Descriptive statistics and correlations between study variables are presented in Table 2.

Table 2. Descriptive Statistics and Correlations for Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7
1. Shame	3.2	1.3	—						
2. Engagement	6.5	1.5	−.20**	—					
3. Actions	6.7	2.1	-.44**	.50**	—				
4. Family	4.9	1.7	-.32**	.15*	.22**	—			
5. Friends	6.1	1.1	−.32**	.14*	.21**	.28**	—		
6. Depression	6.3	5.7	.54**	−.19**	-.53**	-.27**	-.30**	—	
7. Social anxiety	33.7	18.9	.47**	−.19**	-.38**	−.32**	−.22**	.48**	—

*$p < .05$. **$p < .01$.

All variables were significantly correlated. Shame felt in traumatic experiences presented a negative and very weak association with compassionate engagement ($r = .20$, $p = .001$), a negative and moderate association with compassionate actions, and perceived social supports (from family and friends) ($-.32 < r < -.44$, $p < .001$). Additionally, shame felt in traumatic experiences showed a positive and moderate association with depression and social anxiety symptoms ($.47 < r < .54$, $p < .001$). Correlations between self-compassion and perceived social support with depression and social anxiety symptoms were all negative. On one hand, compassionate engagement had a very weak correlation with both depression and social anxiety symptoms ($r = -.19$, $p = .002$) and compassionate actions presented a moderate correlation with the same variables ($-.38 < r < -.53$, $p < .001$). On the other hand, perceived social support from family presented a weak correlation with depressive symptoms ($r = -.27$, $p < .001$) and moderate with social anxiety symptoms ($r = -.32$, $p < .001$) and the inverse pattern was found with perceived social support from friends (moderate association with depressive symptoms; $r = -.30$, $p < .001$, and a weak association with social anxiety symptoms; $r = -.22$, $p < .001$).

Mediation analyses

The proposed models had four mediator variables: compassionate engagement, compassionate actions, perceived social support from family, and perceived social support from friends. Due to the very weak correlation of compassionate engagement (mediator variable) with shame felt in traumatic experience (independent variable), with depressive and with social anxiety symptoms (dependent variables), only compassionate actions and both perceived social support from family and friends were used as a mediator variable in the tested models.

Model one, represented in Figure 1, comprised shame felt in traumatic experiences as the independent variable, compassionate actions, perceived social support from family, and perceived social support from friends as a mediator variables, and depressive symptoms as the dependent variable. Only compassionate actions and perceived social support from friends presented a significant indirect

effect ($\beta_{actions}$ = 0.67, *SE* = .15; 95% CI [0.406; 0.987]; β_{family} = 0.08, *SE* = 0.07; 95% CI [-0.047; 0.233]; $\beta_{friends}$ = 0.14, *SE* = .09; 95% CI [0.006; 0.353]). Regarding pairwise contrasts, compassionate actions and perceived social support from friends showed a significant difference in their indirect effects ($\beta_{actions\text{-}friends}$ = 0.53, *SE* = .18; 95% CI [0.178; 0.894]).

Additionally, before the introduction of the mediator variables, the total effect was significant (β = 2.33, *SE* = .23; 95% CI [2.78; 0.535]), and after the introduction of the mediators, the model still presented a significant direct effect (β = 1.43, *SE* = .24; 95% CI [0.948; 1.912]). Both compassionate actions and perceived social support from friends partially mediated the relationship between shame felt during traumatic experiences and depressive symptoms, with compassionate actions having a significantly higher effect compared to perceived social support from friends.

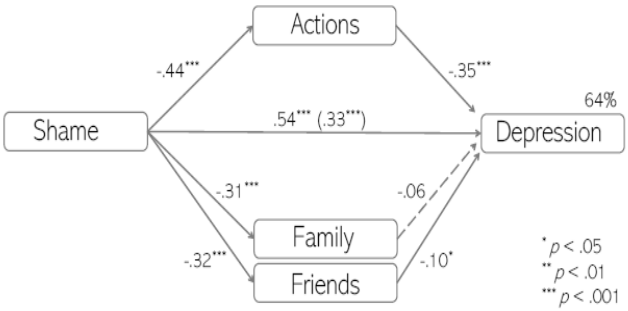

Figure 1. Mediating model predicting depressive symptoms with standardized effects.

The second model, represented in Figure 2, had shame felt in traumatic experiences as an independent variable, compassionate actions, perceived social support from family, and perceived social support from friends as a mediator variables, and social anxiety symptoms as the dependent variable. Only compassionate actions and perceived social support from family presented a significant indirect effect ($\beta_{actions}$ = 1.27, *SE* = .46; 95% CI [0.430; 2.239]; β_{family} = 0.74, *SE* = 0.31; 95% CI [0.203; 1.429]; $\beta_{friends}$ = 0.16, *SE* = .27; 95% CI [-0.310; 0.766]). Regarding pairwise contrasts, compassionate actions and perceived social support from family did not show a significant difference in their indirect effects ($\beta_{actions\text{-}family}$ = 0.53, *SE* = .60; 95% CI [-0.628; 1.716]).

Additionally, before the introduction of the mediator variables, the total effect was significant (β = 6.76, *SE* = .79; 95% CI [5.196; 8.315]), and after the introduction of the mediators, the independent variable maintained a significant direct effect (β = 4.57, *SE* = .90; 95% CI [2.801; 6.341]). In sum, both compassionate actions and perceived social support from family partially mediated the relationship between shame felt during traumatic experiences and social anxiety symptoms.

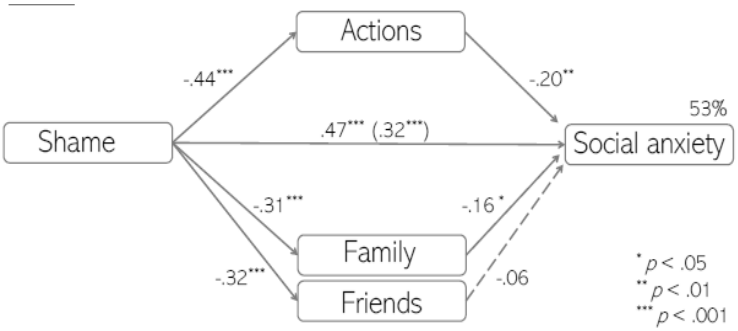

Figure 2. Mediating model predicting social anxiety symptoms with standardized effects

Discussion

The present study aimed to explore the mediation effect of self-compassion and perceived social support in the relationship between shame felt in shame traumatic experiences and psychopathology among SM individuals.

All the associations between study variables were, as expected, significant. Shame felt in traumatic experiences showed a positive and moderate association with the two psychopathology indicators (depression and social anxiety symptoms). That is, higher levels of shame felt in traumatic experiences were associated with higher levels of depressive and social anxiety symptoms. Johnson and Yarhouse (2013) clarify the association between shame and depressive symptoms as due to self-condemnation of shame, and the association between shame and social anxiety symptoms as due to fear of condemnation of shame. These expected results reinforce the negative association between self-criticism and positive sexual minority identity (Petrocchi et al., 2020) and the higher prevalence of social anxiety in SM individuals (Cohen et al., 2016).

Regarding self-compassion, the compassionate engagement component revealed a negative and very weak associations with both shame felt in traumatic experiences and psychopathology. In case of compassionate actions the same associations were moderate, in line with Matos et al. (2017) that found a negative and moderate association between self-compassion and internalized shame in gay men.

Our findings clarify the association between the components of self-compassion and traumatic shame experiences: compassionate actions seem to be the self-compassion component more negatively associated with shame. In fact, Seabra et al. (2022) found a similar result: compassionate actions presented a higher negative association with shame when compared with compassionate engagement. Regarding the association between self-compassion and psychopathology, our

results are in line with two meta-analyses in SM individuals: self-compassion showed a medium negative pooled association with psychological distress (Carvalho & Guiomar, 2022; Helminen et al., 2022).

Both perceived social support (from family and friends) presented a moderate and negative association with shame felt in traumatic experiences. That is, high levels of perceived social support are associated with lower levels of shame felt in traumatic experiences. In fact, SM individuals presented more levels of withdrawal and avoidance as coping with shame when compared with heterosexual individuals (Santos, 2021). In SM individuals with traumatic shame experiences, withdrawal or avoidance are more prone to have difficulties in developing close relationships with other individuals and feel supported. Since those were early experiences, SM individuals could have felt inadequate and unlovable from an early age and this might have contributed to their social isolation and their current reduced social network. Regarding depression and social anxiety symptoms, perceived social support from friends was more associated with depressive symptoms and perceived social support from family was more associated with social anxiety symptoms. Depressive symptoms are associated with low interest/pleasure and isolation (APA, 2022) and friends may have an important role in fostering companionship and maintaining social activities. In turn, social anxiety symptoms are associated with fear of being negatively evaluated by others (APA, 2022) and family, as the first model of "others", when supportive, conveys feelings of safeness with the others outside the family. One frequent phenomenon in SM individuals is self-vigilance and expectations of rejection (Meyer, 2003) and this can explained the higher levels of rejection sensitivity in SM individuals when compared with heterosexual individuals (Maiolatesi et al., 2022).

Unexpectedly, mediation analyses showed different results according to the dependent variables. Additionally to compassionate actions (that was a mediator variable for both depressive and social anxiety symptoms), only perceived social support from family mediated the relationship between shame felt in traumatic experiences and social anxiety symptoms. In turn, perceived social support from friends mediated the relationship between shame felt in traumatic experiences and depressive symptoms. On one hand, the lack of actions directed at preventing or alleviating one's suffering (compassionate actions), partially explains the impact of traumatic shame experiences on depression and social anxiety symptoms among SM individuals. On the other hand, the lack of perceived social support also seems to mediated this relationship. Specifically, the lack of perceived social support from friends seems to have had a mediator role in the development of depressive symptoms, and the lack of perceived social support from the family may have had the same role in the development of social anxiety symptoms.

Our study has further contributed to refine the finding that self-compassion mediates the relationship between minority stress and mental health (Helminen et al., 2022), by highlighting the role of compassionate actions as a component of self-compassion with a mediator effect. Regarding perceived social support, family

support presented a positive role against social anxiety symptoms and friends support against depressive symptoms. These results are not in line with others studies. For example, Milton and Knutson (2021) found that social support from biological family was the only negative predictor of depressive symptoms among SM individuals (compared to chosen families). Even if friends can be considered as part of chosen family, we hypothesized that participants considered friends as peers and not as a surrogate family. Another study has highlighted the importance of chosen families with African American SM as a protective factor against distress (Hailey et al., 2020). In this study, rejection by the family of origin was not assessed, and we hypothesize that this variable could help explaining which family and friends they considered. Maybe the results would be different considering the family of origin, chosen family and friends. Future research is warranted to explore this hypothesis further. In any case, some authors referred that the relevance of social support is overestimated in the relationship with well-being (la Roi et al., 2022) and our results seem to corroborate this statement. Predicting depressive symptoms, compassionate actions had a stronger effect compared to social support from friends, suggesting that compassionate actions have a more relevant role. That is, the lack of perceived social support from friends partially explains the relationship between shame felt in traumatic experiences and depressive symptoms but the lack of compassionate actions explains even more of these symptoms. These results suggested that emotional processing of traumatic shame experiences through self-compassion seems to be more important than perceived social support from friends, and reinforcing the Psychological Mediation Framework (Hatzenbuehler, 2009) that recognizes that stigma-related stress in SM individuals impacts cognitive processing and allows higher psychopathology.

Despite the important findings, some limitations should be considered. All measures were self-reported, and the results did not consider other variables like rejection by family (mentioned above), cognitive distortions, and rejection sensitivity. Future studies should consider a more representative sample and explore other variables.

In sum, both individual and community factors have a positive impact on psychopathology in SM with traumatic shame experiences, namely self-compassion and perceived social support. In particular, compassionate actions, and perceived social support from family and friends. Our results seem to reinforce the stronger role of compassionate actions, instead of perceived social support. Skills to facilitate compassionate actions to alleviate and prevent suffering seem to be the most important element to cope with depression and social anxiety symptoms in SM individuals with traumatic shame experiences and may therefore justify interventions that aim to develop this competency.

Authors' note

Informed consent: Informed consent was obtained from all participants involved in the study.

Human rights: The study was conducted following the Declaration of Helsinki, and approved by the Ethics and Deontology Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra (2.11.2019).

Consent of ethics: The study was conducted following the Declaration of Helsinki, and approved by the Ethics and Deontology Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra (2.11.2019).

Conflict of interest: The authors declare no conflict of interest.

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THE ROLE OF EARLY MALADAPTIVE SCHEMAS IN THE CHANGE IN GENERAL MENTAL HEALTH AND WELL-BEING DURING THE COVID-19 CORONAVIRUS PANDEMIC

Joanna Urbańska[1], *Anna Słysz*[2*]

[1] Department of Psychology and Cognitive Sciences, Adam Mickiewicz University, Poznań, Poland, e-mail: Joanna.urbanska@amu.edu.pl

[2] Department of Psychology and Cognitive Sciences, Adam Mickiewicz University, Poznań, Poland, e-mail: aslysz@amu.edu.pl

Abstract

This presented research aimed to determine the role of early maladaptive schemas in the change in general mental health and well-being during the COVID-19 coronavirus pandemic. We focused on changes in mental health (anxiety and depressive symptoms, morbid thoughts, and suicidal ideation) and well-being. Our retrospective study included 499 adults (316 women and 173 men). We employed the following research tools: the General Health Questionnaire (GHQ-30), the shortened version of the WHO Quality of Life Questionnaire (WHOQOL-BREF), the HASS-BREF Scale to assess the severity of suicidal ideations and behaviors, and Young Schema Questionnaire (YSQ-S3-PL). The questionnaires' instructions for the subjects were modified to obtain information for three specific periods: before the pandemic, at the most difficult moment of the pandemic for individuals, and in the last two weeks (the time period preceding data collection; January/February 2021). Results of the research indicate that during the COVID-19 pandemic, many people declared a significant increase in the number of depressive or anxiety symptoms. Early maladaptive schemas (Abandonment, Insufficient Self-Control) predict negative changes in mental health. In addition, other early maladaptive schemas (Self-Sacrifice, Unrelenting Standards) predict negative well-being changes. Interestingly, the Subjugation schema can temporarily play an adaptive role in exceptional situations, such as a pandemic.

Keywords: COVID-19 pandemic, early maladaptive schemas, mental health, well-being, suicidal thoughts.

* Correspondence concerning this article should be addressed to Joanna Urbańska, Department of Psychology and Cognitive Sciences, Adam Mickiewicz University, ul. Wieniawskiego 1, 61-712 Poznań, Poland.
E-mail: Joanna.urbanska@amu.edu.pl

Early maladaptive schema therapy is one of the most popular models in the cognitive-behavioral approach. Schemas therapy aims to restore mental well-being and shape the ability to independently care for and meet their emotional needs. It emphasizes a deep therapeutic relationship and the patient's basic universal emotional needs, distinguishing schema therapy from a wide range of CBT (Rafaeli et al., 2011). Schema therapy are described as an emerging 'third wave' psychotherapy (Spedding & Chibanda, 2019). Jeffrey E. Young (1999, in Young et al., 2003), the creator of this therapy, defines an early maladaptive schema (EMS) as a broad, pervasive theme or pattern comprised of memories, emotions, cognitions, and bodily sensations regarding oneself and relationships with others. Schemas develop during childhood or adolescence due to unmet needs, and the emphasis is placed on the interaction of the environment and the child's temper. The following EMS may result from deprivation of the need for safe attachment: Abandonment, Mistrust/Abuse, Emotional Deprivation, Defectiveness, and Social Isolation. In contrast, deprivation of the need for autonomy can lead to EMS: Dependance, Vulnerability to Harm, Enmeshment, and Failure. Deprivation of the need for realistic boundaries can lead to the perpetuation of other EMS: Entitlement, Insufficient Self-Control. Deprivation of the need for self-expression can result in the emergence of three other EMS: Subjugation, Self-Sacrifice, and Approval Seeking. Finally, the result of the frustration of the need for spontaneity can be the formation of EMS: Negativity/Pessimism, Emotional Inhibition, Unrelenting Standards, and Punishment (Young et al., 2003). EMS also occur in healthy people, but they are smaller and may remain inactive until the individual is in a stressful situation.

Results of a few studies indicate that EMS drives vulnerability to symptoms of anxiety and depression (Cámara & Calvete, 2012; Harris & Curtin, 2002; Jabłoński & Chodkiewicz, 2017; Mącik, 2018). Symptoms of depression are associated with such schemas as Social Isolation, Failure, Emotional Inhibition (Cámara & Calvete, 2012), Defectiveness, Insufficient Self-Control, and Vulnerability to Harm (Harris & Curtin, 2002), while anxiety symptoms are associated with Abandonment, Mistrust, and Unrelenting Standards (Cámara & Calvete, 2012). Other studies (Shahamat, 2011) point to a significant relationship between EMS of Defectiveness and symptoms of mental disturbances (somatization, anxiety, and depression). According to Cormier et al. (2011), the most characteristic schemas for depressed patients are Defectiveness, Dependence, and Vulnerability to Harm. Interesting research on the results of the COVID-19 pandemic (especially the quarantine) was conducted in Portugal (Faustino et al., 2022). They showed several positive associations between EMS (Mistrust/Abuse, Vulnerability to Harm, Negativity/Pessimism) and COVID-19 anxiety and negative associations between all schemas and psychological well-being. However, no studies have analyzed the dynamics of the appearance and changes in such symptoms in the context of the COVID-19 pandemic experience. Our research attempts to fill this gap and identify which EMS are predictors of change in general mental health and well-being during

the COVID-19 coronavirus pandemic. Study during the pandemic is justified because the dysfunctional nature of schemas is particularly visible when an individual faces difficulties or a threat. The current knowledge of the role of EMS during the COVID-19 pandemic will allow therapists to better plan therapeutic interventions in pandemic-like situations (e.g., war, natural disasters, new pandemics in the future, etc.).

Since emotional responses (e.g., anxiety) to the COVID-19 pandemic are common (WHO, 2022; Xiong et al., 2020), we assume that most reactions to the current pandemic situation may be considered a natural response to a crisis. A defining feature of a crisis is that it poses a risk to some significant interests of a person; in a pandemic, health and life are at risk, as life plans and relationships. The following characteristics of a situational crisis (as listed by Miller, 2011) may apply to the COVID-19 pandemic: suddenness (rapid spread of the coronavirus and a sharp increase in cases), unpredictability (we do not know how long the pandemic will last and how it will be progressing), intensity (considering the number of cases and deaths) and finally uncontrollability (the absence of fully effective medication, risk of becoming infected in several places). Therefore, emotional and behavioral reactions typical of a psychological crisis can be expected. During a pandemic, several needs (such as security, autonomy, and spontaneity) are frustrated, particularly if a person directly experiences disease or social isolation. During the coronavirus pandemic, an EMS may be triggered by the feeling of threat, i.e., the frustration of the core emotional need for security and any other difficulties preventing fulfilling one's needs. We hypothesized that EMS are potential predictive factors influencing the extent of psychological burden during the COVID-19 pandemic.

For these theoretical and empirical reasons, we hypothesized that (1) there is a significant relationship between the level of activation of all EMS (e.g., Insufficient Self-Control, Abandonment, Vulnerability to Harm, Social Isolation, Defectiveness, Enmeshment/Undeveloped Self, Entitlement Emotional Deprivation, Unrelenting Standards) and indicators of the deterioration of health and well-being; (2) EMS are significant predictors of the change in general mental health during the COVID-19 coronavirus pandemic, and (3) EMS are significant predictors of the change in well-being during the COVID-19 coronavirus pandemic.

Material and methods

Online surveys were conducted in Poland between January 15 and February 7, 2021, in a group of 499 participants (see Table 1). The average age of the respondents was 31.31 (between the ages of 18 to 72; SD = 12.48). Facebook advertisements were used for recruiting participants.

Table 1. Frequency statistics for sociodemographic variables

Sociodemographic variables		*n*	%
Gender	Female	316	63
	Male	173	35
	Other	10	2
Education	Primary education	3	1
	Lower secondary education	21	4
	Vocational education	24	5
	Secondary education	132	26
	Incomplete higher education	102	20
	Higher education	217	43
Terms of occupation	Unemployed	29	6
	Student	208	42
	Employee/self-employee	242	48
	Pensioner	20	4
Mode of professional work	Stationary work	101	20
	Online work	222	44
	Mixed work	90	18
	Not applicable	86	17
Lives alone	Yes	75	15
	No	424	85
Romantic relationship	No	167	33
	Informal	157	31
	Formal	131	26
	No response	44	9
Have children	No	373	75
	Yes – one	50	10
	Yes – two	54	11
	Yes – three or more	21	4
	No response	2	0
Material status	Insufficient	102	20
	No response	151	30
	Sufficient	246	49
Diagnosed severe somatic disease before the pandemic	Yes	25	5
	No	450	90
	No response	24	5
Diagnosed mental illness before the pandemic	Yes	89	18
	No	387	78
	No response	23	5
Contact with a COVID-19 patient	Yes	290	58
	No	209	42
Positive COVID-19	Yes	66	13
	No	422	85
	No response	11	2
Quarantine	Yes	170	34
	No	329	66

The research project (design and course of the study, questionnaires, and instructions) was approved by the Research Ethics Committee at University [affiliation]. The study instruments included a standard instruction for psychometric tests, GDPR privacy notice, consent to participation in the study, particulars (to measure sociodemographic variables: gender, age, education, occupation, etc.) as well as questions about health, contacts with people with coronavirus infections, quarantine, general functioning during the pandemic and psychometric tools such as YSQ-S3-PL, GHQ-30, WHOQOL-BREF, HASS-BREF.

The Young Schema Questionnaire (YSQ-S3-PL) is a self-report questionnaire focused on assessing 18 EMS. The Polish version of the questionnaire was used (Oettingen et al., 2017). The reliability coefficient in our sample, measured with Cronbach's alpha for individual scales, was between 0.62 and 0.81. The discriminatory validity of the questionnaire is satisfactory.

David Goldberg's General Health Questionnaire (GHQ-30) in Polish was used to assess the mental health of adults, more specifically, non-psychotic mental health disturbances, in the general population. The GHQ-30 questionnaire helps identify people whose health deteriorated due to experiencing difficulties or mental diseases in the general population. The questionnaire has three scales: depression and anxiety, general functioning, and interpersonal relations. The internal consistency of the GHQ scale in our sample, as measured by Cronbach's alpha, is up to 0.97 (Frydecka et al., 2010).

The World Health Organization Quality of Life Questionnaire (WHOQOL-BREF) in Polish (Jaracz et al., 2006) was used to evaluate well-being in four domains: physical health, psychological health, social relationships, and environment (Whoqol Group, 1995). Well-being is the most natural aspect of the subjective quality of life (Olthuis and Dekkers, 2005). Cronbach's alpha was considered adequate ($\alpha = 0.92$).

The brief Polish version of the Harkavy Asnis Suicide Survey (HASS-BREF) was used to assess suicidal thoughts and behavior (Friedman and Asnis, 1989). The complete version of the scale includes 20 statements; 10 were used for this study. In earlier pilot studies, the reliability of the half created from selected items was satisfactory and the reliability of the full tool checked with split-half (Spearman-Brown) method was high. HASS-BREF also had good reliability in our sample ($\alpha = 0.92$).

For the three questionnaires (GHQ-30, WHOQOL-BREF, and HASS-BREF), the instructions for the respondents were modified to collect information about the respondents' health, well-being, and severity of suicidal ideation in three time periods: 1) before the pandemic, 2) at the most difficult time during the

pandemic, 3) over the last two weeks before participation in the study (between January 15 and February 7, 2021).

The authors tested the reliability of tools using the internal consistency method. The reliability of the tools, as measured by Cronbach's alpha, is high, ranging from 0.92 to 0.96 for tools used to evaluate health and well-being. As for the early maladaptive schema questionnaire, given the number of questions for each scale (only 5), the reliability coefficients seem satisfactory (0.64 to 0.92).

Results and analysis

Quantitative analysis, using PS IMAGO PRO 7 (IBM SPSS Statistics 27), was conducted for the sample (variables statistics, means comparison, non-parametric options for correlation coefficients, regression analysis). A backward stepwise linear regression was used to identify possible predictors of the outcome change in GHQ/WHOQOL out of EMS that correlate with the dependent variable. At each step, variables were chosen based on p-values, and a p-value threshold of 0.1 was used to limit the number of variables included in the final model.

Table 2 presents descriptive statistics for the main variables.

Table 2. The mean results in HASS-BREF, GHQ-30, and WHOQOL-BREF for the whole sample for the two periods: before the pandemic, and at the most difficult time (N = 499)

	M	*SE*	*SD*
HASS-BREF			
Before	4.32	.28	6.21
Difficult	5.24	.5	7.75
GHQ-30			
Before	56.37	.61	13.68
Difficult	80.62	.91	20.25
WHO-QOL-BREF			
Before	96.72	.74	16.48
Difficult	78.52	.80	17.8

Note: M – mean, *SE* – standard error, *SD* – standard deviation, Before – before the pandemic COVID-19, Difficult – the most difficult time of the pandemic COVID-19 for individuals.

Further analysis showed a significant relationship between the activation level of EMS and indicators of the deterioration of health or well-being and the change in general mental health/well-being during the COVID-19 coronavirus pandemic (see Table 3).

Table 3. Correlation coefficients (rho) between early maladaptive schemas and GHQ-30, HASS-BREF, WHOQOL-BREF, and change in GHQ-30, HASS-BREF, WHOQOL-BREF

	HASS (B)	HASS (MD)	HASS (Ch)	GHQ (B)	GHQ (MD)	GHQ (Ch)	WHO-QOL (B)	WHO-QOL (MD)	WHO-QOL (Ch)
ED	.30**	.30**	.081	.37**	.22**	.016	-.47**	-.39**	-.046
AB	.42**	.45**	.153**	.37**	.41**	.229**	-.32**	-.42**	.149**
MA	.41**	.42**	.133**	.37**	.35**	.149**	-.39**	-.43**	.075
SI	.52**	.41**	.023	.47**	.34**	.092*	-.43**	-.42**	.029
DS	.40**	.40**	.109*	.42**	.29**	.050	-.50**	-.42**	-.043
FA	.40**	.40**	.083	.45**	.35**	.111*	-.44**	-.43**	.038
DI	.39**	.39**	.081	.48**	.35**	.084	-.46**	-.43**	.018
VU	.42**	.44**	.157**	.42**	.41**	.185**	-.42**	-.48**	.105*
EM	.26**	.30**	.142**	.35**	.24**	.052	-.38**	-.34**	-.002
SB	.40**	.41**	.124**	.45**	.36**	.109*	-.43**	-.45**	.067
SS	.14**	.14**	.103*	.13**	.16**	.107*	-.10*	-.22**	.132**
EI	.25**	.26**	.085	.34**	.31**	.131**	-.35**	-.39**	.060
US	.29**	.27**	.083	.27**	.31**	.177**	-.20**	-.37**	.178**
ET	.20**	.22**	.075	.25**	.17**	.023	-.23**	-.25**	.028
IS	.36**	.39**	.087	.36**	.36**	.169**	-.33**	-.41**	.123**
AS	.30**	.33**	.085	.29**	.31**	.165**	-.22**	-.32**	.134**
NP	.49**	.48**	.096*	.47**	.43**	.188**	-.42**	-.47**	.103*
PU	.39**	.37**	.083	.35**	.29**	.103*	-.33**	-.35**	.030

Note. B – before the pandemic COVID-19, MD – the most difficult time of the pandemic COVID-19, Ch – change (value for the most difficult time of the pandemic minus the pre-pandemic score), ED – Emotional Deprivation schema, AB – Abandonment schema, MA – Mistrust/Abuse schema, SI – Social Isolation schema, DS – Defectiveness schema, FA – Failure schema, DI – Dependance schema, VU – Vulnerability to harm schema, EM – Enmeshment schema, SB – Subjugation schema, SS – Self-Sacrifice schema, EI – Emotional inhibition schema, US – Unrelenting Standards schema, ET – Entitlement schema, IS – Insufficient Self-Control schema, AS – Approval Seeking schema, NP – Negativity/Pessimism schema, PU – Punishment schema, *p < .005, **p < .001.

All correlations between EMS and the main variables (i.e., general mental health, morbid thoughts, and well-being) were significant (r from 0.1 to 0.52, $p < 0.005$ or $p < 0.001$). Moreover, a relationship was also observed between EMS and negative change in general mental health and a negative shift in well-being. In this case, not all correlations turned out to be statistically significant. The negative role of changes during the COVID-19 pandemic has been revealed for schemes: Abandonment, Vulnerability to harm, Subjugation, and Negativity/Pessimism.

Further regression tests were conducted to provide predictors of change between the time before the pandemic and the most difficult time of the pandemic). A backward stepwise linear regression analysis ($F = 10.139$, $p < 0.001$, $N = 499$) was performed to identify predictors of the dependent variable "change in general mental health" (value for the most difficult time of the pandemic minus the pre-pandemic score). The results showed that Abandonment, Subjugation, and Insufficient Self-Control were predictors of changes in mental health. The negative value of the beta coefficient for Subjugation means that as the schema becomes stronger, the

difference in general mental health is smaller. See Table 4 for a more detailed presentation of the results.

Table 4. Standardized and unstandardized coefficients of regression for variable change in GHQ

Variables	B	SE	Beta
Abandonment schema	.646	.176	.216
Subjugation schema	-.362	.210	-.104
Insufficient Self-Control schema	.371	.184	.108
R2 = .051			

The model accounts for 5.2% of the variance in GHQ change (most difficult time minus pre-pandemic).

In the same way, regression analysis ($F = 9.021$, $p < 0.001$, $N = 499$) was performed for the dependent variable "change in the subjective evaluation of well-being" (score for the pre-pandemic score minus the most difficult time of the pandemic). Self-Sacrifice and Unrelenting Standards were predictors of changes in the subjective evaluation of well-being during the COVID-19 pandemic. The well-being assessment changes more when the schemas are activated. The results are presented in Table 5.

Table 5. Standardized and unstandardized coefficients of regression for variable change in WHOQOL

Variables	B	SE	Beta
Self-Sacrifice schema	.289	.159	.09
Unrelenting Standards schema	.412	.145	.141
R2 = .039			

The model accounts for 3.9% of the variance in WHOQOL change (most difficult time minus pre-pandemic).

The lack of regression analysis concerning HASS-BREF is because the severity of suicidal ideations and behaviors concerned only a very small percentage of the sample (6% in the most difficult moments).

Discussion and conclusions

The research presented here aimed to determine predictors of change in general mental health and well-being during the COVID-19 coronavirus pandemic. Interestingly, the important predictors of changes in general mental health turned out to be Abandonment and Insufficient Self-Control. The Abandonment schema is

related to the frustration of attachment. In people with a strong Abandonment schema, the consequences of the pandemic situation, where it was impossible to fulfill the attachment need, could be more severe. The consequences include strong fear of losing close ones, a breakdown of relationships, and the resulting impact on the feeling of safety. The Insufficient Self-Control schema is related, on the one hand, to a low tolerance for frustration in achieving one's goals and, on the other hand, too little capacity to control own emotions and impulses (Roediger et al., 2018). During the pandemic, with social isolation and several externally imposed constraints, discomfort and frustration with different goals were unavoidable. Consequently, Insufficient Self-Control schema activation could aggravate symptoms of mental health disturbances related to emotions (e.g., anxiety) or depressive symptoms. It could contribute to a decrease in well-being. Presumably, people with a deficit in self-control experienced the largest drop in well-being and mental health deterioration subjectively. Unrelenting Standards schema may have contributed to a reduction in well-being, as it was only possible to meet some of the obligations and requirements of the new and unstable situation. This corresponds to the findings of other authors (Flett and Hewitt, 2020) on the psychological problems associated with the global health crisis among vulnerable perfectionists.

The results of our study on the predictive significance of such schemas as Insufficient Self-Control and Abandonment for the subjective evaluation of mental health are consistent with the findings of other researchers (Cámara, Calvete, 2012; Harris, Curtin, 2002) published before the COVID-19 pandemic.

The findings for protective factors are also interesting. The Subjugation schema, related to the surrender of control, proved to protect the respondents from the deterioration in mental health. Most likely, people who have learned to sacrifice some of their needs, despite the emotional consequences, were more resistant to the frustration of their needs caused by the pandemic, which could have mitigated the risk of developing mental health disturbances. Although it might be expected that another schema that involves sacrificing one's needs for others, namely Self-Sacrifice, should have a similar function, our study showed that this was not the case. The schema contributed to the lowering of well-being. This means that the frustration of different needs during the pandemic could be so significant that even those ordinarily willing to give up fulfilling their needs still feel the psychological consequences of that frustration.

Our research is not without limitations. The first one is the retrospective nature of the study. By asking the respondents about the pandemic's previous periods, we could find out how they evaluated the most difficult moments and their mental health after some time had passed. However, we cannot be sure if they actually felt like that. Another limitation is the use of self-report methods only for the evaluation of the mental state of the respondents. Objective tools (such as physiological tests) could provide more information. Another kind of limitation is that EMS measurement was a one-off. The results of our research do not allow us to determine to what extent the schemas contribute to the severity of symptoms of

anxiety and depression and to what extent it is symptoms (e.g., anxiety) that activate the schema. It is not known what the dynamics of EMS activation was over time. We may be dealing with a vicious circle: an active schema worsens mental health and lowers mood, which strengthens the schema, leading to further deterioration of mental health, etc. Yet another limitation, though justified, is that the study involved mainly volunteers and internet users. Our study did not cover many people in their late adulthood. Also, people with above-average severity of mental health disturbances (e.g., depression) did not participate in the study because their low mood and fatigue prevented them from engaging in a cognitively demanding task.

Our research on EMS provides new information on factors affecting a crisis response. The study showed that schemas might affect how people cope with the ongoing COVID-19 pandemic. Interestingly, the schemas that matter most to negative changes in general mental health in the COVID-19 pandemic situational crisis are linked to the frustration of two different needs: secure attachment and protection (Abandonment schema) and realistic limitations and self-control (Insufficient Self-Control schema). Therefore, the psychotherapist must focus on building a relationship with such a patient, setting boundaries, and supporting self-control-related competencies. Schema therapy can be a good model for working with a patient experiencing the pandemic's psychological effects.

As the research results presented above indicate, during the COVID-19 pandemic, many people declared a significant increase in the number of depressive or anxiety symptoms. It is known that the schemas are activated in particular in the most difficult moments when a person cannot meet the needs. However, therapeutic work outside the critical periods for the population, such as pandemics, natural disasters, or violent conflicts, is equally important. Psychoeducation in the field of maladaptive schemas and reactions to them can help people understand the role and importance of active schemas in their behaviors that aggravate problems in everyday life. For example, working with the Unrelenting Standards schema, especially on unhealthy perfectionism, by leaving the over-compensator mode and performing tasks while taking care of a sensitive child from the position of a healthy adult can help patients discover the pleasure of life. This schema enhances depressive and anxiety disorders. Patients feel inadequate in most areas, from personal to professional life. Work on reducing the impact of this schema on everyday functioning can improve people's well-being. Another example might involve working with someone with an active Abandonment schema. Regardless of whether it is the time of a pandemic or an economic crisis, the personal competence to distinguish the situation of real abandonment from the problem of escalating the fear of expected abandonment is very important. Therapeutic work with schema modes can help the patient to respond more adaptively instead of remaining in defensive or childlike modes. Imaginative techniques, such as an emotional bridge to the past with scenario change, can provide patients with an image and experience of possible fulfillment of their needs even in very difficult situations (e.g., getting help in the event of an accident or being a victim of aggression or harassment).

As part of the psychoeducation, the therapist can also show patients with an active Subjugation schema that it can temporarily play an adaptive role in exceptional situations, such as a pandemic or natural disasters. In some cases, temporary changes in conditions and subordination behaviors may be the adaptive solution. Therefore, the context (type of crisis, etc.) may provide a background for a greater or lesser impact of schema on mental health deterioration.

To sum up, the basic recommendation from the results of our research is that it is worth working on reducing the impact of maladaptive schemas on human functioning in everyday life, as this may act as a protective factor in the most difficult moments. This is a prevention with a possible clear positive role in the life of a person who struggles with specific difficulties in meeting needs. The second important recommendation concerns the therapeutic function of elaboration (reflection) with patients about the negative situations they experience (every person sooner or later may experience, for example, real rejection by someone, deception, or injury). The point is to normalize such situations in which it turns out that the world could be dangerous and not to interpret them in a way that would strengthen the schema. Empirical research of this type is, therefore, on the one hand, a contribution to the empirical testing of schema theory and, on the other hand, a source of guidance for therapeutic practice. Further research could concern which schemas are activated depending on the difficult (crisis) situation type, and the dynamics of activation of particular schemas over time.

Authors' note

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